United States Environmental Protection Agency

Clean Energy-Environment Guide to Action

Policies, Best Practices, and Action Steps for States

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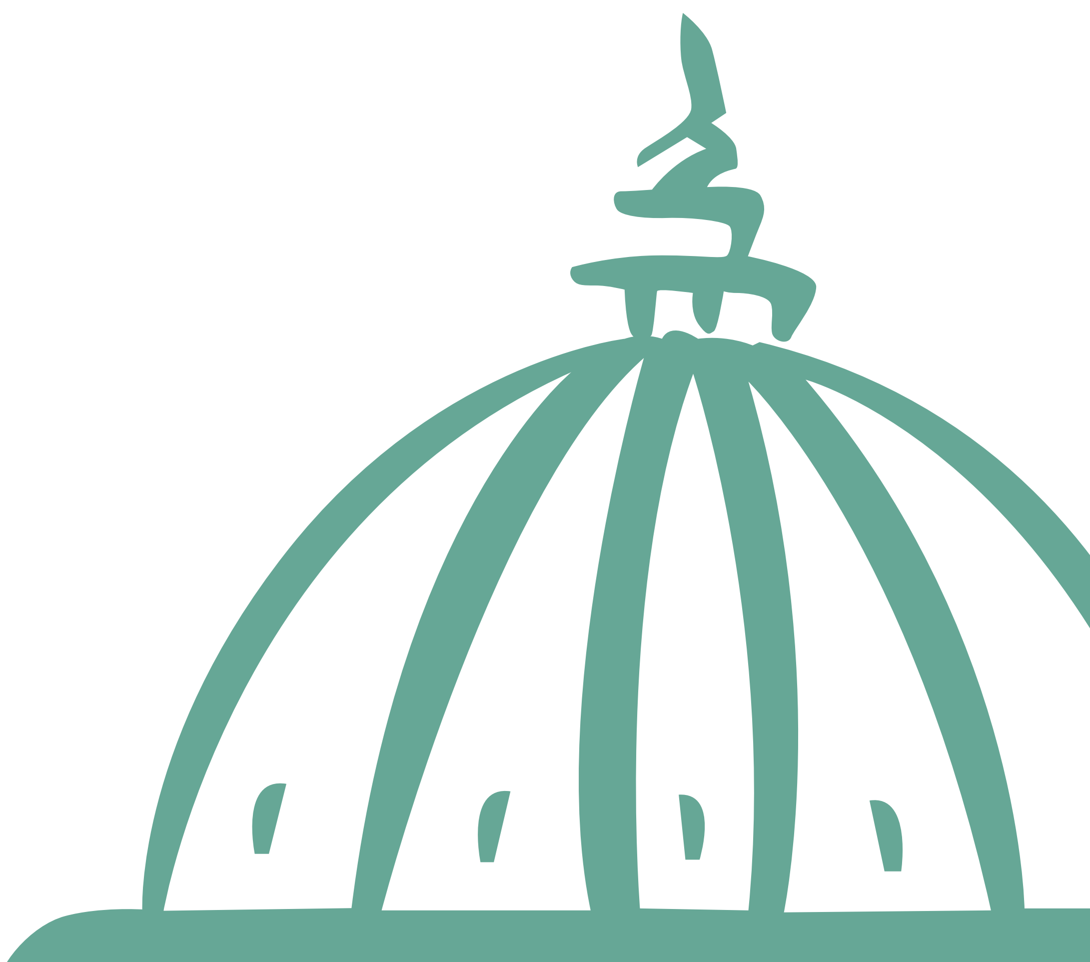

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Contents

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Preface

The *Clean Energy-Environment Guide to Action* is a cornerstone of U.S. Environmental Protection Agency's Clean Energy-Environment State Partnership Program, a voluntary program to help states incorporate clean energy into a low-cost, clean, and reliable energy system. The *Guide to Action* provides in-depth information about 16 clean energy policies and programs that states are using to meet their energy, environmental, and economic objectives. Each policy description is based on states' experiences in designing and implementing policies that enhance energy efficiency and/or increase the use of renewable energy and clean distributed generation (including combined heat and power). States have found that these 16 clean energy policies and programs offer numerous opportunities to save energy, improve air quality, reduce greenhouse gas emissions, improve system reliability and security, and enhance economic development.

The *Guide to Action* is intended for use by state energy, environment, and economic policymakers and public utility commissions. States participating in the Clean Energy-Environment State Partnership Program will use the *Guide to Action* to develop a *Clean Energy-Environment Action Plan* for employing existing and new clean energy policies to increase their use of clean energy. Other states are also encouraged to use the *Guide to Action* to examine the role clean energy can play. Any comments, questions, and corrections related to the *Clean Energy-Environment Guide to Action* and the State Partnership Program can be directed to the contacts provided in the *Guide to Action* on page ES-29.

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Key Acronyms and Abbreviations

A

ACEEE	American Council for an Energy-Efficient Economy
ACP	Alternative Compliance Payment
AEPS	Alternative Energy Portfolio Standard
ALAPCO	Association of Local Air Pollution Control Officials
APPA	American Public Power Association
APR	Annual Percentage Rate
ASAP	Appliance Standards Awareness Project
ASE	Alliance to Save Energy
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials

B

BCAP	Building Codes Assistance Project
BECI	Building Energy Conservation Initiative
BETC	Business Energy Tax Credit
Btu	British Thermal Unit

C

CAIR	Clean Air Interstate Rule
CALMAC	California Measurement Advisory Council
CCEF	Connecticut Clean Energy Fund
CEC	California Energy Commission
CEDC	Clean Energy Development Council
CESA	Clean Energy States Alliance
CFC	Chlorofluorocarbon
CFL	Compact Fluorescent Lighting
CHP	Combined Heat and Power
CIP	Conservation Improvement Program
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COBRA	Co-Benefits Risk Assessment
CONEG	Coalition of Northeast Governors
CPUC	California Public Utilities Commission

D

DEER	Database for Energy Efficient Resources
DG	Distributed Generation
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DSIRE	Database of State Incentives for Renewable Energy
DSM	Demand-Side Management

E

ECPA	Energy Conservation and Production Act
EEPS	Energy Efficiency Portfolio Standards
EE/RE	Energy Efficiency/Renewable Energy
EGRID	Emissions and Generation Resources Integrated Database
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act
ERAM	Electric Rate Adjustment Mechanism
ERCOT	Electric Reliability Council of Texas
ESCO	Energy Service Company
ESL	Energy Systems Laboratory at Texas A&M University
ESP	Electric Service Provider
ESPC	Energy Savings Performance Contracting

F

FEMP	Federal Energy Management Program
FERC	Federal Energy Regulatory Commission

G

GCVTC	Grand Canyon Visibility Transport Commission
GPCP	Green Power Choice Program
GSA	U.S. General Services Administration
GSC	Governor's Steering Committee
GSP	Gross State Product
GW	Gigawatt
GWh	Gigawatt-hour

H

HERS	Home Energy Rating System
Hg	Mercury
HVAC	Heating, Ventilation, and Air Conditioning

I

IC	Internal Combustion
ICC	International Code Council
ICLEI	International Council for Local Environmental Initiatives
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IEPR	Integrated Energy Policy Report
IES	Illuminating Engineering Society
IESNA	Illuminating Engineering Society of North America
IOU	Investor-Owned Utility
IPM	Integrated Planning Model
IPMVP	International Performance Measurement and Verification Protocol
IREC	Interstate Renewable Energy Council
IRP	Integrated Resource Planning
IRS	Internal Revenue Service
ISO	Independent System Operator

J

K

kW	Kilowatt
kWh	Kilowatt-hour

L

lb/kWh	Pounds per Kilowatt-hour
lb/MMBtu	Pounds per Million British Thermal Units
lb/MWh	Pounds (of Emissions) per Megawatt-hour
LBNL	Lawrence Berkley National Laboratory
LCOE	Levelized Cost of Electricity
LEED	Leadership in Energy and Environmental Design
LEV	Low Emission Vehicle
LRAM	Lost Revenue Adjustment Mechanism

M

MADRI	Mid-Atlantic Distributed Resources Initiative
MAIN	Mid-Atlantic Interconnected Network
MAPP	Mid-Continent Area Power Pool
MCS	Model Conservation Standards
MEC	Model Energy Code
MEEA	Midwest Energy Efficiency Alliance
Midwest ISO	Midwest Independent System Operator
MLP	Master Lease Purchase
MLPP	Master Lease Purchase Program
MMBtu	Million British Thermal Units
MMTCE	Million Metric Tons of Carbon Equivalent
$MMTCO_2e$	Million Metric Tons of Carbon Dioxide Equivalent
MRA	Monthly Revenue Adjustment
MRO	Midwest Reliability Organization

MSW	Municipal Solid Waste
M&V	Measurement and Verification
MW	Megawatt
MWh	Megawatt-hour

N

NABCEP	North American Board of Certified Energy Practitioners
NAECA	National Appliance Energy Conservation Act
NARUC	National Association of Regulatory Utility Commissioners
NBI	New Buildings Institute
NCSL	National Conference of State Legislatures
NEDRI	New England Demand Response Initiative
NEEP	Northeast Energy Efficiency Partnerships
NEGC	New England Governors' Conference
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Council
NESCAUM	Northeast States for Coordinated Air Use Management
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_x	Nitrogen Oxide
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratory
NSPS	New Source Performance Standards
NYSERDA	New York State Energy Research and Development Authority

O

OMS	Organization of Midwest Independent System Operator States
OTC	Ozone Transportation Commission

P

PBF	Public Benefits Fund
PBR	Performance-Based Ratemaking
PM2.5	Particulate Matter (2.5 micrometers or smaller)
PNNL	Pacific Northwest National Laboratory
ppm	Parts Per Million
PRAM	Periodic Rate Adjustment Mechanism
PRC	Public Regulation Commission
PSC	Public Service Commission
PTC	Production Tax Credit
PUC	Public Utility(ies) Commission
PUD	Public Utility District
PURPA	Public Utilities Regulatory Policy Act
PV	Photovoltaic
PVE	Petroleum Violation Escrow

Q

QF	Qualifying Facilities
Quad	Quadrillion British Thermal Units

R

RACT	Reasonably Available Control Technology
RAP	Regulatory Assistance Project
R&D	Research and Development
REC	Renewable Energy Credit/Certificate
REPP	Renewable Energy Policy Project
RES	Renewable Energy Standard
RESNET	Residential Energy Services Network
RETC	Residential Energy Tax Credit
RFP	Request for Proposals
RGR	Renewable Generation Requirement
RIM	Rate Impact Measure
ROE	Return on Equity
RPS	Renewable Portfolio Standard
RTO	Regional Transmission Organization

S

SBC	System Benefits Charge
SELP	State Energy Loan Program
SEP	Supplemental Environmental Project
SGIP	Self-Generation Incentive Program
SIP	State Implementation Plan
SIR	Standard Interconnection Requirements
SO_2	Sulfur Dioxide
STAPPA	State and Territorial Air Pollution Program Administrators
SWEEP	Southwest Energy Efficiency Project

T

T&D	Transmission and Distribution
TRC	Total Resource Cost
T-REC	Tradable Renewable Certificate
TWh	Terawatt-hour

U

UL	Underwriters Laboratory
USAEE/IAEE	U.S./International Association for Energy Economics
USCHPA	U.S. Combined Heat and Power Association
USGBC	U.S. Green Building Council

V

W

WAP	Weatherization Assistance Program
WGA	Western Governors' Association
WIEB	Western Interstate Energy Board
WRAP	Western Regional Air Partnership

X

Y

Z

Executive Summary

Overview

Across the country, states are using clean energy policies to help meet their expanding energy demand in a clean, low-cost, reliable manner. In addition, a growing number of states are interested in learning about successful clean energy strategies and their economic and environmental benefits.

The U.S. Environmental Protection Agency's (EPA's) *Clean Energy-Environment Guide to Action* is designed to share the experiences and lessons learned from successful state clean energy policies and help states evaluate these options, programs, and policies to determine what is most appropriate for them. The *Guide to Action* describes 16 clean energy policies, details the best practices and attributes of effective state programs, and provides resources for more information. The policies were selected from among a larger universe of clean energy strategies because of their proven effectiveness and their successful implementation.

States that are developing new clean energy programs or enhancing existing ones can use the *Guide to Action* to:

- Develop clean energy programs and policies appropriate to their state.
- Identify the roles and responsibilities of key decisionmakers—such as environmental regulators, state legislatures, public utility commissioners, and state energy offices.
- Access and apply technical assistance resources, models, and tools available for state-specific analyses and program implementation.
- Learn from each other as they develop their own clean energy programs and policies.

EPA's Clean Energy-Environment State Partnership Program

The **Clean Energy-Environment State Partnership Program** is a voluntary program designed to help states analyze and implement available policies and programs that effectively integrate clean energy into a low-cost, clean, reliable energy system for the state.

States participating in the Clean Energy-Environment State Partnership Program will use the *Guide to Action* to develop a *Clean Energy-Environment State Action Plan* for implementing existing and new energy policies and programs to increase their use of clean energy.

The EPA *Clean Energy-Environment Guide to Action* identifies and describes 16 clean energy policies and strategies that are delivering economic and environmental results for states. These policies focus on clean energy opportunities for public entities, industry, electricity generators and suppliers, homes, and businesses. There are also opportunities for states to promote clean energy in the transportation sector. These policies and programs are beyond the scope of the current *Guide to Action* but may be addressed in future editions.

Why Clean Energy?

Clean energy offers a cost-effective way to meet our nation's growing demand for electricity and natural gas while reducing emissions of air pollutants and greenhouse gases, lowering energy costs, and improving the reliability and security of the energy system.

States and the U.S. energy industry face multiple energy and environmental challenges in providing affordable, clean, and reliable energy in today's complex energy markets. In terms of energy challenges, total U.S. energy demand is expected to increase by more than one-third by 2025, with electricity demand rising by almost 40% (EIA 2005a). This growth stresses current systems, reduces reliability, and requires substantial new investment in system expansions. In addition, higher natural gas prices increase energy costs for households and businesses and raise the financial risk associated with the development of new generation based on gas technologies. Environmental challenges stem from fossil fuel-based electricity generation, which is a major source of air pollutants that form ground-level ozone and fine particulate matter, as well as greenhouse gases. Although emission levels are declining, high pollution levels persist in many parts of the United States—nearly half of the U.S. population lives in counties where air quality sometimes exceeds the federal 8-hour standard for ozone (EPA 2005a).[1]

Clean energy includes demand- and supply-side resources that deliver clean, reliable, and low-cost ways to meet energy demand and reduce peak electricity system loads. Energy efficiency measures reduce demand for energy generation, which reduces the amount of fuel needed to power our daily lives. Renewable energy sources avoid the use of fossil fuels, and combined heat and power (CHP) can provide much greater energy output for the amount of fuel used.

What Is Clean Energy?

Clean energy includes energy efficiency and clean energy supply, which refers to clean distributed generation and renewable energy.

Energy efficiency (EE) reduces demand for energy and peak electricity system loads. Common energy efficiency measures include hundreds of technologies and processes for practically all end uses across all sectors of the economy.

Renewable energy (RE) is partially or entirely generated from non-fossil energy sources. Renewable energy definitions vary by state, but usually include wind, solar, and geothermal energy; some states might also include low-impact or small hydro, biomass, biogas, and waste-to-energy.

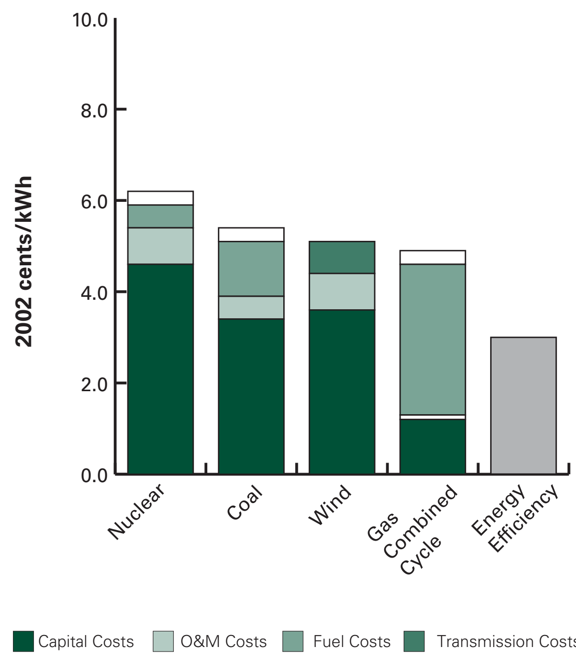
Combined heat and power (CHP), also known as cogeneration, is a clean, efficient approach to generating electric and thermal energy from a single fuel source.

Clean distributed generation (DG) refers to non-centralized—usually small-scale—renewable energy and CHP.

States are finding clean energy to be cost-competitive with traditional sources of generation. Figure ES.1 illustrates the comparative cost of electricity from a range of sources, including energy efficiency and wind. More specifically, states' experiences with clean energy programs and policies have shown that:

- *Well-Designed Energy Efficiency Programs Cost Less Than Supplying New Generation from Power Plants.* Energy efficiency programs are saving energy at an average life cycle cost of about $0.03

Figure ES.1: Clean Energy Is Competitive with Fossil Fuel and Nuclear Generation Technologies



Note: The costs for nuclear, coal, wind, and gas combined cycle are projections for the cost of producing energy from new plants in 2010. The cost for energy efficiency is a median figure based on recent reports of the cost of energy saved over a portfolio of programs in leading states.

Sources: ACEEE 2004, EIA 2004.

1 In April 2005, 134 million people were living in 470 counties where the air quality sometimes exceeds the federal 8-hour standard for ozone. Seventy-five million people were living in more than 200 counties that do not meet the PM2.5 standard (EPA 2005a).

Energy Savings Potential from State Clean Energy Actions

The potential energy savings achievable through state actions is significant. EPA estimates that if each state were to implement cost-effective clean energy-environment policies, the expected growth in demand for electricity could be cut in half by 2025, and more demand could be met through cleaner energy supply. This would mean annual savings of more than 900 billion kilowatt-hours (kWh) and $70 billion in energy costs by 2025, while preventing the need for more than 300 power plants and reducing greenhouse gas emissions by an amount equivalent to emissions from 80 million of today's vehicles.[a]

[a] This estimate is based on EPA analysis of independent evaluations of the potential for cost-effective energy efficiency investments to help meet the nation's growing demand for energy and electricity. Evaluations include a 2004 meta-analysis that examined the results of 11 different studies that estimated the potential for energy efficiency in various states and regions in the country and for the United States as a whole (Nadel et al. 2004).

per kilowatt-hour (kWh) saved, which is 50% to 75% of the typical cost of new power sources and less than one-half of the average retail price of electricity (ACEEE 2004a, EIA 2005b).

- *There Is Significant Potential for Additional Cost-Effective Investment in Energy Efficiency.* State and regional energy efficiency potential studies have found that adoption of economically feasible and technically achievable, but as yet untapped, energy efficiency could yield a 24% savings in total electricity demand nationwide by 2025, which is equivalent to a 50% or greater reduction in electricity growth (SWEEP 2002, Nadel et al. 2004, NEEP 2005, NWPCC 2005). Many states could capture a greater portion of achievable energy potential and lower energy costs for consumers and businesses by increasing spending on cost-effective energy efficiency.
- *Renewable Energy Technologies Are Increasingly Competitive with Conventional Generation.* Renewable energy continues to grow rapidly, in part because state policies are helping increase its cost competitiveness. For example, depending on geographic location, wind energy technology can produce power at about $0.04 to $0.06/kWh, which is competitive with conventional natural gas combined cycle generation (Navigant 2003). In 2004, approximately 18 gigawatts (GW) of non-hydro renewable capacity was operational in the United States, representing about 2% of total U.S. electricity generation capacity (EIA 2005c).
- *CHP Systems Are Substantially More Efficient Than Traditional Electricity Generation Purchased from the Grid and for Meeting Thermal Needs with a Boiler or Process Heater Alone.* CHP systems achieve fuel use efficiencies that typically range between 60% and 75%, a significant improvement over the average efficiency of separately generated heat and power. In 2004, approximately 80 GW of CHP were operational in the United States (EPA 2004a).

States are also using clean energy to promote economic development by reducing energy costs, creating jobs, and attracting business investments in clean energy technologies and services. For example, investment in energy efficiency leads to energy bill savings, with those savings being reinvested in the economy and supporting more jobs than if the energy were purchased (SWEEP 2002). Clean energy projects create short-term construction and installation jobs and provide numerous long-term opportunities associated with new clean energy businesses.

Clean energy addresses environmental challenges by helping improve air quality. Energy efficiency, renewable resources, and clean energy technologies such as CHP systems can reduce air pollution and greenhouse gas emissions. States are implementing a range of innovative approaches that are achieving quantifiable reductions in air pollutants through clean energy programs, policies, and measures.

Opportunities for State Action

State governments are increasingly developing policies and programs that address their energy challenges and spur greater investment in energy efficiency, renewable energy, and clean distributed resources. For example, states are:

- *Leading by example* by establishing programs that achieve substantial energy cost savings within their own state facilities, fleets, and operations and encouraging the broader adoption of clean energy by the public and private sectors. State governments across the country are collaborating with state agencies, local governments, and schools to identify and capture energy savings within their facilities and operations, purchase or generate renewable energy, and use clean DG/CHP in their facilities.
- *Establishing ratepayer-funded energy efficiency programs* (e.g., public benefits funds) to help overcome a variety of first-cost, informational, split-incentive, and other market barriers that limit greater reliance on energy efficiency. Seventeen states and Washington, D.C. have adopted public benefits funds (PBFs) for energy efficiency, and 16 states have developed PBFs for clean energy supply (ACEEE 2004b, ACEEE 2004c, UCS 2004, DSIRE 2005, Navigant 2005).
- *Adopting state minimum appliance efficiency standards* for products not covered by the federal government that yield net cost savings to businesses and consumers. Ten states have adopted appliance standards covering 36 types of appliances (Delaski 2005, Nadel et al. 2005).
- *Establishing renewable portfolio standards* (RPS) that direct electric utilities and other retail electric providers to supply a specified minimum percentage (or absolute amount) of customer load with eligible sources of renewable electricity. Twenty-one states and Washington, D.C. have adopted RPS requirements, which are expected to generate more than 26,000 MW of new renewable energy capacity by 2015 (Navigant 2005).
- *Reviewing utility incentives and planning processes* and designing policies that accurately value energy efficiency, renewables, and distributed resources in a way that "levels the playing field" so public utility commissions and consumers can make fair, economically based comparisons between clean energy and other resources. More than 12 states have developed approaches that remove disincentives for utilities to invest in demand-side resources.

The *Guide to Action*

The *Guide to Action* presents a menu of 16 clean energy strategies that states can review and choose from when developing their clean energy policies or *Clean Energy-Environment Action Plans* (see *What States Can Do*, page ES-21, for additional information about *Clean Energy-Environment Action Plans*). States have found that a combination of clean energy policies, developed as a coordinated package, is the most effective approach. Typically, states have chosen policies to address each of the clean energy areas: energy efficiency (EE), renewable energy (RE), and clean DG.

Table ES.1 provides an overview of the policies addressed in the *Guide to Action* and the type(s) of clean energy targeted by each policy. These policies were selected for inclusion in the *Guide to Action* because of their proven effectiveness, their ability to help overcome the barriers states face as they promote clean energy, and their successful implementation by a number of states. The information presented about each policy is based on proven models, state experiences, and lessons learned.

Table ES.2 presents additional detail about each of the 16 policies, including information on specific approaches states can use to implement each policy, key design issues and resources, and states that can serve as examples of each policy. (Note that many other states have also implemented these policies; for more information, see the policy sections in the *Guide to Action*.) A brief description of each of the 16 policies, including highlights of state experiences with each policy, follows Table ES.2.

Table ES.1: Summary of Clean Energy Policies by Type of Clean Energy

Clean Energy Policy	*Guide to Action* Section	Type of Clean Energy: EE	RE	Clean DG/ CHP
State Planning and Incentive Structures				
Lead by Example	3.1	●	●	●
State and Regional Energy Planning	3.2	●	●	●
Determining the Air Quality Benefits of Clean Energy	3.3	●	●	●
Funding and Incentives	3.4	●	●	●
Energy Efficiency Actions				
Energy Efficiency Portfolio Standards (EEPS)	4.1	●		
Public Benefits Funds (PBFs) for Energy Efficiency	4.2	●		
Building Codes for Energy Efficiency	4.3	●		
State Appliance Efficiency Standards	4.4	●		
Energy Supply Actions (Renewable Energy and Combined Heat and Power)				
Renewable Portfolio Standards (RPS)	5.1		●	●
Public Benefits Funds (PBF) for State Clean Energy Supply Programs	5.2		●	●
Output-Based Environmental Regulations to Support Clean Energy Supply	5.3		●	●
Interconnection Standards	5.4		●	●
Fostering Green Power Markets	5.5		●	●
Utility Planning and Incentive Structures				
Portfolio Management Strategies	6.1	●	●	●
Utility Incentives for Demand-Side Resources	6.2	●	●	●
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	6.3		●	●

Table ES.2: Summary of Clean Energy Policies

Policy Description	Specific Approaches	Design Issues	State Examples	Key Resources in the *Guide to Action*
State Planning and Incentive Structures				
Section 3.1 Lead by Example				
States lead by example by establishing programs that achieve substantial energy cost savings within their own operations, buildings, and fleets and demonstrate the feasibility and benefits of clean energy to the larger market.	• Energy savings targets for public buildings. • Renewable and energy efficiency purchase commitments for state facilities. • State loan and incentive programs for public buildings. • Energy performance contracting. • Technical support and training. • State clean energy planning.	• Understand state's own energy use and then set aggressive goals. • Collaborate across public agencies, local governments, schools, private sector, and nonprofit organizations. • Identify funding sources and develop funding mechanisms. • Measure, verify, and communicate energy savings.	CA, CO, IA, NH, NJ, NY, OR, TX	• Details about state-specific "lead by example" program design. • Evaluation guidelines and information resources. • Examples of legislation and executive orders passed by states related to lead by example actions.
Section 3.2 State and Regional Energy Planning				
Energy planning at a state or regional level can be an effective means for ensuring that clean energy is considered and used as an energy resource to help states address their multiple energy, economic, and environmental goals.	• Clean energy plan. • Clean energy included within a comprehensive state energy plan. • Planning conducted by energy providers.	• Analyze a full range of impacts for a variety of policy scenarios. • Establish specific quantitative and other goals; monitor and report progress regularly. • Link the plan to action by developing specific steps for plan adoption and implementation, and making these actions enforceable where appropriate.	CA, CT, NM, NY, OR, Northwest Power Planning and Conservation Council, New England Governors' Conference, Western Governors' Association, Western Interstate Energy Board	• Design information. • Benefits of energy plans. • Program implementation and evaluation. • Links to existing state and regional energy plans. • References to articles on energy planning.
Section 3.3 Determining the Air Quality Benefits of Clean Energy				
States estimate the emission reductions from their clean energy programs, incorporate those reductions into air quality programs, and evaluate and report the emission reduction benefits of their clean energy programs and policies.	• Incorporating clean energy into air quality plans and long-term utility planning requirements. • Developing set-asides for energy efficiency and renewable energy projects. • Tracking and reporting emission reductions.	• Choose the most appropriate methodology for the given purpose, geographic scope, time scale, magnitude of energy savings, available resources, and available data. • Make all assumptions and inputs transparent; identify how to address electricity dispatch, imports and exports, line losses, and transmission constraints. • Understand and account for how the results will interact with other programs.	LA (local), MD (local), TX, WI, Western Regional Air Partnership	• Information about EPA guidance and analyses. • General and specific information about quantification methods and tools. • Articles about quantifying emission reductions. • State examples.

(continued on next page)

Table ES.2: Summary of Clean Energy Policies (continued)

Policy Description	Specific Approaches	Design Issues	State Examples	Key Resources in the *Guide to Action*
State Planning and Incentive Structures *(continued)*				
Section 3.4 Funding and Incentives				
States implement a range of targeted funding and incentives strategies that encourage governments, businesses, and consumers to save energy through cost-effective clean energy investments. Between 20 and 30 states have revolving loan funds for energy efficiency, tax incentives for renewable energy, grants for renewable energy, or rebates for renewable energy.	• Revolving loan funds. • Energy performance contracting. • Tax incentives. • Grants, rebates, and generation incentives. • NO_x set-asides for energy efficiency and renewable energy projects. • Supplemental Environmental Projects (SEPs).	• Develop specific target markets and technologies based on technical and economic analysis. • Use financing and incentives as part of a broader package of services designed to encourage investments. • Establish specific technical and financial criteria for clean energy investments. • Track program participation, costs, and energy savings to enable evaluation and improvement.	CA, CO, IA, MT, NY, OR, TX, WA	• Program design information, including funding sources, levels, and duration. • Implementation and evaluation information. • Information about federal incentives and existing state programs. • Examples of legislation.
Energy Efficiency Actions				
Section 4.1 Energy Efficiency Portfolio Standards (EEPS)				
Similar to Renewable Portfolio Standards (see Section 5.1), EEPS direct energy providers to meet a specific portion of their electricity demand through energy efficiency. Seven states have direct or indirect EEPS requirements.	• Energy efficiency targets for energy providers as a percentage of load growth, base year sales, or fixed energy savings (e.g., kWh).	• Use economic potential studies and other analyses to help establish the energy savings target. • State the target clearly (e.g., as a percentage of base year energy sales) and establish a robust measurement and verification process. • Ensure workable funding mechanisms are available to meet the goal.	CA, IL, NJ, NV, PA, TX	• Information about state experiences. • Information about measurement and verification. • Examples of legislation and PUC rulemakings.
Section 4.2 Public Benefits Funds (PBFs) for Energy Efficiency				
PBFs for energy efficiency are pools of resources used by states to invest in energy efficiency programs and projects and are typically created by levying a small charge on customers' electricity bills. Seventeen states and Washington, D.C. have established PBFs for energy efficiency.	• Funds for efficiency programs based on a system-wide charge (mills per kWh). • Grants, rebates, and loans. • Technical assistance, education, and training support for energy efficiency investments.	• Establish funding via a universal, nonbypassable charge at a rate that captures economic energy efficiency potential, but is not a cap on investments. • Set the duration for an extended period of time (e.g., five to 10 years) to provide continuity and certainty for investors. • Select the most appropriate administering organization for the given conditions (e.g., utilities, state agencies, independent organizations). • Regularly evaluate the program's quantitative impacts (e.g., energy saved, emissions avoided, dollars saved, jobs created) and the effectiveness of program operations and delivery.	CA, NY, OR, WI	• Descriptions of cost-effectiveness tests and information on energy and cost savings. • Information about PBF program designs, funding levels, and evaluation methods. • Examples of legislation and PUC rulemakings.

(continued on next page)

Table ES.2: Summary of Clean Energy Policies *(continued)*

Policy Description	Specific Approaches	Design Issues	State Examples	Key Resources in the *Guide to Action*
Energy Efficiency Actions *(continued)*				
Section 4.3 Building Codes for Energy Efficiency				
Building energy codes establish energy standards for residential and commercial buildings, thereby setting a minimum level of energy efficiency and locking in future energy savings at the time of new construction or renovation. More than 40 states have implemented some level of building codes for residential buildings and/or commercial buildings.	• Minimum energy efficiency requirements for residential and commercial buildings. • Periodic review and updates to existing codes. • Code implementation, evaluation, and compliance assistance.	• Develop effective program implementation, evaluation, and enforcement approaches. • Work collaboratively with builders, developers, and building owners to ensure compliance. • Establish requirements and process for periodically reviewing and updating codes to reflect changes in building technology and design. • Promote "beyond code" building programs to achieve additional cost-effective energy efficiency.	AZ, CA, OR, TX, WA	• Information about individual state codes. • Compliance and analytic tools. • Examples of code language.
Section 4.4 State Appliance Efficiency Standards				
State appliance efficiency standards set minimum energy efficiency standards for equipment and appliances that are not covered by federal efficiency standards. Ten states have adopted appliance standards.	• Minimum energy efficiency levels for consumer products and commercial equipment. • Periodic evaluation and review of standards, markets, and product applications.	• Identify the products covered by federal law and carefully define the set of appliances to be covered by the state standard. • Use established test methods, as developed by federal agencies, other states, or industry associations, to set efficiency levels for the state appliance standards. • Consider implementation issues, including product certification, labeling requirements, and enforcement.	CA, CT, NJ, NY	• General and state-specific information about standards. • Definitions of products covered by federal and state standards. • Examples of enabling legislation, state rulemakings, and requests for preemption waivers.
Energy Supply Actions				
Section 5.1 Renewable Portfolio Standards (RPS)				
RPS establish requirements for electric utilities and other retail electric providers to serve a specified percentage or amount of customer load with eligible resources. Twenty-one states and Washington, D.C. have adopted RPS.	• Promoting specified technologies through "technology tiers" and "credit multipliers." • Alternative compliance payments. • Renewable Energy Certificates (RECs) trading.	• Develop broad support for an RPS, including top-level support of the governor and/or legislature by performing studies that analyze job creation, economic development, and customer bill impacts. • Specify which renewable energy technologies and resources will be eligible, based on clearly articulated goals and objectives. • Consider using energy generation (not installed capacity) as a target, make compliance mandatory for all retail sellers, allow utility cost recovery, establish cost caps, and consider flexible compliance mechanisms.	AZ, CA, MA, TX, WI	• Information on state RPS requirements and eligible technologies. • Information on selected state RPS program designs. • Description of renewable energy credits and power markets.
Section 5.2 Public Benefits Funds (PBFs) for State Clean Energy Supply Programs				
PBFs are a pool of resources used by states to invest in clean energy supply projects and are typically created by levying a small charge on customers' electricity bills. Sixteen states have established PBFs for clean energy supply.	• Funds for emerging and commercially competitive technologies and clean energy market development programs based on a system-wide charge (mills per kWh). • Grants, rebates, and generation incentives.	• Protect funding from being diverted for other uses. • Consider the importance of technology stages. • Ensure that PBFs support the state's energy and environmental goals and work in concert with other state renewable energy initiatives (e.g., RPS and tax credits).	CA, CT, MA, NJ, NY, OH	• Information on federal resources. • General and specific information on state approaches and models. • Information on funding levels and technologies supported by PBFs. • State examples.

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Table ES.2: Summary of Clean Energy Policies *(continued)*

Policy Description	Specific Approaches	Design Issues	State Examples	Key Resources in the *Guide to Action*
Energy Supply Actions *(continued)*				
Section 5.3 Output Based Environmental Regulations to Support Clean Energy Supply				
Output-based environmental regulations establish emissions limits per unit of productive energy output of a process (i.e., electricity, thermal energy, or shaft power), with the goal of encouraging fuel conversion efficiency and renewable energy as air pollution control measures. Twelve states have established output-based environmental regulations.	• Conventional emission limits using an output formula. • Special regulations for small distributed generators that are output based. • Output-based allowance allocation methods in a cap and trade program. • Output-based allowance allocation set-asides for energy efficiency and renewable energy. • Multi-pollutant emission regulations using an output-based format.	• Determine the types of DG and CHP technologies and applications that may be affected and if the regulation needs to address any specific technology issues. • Gather/review available output-based emissions data for regulated sources. Alternatively, convert available data to output-based format. • Evaluate alternative approaches to account for multiple outputs of CHP units.	CT, IN, MA, TX	• Information on federal and other resources. • Articles on output-based regulation. • Examples of federal and state legislation and program proposals.
Section 5.4 Interconnection Standards				
Standard interconnection rules establish processes and technical requirements that apply to utilities within the state and reduce uncertainty and delays that clean DG systems can encounter when obtaining electric grid connection. Fourteen states have standard interconnection rules, and 39 states offer net metering.	• Standard interconnection rules for DG systems through defined application processes and technical requirements. • Net metering, which defines application processes and technical requirements, typically for smaller projects.	• Develop standards that cover the scope of the desired DG technologies, generator types, sizes, and distribution system types. • Address all components of the interconnection process, including issues related to the application process and technical requirements. • Create a streamlined process for generators that are certified compliant with technical standards such as IEEE Standard 1547 and UL Standard 1741. • Consider adopting portions of national models and successful programs in other states.	MA, NJ, NY, TX	• State-by-state assessment and references. • Information on federal and other resources. • National standards organizations. • Examples of standard interconnection rules.
Section 5.5 Fostering Green Power Markets				
States play a key role in fostering the development of voluntary green power markets that deliver cost-competitive, environmentally beneficial renewable energy resources by giving customers the opportunity to purchase clean energy. Green power is available in more than 40 states.	• Customer access to green power markets. • Green pricing tariffs. • Green "check-off" programs. • Establishing quantitative goals and objectives for green power markets.	• Encourage new resources to ensure that renewable benefits are realized. • Create real value for green power customers (e.g., by exempting them from utility fuel adjustment charges or developing recognition programs for commercial customers). • Create programs with sufficiently long time horizons to encourage long-term power contracts. • Determine the appropriate relationship between green power purchases and compliance with RPS.	CT, MA, NJ, NM, WA	• Information about state programs. • Examples of state legislation and regulations. • Information on federal and other resources.

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Table ES.2: Summary of Clean Energy Policies *(continued)*

Policy Description	Specific Approaches	Design Issues	State Examples	Key Resources in the *Guide to Action*
Utility Planning and Incentive Structures				
Section 6.1 Portfolio Management Strategies				
Portfolio management strategies include energy resource planning approaches that place a broad array of supply and demand options on a level playing field when comparing and evaluating them in terms of their ability to meet projected energy demand and manage uncertainty.	• Energy resource planning and procurement. • Integrated resource planning (IRP). • Retail choice portfolio management.	• Identify state policy goals for portfolio management, such as cost, environmental impacts, resource diversity, and risk management. • Identify the entities that procure and plan for energy supply, transmission, and distribution. • Determine the appropriate process for acquiring and comparing alternative resource options. • Establish clear roles for utility and regulatory authorities in selecting evaluation criteria, reviewing proposals, and choosing final resources. • Require that all demand and supply resources be considered in meeting identified needs.	CA, CT, IA, MT, NV, OR, PA, VT, Idaho Power, Northwest Power and Conservation Council, PacifiCorp, Puget Sound Energy	• Design guidance. • Information on program implementation and evaluation. • State and regional examples and links to key references.
Section 6.2 Utility Incentives for Demand Side Resources				
A number of approaches—including decoupling and performance incentives—remove disincentives for utilities to consider energy efficiency and clean distributed generation equally with traditional electricity generation investments when making electricity market resource planning decisions.	• Decoupling utility profits from sales volume. • Program cost recovery. • Shareholder performance incentives.	• Understand state utility ratemaking and revenue requirements. • Determine if utility rates create financial disincentives for energy efficiency and clean distributed generation. • Gather information and stakeholder input on utility incentive options. • Devise an implementation plan to remove disincentives.	AZ, CA, CT, ID, MA, MD, ME, MN, NM, NV, NY, OR, WA	• Design guidance. • References to state incentive regulation efforts. • References to articles and Web sites on utility incentives.
Section 6.3 Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation				
Electric and natural gas rates, set by Public Utility Commissions, can be designed to support clean DG projects and avoid unintended barriers, while also providing appropriate cost recovery for utility services on which consumers depend.	• Utility ratemaking and revenue requirements. • Revised standby rate structures. • Exit fee exemptions. • Natural gas rates for DG and/or CHP. • In regulated markets, help generators and utilities establish appropriate buyback rates.	• Ensure that state PUC commissioners and staff have current and accurate information on rate issues for CHP and renewables and their potential benefits for the generation system. • Open a generic PUC docket, if needed, to explore the actual costs and system benefits of onsite clean energy supply and rate reasonableness. • Engage energy users to accurately examine the costs and system benefits of existing and planned onsite clean DG.	*Exit Fees:* CA, IL, MA *Standby Rates:* CA, NY *Gas Rates:* NY	• Examples of state legislation and rules. • Information on federal resources. • Articles about ratemaking.

State Planning and Incentive Structures

States are substantially reducing energy costs and emissions and are supporting in-state economic development through clean energy policies. The *Guide to Action* provides resources on the following policies that states have successfully implemented to promote clean energy within their own operations, through state and regional energy and air quality planning efforts, and funding and incentive programs.

Lead by Example

State and local governments are implementing a range of "lead by example" programs and policies that advance the use of clean energy within their own facilities, fleets, and operations, substantially reducing their energy bills. These bills are sizable—states are responsible for more than 16 billion square feet of building space and spend more than $11 billion annually on building energy costs, which can account for as much as 10% of a typical government's annual operating budget (DOE 2005a). In addition to achieving energy savings within state facilities, lead by example initiatives promote the adoption of clean energy technologies by the public and private sectors.

States have initiated lead by example initiatives through executive orders, legislation, and agency rulemakings. Typically, these initiatives are coordinated by the state energy office, and involve multiple agencies and programs across state and local government and other public agencies.

States Are Leading by Example

- *New York's* "Green and Clean" State Buildings and Vehicles, administered by the New York State Energy Research and Development Authority (NYSERDA), sets aggressive targets for reducing energy use in state buildings and vehicles, green power purchasing, and purchasing energy efficient products.
- *Iowa's* Executive Order Number 41 directs state agencies to obtain at least 10% of their electricity from renewable energy sources by 2010. To satisfy this requirement, agencies may generate their own renewable energy or may participate in their utility's green power programs (Iowa 2005).
- *New Hampshire's* Executive Order 2005-4 requires state agencies to reduce energy use by 10% and purchase ENERGY STAR equipment. Executive Order 2004-7 requires state staff to conduct an inventory of annual energy use by all state facilities, using EPA's Energy Performance Rating System to assess energy efficiency, and to conduct audits to identify energy efficiency opportunities in state facilities.

State and Regional Energy Planning

Energy planning at a state or regional level is an effective means for ensuring that clean energy is considered and used as an energy resource to help states address their multiple energy and nonenergy

States and Regions Are Developing Energy Plans

- *California's* Integrated Energy Policy Report (IEPR) is an extensive assessment prepared biennially at the direction of the state legislature. It includes policy recommendations for addressing multiple goals, including conserving resources; protecting the environment; ensuring reliable, secure, and diverse energy resources; enhancing the state's economy; and protecting public health and safety. The IEPR is complimented by a brief "blueprint" for energy-related actions, the California "Energy Action Plan" (CEC 2005a).
- The *Connecticut Energy Advisory Board* develops an Annual Energy Plan that includes specific strategies to support energy efficiency and renewable resources based on a detailed assessment of supply and demand options and related policy opportunities and challenges. The Plan describes how programs and policies across the state help advance Connecticut's energy and other goals and includes a progress report on the Connecticut Climate Change Action Plan, as a significant energy-related initiative (CEAB 2005).
- The *Western Governors' Association's Clean and Diversified Energy Advisory Committee (CDEAC)*, created by the governors of 18 western states, recently undertook an extensive analysis to explore how to meet a regional goal of developing 30,000 MW of clean energy by 2015 and increasing energy efficiency 20% by 2020 (WGA 2005).

challenges. Energy planning helps support a cost-effective response to projected load growth (possibly avoiding the need for new power plants and infrastructure); improves system reliability, supply diversity, and security; reduces energy prices and price volatility; and reduces the environmental impact of energy generation. Energy plans are usually developed by one or more state agencies. Typically, the state energy office leads the planning effort, and a variety of public and private sector stakeholders play a role in developing the plan or providing input.

Energy planning takes place in several contexts—it can be part of a broad, multi-faceted strategy (e.g., the New York State Energy Plan), or a more targeted effort that specifically addresses one or more clean energy goals (e.g., the Illinois Sustainable Energy Plan). At the regional level, planning typically occurs in two separate but related forums. In one approach, government or quasi-government entities (e.g., governors' associations) focus on developing broad regional policy approaches. Alternatively, power system operators engage in rigorous power system planning (with input from states) that focuses on providing reliable and adequate power supplies within their region. Both forums offer opportunities to consider clean energy as a way of meeting future energy demand.

Determining the Air Quality Benefits of Clean Energy

Meeting energy demand through clean energy sources can reduce emissions from fossil-fueled generators and provide many emissions benefits. States are employing a number of methods to quantify the emission reductions from their clean energy programs and policies and incorporate those reductions into documentation for air quality planning efforts, energy planning, and clean energy program results.

Quantifying emission reductions from clean energy options provides states with additional information to use when selecting among alternative clean energy solutions, determining the best way to design clean energy programs to comply with existing and prospective regulations, and determining the best investment opportunities for a specific clean energy program. Some states are working with EPA to include clean energy as an emission reduction measure in air quality plans. EPA provides guidance and can help states identify ways to use emission reduction data and appropriate quantification methods and documentation requirements (EPA 2004b).

States Are Identifying the Air Quality Benefits of Clean Energy

- The *Texas* Legislature passed the Texas Emissions Reduction Plan in 2001, requiring counties to implement energy efficiency measures and reduce electricity consumption 5% a year for five years to help the state comply with federal emissions limits and standards. The Texas Commission on Environmental Quality worked with EPA and several Texas organizations to develop a methodology for quantifying the nitrogen oxide (NO_x) emission reductions associated with energy savings from individual clean energy projects.
- The *Western Regional Air Partnership (WRAP)* was established in 1997 to help incorporate 10% renewable energy into its resource mix by 2010 and 20% by 2015 in an effort to reduce regional haze. A WRAP study of the air emission reductions from state clean energy programs estimated that NO_x emissions would be reduced by about 14,000 tons and carbon dioxide (CO_2) emissions by about 56 million metric tons by 2018 (WRAP 2003).

Funding and Incentives

States are using well-designed, targeted funding and incentives for a broad range of clean energy technologies and services. State funding and incentive programs, some of which are self-sustaining (e.g., revolving loan funds), deliver energy and cost savings for governments, businesses, and consumers. These programs help overcome barriers, stimulate markets and build infrastructure, and leverage public and private sector investment. States have made additional investments and achieved subsequent savings by coordinating financial incentives with federal incentives (e.g., the production tax credit for renewable energy generation), other state programs, and utility-based clean energy programs.

States Are Providing Funding and Incentives for Clean Energy

- The *Texas* LoanSTAR program is a self-sustaining program that provides low-interest loans to finance energy conservation retrofits in state public facilities. Loans are repaid in four years or less using cost savings from verified energy reductions. Public agencies in Texas have reduced their energy costs by more than $150 million through the LoanSTAR program (DOE 2005c, Texas SECO 2005).
- *Oregon* offers the Business Energy Tax Credit (BETC) and Residential Energy Tax Credit (RETC) to businesses and residents. Through 2004, more than 12,000 energy tax credits worth $243 million have been awarded. Altogether, these investments save or generate energy worth about $215 million a year (Oregon DOE 2005).

Energy Efficiency Actions

States have implemented a variety of policies and programs that encourage investment in and adoption of energy efficiency. Cost-effective energy efficiency programs can be structured to help remove the key market, regulatory, and institutional barriers that might otherwise hinder investment in energy efficiency measures by consumers, businesses, utilities, and public agencies. The *Guide to Action* describes four energy efficiency policies that a number of states have successfully implemented to support greater investment in and adoption of energy efficiency.

Energy Efficiency Portfolio Standards (EEPS)

EEPS require energy providers to meet a specific portion of their electricity demand through energy efficiency. A relatively recent policy tool, EEPS have been developed primarily in states with restructured utility markets, typically as a partial replacement for their Integrated Resource Planning (IRP) requirements. EEPS offer several policy advantages, including simplicity, specificity, and economies of scale.

To date, seven states have adopted EEPS either directly or indirectly (with energy efficiency as a component of a larger clean energy target or goal). Overall, these EEPS targets range from the equivalent of a 10% to 50% reduction in energy demand growth (EPA 2005b). Specific EEPS designs vary by state. Some states, such as California, have established specific energy savings goals defined in terms of the amount of savings (e.g., expressed as MW, megawatt-hours [MWh], and/or therm savings) required over a specified time frame. Other states (e.g., Connecticut, Texas, and Illinois) require utilities to use energy efficiency to meet a specified percentage of total energy sales or forecast load growth over a certain time period. EEPS targets have been established by state legislatures and are administered by the state public utility commission (or other regulatory body), with input from utilities, public interest organizations, and the general public.

States Are Adopting Energy Efficiency Portfolio Standards

- The *California* EEPS sets ambitious annual energy savings goals for the period 2004 to 2013 for the state's four largest investor-owned utilities (IOUs). The cumulative effect of these goals is estimated to result in annual savings in 2013 of 23,183 GWh, 4,885 MW of peak demand, and 444 million therms of natural gas and to meet more than half of the IOUs' electricity sales growth and nearly half of natural gas sales growth (CPUC 2004, CEC and CPUC 2005).
- *Texas* was the first state to implement an EEPS. The Texas PUC calculated that it has exceeded its target of a 10% reduction in load growth by 2004 and has saved more than 400 million kWh of electricity at a cost of $82 million, for a net benefit of $76 million to date (Gross 2005).

Public Benefits Funds (PBFs) for Energy Efficiency

Many states have found that PBFs, also known as system benefits charges (SBCs) or clean energy funds, are an effective mechanism for securing investment in cost-effective energy efficiency, resulting in lower-cost, cleaner energy. PBFs are typically created by levying a small charge on every customer's electricity bill, thus providing an annual revenue stream to fund energy efficiency programs. States with restructured as well as traditional electricity markets are using PBFs as a component of their clean energy policy portfolios.

To date, 17 states and Washington, D.C. have established PBFs to support energy efficiency at various levels of funding (ACEEE 2004b, ACEEE 2004c). For the more comprehensive programs, funding levels range from about 1% to 3% of total utility revenues. PBF charges range from 0.03 to 3 mills[2] per kWh and are equivalent to about $0.27 to $2.50 on a residential customer's monthly energy bill (ACEEE 2004b).

PBFs have supported programs that reduce energy demand and related emissions at a lower cost than new supply. For example, for just 12 of the states with energy efficiency PBFs, total annual investments of about $870 million in 2002/2003 yielded nearly 2.8 million kWh of electricity savings. Emission reductions from nine of these states included a total of 1.8 million tons of CO_2. The median program cost was $0.03 per kWh saved, which is 50% to 75% of the typical cost of new power sources and less than half of the average retail price of electricity (ACEEE 2004a, EIA 2005b).

States Are Establishing Public Benefits Funds for Energy Efficiency

- In *New York*, NYSERDA administers the PBF program with the goals of improving system-wide reliability, reducing peak load, improving energy efficiency and access to energy options for underserved customers, reducing environmental impacts, and facilitating competition in the electricity markets. NYSERDA has invested more than $350 million in energy efficiency programs and brought about an estimated additional investment of $850 million, for a total of $1.2 billion in public and private sector energy- and efficiency-related investments in the state. The program is expected to result in a total of $2.8 billion in new public and private investment in New York (NYSERDA 2004).
- *California* established the first PBF for energy efficiency in 1996. The California Public Utility Commission (CPUC) provides policy oversight of the state PBF (known in the state as the "Public Goods Charge"), approves plans for efficiency programs in each of the utility service areas, and coordinates statewide activities. The PBF provides $289 million annually for energy efficiency programs, at a cost of less than 3 cents per kWh saved. The CPUC has adopted aggressive energy efficiency savings goals for regulated electric and natural gas utilities, which will capture additional cost-effective energy savings, with $2 billion authorized for energy efficiency programs in 2006–2008. This investment will achieve $2.7 billion in net savings to consumers and meet more than half of future electricity load growth over the next decade—avoiding the need for three large (500 MW) power plants (CPUC 2005).
- The *Wisconsin* PBF, Focus on Energy, is a public-private partnership with the goals of encouraging energy efficiency and renewable energy, enhancing the environment, and ensuring a future supply of energy. This program realized a total lifetime energy savings of $214.5 million during FY 2004 for a program benefit-cost ratio of 5.4 to 1 (WI DOA 2004).

[2] A mill is equivalent to one-tenth of a cent.

Building Codes for Energy Efficiency

Building energy codes establish standards that set a minimum level of energy efficiency for residential and commercial buildings, thereby locking in the energy savings at the time of new construction or renovation. Well-designed, implemented, and enforced codes can help eliminate inefficient construction practices and technologies with little or no increase in total project costs.

Codes typically specify requirements for "thermal resistance" in the building shell and windows, minimum air leakage, and minimum heating and cooling equipment efficiencies. These measures can reduce energy use by 30% or more, resulting in cost savings for businesses and consumers (DOE 2005b). Building energy codes also reduce peak energy demand, air pollution, and greenhouse gas emissions. Recognizing these benefits, a majority of states have adopted building energy codes in some form for residential and commercial construction.

State Appliance Efficiency Standards

State appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products that are not already covered by federal efficiency standards. Federal laws such as the recent Energy Policy Act of 2005 (EPAct 2005) have established appliance efficiency standards for more than 40 products. States are preempted from setting their own standards for the products covered by federal standards but can enact standards for products that are not yet covered by federal law (which in many cases emerged from state standard-setting activities) or may petition for a waiver under particular circumstances. Ten states have adopted standards covering a total of 36 types of appliances and at least two additional states are considering adopting standards (Delaski 2005, Nadel et al. 2005).

States Are Implementing Building Energy Codes for Energy Efficiency

- *California's* Title 24 standards for residential and commercial buildings are stringent and well enforced. They include a combination of performance-based and mandatory provisions that are expected to yield $43 billion in electricity and natural gas savings by 2011. The standards are expected to reduce annual energy demand by 180 MW, equivalent to the electricity requirements of 180,000 average-sized California homes (CEC 2003).
- *Oregon and Washington* take a simple and prescriptive approach to building energy codes. The result is a high level of code compliance; a recent construction practice survey found that 94% of homes surveyed in Washington and 100% in Oregon met or exceeded code requirements for the building envelope (Ecotope 2001).

States Are Implementing Appliance Efficiency Standards

- *California* was the first state to initiate an appliance efficiency standards program (in 1977) and maintains the most active and well-funded standards program of any state. California law now covers 30 products; new or upgraded standards are under consideration for three products. Operated by the California Energy Commission (CEC), the appliance standard program is currently reducing peak electric demand by about 2,000 MW or about 5% of peak load. These savings account for about 20% of California's total peak demand reductions from all efficiency programs over the past 20 years (CEC 2005a, CEC 2005b).
- *New York's* Appliance and Equipment Energy Efficiency Standards Act of 2005 established state energy efficiency standards for 14 household appliances and electronic equipment not covered by federal standards. The law also requires efficiency standards for electronic products that use standby power when they are turned off but remain plugged in (e.g., DVD players and recorders) to reduce "phantom" energy consumption. These standards are expected to save 2,096 GWh of electricity annually, enough to power 350,000 homes. This equates to annual savings of $284 million per year (State of New York 2005).

Energy Supply Actions

States can achieve a number of environmental and economic benefits by encouraging the development of clean energy supply (i.e., renewable energy and CHP) as part of a balanced energy portfolio. The *Guide to Action* describes five policies that states have successfully used to support and encourage continued growth of clean energy supply in their state.

Renewable Portfolio Standards (RPS)

RPS provide states with a tool to increase the amount of renewable energy using a cost-effective, market-based approach. RPS, which can be used in both regulated and restructured electricity markets, require electric utilities and other retail electric providers to supply a specified minimum percentage or amount of customer load with eligible sources of renewable electricity. As of September 2005, RPS requirements have been established in 21 states and Washington, D.C. More than 2,300 MW of new renewable energy capacity (through 2003) is attributable to RPS programs. RPS is cited as the driving force behind the installation of approximately 47% of new wind capacity additions in the United States between 2001 and 2004 (Bird and Swezey 2004).

PBFs for State Clean Energy Supply Programs

PBFs for clean energy supply accelerate the development of renewable energy and CHP within a state. They are typically created by levying a small fee or surcharge on customers' electricity rates (e.g., for renewable energy, this fee ranges from approximately 0.01 to 0.1 mills/kWh). While PBFs have traditionally been used to fund energy efficiency and low-income programs, states have recently begun to implement PBFs to support clean energy supply. PBFs were initially established by states undergoing electricity market restructuring but are now used by both restructured states and states with traditional electricity markets.

As of 2005, 16 states had established renewable energy programs that are expected to provide more than $300 million annually in support of clean energy supply. PBFs will provide much of this funding; according to one estimate, clean energy funding will total $4 billion by 2017 (UCS 2004, DSIRE 2005, Navigant 2005).

States Are Implementing Renewable Portfolio Standards

- *Texas* was among the first states to establish a RPS requirement and is considered by many policymakers and advocates to be among the most successful. Between 1999, when the RPS was initiated, and February 2005, 1,187 MW of renewable energy capacity was installed in Texas. The Texas RPS includes long-term contracts, penalties for noncompliance, and RECs trading.
- *California's* RPS—enacted by the state legislature in September 2002—is among the most aggressive in the country. The RPS requires retail sellers of electricity to purchase 20% renewable electricity by 2017. At a minimum, retailers must increase their use of renewable electricity by 1% each year. California is considering increasing the RPS requirement to 33% by 2020 (CEC 2005a).

States Are Establishing Public Benefits Funds for State Clean Energy Supply Programs

- *New Jersey's* clean energy initiative, administered by the New Jersey Board of Public Utilities, provides information and financial incentives and creates enabling regulations designed to help New Jersey residents, businesses, and communities reduce their energy use, lower costs, and protect the environment. New Jersey's Clean Energy Program has three components: residential programs, commercial and industrial programs, and renewable energy programs. CHP is funded as an efficiency measure through the commercial and industrial programs.
- In *New York*, the New York State Energy Research and Development Authority (NYSERDA) administers the New York Energy $mart program, which is designed to support certain public benefits programs during the transition to a more competitive electricity market. About 2,700 projects in 40 programs are funded by a charge on the electricity transmitted and distributed by the state's investor-owned utilities.

Output-Based Environmental Regulations to Support Clean Energy

Designing environmental regulations that account for the emission reduction benefits of energy efficiency, renewable energy, and CHP increases the attractiveness for facilities to install clean energy technologies and increase efficiency. Output-based environmental regulations, which relate emissions to the productive output of a process, accomplish this by encouraging the use of fuel conversion efficiency and renewable energy as air pollution control measures. For electric generation, this unit of measure is the amount of emissions per MWh (lb/MWh). In contrast, most environmental regulations for power generators and boilers have historically established emission limits based on heat input or exhaust concentration (lb/MMBtu or parts per million [ppm]). These traditional input-based limits do not account for the pollution prevention benefits of process efficiency in ways that encourage the application of more efficient generation approaches.

Interconnection Standards

Standard interconnection rules encourage the connection of clean distributed generation (DG) systems (i.e., renewable and CHP) to the electric grid by establishing uniform processes and technical requirements that apply to utilities within a state. These rules reduce the uncertainty and prevent long delays and costs that clean DG systems may encounter when obtaining approval for grid connection. In addition, some states use net metering rules to govern interconnection of smaller DG systems. Net metering, which can be considered a subset of interconnection standards for small-scale projects, allows smaller DG owners to offset power that they obtain from the grid with excess power that they can supply

States Are Developing Output-Based Regulations

- *Connecticut* has adopted an output-based regulation for NO_x, particulate matter, carbon monoxide (CO), and CO_2 from small distributed generators (< 15 MW capacity), including CHP. The regulation values the efficiency of CHP based on the emissions that are avoided by not having separate electric and thermal generation. Connecticut also allocates allowances based on energy output in its NO_x trading program.
- *Massachusetts* has incorporated the output-based approach in several important regulations. The Massachusetts NO_x cap and trade program allocates emission allowances to affected sources (generators > 25 MW) on an output basis, including the thermal output of CHP. This approach provides a significant economic incentive for CHP within the emissions cap. Massachusetts also has a multi-pollutant emission regulation (NO_x, sulfur dioxide [SO_2], mercury [Hg], CO_2) for existing power plants, which uses an output-based format for conventional emission limits. In addition, Massachusetts allocates 5% of its NO_x state trading program budget to a public benefits set-aside account to provide for allocations for energy efficiency and renewable energy.

States Are Establishing Interconnection Standards

- In *New Jersey*, the New Jersey Board of Public Utilities developed net metering and interconnection standards for Class I renewable energy systems. These rules, which became effective on October 4, 2004, are separated into three levels based on system size and technical certification. Each level has specific interconnection review procedures and timelines for each step in the review process. The New Jersey interconnection standard is designed to support systems up to 2 MW.
- In *Texas*, the Texas Public Utility Commission adopted substantive rules in November 1999 that apply to generation facilities of 10 MW or less that connect to distribution-level voltages at the point of common coupling. These rules are intended to streamline the interconnection process for applicants, particularly those with smaller devices and those that are likely to have minimal impact on the electric utility grid. This ruling applies to both radial and secondary network systems[a] and requires Texas utilities to evaluate applications based on pre-specified screening criteria, including equipment size and the relative size of the DG system to feeder load.

[a] A radial distribution system is the most common electric power system. In this system, power flows in one direction from the utility source to the customer load.

through their grid connection. As of November 2005, 14 states had adopted standard interconnection requirements for distributed generators and seven additional states were in the process of developing similar standards. As of early 2005, 39 states and Washington, D.C. had rules or provisions for net metering (Navigant 2005).

Fostering Green Power Markets

Green power is a small but growing market that provides electricity customers the opportunity to make environmental choices about their electricity consumption by purchasing electricity generated by renewable resources. Green power programs in more than 40 states currently serve approximately 540,000 customers, representing nearly 4 billion kWh annually. These green power markets have resulted in the construction of more than 2,200 MW of new renewable capacity over the past 10 years. A recent study estimates this could reach 8,000 MW by 2015 by giving customers the choice to support cleaner electricity generation options in both vertically integrated and competitive retail markets (Wiser et al. 2001).

Because participation in green power programs is voluntary, the role for states may be more limited than with other clean energy policy options, but it is still important. In vertically integrated markets (i.e., states where regulated utilities perform generation, transmission, and distribution functions), several states require utilities to offer a green pricing tariff. This policy ensures that all customers have the option available to them. In restructured markets, green power products are available from a range of competitive suppliers. Customers are also increasingly able to add renewable energy to their default service with "green check-off" programs, which enable customers to select green power while maintaining service with the default provider.

States Are Encouraging Green Power Markets

- *New Jersey* is the first state with restructured electricity markets to institute a statewide voluntary green power program. The New Jersey Clean Energy Council established a goal to double the amount of green electricity purchased by electric customers and increase the load served by qualified renewable resources by 50% over the Class I RPS. The state's Green Power Choice Program supports this goal by implementing a statewide green check-off program that requires utilities to offer retail electricity customers the option of selecting an energy product with a higher level of renewable energy than required by the state RPS.
- *New Mexico* provides a state-mandated utility green pricing program that was created by regulatory authority. In 2002, the New Mexico Public Regulation Commission (PRC) adopted regulations requiring all investor-owned utilities and electric cooperatives in the state to offer their customers a voluntary renewable energy tariff. These tariffs allow consumers the option of purchasing more renewable energy than is required by the RPS, range from 1.8 cents/kWh to 3.2 cents/kWh, and combine varying mixes of wind, solar, and biomass. Utilities are also required to develop educational programs for their customers on the benefits and availability of the voluntary renewable energy program (DOE 2005d).

Utility Planning and Incentive Structures

Long-term utility planning policies and incentive structures play an important role in determining the attractiveness of investments in energy efficiency and clean DG. In many states, utility profits are reduced if they experience decreased energy sales as a result of aggressive investments in energy efficiency or customer-sited DG. The *Guide to Action* describes specific approaches state PUCs can use to address these disincentives to creating low-cost, clean energy markets by allowing for a fair, economically based comparison between supply- and demand-side resource alternatives.

Portfolio Management Strategies

Portfolio management refers to the electric utility's energy resource planning and procurement strategies, covering both supply- and demand-side resources. State PUCs are requiring electric utilities to conduct portfolio management as a way to provide least-cost and stable electric and natural gas

States Are Requiring Utilities to Manage Their Portfolios

- The *Northwest Power and Conservation Council's* Fifth Northwest Electric Power and Conservation Plan includes policies to enable the region to manage uncertainties that affect the power system and mitigate risks associated with these uncertainties. Clean energy options promoted in the plan include energy conservation and efficiency (targeted at 700 MW between 2005 and 2009), demand response (targeted at 500 MW between 2005 and 2009), and wind power (targeted at 1,100 MW between 2005 and 2014 from system benefits charges and utility integrated resource plans) (Northwest Power and Conservation Council 2005).
- In *California*, the CPUC requires each utility to submit a 10-year procurement plan biennially. Each plan must demonstrate that the utility has adequate, reliable supplies and complies with CPUC goals for efficiency and renewable energy. Utilities must prioritize their resource procurements by following the "loading order" established in the state's Energy Action Plan (EAP), as follows: (1) energy efficiency and demand response, (2) renewable energy (including renewable DG), and (3) clean fossil-fueled DG and clean fossil-fueled central-station generation. CPUC authorized $2 billion in procurement funding for energy efficiency programs from 2006 to 2008. These measures are expected to achieve $2.7 billion in net savings to consumers and avoid the need for three large (500 MW) power plants (CPUC 2005).

service to customers over the long term. Portfolio management can also increase energy efficiency, renewable generation, and clean DG in order to address reliability, safety, and environmental issues.

Portfolio management strategies are implemented through individual utilities' integrated resource plans in states served by regulated, vertically integrated utilities. These plans consider a broad array of supply and demand options using predefined criteria for evaluating options to meet projected needs. They compare a utility's current and projected future generation needs to all of its available generation demand- and supply-side options. "Retail Choice" portfolio management strategies refer to portfolio management by deregulated utilities. These strategies strive to protect consumers from high electricity prices by requiring competitive procurement policies. In either case, an ideal portfolio is diversified and involves choosing among a variety of electricity products and contracts, including energy efficiency, renewables, and clean DG, to enable the utility to adapt to shifting market conditions.

Utility Incentives for Demand-Side Resources

States are reworking traditional electric and gas utility rate structures to incorporate incentives for demand-side resources (e.g., energy efficiency and clean DG). Traditional ratemaking structures link a utility's financial health to the volume of electricity or gas it sells, thus providing a disincentive to investing in cost-effective demand-side resources that reduce sales. Aligning utilities' investment incentives with state interests of providing efficient, affordable, and reliable energy can "level the playing field" to allow for a fair,

States Are Creating Incentives for Utilities to Invest in Demand-Side Resources

- In 2005, *California* re-adopted a revenue balancing mechanism that applies between rate cases and removes the throughput disincentive by allowing for rate adjustment based on actual electricity sales. The California public utilities are also returning to larger-scale promotion of energy efficiency through their demand-side management programs. Simultaneously, the CPUC is revising its policies to establish a common approach for evaluating the performance of energy efficiency programs that defer more costly supply-side investments (CEC and CPUC 2005).
- In September 2002, the *Oregon* PUC adopted a partial decoupling mechanism for one of its gas utilities, Northwest Natural Gas, that uses a price elasticity adjustment and a revenue deferral account (Oregon PUC 2002). An evaluation found that the mechanism reduced, but did not completely remove, the link between sales and profits and that it "is an effective means of reducing NW [Northwest] Natural's disincentive to promote energy efficiency" (Hansen and Braithwait 2005).

economically based comparison between supply- and demand-side resource alternatives.

States with incentive policies for demand-side resources have implemented policies that: (1) remove disincentives by "decoupling" profits from sales volumes, (2) ensure that utilities recover their costs for effective, economic energy efficiency and clean DG programs, and (3) create incentives for utility managers and shareholders to actively invest in well-run and high-performing energy efficiency and clean DG programs.

Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation

The unique operating profile of clean energy supply projects (i.e., renewable energy and CHP) may require different types of rates and different rate structures. However, if not properly designed, these rates and charges can create unnecessary barriers to the use of renewables and CHP. Appropriate rate design is critical to allowing utility cost recovery while also providing appropriate price signals for clean energy supply.

Customer-sited clean energy supply projects are usually interconnected to the power grid and may purchase electricity from or sell to the grid. Electric utilities typically charge these customers special rates for electricity and for services associated with this interconnection. These rates include exit fees, standby rates, and buyback rates. A key state PUC objective is to ensure that consumers receive reliable power at the lowest cost. In approving these rates, the PUC can support renewable and CHP projects and avoid unanticipated barriers while also providing appropriate cost recovery for the utility services on which consumers depend.

As of early 2005, several states had evaluated or begun to evaluate utility rate structures and had made changes to promote CHP and renewables as part of their larger efforts to support cost-effective clean energy supply as an alternative to expansion of the electric grid. This type of work is typically conducted by the state PUC through a formal process (i.e., docket or rulemaking) that elicits input from all stakeholders.

States Are Developing Utility Rates to Support Clean Energy Supplies

- In *California*, several types of exit and transition fees exist that are handled differently depending on the utility. Fee exemptions exist for various classes of renewable and CHP systems, including: systems smaller than 1 MW that are net-metered or are eligible for CPUC or CEC incentives for being clean and super-clean; ultra-clean and low-emission systems that are 1 MW or greater and comply with California Air Resources Board (CARB) 2007 air emission standards; and zero-emitting or highly efficient (> 42.5% efficiency) systems built after May 1, 2001.
- In *New York*, the New York State Public Service Commission (NYPSC) voted in July 2003 to approve new standby rates for utilities' standby electric delivery service to DG customers and standby service to independent wholesale electric generating plants that import electricity as "station power" to support their operations. A key consideration was for the rates to result in onsite generation running when it is less expensive than purchasing power from the grid. The NYPSC has also directed electric utilities to consider DG as an alternative to traditional electric distribution system improvement projects. It required natural gas companies to create a natural gas rate class specifically for DG users that provides predictable gas rates for the emerging DG industry (ceilings are frozen until at least the end of 2007).

What States Can Do

As described previously in this Executive Summary, states are supporting clean energy through a diverse range of programs and policies. Each policy description in the *Guide to Action* includes specific action steps and best practices drawn from state experiences for designing, implementing, and evaluating clean energy programs. When developing a comprehensive approach to clean energy, states can use this information to:

- Develop a *Clean Energy-Environment Action Plan* that establishes clean energy goals to increase the use of cost-effective clean energy in their state and identifies programs and policies to achieve these goals.
- Implement a coordinated package of policies, programs, and strategies defined in the *Clean Energy-Environment Action Plan*.
- Draw on federal, state, and other resources to help achieve clean energy goals.

Using the *Guide to Action*

The *Guide to Action* provides a menu of clean energy policies and programs that states have successfully implemented. When using the *Guide to Action*:

- Select from the menu of policies by reviewing Table ES.2 and the chapter introductions to identify policies that are most likely to meet state goals. Cross-references are provided within each section to help efficiently navigate the document.
- Keep in mind that some of the policies described in the *Guide to Action* represent different paths to the same goal or can be used in combination to achieve a goal.
- Consider designing clean energy programs by building upon the established models, examples, and action items described for each policy.

Develop a *Clean Energy-Environment Action Plan*

A *Clean Energy-Environment Action Plan* describes a clear strategy for delivering clean, low-cost, reliable, and stable-priced energy to state residents through a portfolio of energy efficiency, renewable energy, and clean DG policies and programs. Chapter 2 of the *Guide to Action* details the key steps involved in developing this clean energy strategy. These steps typically include:

1. *Create a Collaborative.* States have found it particularly useful to reach out to the parties in their states that are interested in and/or may be affected by changes in energy use within the state. Key players in the collaborative can include representatives from the governor's office, state legislature, state agencies, and universities. Stakeholders include utilities; independent system operators and regional transmission organizations; independent power producers, independent transmission system owners, and energy suppliers; environmental and consumer organizations; other private sector interests; and the public.
2. *Establish a Quantitative Goal Based on Future Energy Use Expectations and the Potential for Clean Energy in the State.* A quantitative clean energy goal defines a specific level of cost-effective clean energy the state can strive to acquire during a particular period of time. To define their goals, states can:
    - Develop or refine a baseline inventory of their energy use and emissions and make projections about the future.
    - Conduct energy efficiency and/or renewable energy potential analyses to determine areas of greatest opportunity for energy savings. These findings help states identify opportunities and determine the feasibility of different goals based on technologies or resource availability. Understanding and quantifying the potential for clean energy within the state also helps states ensure that they are providing adequate funding to make cost-effective investments in clean energy.

- Quantify the full range of savings to maximize the benefits of clean energy. By assessing and quantifying the full range of short- and long-term energy, environmental, and economic benefits from energy efficiency and renewable energy, states can ensure that their policy decisions are based on a complete accounting of the benefits of clean energy.

3. *Identify Both Existing and New Clean Energy Policies and Programs.* As states develop their *Clean Energy-Environment Action Plans*, they identify policies that could help achieve their goal by conducting an inventory of existing policies, identifying new clean energy policies that build on lessons learned from their own experience and other states' experiences, and establishing criteria to evaluate the policies. When selecting policies to include in their plan, states also can identify the market, regulatory, and/or institutional barriers to implementing the clean energy programs and develop approaches to mitigate or remove these barriers. Finally, states can also target support for investment in new clean energy technologies as they emerge in the marketplace.
4. *Design Policies and Evaluate Their Impacts.* States compare the impacts of different clean energy policies to ensure that they work well together. They also find it advantageous to identify the type of action, key players required, and time frame for implementation when designing a policy. Once policies are initially designed, states use analytic tools to evaluate the options based on the criteria they have developed. The tools enable states to quantify the impacts of the various policies and rank them according to the agreed-upon criteria. This usually includes an assessment of the energy, economic, and/or environmental and public health impacts of the options.
5. *Develop a Measurement, Evaluation, and Reporting Plan.* As states design and evaluate clean energy policy options, they often find it beneficial to consider in advance the ways they will measure the success of the implemented policies. This measurement, evaluation, and reporting plan enables states to regularly check their progress against their goals and adjust their course as needed.
6. *Recommend Specific Actions for State Decision-Makers.* Once policy options have been assessed and ranked according to the desired criteria, the collaborative typically reviews the findings. Based on the rankings and discussion among the stakeholders, recommendations for action are presented in the *Clean Energy-Environment Action Plan*.

Implement the *Clean Energy-Environment Action Plan*

The actions required to design and implement the clean energy programs articulated in a *Clean Energy-Environment Action Plan* vary according to type of program. Nevertheless, the following key themes have emerged that apply to all clean energy programs and that states can follow to help ensure the success of their programs:

- *Involve Stakeholders in Clean Energy Program Development and Deployment.* Clean energy policy objectives require broad public and political support to be successful. Successful states have implemented clean energy policies with the support of their governor, legislature, and state agencies. If support is lacking, states can consider implementing education programs on the environmental and economic benefits of clean energy. When support for clean energy activities is established, it is important to involve multiple stakeholders during discussions and negotiations about clean energy objectives.
- *Incorporate Clean Energy As a Resource in Other State and Utility-Level Resource Planning Decisions.* States can look for opportunities to incorporate clean energy policies as part of other state and utility-level planning decisions.
- *Evaluate the Effectiveness of Clean Energy Programs.* Evaluation is important to sustaining the success of state clean energy programs. By measuring program success against stated objectives on a regular basis and in a transparent way, states can identify problems, develop approaches for addressing these issues, and ensure continued support from stakeholders. Evaluating energy efficiency programs can also entail using special techniques to measure and verify the energy savings from these programs.

- *Communicate Program Results.* States communicate the findings from their program evaluation to key players and stakeholders on a regular basis. By reporting on the progress and lessons learned for each clean energy policy and for the overall program and soliciting feedback on these findings, states can ensure a transparent implementation process and continued support for their program. States can also help ensure continued support for clean energy policies by communicating the energy, economic, and environmental benefits accrued from these programs to stakeholders.

Each of the policy description sections in the *Guide to Action* describes how states consider these and other themes as they develop and implement clean energy programs and policies.

Leverage Federal, State, and Other Resources

As states pursue policies and programs for promoting clean energy, they can work with a variety of federal, state, and nonprofit organizations to help enhance their clean energy programs. Table ES.3 provides examples of how these federal, state, and other resources can be used when developing each of the 16 clean energy policies and programs covered in the *Guide to Action*. The following section, *Information Resources*, provides a list of the key federal voluntary program resources available to states (a more detailed description is provided in Appendix A, *Federal Clean Energy Programs*) and a summary of the Web sites for each of the resources described in Table ES.3.

Table ES.3: Federal, State, and Nonprofit Resources for Enhancing State Clean Energy Programs

Policy Name (Section No.)	Examples of State Actions[a]
Chapter 3. State Planning and Incentive Structures	
Lead by Example (3.1)	• Establish energy savings and renewable energy goals for state and local government facilities (including leased space), schools, colleges, and universities. Use ENERGY STAR tools, guidelines, and partnerships and join the ENERGY STAR Challenge to improve building energy efficiency by 10% or more. • Procure ENERGY STAR-qualified products using ENERGY STAR product procurement information and online training resources. • Require ENERGY STAR certification as part of green building/energy efficiency standards in new state and local government buildings, K-12 schools, and colleges and universities. • Purchase renewable energy for state facilities under EPA's Green Power Partnership Program. • Use CHP in public facilities with help from EPA's CHP Partnership. • Leverage ENERGY STAR consumer education activities, such as National Campaigns.
State and Regional Energy Planning (3.2)	• Develop and implement a *Clean Energy-Environment Action Plan* with guidance and support from EPA's Clean Energy-Environment State Partnership Program. • Leverage DOE State Energy Program funding (to state energy offices) and grants authorized by EPAct 2005 (Section 140) to support state energy planning and deploy clean energy technologies.
Determining the Air Quality Benefits of Clean Energy (3.3)	• Use the software tools, analyses, and EPA guidance described in Section 3.3 of the *Guide to Action* to evaluate the air quality benefits of clean energy policies and programs. • Incorporate emission reductions from clean energy into air quality planning using EPA's Guidance: Incorporating Emerging and Voluntary Measures in a State Implementation Plan (2004).
Funding and Incentives (3.4)	• Use ENERGY STAR financing information and training sessions for public and private sector organizations. • Learn about federal and state funding opportunities using EPA's Funding Opportunities Directory and CHP and biomass/biogas funding opportunities database. • Use EPA's Supplemental Environmental Projects Toolkit to convert environmental enforcement settlements into environmentally beneficial projects. • Include provisions for energy savings performance contracting using the information resources in Section 3.4. Identify energy service companies in your state using ENERGY STAR's online directory of service and product providers. • Leverage federal tax incentives authorized by EPAct 2005 for energy efficiency and renewable energy.
Chapter 4. Energy Efficiency Actions	
Energy Efficiency Portfolio Standards (EEPS) (4.1)	• Assess energy efficiency potential, evaluate past successes, and then design, develop, implement, and evaluate a customized EEPS program for your state. Contact EPA's Clean Energy-Environment State Partnership Program for more information and technical assistance to support the design of an EEPS for your state.
Public Benefits Funds (PBFs) for Energy Efficiency (4.2)	• Enhance PBF programs by leveraging ENERGY STAR's portfolio of energy efficiency program and service delivery models, building performance and product specifications, network of partners, and consumer education and awareness campaigns.
Building Codes for Energy Efficiency (4.3)	• Regularly update, implement, evaluate, and enforce building codes using compliance tools, technical assistance, and other code information and support available from DOE and the Building Codes Assistance Project. • Encourage construction of beyond-code ENERGY STAR-qualified new homes using ENERGY STAR education and training resources.
State Appliance Efficiency Standards (4.4)	• Use DOE's information resources to identify products that are covered by federal standards and obtain information about state appliance standards. • Identify potential products for which standards could be established, and estimate the overall benefits and costs of upgrading current standards or setting new standards using the information resources provided by the California Energy Commission and the Appliance Standards Awareness Project.

[a] See *Federal, State, and Nongovernmental Clean Energy Resources* on page ES-27 for the URLs for the underlined resources listed in this table.

(continued on next page)

Table ES.3: Federal, State, and Nonprofit Resources for Enhancing State Clean Energy Programs *(continued)*

Policy Name (Section No.)	Examples of State Actions[a]
Chapter 5. Energy Supply Actions	
Renewable Portfolio Standards (RPS) (5.1)	• Determine the renewable energy and CHP potential in your state and develop an RPS for your state with assistance from the National Renewable Energy Lab (NREL) and EPA's CHP Partnership. • Leverage the federal production tax credit and other federal incentives to advance renewable energy resource development and achieve standards.
Public Benefits Funds (PBF) for State Clean Energy Supply Programs (5.2)	• Use lessons learned from other state PBF programs described in Section 5.2 of the *Guide to Action* to establish or enhance your state programs. • Leverage other funding sources without activating "double-dipping" clauses. For example, incentives for wind projects allow developers to take advantage of federal incentives such as the production tax credit (PTC) and accelerated depreciation. • Contact EPA's CHP Partnership for assistance in designing a CHP incentive program.
Output-Based Environmental Regulations to Support Clean Energy Supply (5.3)	• Review federal programs that have adopted output-based regulations with recognition of CHP, including the proposed New Source Performance Standards (NSPS) for NO_x from electric utility boilers and combustion turbines, and the new EPA cap and trade programs (Clean Air Interstate Rule and the Clean Air Mercury Rule). For more information, visit the CHP Partnership State Resources Web site. • Use EPA's CHP Partnership resources, including *Output-Based Regulations: A Handbook for Air Regulators* to evaluate opportunities to adopt output-based regulations.
Interconnection Standards (5.4)	• Review existing model rules, such as those developed by FERC, NARUC, and IREC, as well as other state rules described in Section 5.4. • Develop an interconnection standard for clean DG/CHP projects with assistance from EPA's CHP Partnership.
Fostering Green Power Markets (5.5)	• Use EPA's Green Power Partnership resources and partners to enhance green power markets programs. • Learn about other state Green Power programs and policy approaches using the information resources available in Section 5.5 of the *Guide to Action* and from the DOE Green Power Network. • Take advantage of federal renewable energy incentives to complement state efforts to foster green power markets.
Chapter 6. Utility Planning and Incentive Structures	
Portfolio Management Strategies (6.1)	• Link portfolio management policies to other state policies described in Section 6.1, such as RPS, energy efficiency policies, and energy planning policies. • Incorporate lessons learned from other states and regions as described in Section 6.1 of the *Guide to Action*. • Contact the EPA-State Energy Efficiency and Renewable Energy Projects staff and/or EPA/DOE Energy Efficiency Action Plan staff for further assistance.
Utility Incentives for Demand-Side Resources (6.2)	• Incorporate lessons learned from states to remove financial disincentives and create incentives for utilities to invest in demand-side resources as described in Section 6.2 of the *Guide to Action*. • Contact the EPA-State Energy Efficiency and Renewable Energy Projects staff and/or EPA/DOE Energy Efficiency Action Plan staff for further assistance.
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation (6.3)	• Contact EPA's CHP Partnership for assistance in evaluating current utility rate structures for DG, such as standby rates, and developing rate structures that avoid unwarranted barriers, while also providing appropriate cost recovery for utility services. • Review the Regulatory Assistance Project's report, Accommodating Distributed Resources in the Wholesale Market.

[a] See *Federal, State, and Nongovernmental Clean Energy Resources* on page ES-27 for the URLs for the underlined resources listed in this table.

Information Resources

Key Federal Program Resources

A list of key EPA and DOE voluntary program resources available to states is provided below.

Federal Clean Energy Programs

EPA and DOE administer a number of voluntary programs that promote the production and use of clean energy and complement the Clean Energy-Environment State Partnership Program. These programs include:

ENERGY STAR

ENERGY STAR is a voluntary, public-private partnership designed to reduce energy use and related greenhouse gas emissions. The program, administered jointly by EPA and DOE, has an extensive network of partners including equipment manufacturers, retailers, builders, energy service companies, private businesses, and public sector organizations. EPA and DOE invest in a portfolio of energy efficiency efforts that state and utility energy efficiency programs can leverage to further their energy efficiency programs, including:

- Establishing performance specifications and performing outreach on efficient products.
- Establishing energy efficiency delivery models to existing homes.
- Establishing performance specifications and performing outreach for new homes.
- Improving the performance of new and existing commercial buildings.
- Conducting education and awareness building.

More information about ENERGY STAR can be found at: http://www.energystar.gov.

EPA-State Energy Efficiency and Renewable Energy Projects

This program is a joint initiative between EPA, the National Association of Regulatory Utility Commissioners (NARUC), and individual state utility commissions. It explores utility regulatory and market-based approaches that deliver significant energy cost savings and other benefits through greater use of energy efficiency, renewable energy, and clean distributed generation. More information can be found at: http://www.epa.gov/cleanenergy/utilitypolicy/.

Energy Efficiency Action Plan

This joint effort between DOE and EPA engages energy market leaders—including electric and gas utilities, state utility regulators and energy agencies, energy consumers, energy service providers, and environmental/energy efficiency advocates—in the development of an *Energy Efficiency Action Plan*. Action Plan participants will identify key barriers limiting greater U.S. investment in energy efficiency and develop and document sound business practices for removing these barriers. More information is available at: http://epa.gov/cleanenergy/eeactionplan.htm.

The Combined Heat and Power (CHP) Partnership

This EPA partnership seeks to reduce the environmental impact of power generation by fostering the use of CHP. The CHP Partnership works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development of new policies, programs, and projects and promotes their energy, environmental, and economic benefits. More information is available at: http://www.epa.gov/chp.

The Green Power Partnership

EPA's Green Power Partnership is a voluntary partnership between EPA and organizations that are interested in buying green power. Through this program, EPA supports organizations that are buying, or planning to buy, green power. As a Green Power Partner, an organization pledges to replace a portion of its electricity consumption with green power within one year of joining the partnership. See http://www.epa.gov/greenpower.

State Activities and Partnerships

DOE's Office of Energy Efficiency and Renewable Energy (EERE) provides technical assistance to state and local jurisdictions that enables them to adopt renewable energy and energy efficiency technologies. The program offers training, technical assistance, and information on state activities. More information can be found at: http://www.eere.energy.gov/states/.

The State Energy Program

DOE provides grants to states and directs funding to state energy offices from technology programs in EERE. States use grants to address their energy priorities and program funding to deploy emerging renewable energy and energy efficiency technologies. More information is available at: http://www.eere.energy.gov/state_energy_program/.

Technical Assistance Program (TAP)

TAP provides state and local officials quick, short-term access to experts at DOE national laboratories for assistance with crosscutting renewable energy and energy efficiency policies and programs. TAP helps states in crosscutting areas not currently covered by an existing DOE program. More information is available at: http://www.eere.energy.gov/wip/informationsources/Tap.html.

For more information on EPA, DOE, and other federal agency clean energy efforts, see Appendix A, *Federal Clean Energy Programs*.

Federal, State, and Nongovernmental Clean Energy Resources

The following Web sites provide links to the federal, state, and nonprofit information resources and technical assistance opportunities that are described in Table ES.3.

Organization	Resource	URL
Federal Resources		
EPA and DOE	ENERGY STAR	http://www.energystar.gov/index.cfm?c=hom.index
	Energy Efficiency Action Plan	http://www.epa.gov/cleanenergy/eeactionplan.htm
	ENERGY STAR Financing Strategies	http://www.energystar.gov/index.cfm?c=business.bus_internet_presentations#money
	ENERGY STAR for Government	http://www.energystar.gov/index.cfm?c=government.bus_government
	ENERGY STAR National Campaigns	http://www.energystar.gov/index.cfm?c=promotions.pt_national_promotions
	ENERGY STAR Online Training Sessions	http://www.energystar.gov/index.cfm?c=business.bus_internet_presentations#procure
	ENERGY STAR Purchasing & Procurement	http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing
	ENERGY STAR Qualified New Homes	http://www.energystar.gov/index.cfm?c=new_homes.hm_index
	ENERGY STAR Qualified Products	http://www.energystar.gov/index.cfm?fuseaction=find_a_product
	ENERGY STAR Residential Marketing and Sales Materials	http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.pt_ResMktgSalesMaterials
	ENERGY STAR Service and Product Provider Directory	http://www.energystar.gov/index.cfm?fuseaction=SPP_DIRECTORY
	Federal Tax Credits for Residential Energy Efficiency	http://www.energystar.gov/index.cfm?c=products.pr_tax_credits
EPA	Clean Energy-Environment State Partnership Program	http://www.epa.gov/cleanenergy/stateandlocal/ourpartners.htm
	Combined Heat and Power Partnership	http://www.epa.gov/chp/
	• CHP Partner Resources, Funding Opportunities	http://www.epa.gov/chp/funding_opps.htm
	• CHP Partnership State Resources	http://www.epa.gov/chp/state_resources.htm
	• CHP Partnership State Resources: Output-Based Regulations	http://www.epa.gov/chp/state_resources/output_based_reg.htm
	• CHP Partnership State Resources: Utility Rates	http://www.epa.gov/chp/state_resources/utility.htm
	EPA Guidance Documents: Incorporating Emerging and Voluntary Measures in a State Implementation Plan	http://www.epa.gov/ttn/oarpg/t1/memoranda/evm_ievm_g.pdf (http://www.epa.gov/cleanenergy/stateandlocal/guidance.htm)
	EPA-State Energy Efficiency Renewable Energy Projects	http://www.epa.gov/cleanenergy/utilitypolicy/
	Funding Opportunities: A Directory of Energy Efficiency, Renewable Energy and Environmental Protection Assistance Programs	http://www.epa.gov/cleanenergy/pdf/eere_fun.pdf

Organization	Resource	URL
Federal Resources *(continued)*		
EPA	Green Power Partnership	http://www.epa.gov/greenpower/
	Supplemental Environmental Projects Toolkit	http://www.epa.gov/cleanenergy/pdf/sep_toolkit.pdf
DOE	Appliances and Commercial Equipment Standards	http://www.eere.energy.gov/buildings/appliance_standards/
	Building Energy Codes Program	http://www.energycodes.gov/
	Energy Policy Act of 2005: Tax Credits for Renewable Energy	http://www.energy.gov/taxbreaks.htm
	The Green Power Network	http://www.eere.energy.gov/greenpower/
	National Renewable Energy Laboratory	http://www.nrel.gov/
	State Energy Program	http://www.eere.energy.gov/state_energy_program/about.cfm
State and Nonprofit Resources		
Appliance Standards Awareness Project	Appliance Standards Awareness Project Web site	http://www.standardsasap.org
Building Codes Assistance Project	Building codes implementation and technical assistance	http://www.bcap-energy.org
California Energy Commission	Appliance efficiency regulations and products database	http://www.energy.ca.gov/appliances/
DSIRE	Information on federal incentives for renewable energy and energy efficiency	http://www.dsireusa.org/library/includes/genericfederal.cfm?CurrentPageID=1&state=us
The Regulatory Assistance Project (RAP)	RAP report: Accommodating Distributed Resources in the Wholesale Market	http://www.raponline.org/showpdf.asp?PDF_URL=%22Pubs/DRSeries/DRWhlIMkt.pdf%22
U.S. Green Building Council	LEED certification requirements	http://www.usgbc.org

EPA Clean Energy-Environment State Partnership Program Contact Information

To download the *Clean Energy-Environment Guide to Action*, visit EPA's Clean Energy Web site at: http://www.epa.gov/cleanenergy/stateandlocal/.

To order a print copy of the *Guide to Action*, contact the National Service Center for Environmental Publications (NSCEP) at: http://www.epa.gov/ncepihom/ordering.htm. Or call NSCEP at: 1-800-490-9198. Request EPA Publication No. 430-R-06-001.

For more information about the *Guide to Action*, please contact the EPA Clean Energy-Environment State Partnership Program staff:

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Clean EnergyEnvironment
STATE PARTNERSHIP

Chapter 1. Introduction and Background

Summary

Across the nation, states are developing and adopting a variety of clean energy policies and programs to meet energy, economic, and environmental goals. These efforts are significantly increasing end-use energy efficiency, production of renewable energy, and the efficiency of energy generation. They have resulted in substantial energy savings, improved air quality, reduced greenhouse gas emissions, improved reliability, and security of the electric grid. They have also enhanced economic development and created new jobs.

Clean energy policies and programs with which states now have considerable experience include:

- Providing sufficient energy efficiency program funding (through a variety of means) to capture significant portions of the cost-effective energy efficiency potential in the state.
- Developing utility incentives and removing disincentives to encourage greater utility investment in energy efficiency.
- Establishing state-level appliance efficiency standards for products and equipment.
- Establishing or updating residential and commercial building codes and improving building design and operation practices.
- Setting electricity portfolio requirements for energy efficiency, renewable energy, and combined heat and power (CHP) and other clean distributed resources.
- Developing electricity market rules that remove obstacles to advanced high-efficiency clean distributed generation (DG) systems, including CHP.
- Leading by example by promoting and investing in energy efficiency and renewable energy for state buildings and facilities, among other initiatives.

EPA's Clean Energy-Environment State Partnership Program

The **Clean Energy-Environment State Partnership Program** is a voluntary program designed to help states review and adopt available policies and programs that effectively integrate clean energy into a low-cost, clean, reliable energy system for the state. Clean energy includes energy efficiency and clean energy supply, which includes clean distributed generation (DG)[a].

States participating in the Clean Energy-Environment State Partnership Program will use the *Guide to Action* to develop a *Clean Energy-Environment State Action Plan* for using existing and new energy policies and programs to increase the use of clean energy.

The U.S. Environmental Protection Agency's (EPA's) ***Clean Energy-Environment Guide to Action*** identifies and describes 16 clean energy policies and strategies that are delivering economic and environmental results for states. These policies focus on opportunities for homes, public and private organizations, businesses, and electricity generation. While there are also opportunities for states to promote clean energy in the transportation sector, the *Guide to Action* does not currently include these policies. EPA is exploring the addition of these policies at a later date.

The *Guide to Action* helps state energy and environmental policymakers design and implement a clean energy plan that will:

- Save money by lowering energy demand and supply costs.
- Lower emissions of greenhouse gases and improve air quality.
- Reduce price volatility in energy markets.
- Enhance the reliability of the electric system.
- Avoid the need for new power plants and related fuel and supply infrastructure.
- Create economic development opportunities and new jobs.

[a] Throughout the *Guide to Action*, "clean DG" refers to non-centralized, usually small-scale, renewable energy and combined heat and power (CHP). "Clean energy supply" refers to renewable energy and CHP in both distributed and centralized applications.

The U.S. Environmental Protection Agency (EPA) has developed this *Clean Energy-Environment Guide to Action* to help states build upon this broad experience, evaluate a suite of clean energy options, and develop a *Clean Energy-Environment Action Plan* to outline the programs and policies that will increase their use of cost-effective clean energy. The *Guide to Action* describes 16 clean energy policies and strategies that states have used to meet their clean energy objectives. For each policy, the *Guide to Action* provides an overview of the benefits and details how states have successfully designed and implemented the policy.

The 16 clean energy policies focus on the role of demand- and supply-side resources (i.e., energy efficiency/renewable energy [EE/RE] and CHP) in providing clean, reliable, and affordable energy for homes, businesses, and public institutions. Clean energy also plays an important role in reducing emissions from the transportation sector. Examples of the types of clean energy transportation policies that states are implementing and resources for further information are shown in the box entitled *State Clean Energy Policies for Transportation* on page 1-3.

What Is Clean Energy?

Clean energy includes demand- and supply-side resources that deliver clean, reliable, and low-cost ways to meet energy demand and reduce peak electricity system loads. Clean energy resources include energy efficiency and clean energy supply, which includes renewable energy and CHP in distributed and centralized applications.

Energy efficiency reduces demand for energy and peak electricity system loads. Common energy efficiency measures include hundreds of technologies and processes for practically all end uses across all sectors of the economy.

Renewable energy is partially or entirely generated from non-fossil energy sources. Renewable energy definitions vary by state, but usually include solar, wind, geothermal, biomass, biogas, and low-impact hydroelectric power.

CHP, also known as cogeneration, is a clean, efficient approach to generating electric and thermal energy from a single fuel source.

For more information, visit EPA's Clean Energy Web site (http://www.epa.gov/cleanenergy) and the ENERGY STAR Web site (http://www.energystar.gov).

Why Clean Energy?

States are facing a number of environmental, public health, energy, and related challenges. Clean energy, where cost-effective, offers a way to meet these challenges, which continue to expand as energy demand continues to grow. The benefits of clean energy include:

- Reduced emissions of air pollution and greenhouse gases.
- Lower customer energy bills.
- Enhanced economic development and job creation.
- Improved reliability and security of the energy system.

A more detailed discussion of the challenges states are facing and how clean energy policies and programs can help address them follows.

Environmental and Public Health Challenges

Fossil fuel-based electricity generation is a major source of air pollutants and greenhouse gases, which pose serious risks to public health and the environment, as summarized as follows:

- *Fine-particle pollution* may raise the risk of heart attack and worsen respiratory disease in vulnerable people, leading to perhaps 60,000 premature deaths per year in the United States (Kaiser 2005).
- *Ground-level ozone* can cause a variety of health problems including aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses such as pneumonia and bronchitis. It can also cause damage to plants and ecosystems, including reduced crop and forest yields and increased plant vulnerability to disease, pests, and harsh weather (EPA 2005b).

- *Greenhouse gases* are another byproduct of fossil fuel combustion. The levels of heat-trapping carbon dioxide (CO_2) in the atmosphere are expected to rise in the future as energy use and fossil fuel-based generation increase. States are concerned about how their economies, natural resources and ecosystems, water supplies, and public health could be affected by global climate change and are taking action to reduce their greenhouse gas emissions (Rabe 2004).

Figure 1.1a: Nonattainment Areas Ozone *(8-hour)*

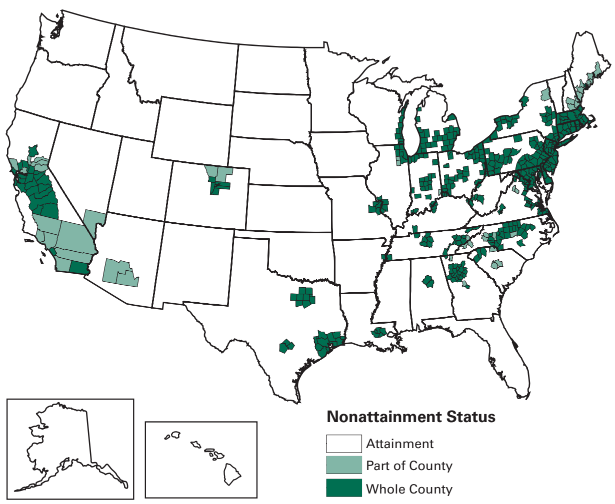
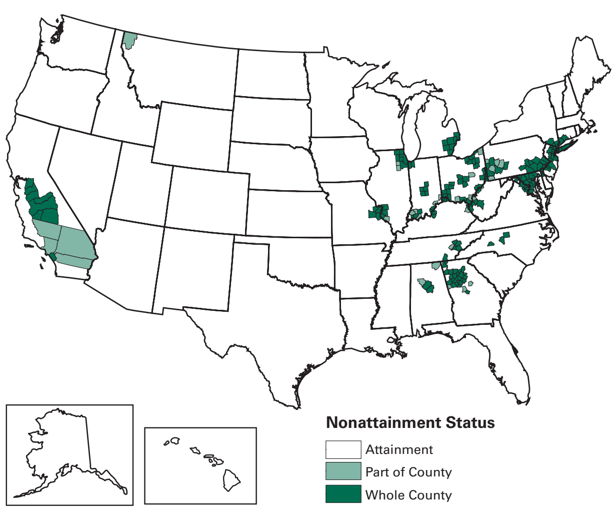


Figure 1.1b: Nonattainment Areas $PM_{2.5}$



Source: EPA 2005a.

Although emissions of sulfur dioxide (SO_2) and nitrogen oxide (NO_x) from power generation are declining, ground-level ozone exceeds federal standards for the protection of public health in many areas of the country. In April 2005, with the designation of non-attainment areas for ozone (8-hour) and fine particulate matter (PM) in effect, 134 million people were living in more than 470 counties where the air quality sometimes exceeds the federal 8-hour standard for ozone (see Figure 1.1a). Seventy-five million people were living in more than 200 counties that do not meet the PM2.5 standard (i.e., for PM that is 2.5 micrometers or smaller; see Figure 1.1b) (EPA 2005a). States with counties that are not in attainment with these standards need to develop and implement programs that reduce air pollution so that these areas meet federal air quality standards.

State Clean Energy Policies for Transportation

The *Clean Energy-Environment Guide to Action* focuses on clean energy opportunities for homes, businesses, and electricity generation. There are also many opportunities for states to promote clean energy in the transportation sector, which represents approximately one-third of U.S. energy consumption. In some states (e.g., California), transportation represents more than half of the state's total energy consumption. States are developing their own clean energy transportation policies and initiatives that are helping to improve air quality, save energy, and reduce dependence on imported energy sources. These policies and initiatives include setting minimum requirements for the use of biofuels, purchasing efficient vehicles for state fleets, and developing refueling infrastructure for alternative fuel vehicles (AFVs) (e.g., E-85 refueling stations).

For example, Minnesota's clean fuels program uses renewable fuels produced in Minnesota, such as ethanol and biodiesel, to reduce air pollution, promote economic development, and reduce dependence on imported energy supplies. The program is credited with helping the state achieve an acceptable level of ozone in every county (Minnesota Chamber of Commerce 2003).

For more information about EPA's voluntary transportation programs, visit the EPA Office of Transportation and Air Quality Planning's Voluntary Programs Web site (http://www.epa.gov/otaq/voluntary.htm).

Energy Challenges

States and the U.S. energy industry face multiple challenges in providing affordable, clean, and reliable energy in today's complex energy markets. These challenges include:

- *Electricity demand* continues to rise. Given current energy consumption and demographic trends, the U.S. Department of Energy (DOE) projects that U.S. energy consumption will increase by more than a third by the year 2025. Electric power consumption is expected to increase by almost 40%, and total fossil fuel use is projected to increase similarly (EIA 2005a). This growth in demand stresses current systems and requires substantial new investments in system expansions.
- *Energy reliability and security* is crucial. Recent events, such as the Northeast electricity blackout of August 2003, increased focus on the need for energy reliability and its economic and human welfare affects. These concerns, combined with the year-to-year uncertainty surrounding availability of hydro resources and continued public uncertainty about the safety of nuclear power and its waste products, represent risks for many of the current generation methods. In addition, owners of energy generation, transmission, and distribution assets, and all levels of government, are paying increased attention to the security risks surrounding our critical energy supply, transmission, and distribution infrastructure.
- *Transmission systems* are overburdened in some places, limiting the flow of economical generation and, in some cases, shrinking reserve margins of the electricity grid to inappropriately small levels. This can cause reliability problems and high electricity prices in or near congested areas.
- Many existing *base load generation* plants are aging. Significant retrofits are needed to ensure old generating units meet current and future emissions regulations.
- *Energy prices* are high. Higher natural gas prices increase energy costs for households and businesses and raise the financial risk associated with the development of new generation based on gas technologies, which had been expected to make up more than 60% of capacity additions over the next 20 years (EIA 2005a). Coal prices are also increasing and contributing to higher electricity costs.

Energy Savings Potential from State Clean Energy Actions

The potential energy savings achievable through state actions is significant. EPA estimates that if each state were to implement cost-effective clean energy-environment policies, the expected growth in demand for electricity could be cut in half by 2025, and more demand could be met through cleaner energy supply. This would mean annual savings of more than 900 billion kilowatt-hours (kWh) and $70 billion in energy costs by 2025, while preventing the need for more than 300 power plants and reducing greenhouse gas emissions by an amount equivalent to emissions from 80 million of today's vehicles.[a]

[a] This estimate is based upon EPA analysis of independent evaluations of the potential for cost-effective energy efficiency investments to help meet the nation's growing demand for energy and electricity. One of these independent evaluations is a 2004 meta-analysis that examined the results of 11 different studies that estimated the potential for energy efficiency in various states and regions in the country and for the United States as a whole (Nadel et al. 2004). This meta-analysis shows that the adoption of economically feasible and technically achievable, but as yet untapped, energy efficiency could yield a 24% savings in total electricity demand nationwide, which would result in a 50% or greater reduction in the growth in electricity demand by 2025.

Related Challenges

In addition to environmental and energy challenges, other challenges facing states include:

- Addressing concerns about energy prices and the ability of consumers, especially low-income households, to pay energy bills. Inability to pay energy bills has repercussions for individuals and the economy.
- Addressing economic development needs, particularly in rural areas and small communities.
- Educating the public about energy issues, including raising awareness about using energy wisely and the consequences of energy use, and motivating behavior changes.

Clean Energy Can Be a Big Part of the Solution

Recent state analyses have found that that there is potential for clean energy to cost-effectively meet much of the growth in energy demand expected over the next 10 to 20 years (Rufo and Coito 2002, Nadel et al. 2004, and Geller et al. 2005). Analyses have also shown that energy efficiency can be delivered through programs at a cost ($0.02–0.04/kWh) much less than new generation, offering a low-cost means of increasing the overall reliability of the system as both base load and peak load demand are reduced (Nadel and Geller 2001).

As an example, from 1975 through 2003 California's energy efficiency programs have saved 40,000 gigawatt-hours (GWh), 15% of the annual electricity use. California's recent energy efficiency programs continue to deliver efficiency at half the cost of base load generation (see Figures 1.2a and 1.2b) while having played a key role in mitigating the effects of the state's electricity crisis in 2001 (Wiser et al. 2004). The state's enhanced efforts to utilize energy efficiency as an in-state energy resource are expected to meet about half of the expected growth in electricity demand by 2013 through energy efficiency in addition to reduced demand for natural gas (CPUC 2004).

System reliability also benefits from clean energy strategies by reducing peak load demand, as the shrinking load and stress in the power distribution system decreases the likelihood of failure. For example, the demand-side management (DSM) program in Massachusetts has reduced peak demand by 7.2% and the price of peak power by 30% to 40% (NEDRI 2003).

Figure 1.2a: Energy Savings from California's Energy Efficiency Programs

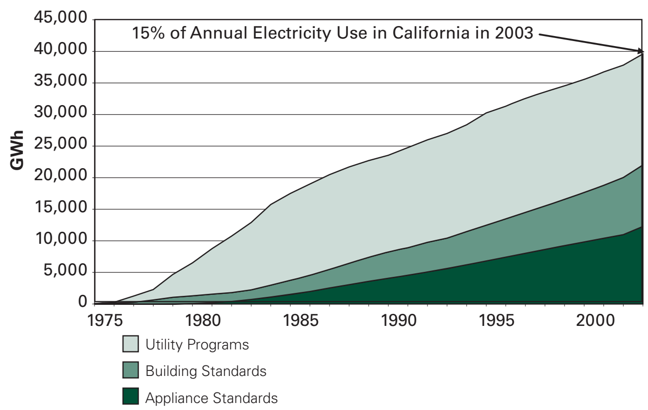
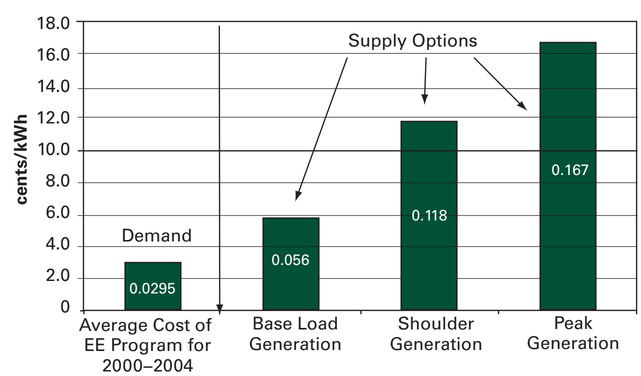


Figure 1.2b: Comparison of Energy Efficiency Program Costs to Supply Generation Costs
(2000 to 2004)



Sources: 1.2a: CEC 2003. 1.2b: CEC 2005.

- Addressing community opposition to siting new energy generation, transmission, and distribution facilities and concerns about environmental impacts of energy resource development (e.g., oil, gas, liquefied natural gas [LNG] terminals, and transmission lines).

How Does Clean Energy Address These Challenges?

States are finding that energy efficiency and clean energy supply, which includes renewable energy and clean DG technologies (e.g., CHP), can play an important role in helping meet their energy and environmental challenges. Clean energy can:

- *Reduce Energy-Related Air Emissions.* Using energy more efficiently through more efficient end uses, or through more efficient generation such as CHP, reduces the amount of fuel required for a given service or to produce a unit of energy output and reduces the corresponding emissions of pollutants and greenhouse gases. Electricity from renewable resources such as solar, geothermal, and wind technologies generally does not contribute to global climate change or local air pollution since no fuels are combusted in these processes.

- *Increase Power Reliability*. CHP and renewable energy, as DG, can reduce electricity infrastructure vulnerability, improve security of the electricity system, and reduce grid congestion. These technologies can be operated independently in the event of a disruption to central systems and targeted to load pockets to reduce grid congestion, potentially deferring or displacing more expensive transmission and distribution infrastructure investments. A 2005 study for the California Energy Commission (CEC) found that strategically sited DG yields improvements to grid system efficiency and provides additional reserve power, deferred costs, and other grid benefits (Evans 2005). Energy efficiency can also improve electric system reliability since energy efficiency reduces both base load and peak power requirements, thus decreasing the likelihood of system failure (Nadel and Geller 2001).
- *Increase Fuel Diversity*. Increased fuel diversity avoids over-reliance on a single fuel, which can cause disruption or price volatility if supply of that fuel is constrained. Renewable energy technologies broaden the energy mix. CHP can be fueled by a variety of fuels, including natural gas, coal, biomass, and biogas.
- *Provide More Efficient Use of Natural Resources*. Energy efficiency reduces demand for energy generation, which reduces the amount of fuel—coal, natural gas, or oil—needed to power our daily lives. CHP can provide much greater energy output for the amount of fuel used and renewable energy sources avoid the use of fossil fuels. Each of these clean energy sources also results in water savings through reduced water use and avoided thermal pollution.
- *Increase State Economic Development*. Investments in clean energy can promote economic development in a variety of ways. According to several studies, energy efficiency leads to energy bill savings, with re-spending of these savings supporting more jobs than if the energy were purchased (SWEEP 2002). Clean energy projects create short-term construction and installation jobs and provide numerous long-term opportunities associated with new clean energy businesses (Rabe 2004, Geller et al. 2005). EE/RE and CHP may help reduce fuel price volatility and increase fuel diversity, leading to a more stable energy supply portfolio (Wiser et al. 2005). Energy efficiency and renewable energy also draw on local resources that can offset imports from out-of-state. Use of these in-state resources improves the state balance of trade and can create long-term economic value.

Opportunities for State Action

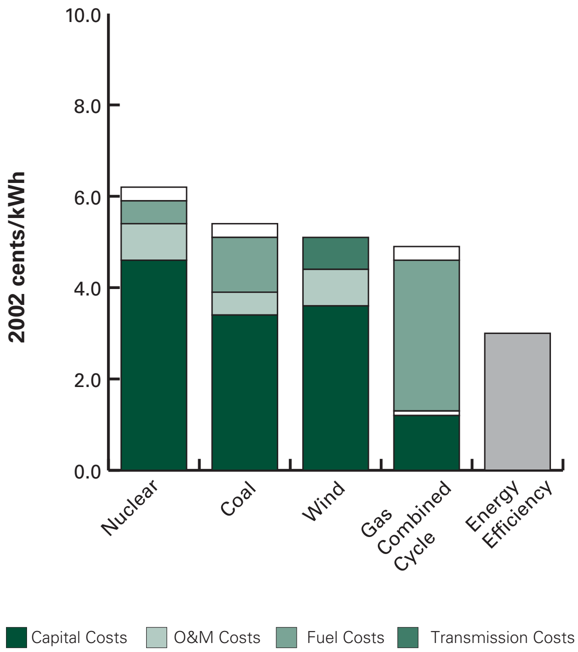
State policies and programs are successfully expanding the role of clean energy in the U.S. energy system. States are finding clean energy to be cost-competitive with traditional sources of generation, as demonstrated in Figure 1.3, which illustrates the comparative cost of electricity from a range of sources, including energy efficiency, under typical assumptions.

To help capture the cost savings and other benefits of clean energy, many states have implemented policies and programs to increase the use of clean energy alongside other sources. For example:

- Seventeen states and Washington, D.C. have adopted public benefits funds (PBFs) for energy efficiency that provide more than $1 billion annually to support cost-effective clean energy (ACEEE 2004b).
- Twenty-one states and Washington, D.C. have adopted renewable portfolio standards (RPS) to increase the amount of wind, solar, biomass, and other renewable resources in their energy portfolios. Existing RPS requirements are expected to result in the generation of more than 25,000 megawatts (MW) of new renewable energy by 2017—enough power for nearly 17 million homes (Wiser et al. 2004).

Nevertheless, there remain significant additional opportunities for states to implement policies and programs and spur greater investment in clean energy. This section provides an overview of opportunities for state action for each of the clean energy areas: energy efficiency, renewable energy, and CHP.

Figure 1.3: Clean Energy Is Competitive with Fossil Fuel and Nuclear Generation Technologies



Note: The costs for nuclear, coal, wind, and gas combined cycle are projections for the cost of producing energy from new plants in 2010. The cost for energy efficiency is a median figure based on recent reports of the cost of energy saved over a portfolio of programs in leading states.

Sources: ACEEE 2004, EIA 2004.

Energy Efficiency

States are finding that well-designed and administered energy efficiency programs can cost-effectively offset a significant portion of expected growth in energy demand.

Achievable savings range from 10% to 35% of electricity demand and up to 10% of natural gas demand (Nadel et al. 2004). For example, a recent study of Connecticut's energy efficiency potential found that there is significant potential in all sectors of the state and that the state could reduce both peak demand and electricity use by 13% between 2003 and 2012 at an average cost of 1.4 cents/kWh saved over the lifetime of the investment. In addition, capturing the achievable and cost-effective energy efficiency potential would generate $3 in benefits for each $1 invested—equivalent to net benefits of $1.8 billion (Schlegel 2004, Environment Northeast 2005).

Chapter 2, *Developing a Clean Energy-Environment Action Plan*, presents more information about state clean energy potential studies and links to individual state analyses. Other studies indicate similar levels of savings for California, the Northwest, the Northeast, and other locations. These potential studies build on more than a decade of experience showing that well-designed energy efficiency efforts cost less than traditional sources of generation, while offering a range of environmental and economic benefits that continue to accrue year after year. These programs are saving energy, on average, at a life cycle cost of about $0.03/kWh saved, which is 50% to 75% of the typical cost of new power sources and less than 50% of the average retail price of electricity (ACEEE 2004a, ACEEE 2004b, EIA 2005b).

As of 2003, about $1.4 billion is being spent annually on ratepayer-funded energy efficiency programs in the electricity sector nationwide to capture this energy efficiency potential (York and Kushler 2005). This funding is provided through PBF programs (see Section 4.2, *Public Benefits Funds for Energy Efficiency*) and programs developed as part of utility integrated resource plans (see Section 6.1, *Portfolio Management Strategies*). These programs are reducing electricity demand by about 0.8% to 1% per year in states with comprehensive energy efficiency programs, which will result in cumulative energy savings of 10% or more over the next decade (ACEEE 2004b).

There is an opportunity to provide greater funding to capture the cost-effective potential that remains in most states. Across the 50 states, 2003 spending on energy efficiency programs as a percentage of utility revenues averaged 0.5%. The top 10 states (shown in Table 1.1) are spending between 1% and 3% of utility revenues on energy efficiency (York and Kushler 2005). In many states, the level of energy efficiency spending is much less than what would be needed to capture a substantial portion of the economic and achievable potential over the next decade (Nadel et al. 2004).

Table 1.1: 2003 Energy Efficiency Spending As a Percentage of Utility Revenues

Top 10 States	Spending As a Percent of Annual Total Revenues
Vermont	3.0
Massachusetts	2.4
Washington	2.0
Rhode Island	1.9
New Hampshire	1.8
Oregon	1.7
Wisconsin	1.4
New Jersey	1.4
Montana	1.3
Iowa	1.2
U.S. Average	0.5

Source: York and Kushler 2005.

Clean Energy Supply Programs

Renewable Energy

Renewable energy is partially or entirely generated from non-fossil energy sources. Definitions of renewable energy vary by state but usually include wind, solar, biomass, and geothermal energy; some states also include low-impact or small hydro, biogas, waste-to-energy, and CHP.

Renewable energy technologies continue to experience rapid growth in the United States due to state activity and increased cost-competitiveness. As of 2004, 2,300 MW of new renewable energy capacity had been developed as a result of state requirements, with an additional 1,600 MW coming online to serve voluntary green power market demand (Bird and Swezey 2004).

Renewable technologies are experiencing market growth due to several drivers. First, the cost of renewable energy technologies is approaching competitiveness with fossil fuel-fired technologies in some regions. For example, depending on geographic location, wind energy technology can produce power at about \$0.04–\$0.06/kWh,[3] compared to the \$0.30/kWh it cost in the early 1980s (Bird and Swezey 2004). This compares favorably to an average cost of conventional natural gas combined cycle generation, which was about \$0.065/kWh in October 2005. Due to renewable energy's low or free fuel costs, it is also attractive in markets where fuel price volatility is increasing.

Wind and photovoltaic (PV) markets have experienced double-digit growth over the past decade, mainly as a result of the policies and benefits described above. In the United States, annual installations of renewable energy exceeded 800 MW in 2004 (excluding large hydroelectric power) and are expected to reach almost 4,000 MW per year by 2013. State RPS are spurring rapid growth in renewable energy installations in the United States, with RPS cited as the driving force behind the installation of approximately 47% of new wind capacity additions in the United States between 2001 and 2004 (Wiser 2005).

Combined Heat and Power

CHP, also known as cogeneration, is the simultaneous generation of electric and thermal energy from a common fuel source. CHP is not a specific technology, but an efficient application of technologies to meet an energy user's needs.

Typically, two-thirds of the energy in a conventional power plant is lost when the waste heat is not recovered. CHP captures and uses the waste heat to meet the thermal needs (e.g., process heat, space heating, cooling hot water) of commercial and industrial facilities. A CHP system is substantially more efficient than purchasing electricity from the grid and meeting thermal needs with a boiler or process heater. CHP systems achieve fuel use efficiencies that typically range between 60% and 75%, a significant improvement over the average efficiency of separate heat and power (EPA 2004). This improvement in efficiency is an effective pollution

3 Based on the results of the Navigant Consulting, Inc. (NCI) proprietary Levelized Cost of Electricity (LCOE) Model. This number is based on a range of recent NCI LCOE runs for different types of financing and wind speeds. This cost excludes the production tax credit (PTC) but includes accelerated depreciation. Without accelerated depreciation, the range is \$0.04–0.07/kWh (Navigant 2003).

prevention strategy that reduces air pollutant emissions as well as fuel costs for a given energy output.

In 2004, approximately 80 gigawatts (GW) of CHP were operational in the United States, up from less than 10 GW in 1980 (EPA 2004). There is potential for additional CHP in a variety of applications, including district energy at universities and downtown areas, industrial scale CHP in many industry sectors, and in commercial buildings such as hotels and casinos.

The *Clean Energy-Environment Guide to Action*

EPA developed the *Clean Energy-Environment Guide to Action* to help states evaluate clean energy options and develop their own *Clean Energy-Environment Action Plans* for implementing cost-effective clean energy programs that meet their environmental, energy, and economic goals. The *Guide to Action*:

- Identifies and analyzes a suite of cost-effective state clean energy policies and describes best practices, potential models, key features, and examples of effective state implementation for each policy.
- Helps states understand the analytical tools and methods that can be used to estimate the environmental and economic benefits of their clean energy programs.
- Links states to relevant guidance and technical support resources.

The *Guide to Action* identifies and describes 16 clean energy policies and strategies that states have used to pursue cost-effective clean energy. These policies are categorized according to whether they involve state planning and incentives programs, energy efficiency actions, energy supply actions (i.e., renewable energy and CHP), or utility planning and incentive structures. Table 1.2 describes each policy and lists many of the more specific approaches that can be used to implement each type of policy.

Using the *Guide to Action*

The *Guide to Action* provides a menu of clean energy policies and programs with which states have considerable experience and success. When using the *Guide to Action:*

- Select from the menu of policies by reviewing Table 1.2 and the chapter introductions to identify policies that are most likely to meet state goals. The process for developing a state *Clean Energy-Environment Action Plan* is described in Chapter 2.
- Keep in mind that some of the policies described in the *Guide to Action* represent different paths to the same goal or can be used in combination to achieve a goal.
- Design clean energy programs by building upon the established models, examples, and action items described for each policy, rather than starting "from scratch."

The policies in the *Guide to Action* can be viewed as a menu of policies and programs with which states have significant experience. Some of these policies represent different paths to a goal or can be used in combination to achieve a goal. States can select the appropriate mix of policies to achieve their goals. For example, in its 2005 Climate Change Action Plan, Connecticut developed a coordinated package of 55 recommended actions that include appliance standards, building codes, government green power purchases, a production tax credit, an RPS, and other clean energy policies (see Chapter 2, *Developing a Clean Energy-Environment Action Plan*).

For each of the 16 policies, the *Guide to Action* provides the following information:

- The objectives and benefits of the policy.
- Examples of states that have implemented the policy.
- Responsibilities of key players at the state level, including typical roles of the main stakeholders.
- Opportunities to coordinate implementation with other federal and state policies, partnerships, and technical assistance resources.

- Best practices for policy design, implementation, and evaluation, including state examples.
- Action steps for states to take when adopting or modifying their clean energy policies, based on established state programs.
- Resources for additional information on individual state policies, legislation and regulations, and analytical tools and methods to quantify emission reductions and estimate energy and cost savings.

Table 1.2: Summary of Clean Energy Policies

Policy	Description	State Examples	Specific Approaches	*Guide* Section No.
State Planning and Incentive Structures				
Lead by Example	States lead by example by establishing programs that achieve substantial energy cost savings within their own operations, buildings, and fleets and demonstrate the feasibility and benefits of clean energy to the larger market.	CA, CO, IA, NH, NJ, NY, OR, TX	• Energy savings targets for public buildings. • Renewable and energy efficiency purchase commitments for state facilities. • State loan and incentive programs for public buildings. • Energy performance contracting. • Technical support and training. • State clean energy planning.	3.1
State and Regional Energy Planning	Energy planning at a state or regional level can be an effective means for ensuring that clean energy is considered and used as an energy resource to help states address their multiple energy, economic, and environmental goals.	CA, CT, NM, NY, OR, New England Governors' Conference (NEGC), Northwest Power and Conservation Council, Western Governors' Association (WGA), Western Interstate Energy Board (WIEB)	• Clean energy plan. • Clean energy included within a comprehensive state energy plan. • Planning conducted by energy providers.	3.2
Determining the Air Quality Benefits of Clean Energy	States estimate the emission reductions from their clean energy programs, incorporate those reductions into air quality programs, and evaluate and report the emission reduction benefits of their clean energy programs and policies.	LA (local), MD (local), TX, WI, Western Regional Air Partnership (WRAP)	• Incorporating clean energy into air quality plans and long-term utility planning requirements. • Developing set-asides for energy efficiency and renewable energy projects. • Tracking and reporting emission reductions.	3.3

(continued on next page)

Table 1.2: Summary of Clean Energy Policies *(continued)*

Policy	Description	State Examples	Specific Approaches	*Guide* Section No.
		State Planning and Incentive Structures *(continued)*		
Funding and Incentives	States implement a range of targeted funding and incentives strategies that encourage governments, businesses, and consumers to save energy through cost-effective clean energy investments. Between 20 and 30 states have revolving loan funds for energy efficiency, tax incentives for renewable energy, grants for renewable energy, or rebates for renewable energy.	CA, CO, IA, MT, NY, OR, TX, WA	• Revolving loan funds. • Energy performance contracting. • Tax incentives. • Grants, rebates, and generation incentives. • NO_x set-asides for energy efficiency and renewable energy projects. • Supplemental Environmental Projects (SEPs).	3.4
		Energy Efficiency Actions		
Energy Efficiency Portfolio Standards	Similar to Renewable Portfolio Standards (see Section 5.1), EEPS direct energy providers to meet a specific portion of their electricity demand through energy efficiency. Seven states have direct or indirect EEPS requirements.	CA, IL, NJ, NV, PA, TX	• Energy efficiency targets for energy providers as a percentage of load growth, base year sales, or fixed energy savings (e.g., kWh).	4.1
Public Benefits Funds for Energy Efficiency	PBFs for energy efficiency are pools of resources used by states to invest in energy efficiency programs and projects and are typically created by levying a small charge on customers' electricity bills. Seventeen states and Washington, D.C. have established PBFs for energy efficiency.	CA, NY, OR, WI	• Funds for efficiency programs based on a system-wide charge (mills per kWh). • Grants, rebates, and loans. • Technical assistance, education, and training support for energy efficiency investments.	4.2
Building Codes for Energy Efficiency	Building energy codes establish energy standards for residential and commercial buildings, thereby setting a minimum level of energy efficiency and locking in future energy savings at the time of new construction or renovation. More than 40 states have implemented some level of building codes for residential buildings and/or commercial buildings.	AZ, CA, OR, TX, WA	• Minimum energy efficiency requirements for residential and commercial buildings. • Periodic review and updates to existing codes. • Code implementation, evaluation, and compliance assistance.	4.3
State Appliance Efficiency Standards	State appliance efficiency standards set minimum energy efficiency standards for equipment and appliances that are not covered by federal efficiency standards. Ten states have adopted appliance standards.	CA, CT, NJ, NY	• Minimum energy efficiency levels for consumer products and commercial equipment. • Periodic evaluation and review of standards, markets, and product applications.	4.4

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Table 1.2: Summary of Clean Energy Policies *(continued)*

Policy	Description	State Examples	Specific Approaches	*Guide* Section No.
		Energy Supply Actions		
Renewable Portfolio Standards	RPS establish requirements for electric utilities and other retail electric providers to serve a specified percentage or amount of customer load with eligible resources. Twenty-one states and Washington, D.C. have adopted RPS.	AZ, CA, MA, TX, WI	• Promoting specified technologies through "technology tiers" and "credit multipliers." • Alternative compliance payments. • Renewable Energy Certificates (RECs) trading.	5.1
Public Benefits Funds for State Clean Energy Supply Programs	PBFs are a pool of resources used by states to invest in clean energy supply projects and are typically created by levying a small charge on customers' electricity bills. Sixteen states have established PBFs for clean energy supply.	CA, CT, MA, NJ, NY, OH	• Funds for emerging and commercially competitive technologies and clean energy market development programs based on a system-wide charge (mills per kWh). • Grants, rebates, and generation incentives.	5.2
Output-Based Environmental Regulations to Support Clean Energy Supply	Output-based environmental regulations establish emissions limits per unit of productive energy output of a process (i.e., electricity, thermal energy, or shaft power), with the goal of encouraging fuel conversion efficiency and renewable energy as air pollution control measures. Twelve states have established output-based environmental regulations.	CT, IN, MA, TX	• Conventional emission limits using an output formula. • Special regulations for small distributed generators that are output based. • Output-based allowance allocation methods in a cap and trade program. • Output-based allowance allocation set-asides for energy efficiency and renewable energy. • Multi-pollutant emission regulations using an output-based format.	5.3
Interconnection Standards	Standard interconnection rules establish processes and technical requirements that apply to utilities within the state and reduce uncertainty and delays that clean DG systems can encounter when obtaining electric grid connection. Fourteen states have standard interconnection rules, and 39 states offer net metering.	MA, NJ, NY, TX	• Standard interconnection rules for DG systems through defined application processes and technical requirements. • Net metering, which defines application processes and technical requirements, typically for smaller projects.	5.4

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Table 1.2: Summary of Clean Energy Policies *(continued)*

Policy	Description	State Examples	Specific Approaches	*Guide* Section No.
		Utility Planning and Incentive Structures		
Fostering Green Power Markets	States play a key role in fostering the development of voluntary green power markets that deliver cost-competitive, environmentally beneficial renewable energy resources by giving customers the opportunity to purchase clean energy. Green power is available in more than 40 states.	CT, MA, NJ, NM, WA	• Customer access to green power markets. • Green pricing tariffs. • Green "check-off" programs. • Net metering.	5.5
Portfolio Management Strategies	Portfolio management strategies include energy resource planning approaches that place a broad array of supply and demand options on a level playing field when comparing and evaluating them in terms of their ability to meet projected energy demand and manage uncertainty.	CA, CT, IA, MT, NV, OR, PA, VT, Idaho Power, Northwest Power and Conservation Council, PacifiCorp, Puget Sound Energy	• Energy resource planning and procurement. • Integrated resource planning (IRP). • Retail choice portfolio management.	6.1
Utility Incentives for Demand-Side Resources	A number of approaches—including decoupling and performance incentives—remove disincentives for utilities to consider energy efficiency and clean DG equally with traditional electricity generation investments when making electricity market resource planning decisions.	AZ, CA, CT, ID, MA, MD, ME, MN, NY, NM, NV, OR, WA	• Decoupling utility profits from sales volume. • Program cost recovery. • Shareholder performance incentives.	6.2
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	Electric and natural gas rates, set by Public Utility Commissions (PUCs), can be designed to support clean DG projects and avoid unintended barriers, while also providing appropriate cost recovery for utility services on which consumers depend.	*Exit Fees:* CA, IL, MA *Standby Rates:* CA, NY *Gas Rates:* NY	• Utility ratemaking and revenue requirements. • Revised standby rate structures. • Exit fee exemptions. • Natural gas rates for DG and/or CHP. • In regulated markets, help generators and utilities establish appropriate buyback rates.	6.3

Who Will Use the *Guide to Action*?

The *Guide to Action* is intended for use by state energy, economic, and environmental policymakers. It demonstrates a range of clean energy policy options, best practices, and lessons learned that can inform decisionmaking and policy design.

States participating in the Clean Energy-Environment State Partnership Program will use the *Guide to Action* to:

- Develop their own *Clean Energy-Environment Action Plan* that is appropriate to their state.
- Build on established models and practices adopted by other states.
- Identify the roles and responsibilities of key decisionmakers, such as environmental regulators, state legislatures, public utility commissioners, and state energy offices.
- Access and apply technical assistance resources, models, and tools available for state-specific analyses and program implementation.
- Learn from each other as they develop their own clean energy programs and policies.

States that have not yet developed comprehensive clean energy policies can begin by familiarizing themselves with the material in the *Guide to Action* and contacting EPA for guidance and referral to other resources. For states that are interested in adopting new clean energy policies, the *Guide to Action* provides a proven set of effective policies that draw upon the experiences, insights, and approaches that have been vetted and refined by other states.

Contents of the *Guide to Action*

The *Guide to Action* contains the following chapters and appendices:

- *Executive Summary*, provides a summary of the *Guide to Action*, tailored for state decisionmakers and others who want a concise description of the *Guide's* key findings and recommendations.
- *Chapter 1, Introduction and Background*, defines the term clean energy; describes the environmental, public health, energy, and other challenges that clean energy can address; and summarizes state opportunities for implementing clean energy policies. A summary of the 16 clean energy policies is also presented.
- *Chapter 2, Developing a Clean Energy-Environment Action Plan*, provides information about the steps states have used to develop a *Clean Energy-Environment Action Plan*, including establishing a collaborative process, setting goals, identifying policies and analyzing their impacts, and developing an implementation strategy. It also provides examples of state plans and an overview of the analytical tools and resources available to help states select and evaluate their clean energy options.
- *Chapter 3, State Planning and Incentive Structures*, describes four policies that states have used to help shape their clean energy strategy, quantify and integrate the environmental benefits of clean energy with other programs, and encourage other organizations in the state to invest in clean energy.
- *Chapter 4, Energy Efficiency Actions*, describes four policies that states have used to support greater investment in, and adoption of, energy efficiency through cost-effective programs.
- *Chapter 5, Energy Supply Actions*, describes five policies and emerging approaches that support greater investment in clean energy supply resources, including renewable energy and CHP.
- *Chapter 6, Utility Planning and Incentive Structures*, describes three utility-based policies that remove disincentives for utilities to consider energy efficiency, renewable energy, and clean DG equally with traditional electricity generation investments.
- Technical Appendices include:
  - *Appendix A, Federal Clean Energy Programs*
  - *Appendix B, Energy Efficiency Program Resources*
  - *Appendix C, Clean Energy Supply: Technologies, Markets, and Programs*

Information Resources

Federal Partnerships

As states pursue policies and programs for promoting clean energy, they can work with a variety of federal programs for assistance as described in Appendix A, *Federal Clean Energy Programs.*

For More Information About the *Guide to Action*

To download the *Guide to Action*, visit EPA's Clean Energy Web site at: http://www.epa.gov/cleanenergy/stateandlocal/.

To order a print copy of the *Guide to Action*, visit the National Service Center for Environmental Publications (NSCEP) Web site at: http://www.epa.gov/ncepihom/ordering.htm or contact NSCEP at: 1-800-490-9198.

Request EPA Publication #430-R-06-001.

For more information about this *Guide to Action*, please contact the EPA Clean Energy-Environment State Partnership Program:

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Chapter 2. Developing a Clean Energy-Environment Action Plan

Summary

This chapter describes the process for developing a *Clean Energy-Environment Action Plan* that helps states provide for clean, low-cost, reliable energy. Drawing upon states' experiences, it describes the typical steps for establishing a collaborative process, setting clean energy goals, identifying and evaluating clean energy policies, and developing an implementation strategy.

The *Guide to Action* helps states analyze and compare policies to develop a plan for meeting their clean energy objectives: a *Clean Energy-Environment Action Plan*. It helps states implementing a *Clean Energy-Environment Action Plan:*

- Assess the environmental, energy, and economic benefits of their clean energy portfolios.
- Identify and remove market, regulatory, and institutional barriers to clean energy.
- Integrate clean energy with specific environmental protection or economic development objectives.
- Enhance coordination across state agencies and develop partnerships with electric and natural gas utilities, businesses, environmental groups, and clean energy industries.
- Identify opportunities to coordinate and leverage ongoing state activities and investments, federal programs, and private sector investments.
- Implement policies with effective design and evaluation characteristics.

The *Clean Energy-Environment Action Plan*

Under the U.S. Environmental Protection Agency's (EPA's) Clean Energy-Environment State Partnership Program, states create a *Clean Energy-Environment Action Plan* that outlines policies to further clean energy and environmental goals and provide public health and economic benefits.

EPA provides planning, policy, technical, analytical, and information resources, like the *Clean Energy-Environment Guide to Action,* to help states develop and implement their plans.

The *Clean Energy-Environment Action Plan*

A *Clean Energy-Environment Action Plan* outlines a clear strategy to deliver clean, low-cost, and reliable energy to state residents through the use of energy efficiency, renewable energy, and clean distributed generation (DG). The plans focus explicitly on clean energy but may be developed in conjunction with broad state planning processes, such as comprehensive energy or air quality planning (see Section 3.2, *State and Regional Energy Planning*), state-wide sustainability planning, and resource-specific planning for energy efficiency or clean energy supplies. In addition, many states have developed climate change action plans that include clean energy as a key strategy for saving energy and lowering greenhouse gases.[4] States have also developed "lead by example" action plans focused on state facilities and operations (see Section 3.1, *Lead by Example*).

[4] Twenty-eight states and Puerto Rico have developed climate change action plans (EPA 2005).

States use a range of programs and strategies to achieve their clean energy goals. These programs take many forms and are developed and implemented through multiple agencies and regulatory jurisdictions. A *Clean Energy-Environment Action Plan* can serve as a platform and roadmap for engaging relevant state agencies, including nongovernment stakeholders. In addition, states often work beyond state boundaries on a collaborative basis to develop regional clean energy strategies (e.g., the Western Governors' Clean and Diversified Energy Initiative).

In each case, the steps involved in developing a *Clean Energy-Environment Action Plan* are similar from state to state. They typically include the following:

1. Create a collaborative.
2. Establish a quantitative goal or goals based upon future energy use expectations and the potential for clean energy in the state.
3. Identify both existing and new clean energy policies and programs.
4. Design and evaluate the impacts of policies.
5. Recommend specific actions for state decision-makers.

The order of these steps can vary from state to state. For example, some states develop broad goals before conducting stringent analysis. These goals may be based on regional goals or agreements, other state activities, or political considerations. After the goal is adopted, state agencies typically determine the most effective way to achieve it. Alternatively, some states conduct thorough analyses of their clean energy potential, evaluate policy options, and assess related opportunities before determining a goal. This range of approaches to goal-setting allows each state to proceed in a manner suited to local circumstances. Regardless of the order, however, these steps are common across all plans. Each step is described in greater detail as follows.

1. Create a Collaborative

States have found it particularly useful to reach out to the parties in their states that are interested in and/or may be affected by changes in energy and environmental policies within the state. Key players typically include but are not limited to:

- *The governor and his/her staff*, who can provide leadership and ensure follow-through.
- *State legislatures*, that will ultimately need to provide leadership on policies requiring legislative action. State legislatures' interests and concerns may vary depending on the impact of energy policies on their constituents, including citizens and representatives from various economic sectors.
- *State agencies*, which maintain government data and analytic capacity, and have policy and implementation jurisdiction in the sectors of interest.
- *Universities*, which may provide expertise, analytic support, and/or a neutral forum to convene stakeholder meetings.

Stakeholders can include:

- *Utilities*, which can provide technical expertise and data.
- *Independent system operators (ISOs) and regional transmission organizations*, which can provide technical analyses and information and which are key stakeholders in many clean energy policies.
- *Independent power producers*, independent transmissions owners, and energy suppliers, which can provide information and analysis about electricity markets.
- *Environmental and consumer organizations*, which can provide data, analysis, and feedback.
- *Other private sector interests*, which often maintain significant data and analytic capabilities relevant to energy planning, and which may be affected by new energy policies.
- *The public*, which provides new ideas, input, and/or feedback to the state.

2. Establish a Quantitative Goal or Goals

Each state has its own unique clean energy potential and economic, environmental, energy, and other priorities. Quantitative clean energy goals take those attributes into account and define a specific level of cost-effective clean energy the state can strive to acquire during a particular period of time. Clear policy objectives, such as the development of a clean energy goal or usage targets for specific resources, ensure that all players know the expected outcome. Quantitative goals can be short-term and/or long-term and can include interim milestones. They provide for ease of measurement and reporting, offering a straightforward means of evaluating progress and providing feedback when mid-course corrections are necessary.

Several states have set clear quantitative clean energy goals and are working toward achieving them. For example, New York adopted "the goal of reducing statewide primary energy use in 2010 to a level that is 25% below 1990 energy use per unit of Gross State Product (GSP) and...the goal of increasing the share of renewable energy as a percentage of primary energy use 50% by 2020, up from 10% in 2000 to 15% in 2020" (NYSERDA 2002). The Oregon Renewable Energy Action Plan established a goal to meet 25% of state government's total electricity needs through new renewable energy sources by 2010 and 100% by 2025 (State of Oregon 2005). More examples of state energy goals are presented in Section 3.2, *State and Regional Energy Planning.*

Successful states have considered the following two actions, at a minimum, as they developed their goals.

Develop a Baseline and Forecast

States begin by developing or refining a baseline inventory of their energy use and emissions and making projections about the future. This typically includes making a projection of energy use by end-use sector across the state and load growth forecasts that provide utility-specific data. The baseline and projection enable a state to understand energy and emissions growth expectations and identify particular sectors or sources that might be key targets for policy intervention.

The U.S. Department of Energy (DOE) offers state-level energy use data that can be projected into the future. Some states, such as New York, have their own data or support state university energy models and methods that enhance DOE state energy data and generate a customized baseline and forecast. Alternatively, other states such as Connecticut and Hawaii have used proprietary models, such as the Integrated Planning Model or Energy 2020, to help with state energy modeling. These models make predictions of energy usage and emissions for the electricity sector and the entire energy sector, respectively. Whichever model states choose, they have found it useful to select one that is widely accepted by experts in the field and is clear or "transparent" in its assumptions or workings. This prevents challenges or confusion later when trying to interpret the results.

Assess Energy Efficiency and/or Renewable Energy Potential

States have found it particularly useful to conduct energy efficiency and/or renewable energy potential analyses to determine where the greatest opportunities exist. The findings of these analyses help states identify opportunities and determine the feasibility of different goals based upon technologies or resource availability.

For example, Georgia recently commissioned a study, *Assessment of Energy Efficiency in Georgia*, that "identified substantial, cost-effective energy efficiency potential." The state "commissioned the report to guide the state's efforts in developing the most energy-efficient economy possible (and)...believes the results of this study provide an accurate roadmap toward achieving this goal" (ICF Consulting 2005). Another energy efficiency potential study, *Nevada Energy Efficiency Strategy*, identified policies that would yield about $4.8 billion in net economic benefits, save more than 8,000 gigawatt-hours (GWh) of electricity and 16 billion cubic feet of natural gas per year, and lower projected statewide electricity use by more than 20% by 2020 (Geller et al. 2005). Similar studies can be conducted to assess the resource potential for renewable energy in particular states. One study, *Energy Efficiency and Renewable Energy*

Resource Development Potential in New York State, "found large amounts of technical potential for efficiency and renewable energy…that…would be economical compared to conventional electricity generation" (NYSERDA 2003).

3. Identify Clean Energy Policies and Programs: Existing and New

Clean Energy-Environment Action Plans are intended to help states identify policies currently in place, as well as best-practices from other states. Chapter 3 through Chapter 6 of the *Guide to Action* provide information and resources pertaining to 16 specific programs and policies states have found particularly promising for furthering cost-effective clean energy. States have discovered that these policies help level the playing field for clean energy options that are hindered by existing policy barriers.

The *Guide to Action* helps states determine an appropriate mix of policies to consider for further analysis under their *Clean Energy-Environment Action Plan*. Table 1.2 in Chapter 1 presents details about programs and policies that focus on clean energy opportunities for homes, businesses, public institutions, and electricity generation. While not covered in the *Guide to Action*, transportation sector policies are also important. Several states are integrating transportation policies into their clean energy planning processes.

When identifying promising policies, states typically follow three steps: inventory policies currently in place, identify new policies, and establish criteria to assess policies.

Inventory Existing Policies

States often evaluate the success of existing clean energy programs to determine if they should be extended, expanded, or modified to support the new or revised clean energy-environment goal. States can start by using the policies in the *Guide to Action* as a checklist. States can also review energy plans, air quality plans, and greenhouse gas emission reduction strategies developed by other states.

When considering policy options, states can simultaneously evaluate barriers to advancing cost-effective clean energy. For example, approval processes designed for large distributed generation systems seeking to connect to the grid may be too onerous to allow small systems to come online. Reexamining interconnection standards (discussed in Section 5.4, *Interconnection Standards*) can stimulate the growth of clean energy by making the process more appropriate to the size and scale of the project and cost-effective for the generation owners.

Identify New Policies

Once states have determined which clean energy programs and policies they already have in place, they can use the *Guide to Action* to identify new ones that they might consider implementing. For each policy or program, the *Guide* describes objectives and benefits, state examples, roles and responsibilities of key players, opportunities for coordination with other programs or policies, best practices for policy design and evaluation, action steps for states, and resources for additional information. States can use the information about other states' successes and best practices to identify those options that they would like to explore further for their own *Clean Energy-Environment Action Plan*.

Establish Criteria to Assess Policies

States determine the criteria they use to evaluate their clean energy options. The criteria vary from state to state depending on each state's unique goals and circumstances. Criteria can include but are not limited to: cost-effectiveness, ease of implementation, political feasibility, pollution reduction effectiveness, payback period, and benefit to the economy (e.g., impacts on jobs). To avoid confusion, states have found it useful to define the criteria upfront. For example, when using cost-effectiveness as a criterion, states typically clarify whether they are using dollar per kilowatt hour saved or dollar per unit of emissions saved. States have discovered that this prevents confusion and helps to identify the types of information and tools needed to assess the policies.

States have found it helpful to evaluate initial policy recommendations according to qualitative criteria (e.g., ease of implementation, political feasibility), to identify options suitable for further consideration. These policies can then be ranked and sorted according to the criteria chosen.

4. Design Policies and Evaluate Their Impacts

Once states determine the policies they would like to consider for inclusion in their *Clean Energy-Environment Action Plan*, they proceed to design their specific policies and evaluate the quantitative impacts of the various options. There are several design issues that have arisen as states move forward with the policy evaluation process. The design of the policies can have a profound effect on the impact of the policy. The impacts frequently considered include, but are not limited to, impacts upon energy use and supply, economic indicators, greenhouse gas levels, air quality, and human health. There are numerous tools available to states to help them assess the impacts of the policies.

Design Issues

The impacts of a policy vary depending upon the design of the policy. Clearly, the impact of a renewable portfolio standard set at 2% to be achieved in 10 years will differ significantly from one set at 25% to be achieved in five years. States have found it valuable to evaluate policies using different designs or specifications to find the ones that best meet their criteria.

It is often practical for states to consider how policies relate not just to their goal but to each other. Some policies may effectively complement each other while others may create barriers for other policies. For example, public benefits funds (PBFs) for energy efficiency can be used to bolster the effectiveness of building codes through support for implementation and enforcement. (More information about both of these options is available in Section 4.2, *Public Benefits Funds for Energy Efficiency* and Section 4.3, *Building Codes for Energy Efficiency*, respectively.) As mentioned above, some interconnection standards policies can impede clean energy, depending on how they are defined (see Section 5.4, *Interconnection Standards*).

Finally, states have found it advantageous to identify the type of action, the key players required, and the time frame for implementation when designing a policy. For example, a regulatory action would require one set of specific agencies, stakeholders, and participants and occur on one time line, whereas an energy efficiency public awareness campaign may require an entirely different set of players and take place over varying time frames. States have found it helpful to identify this information upfront so that the appropriate experts can be involved and contribute their expertise early in the process. These experts assist in shaping the policy to maximize its effectiveness. States have realized that this type of planning and specificity upfront improves coordination across programs, ensures that key players know what is expected of them, and facilitates future measurement, evaluation, and communication of results. This process also facilitates the development of an implementation strategy that is a key component of a *Clean Energy-Environment Action Plan.*

Impact Analyses

Once policies are designed, states can use analytic tools to evaluate the options based on the criteria they have developed. The tools enable states to quantify the impacts of the various policies and rank them according to the agreed upon criteria. Usually, this includes an assessment of the energy, economic, and/or environmental and public health impacts of the options, sometimes referred to collectively as co-benefits. States have found it particularly helpful to measure the impact of the policies against the goal established in Step 2. This will enable the collaborative to choose those policies that bring a state closest to its goal.

While analytic tools necessarily involve predictions and uncertainty, they can address a number of specific questions. It is important to thoroughly understand the strengths and weaknesses of the models used, the ways they interact with each other, and the underlying assumptions to avoid misinterpreting the results. As described above, states have found it useful to select models that are widely accepted by experts in the field and are clear or "transparent" in their assumptions and structures.

EPA offers or supports several tools or resources to help states assess the impacts of policies. States can use the tools listed in Figure 2.1 to enhance their assessment of clean energy-environment policies.

Connecticut provides an example of how states can use these tools and resources when developing their plan. The state's 2005 Climate Change Action Plan includes 55 specific recommendations (over 30 of which promoted cost-effective clean energy) to the Governor's Steering Committee (GSC) on Climate Change. The governor and the GSC accepted the majority of the 55 recommendations and requested that the state conduct additional analyses on the rest.

During the policy analysis phase, Connecticut used several modeling tools to conduct customized macroeconomic analyses of four clean energy options. Connecticut worked with EPA specifically to quantify the economic, air quality, and health co-benefits. EPA's new Co-Benefits Risk Assessment (COBRA) model showed that while "the state's (existing) energy efficiency program…was known to achieve a $3 to $1 direct return on investment based on electricity savings…an additional $4 to $1 payback in terms of reduced health costs and public health benefits was identified (through COBRA) as a result of reductions in criteria air pollutants" (Connecticut GSC on Climate Change 2005). Connecticut also used the Greenhouse Gas Equivalencies Calculator to estimate the potential impacts of the 55 recommendations. The state presented its findings to the state legislature in the revised Climate Change Action Plan 2005. Four key

Figure 2.1: Tools and Resources for Assessing the Benefits of Clean Energy

EPA offers or supports several tools or resources to help states assess the benefits of clean energy policies. Information about these and other tools can be found at: http://epa.gov/cleanenergy/stateandlocal/resources.htm.

Energy-Related Tools for States

To learn more about modeling energy policies, EPA provides:

- Guidance on how to effectively model energy efficiency and/or renewable energy policies.
- Support for customized analyses of energy efficiency and/or renewable energy policies for states.

Economic Benefits-Related Tools for States

To determine the technological and economic potential of energy efficiency and/or renewable energy for states, EPA supports:

- Energy efficiency and/or renewable energy potential studies.

To assess the macroeconomic impacts of policies or technological opportunities, EPA supports:

- Rocky Mountain Institute (RMI) Community Energy Opportunity Finder.
- Customized analyses of the impacts of energy efficiency and/or renewable energy policies for partners in the Clean Energy-Environment State Partnership Program.

Environmental and Human Health Benefits

To assess air pollution and greenhouse gas effects of clean energy projects, EPA supports:

- Clean Air and Climate Protection Software, developed by State and Territorial Air Pollution Program Administrators (STAPPA), Association of Local Air Pollution Control Officials (ALAPCO), and International Council for Local Environmental Initiatives (ICLEI).

To assess the air quality, public health benefits, and health cost savings of air pollution reductions, EPA developed:

- The Co-Benefits Risk Assessment (COBRA) screening model.

To better understand greenhouse gas emissions and energy use in your state, EPA supports:

- State Inventory Tool (SIT).
- Emissions Forecasting Tool.
- State Energy Carbon Dioxide (CO_2) Data Tables.
- Emissions and Generation Resources Integrated Database (eGRID).

To translate greenhouse gas emissions into easily understood metrics, EPA developed the:

- Greenhouse Gas Equivalencies Calculator.

committees of the Connecticut General Assembly (the Environment, Energy and Technology, Commerce, and Transportation committees) supported the new plan.

5. Recommend Specific Actions for State Decisionmakers

Once policy options have been assessed and ranked according to the desired criteria, the collaborative typically reviews the findings. Based upon the rankings and discussion among the stakeholders, recommendations for action are presented in the *Clean Energy-Environment Action Plan.* A sample outline for a state action plan, based on Connecticut's 2005 Climate Change Action Plan, is presented in Figure 2.2 on page 2-8.

State Clean Energy-Environment Action Plans typically include the following components:

- *The Clean Energy-Environment Goal(s),* established in Step 2.
- *Descriptions of the Policies Recommended in Order to Achieve the Goal*, developed in Steps 3 and 4.
- *Projected Impacts of the Policies As They Relate to the Goal,* developed in Step 4.
- *An Implementation Strategy,* outlined in Step 4.

A fifth component is often:

- *A Measurement, Evaluation, and Reporting Plan.* As states design and evaluate clean energy policy options, they find it beneficial to consider in advance how to measure success. States often specify an evaluation strategy, a time line for reporting progress, the key metrics to be reported, and the key players involved. This measurement, evaluation, and reporting plan enables states to regularly check their progress against their goals and adjust their course as needed.

Together, these pieces present a strategy to deliver clean, low-cost, and reliable energy to a state and its constituents through the use of energy efficiency, renewable energy, and clean DG. Several states have successfully completed clean energy plans that provide useful models for other states interested in reaping the multiple benefits of cost-effective clean energy. Examples and links to many of these plans are listed in the *Information Resources* section presented on page 2-11.

Figure 2.2: Sample Outline for a *Clean Energy-Environment Action Plan*

(Based on the 2005 Connecticut Climate Change Action Plan at: http://www.ctclimatechange.com/StateActionPlan.html)

Connecticut's *Climate Change Action Plan* is a blueprint for achieving cost-effective greenhouse gas emissions reductions by a specified future date. The Plan was developed by a multi-sector stakeholder group with guidance from state agencies. The resulting climate change policy recommendations support a range of clean energy options, including renewable energy, energy efficiency, and clean distributed generation.

1. Goals

The primary goal of Connecticut's Climate Change Action Plan is to establish a timetable for achieving a specific greenhouse gas emission reductions target, as follows:

To reduce greenhouse gas emissions to 1990 levels by 2010 and an additional 10% below that by 2020.

Other states may elect to frame their goals in terms of metrics such as installed clean energy capacity, clean energy consumption, or air pollution effects.

2. Policy Descriptions

Connecticut stakeholders recommended the following policies to lower greenhouse gas emissions, encourage clean energy supply, and support efficient end-uses.

Residential, Commercial, Industrial Sectors: 25 policies, including:

- Appliance standards
- Heat pump water heater replacement program
- Weatherization Assistance Program (WAP)
- ENERGY STAR Homes Program
- High-performance buildings: schools and other state-funded buildings
- Encourage CHP

Agriculture, Forestry, Waste Sectors: 10 policies

Transportation Sector: 9 policies

Electricity Generation Sector: 9 policies, including:

- Renewable energy strategy (RES)
- Renewable portfolio standard
- Government clean energy purchase
- Production tax credit (PTC)
- Clean Energy Choice (Green power option)
- Renewable Energy Certificates (Green tags)
- Restore Clean Energy Fund
- Energy efficiency and CHP
- Regional cap-and-trade program

Education and Outreach: 1 policy

Greenhouse Gas Reporting: 1 policy

(continued on next page)

Figure 2.2: Sample Outline for a *Clean Energy-Environment Action Plan (continued)*

3. Policy Impacts and Recommendations

Consistent with Connecticut's focus on climate change, all recommended policies are evaluated for their potential to reduce greenhouse gases. Costs, benefits, and "payback" are also analyzed. For selected measures, the state measures co-benefits such as energy savings and air pollution reductions.

Connecticut's policy analysis framework establishes an emissions baseline forecast, sets a reductions goal (with respect to the baseline), and evaluates each measure in the context of the goal. This approach is summarized below on an aggregate and sector-by-sector basis.

All Policies:

Summary of Projected Connecticut Greenhouse Gas Reductions
million metric tons of carbon dioxide-equivalent ($MMTCO_2e$)

	2010	2020
Future Baseline	48.14	56.15
New England Governors/Eastern Canadian Premiers Targets (1990 levels by 2010, 10% below 1990 levels by 2020)	42.40	38.16
Reductions Needed to Meet New England Governors/Eastern Canadian Premiers Targets	5.74	17.99
Projected Reductions By Sector		
Transportation	0.35	3.84
Residential, Commercial, Industrial	4.03	7.29
Agriculture, Forestry, Waste	1.21	1.30
Electricity	3.07	6.89
Connecticut Climate Change Action Plan Total Projected Reductions	**8.66**	**19.32**

4. Implementation Strategy

Following the release of Connecticut's Climate Change Action Plan, the state established a policy implementation strategy consisting of the elements below.

- Present recommendations to the governor and legislature for approval.
- Conduct further analyses of the costs, benefits, and implementation pathways associated with the remaining action items in the stakeholder report that were not slated for immediate implementation.
- Continue to seek public input for new ideas to reduce greenhouse gas emissions, along with information on their cost, benefits, and implementation pathways.

5. Measurement, Evaluation, Reporting

The state also established procedures to build on existing analysis, track progress, and maintain support.

- Track progress on each of the measures approved for immediate implementation.
- Continue to calculate greenhouse gas benefits and costs.
- Continue to analyze the co-benefits of priority policy options.
- Obtain stakeholder feedback on the Action Plan and its implementation.
- Assess progress on each measure and develop an annual report on results.
- Present first annual progress report to the General Assembly at the end of 2005.

(continued on next page)

Figure 2.2: Sample Outline for a *Clean Energy-Environment Action Plan (continued)*

Progress to Date

Connecticut's experience demonstrates that fostering stakeholder buy-in and state government coordination can help achieve success. The following three policies—initially recommended in the Action Plan—are now in place:

Appliance Standards

- Connecticut adopted new energy efficiency standards for a range of residential and commercial appliances and products in May 2004.
- *An Act Concerning Energy Efficiency Standards* will save more than $380 million in energy costs by 2020, conserve more than 430 GWh of electricity, reduce summer peak electricity demand by more than 125 MW, and avoid the emissions of about 65,000 metric tons of carbon.
- The products covered by the Connecticut law include torchiere lighting fixtures, building transformers, commercial refrigerators and freezers, traffic signals, exit signs, large packaged air conditioning equipment, unit heaters, and commercial clothes washers.

RPS

- Connecticut's RPS requires 10% of all retail electricity sales to come from renewable resources by 2010.
- The legislature expanded it in June 2005 by adding new "Class III" requirements covering energy efficiency and CHP plants.
- Under the new Class III requirements, electricity suppliers must purchase 1% of supply from efficiency and CHP by 2007 and 4% by 2010.

Leading by Example

- Connecticut is committed to purchasing 20% of the state government's electricity from "clean" sources by 2010.
- To help accomplish this goal, the Department of Environmental Protection (DEP) announced in November 2005 that it will receive 100% of its yearly electricity (7.6 million kWh) from renewables. This will reduce CO_2 emissions by 3,716 tons a year, which is equivalent to the total electrical needs of 670 households or taking 730 cars off the road for one year.

Information Resources

Clean Energy Potential Studies

Title/Description	URL Address
State Clean Energy Potential Studies	
Assessment of Energy Efficiency in Georgia. 2005. Prepared for Georgia Environmental Facilities Authority by ICF Consulting.	http://www.gefa.org/pdfs/assessment.pdf
Connecticut Conservation and Energy Efficiency: Recent Performance, Future Potential. 2004. Study conducted for the Connecticut Conservation Management Board. December 2.	http://www.easternct.edu/depts/sustainenergy/Upcoming%20events/CT%20Energy%20Future/Presentations/SchlegelC&LM_CTEnergyFuturesDec04f.ppt
Discussion of Proposed Energy Savings Goals for Energy Efficiency Programs in California. 2003. California Energy Commission (CEC). September.	http://www.energy.ca.gov/reports/2003-09-24_400-03-022D.PDF
Energy Efficiency and Renewable Energy Resource Development Potential in New York State, Volume 1: Summary Report. Prepared by Optimal Energy Inc. for NYSERDA. August 2003.	http://www.nyserda.org/sep/EE&ERpotentialVolume1.pdf
Nevada Energy Efficiency Strategy. 2005. Southwest Energy Efficiency Project (SWEEP): H. Geller, C. Mitchell, and J. Schlegel. January.	http://www.swenergy.org/pubs/Nevada_Energy_Efficiency_Strategy.pdf
Nevada Statewide Energy Conservation Plan.	http://dem.state.nv.us/sweep.htm#INTRODUCTION
The Potential for Energy Efficiency in the State of Iowa. Oak Ridge National Laboratory. June 2001.	http://www.ornl.gov/sci/btc/apps/Restructuring/IowaEEPotential.pdf
Regional Energy Efficiency Potential Studies	
Air Pollution Prevention Forum Documents. Western Regional Air Partnership (WRAP).	http://www.wrapair.org/forums/ap2/docs.html
A Balanced Energy Plan for the Interior West. Western Resource Advocates. 2004.	http://www.westernresourceadvocates.org/energy/bep.html
Conservation Regional Technical Forum.	http://www.nwppc.org/energy/rtf/Default.htm
Economically Achievable Energy Efficiency Potential in New England. Northeast Energy Efficiency Partnerships by Optimal Energy.	http://www.neep.org/files/Full_Report.pdf
Emerging Energy-Saving Technologies and Practices for the Buildings Sector As of 2004. ACEEE.	http://aceee.org/pubs/a042toc.pdf
Energy Efficiency and Economic Development in New York, New Jersey, and Pennsylvania. 1997. American Council for an Energy-Efficient Economy (ACEEE), S. Nadel, S. Laitner, M. Goldberg, N. Elliott, J. DeCicco, H. Geller, and R. Mowris.	http://www.aceee.org/store/proddetail.cfm?CFID=784272&CFTOKEN=63415223&ItemID=98&CategoryID=7
5th Northwest Power Plan. Northwest Power and Conservation Council.	http://www.nwppc.org/energy/powerplan/default.htm

Title/Description	URL Address
National Energy Efficiency Potential Studies	
The New Mother Lode: The Potential for More Efficient Electricity Use in the Southwest. November 2002. SWEEP. H. Geller, director of SWEEP; ACEEE, Tellus Institute, Etc Group, Robert Mowris and Associates, and MRG & Associates.	http://www.swenergy.org/nml/
Southwest Energy Efficiency Project (SWEEP).	http://www.swenergy.org/

Clean Energy Plans and Planning Processes

(See also, *Information Resources* in Section 3.2, *State and Regional Energy Planning*)

Title/Description	URL Address
State Energy Efficiency Plans	
California's Secret Energy Surplus: The Potential for Energy Efficiency, September 2002. XENERGY, Inc., M. Rufo and F. Coito.	http://www.ef.org/documents/Secret_Surplus.pdf
Nevada Energy Efficiency Strategy, January 2005. SWEEP: H. Geller, C. Mitchell, and J. Schlegel.	http://www.swenergy.org/pubs/Nevada_Energy_Efficiency_Strategy.pdf
Texas Emissions Reduction Plan. Texas Natural Resource Conservation Commission. 2005.	http://www.tnrcc.state.tx.us/oprd/sips/terp.html
State Renewable Energy Plans	
Oregon Renewable Energy Action Plan. Oregon DOE. 2005.	http://egov.oregon.gov/ENERGY/RENEW/docs/FinalREAP.pdf
Regional Clean Energy Initiatives or Plans	
Harvesting Clean Energy. A New Economic Opportunity for the Rural Northwest.	http://www.harvestcleanenergy.org/pdfs/HCE_Action_Plan.pdf
Powering the South: A Clean & Affordable Energy Plan for the Southern United States. Renewable Energy Policy Project. January 2002.	http://www.repp.org/articles/static/1/binaries/pts_repp_book.pdf
Repowering the Midwest: The Clean Energy Development Plan. Environmental Law and Policy Center et al. 2001.	http://www.repowermidwest.org/plan.php
Southern Alliance For Clean Energy.	http://www.cleanenergy.org
Western Governors' Association (WGA) Clean and Diversified Energy Initiative.	http://www.westgov.org/wga/initiatives/cdeac/
State Climate Change Plans	
EPA Global Warming Web site, Global Warming-Actions. Information on climate change plans.	http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsState.html
Several state climate change action plans, such as the Connecticut Climate Change Action Plan 2005, include clean energy policies as a key component of the state plan.	http://www.ctclimatechange.com/StateActionPlan.html
Stakeholder Processes	
Rhode Island Greenhouse Gas Process. 2002.	http://righg.raabassociates.org/index.asp

Title/Description	URL Address
Macroeconomic Impacts of Clean Energy Policies	
Clean Energy and Jobs: A Comprehensive Approach to Climate Change and Energy Policy. Prepared by J.P. Barrett, Economic Policy Institute, and J.A. Hoerner, Center for a Sustainable Economy, with S. Bernow and B. Dougherty, Tellus Institute. 2002.	http://www.epinet.org/content.cfm/studies_cleanenergyandjobs
Developing a Renewable Energy Based Economy for South Texas: A Blueprint for Development. U.S. Department of Commerce (DOC). 2002.	http://www.solarsanantonio.org/EDAReport.html
The Economic Impact of Generating Electricity from Biomass in Iowa: A General Equilibrium Analysis. G. Weisbrod and X. Lin. 1996.	http://www.edrgroup.com/pages/pdf/Biomass.pdf
Economic Impact of Renewable Energy in Pennsylvania: Analysis of the Advanced Energy Portfolio Standard. R. Pletka, J. Wynne et al. 2004. Black & Veatch Corporation, Overland Park, KS.	http://www.bv.com/energy/eec/studies/PA_RPS_F_AEPS_Analysis.pdf
Economic Impacts and Potential Air Emission Reductions from Renewable Generation & Efficiency Programs in New England: Final Report. W. Steinhurst, R. McIntyre et al. 2005. Synapse Energy Economics, Cambridge, MA.	http://raponline.org/Pubs/RSWS-EEandREinNE.pdf
Energy Efficiency and Economic Development in New York, New Jersey, and Pennsylvania. ACEEE. Nadel, S. Laitner, M. Goldberg, N. Elliott, J. DeCicco, H. Geller, and R. Mowris. 1997.	http://www.aceee.org/store/proddetail.cfm?CFID=784272&CFTOKEN=63415223&ItemID=98&CategoryID=7
Energy Efficiency and Economic Development in the Midwest. S. Laitner, J. DeCicco et al. 1995. ACEEE, Washington, D.C.	http://www.aceee.org/pubs/ed951.htm
Energy Efficiency and Renewable Energy Technologies as an Economic Development Strategy for Texas. M. Goldberg and S. Laitner. 1998. Economic Research Associates, Alexandria, VA.	URL not available.
Job Jolt. The Economic Impacts of Repowering the Midwest: The Clean Energy Development Plan for the Heartland. The Regional Economics Applications Laboratory for the Environmental Law & Policy Center. 2005.	http://www.repowermidwest.org/Job%20Jolt/JJfinal.pdf
The Public Benefit of Energy Efficiency to the Commonwealth of Massachusetts. RAND. 2002.	http://www.rand.org/publications/MR/MR1588/MR1588.pdf
The Public Benefit of Energy Efficiency to the State of Minnesota. M. Bernstein, C. Pernin et al. 2002. RAND Science and Technology, Santa Monica, CA.	http://www.rand.org/publications/MR/MR1587/MR1587.pdf
Renewable Resources: The New Texas Energy Powerhouse. A report on the economic benefits of renewable energy in Texas and how to keep them growing.	http://www.citizen.org/documents/Tx%20Energy%20Powerhouse.pdf

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EPA. 2005. Global Warming-Actions. Global Warming Web site. Accessed July 2005.	http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsState.html
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Chapter 3.
State Planning and Incentive Structures

States are achieving substantial energy cost savings, emission reductions, and economic benefits by implementing planning approaches and incentive structures that advance the use of clean energy. This chapter describes four planning and incentive policies, beginning with state programs to "lead by example" by implementing clean energy actions within their internal operations. It also covers state and regional planning efforts to promote clean energy and quantify related air quality benefits. The last policy describes approaches for financing these clean energy activities.

The policies shown in Table 3.1 were selected from among a larger universe of opportunities for supporting clean energy because of their proven effectiveness and their successful implementation by a number of states. The information presented in each policy description is based on the experiences and best practices of states that are implementing the programs, as well as on other sources, including local, regional, and federal agencies and organizations, research foundations and nonprofit organizations, universities, and utilities.

Table 3.1 also lists examples of some of the states that have implemented programs for each policy. States can refer to this table for an overview of the policies described in this chapter and to identify other states that they may want to contact for additional information about their clean energy programs. The *For More Information* column shows the *Guide to Action* section where each in-depth policy description is located.

In addition to these four policies, which are tied to state planning and incentive structures, states are adopting a number of other policies and programs to promote increased use of energy efficiency and clean energy supply that may interact with planning and incentives. These policies are addressed in other sections of the *Guide to Action*, as listed in the box, *Clean Energy Policies*, and described briefly in Chapter 1.

Clean Energy Policies

Type of Policy	For More Information
State Planning and Incentive Structures	
Lead by Example	**Section 3.1**
State and Regional Energy Planning	**Section 3.2**
Determining the Air Quality Benefits of Clean Energy	**Section 3.3**
Funding and Incentives	**Section 3.4**
Energy Efficiency Actions	
Energy Efficiency Portfolio Standards	Section 4.1
Public Benefits Funds for Energy Efficiency	Section 4.2
Building Codes for Energy Efficiency	Section 4.3
State Appliance Efficiency Standards	Section 4.4
Energy Supply Actions	
Renewable Portfolio Standards	Section 5.1
PBFs for State Clean Energy Supply Programs	Section 5.2
Output-Based Environmental Regulations to Support Clean Energy Supply	Section 5.3
Interconnection Standards	Section 5.4
Fostering Green Power Markets	Section 5.5
Utility Planning and Incentive Structures	
Portfolio Management Strategies	Section 6.1
Utility Incentives for Demand-Side Resources	Section 6.2
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	Section 6.3

Table 3.1: State Planning and Incentive Structures

Policy	Description	State Examples	For More Information
Lead by Example	States lead by example by establishing programs that achieve substantial energy cost savings within their own operations, buildings, and fleets and demonstrate the feasibility and benefits of clean energy to the larger market.	CA, CO, IA, NH, NJ, NY, OR, TX	Section 3.1
State and Regional Energy Planning	Energy planning at a state or regional level can be an effective means for ensuring that clean energy is considered and used as an energy resource to help states address their multiple energy and nonenergy challenges.	CA, CT, NM, NY, OR, New England Governors' Conference (NEGC), Northwest Power and Conservation Council, Western Governors' Association (WGA), Western Interstate Energy Board	Section 3.2
Determining the Air Quality Benefits of Clean Energy	States estimate the emission reductions from their clean energy programs and incorporate those reductions into clean energy programs and policies.	LA (local), MD (local), TX, WI, Western Regional Air Partnership (WRAP)	Section 3.3
Funding and Incentives	States implement a range of targeted funding and incentives strategies that encourage governments, businesses, and consumers to save energy through cost-effective clean energy investments. Between 20 and 30 states have revolving loan funds for energy efficiency, tax incentives for renewable energy, grants for renewable energy, or rebates for renewable energy.	CA, CO, IA, MT, NY, OR, TX, WA	Section 3.4

3.1 Lead by Example

"Lead by example" programs offer states opportunities to achieve substantial energy cost savings within their own operations, demonstrate environmental leadership, and raise public awareness of the benefits of clean energy technologies.

Policy Description and Objective

Summary

State and local governments are implementing a range of programs and policies that advance the use of clean energy within their own facilities, fleets, and operations. These "lead by example" initiatives help state and local governments achieve substantial energy cost savings while promoting the adoption of clean energy technologies by the public and private sectors.

States are leveraging their purchasing power, their control of significant energy-using resources, and the high visibility of their public facilities to demonstrate clean energy technologies and approaches that lower their energy costs and reduce emissions. They also work closely with local governments, schools, colleges and universities, parks and recreation facilities, and other public sector organizations to promote clean energy within their operations. Lead by example programs take many forms, including:

- Incorporating clean energy principles into statewide energy policies.
- Adopting energy efficiency savings goals for existing public buildings.
- Establishing energy efficiency performance standards for new and renovated public buildings.
- Procuring energy-efficient equipment for public facilities, including implementing "green fleets" programs.
- Purchasing and using renewable energy and clean energy generation in public facilities.
- Developing innovative financing mechanisms, including:
  - Establishing energy efficiency loan funds.
  - Creating a master financing program with private sector investors to capture energy savings.
  - Directing public pension fund trustees and managers to establish energy-efficient investment strategies for real estate and securities portfolios and/or allocate investment funds for energy-efficient and renewable energy technology development.
  - Approving legislation enabling state agencies (and other local governments) to enter into energy savings performance contracts that require that the savings cover the cost of financing the improvements out of current and future operating budgets.
- Providing technical assistance and training to state and local facility managers and their staff, including, for example:
  - Developing building design and commissioning guidelines.
  - Assisting with energy audits and implementation of verified savings using Energy Service Companies (ESCOs).

The potential energy and cost savings that can be achieved through energy-efficient improvements in public facilities are substantial. States are responsible for more than 16 billion square feet of building space and spend more than $11 billion annually on building energy costs, which can account for as much as 10% of a typical government's annual operating budget (DOE 2005e).

Objective

The objectives of state lead by example programs vary from state to state. They include:

- Serving as a leading component of comprehensive statewide clean energy programs and initiatives and encouraging action by a broad range of public and private sector organizations.

- Accelerating adoption of clean energy in the marketplace by setting an example and demonstrating cost-effectiveness.
- Educating and informing policymakers and stakeholders and raising public awareness about the multiple environmental, economic, and energy benefits that clean energy offers.
- Achieving cost savings through adoption of energy-efficient technologies and clean generation.

Benefits

Lead by example programs provide direct operational benefits to state and local governments, including:

- Reducing facility operation costs and increasing funding available for nonenergy-related expenditures.
- Encouraging clean energy development in the state and region and demonstrating environmental leadership.
- Achieving substantial cost savings through aggregated purchasing of energy-efficient products and green power.
- Supporting the development of in-state markets for clean energy products, manufacturers, and services (e.g., ESCOs, renewable energy equipment installers, and energy-efficient product retailers).

Many state lead by example programs focus on improving the energy efficiency of equipment and building systems. Additional benefits, however, can be achieved by purchasing or generating clean power for public facilities. A number of options are available to state and local governments, including:

- Purchasing green power for public facility consumption.
- Using combined heat and power (CHP) technologies to reduce energy use through higher efficiency.
- Developing onsite clean energy facilities, such as solar photovoltaic (PV), wind, and CHP.
- Using existing government resources for clean power production (e.g., electricity generation from landfill gas, methane recovery at sewage treatment plants, and biomass resulting from tree and garden trimming).

States with Lead by Example Programs

While the possibilities for state lead by example initiatives are broad, current state lead by example initiatives typically fall into one of the following categories:

- *State Clean Energy Plans.* Several states are incorporating specific clean energy goals and objectives for state facilities in their state energy plans. States that show leadership in this area include Iowa, Connecticut, and California. (See the *State and Local Examples* section on page 3-13.)
- *Energy Savings Targets.* States also set energy savings goals for existing facilities, typically expressed as percentage targets with calendar milestones (e.g., reducing energy use per square foot by 20% by 2010). Several states have enacted legislation to set these targets. For example, in 2003, the Arizona legislature passed HB 2324 that requires state agencies and universities to achieve a 10% reduction in energy use per unit of floor area by 2008 and a 15% reduction by 2011. California,

New York's "Green and Clean" State Buildings and Vehicles

New York's Executive Order 111, adopted in 2001, establishes a comprehensive energy efficiency and renewable energy program through government procurement standards and building design practices. Applicable to all state agencies and departments, the order:

- Sets targets for reducing energy consumption in state buildings.
- Sets goals and targets for purchasing renewable energy sources and clean fuel vehicles.
- Establishes energy performance criteria and guidelines for new and existing buildings.
- Requires purchase of ENERGY STAR products when purchasing new or replacement equipment (New York 2004).

New Hampshire, and New York have also adopted energy savings targets.

- *Energy Efficiency Performance Standards.* Some states establish sustainable design principles that incorporate energy efficiency criteria in performance standards for new and renovated buildings and facilities. States that have established energy efficiency performance standards include Oregon and Massachusetts.
- *Energy-Efficient Purchasing.* States are specifying minimum energy efficiency specifications for a range of products (e.g., appliances, equipment, green fleets of vehicles that use alternative fuels). In some cases, states establish procurement policies that reference the ENERGY STAR label. Where mandatory low-bid requirements are in place, legislative authority might be required to modify procurement regulations. States that have issued executive orders and/or legislation to require procuring energy-efficient products include Arizona, New Hampshire, New York, and California.
- *Clean Energy Generation.* Purchasing and using renewable energy and clean energy generation for state and local facilities is another way states are leading by example. State and local agencies have established clean energy supply targets that are met through onsite generation or by purchasing green power electricity or renewable energy certificates. An increasing number of state and local governments, including New Jersey, New York, and Iowa, are aggregating electricity demand to purchase green power. States are also identifying opportunities to generate clean onsite power, such as CHP systems, and to use clean DG technologies for backup or emergency power.
- *Innovative Financing.* States are developing a wide range of innovative financing mechanisms, including revolving loan funds, tax-exempt master lease-purchase agreements, lease revenue bonds, pension funds, and performance contracting. These financing mechanisms, used to finance programs to implement energy efficiency improvements in existing buildings, renovation projects, and new state facilities, are usually administered by the state energy office or other lead agency, which coordinates the program across multiple state agencies.

  Iowa has been a leader in state financing for public facilities. Legislation passed in the 1980s established the Iowa Energy Bank and the State Facilities Program. In Maryland, the State Agency Loan Program (SALP) provides 0% loans to state agencies for cost-effective energy-efficient improvements in state facilities. This self-sustaining fund is capitalized with national oil overcharge funds. Since its

Iowa's Executive Order 41

Iowa's Executive Order 41, adopted April 22, 2005, directs state agencies to obtain at least 10% of their electricity from renewable energy sources by 2010. To satisfy this requirement, agencies may generate their own renewable energy or participate in their utility's green power programs (Iowa 2005).

Examples of State and Local Green Power Purchasing Contracting

- In 1999, 178 public agencies in New Jersey aggregated power purchases with the goal of negotiating lower energy costs. A portion of the resulting savings was reinvested in clean energy. Now, 12% of the agencies' energy needs are met with green power.
- Montgomery County, Maryland, led a regional partnership to purchase wind energy. Participating entities include six Montgomery County agencies and 12 other local government entities. Green power currently supplies about 5% of the aggregate demand in county facilities.
- The Cape Light Compact in Massachusetts is an organization with members from all 21 towns of Cape Cod and Martha's Vineyard, and Barnstable and Dukes counties. The Compact negotiates lower cost electricity and other benefits for all members. Recently the Compact began to offer customers green power products with up to 100% renewable energy (EPA 2004a, Montgomery County 2004, Cape Light Compact 2005, DOE 2005d).

inception in 1991, SALP has funded more than $9 million to upgrade lighting, controls, boilers, chillers, and other energy equipment. Agencies repay the loan through their fuel and utility budgets, based on the avoided energy costs of the project (MEA 2005).

New Hampshire has a master lease program in place for state facilities that leverages energy savings from current and future operating budgets to cover the financing cost of new equipment. California offers a revenue bond program to provide low-cost financing of alternative energy equipment and for energy and water conservation measures by state and K-12 facilities. While performance contracts are not financing agreements, per se, they can assist with project funding and implementation. In Louisiana, state agencies will be able to issue Request for Proposals (RFPs) that essentially follow the performance contract model developed by the state Energy Fund. Colorado passed enabling legislation authorizing performance contracting in the early 1990s.

- *Technical Support.* Many states lead by example by providing technical assistance, training, and evaluation support to state and local agencies and facility operators. State examples include California's new building design and commissioning guidelines and Oregon's Building Commissioning Program. California's Energy Partnership Program provides a variety of services including conducting energy audits, preparing feasibility studies, and reviewing existing proposals and designs. In Washington, school districts are advised to seek the assistance of the General Administration's Energy Savings Performance Contracting (ESPC) program for energy performance contracts and for project oversight.

Designing an Effective Lead by Example Program

Although specific program designs vary from state to state, a number of common elements exist that have helped states develop effective lead by example programs. These include: involving multiple agencies and levels of government, identifying funding sources, and leveraging federal and state programs.

Participants

- *Executive Branch.* The executive branch plays a key role in lead by example initiatives. Many state governors have issued executive orders that set energy savings targets for existing buildings, define energy and environmental performance standards for new buildings, set fuel economy targets for state-owned or -leased vehicle fleets, create green power purchasing policies, and create efficiency guidelines for purchasing energy-using equipment. Since most lead by example initiatives involve state-owned or -leased property, the executive branch typically has broad powers to change policies and practices involving state facilities, fleets, purchasing operations, and other aspects of state government. An example of this is New York's Executive Order 111, Green and Clean State Buildings and Vehicles, which sets targets for 100% of all new light-duty vehicles to be alternative-fueled vehicles by 2010 and for energy consumption in all buildings to be reduced by 35% (relative to 1990 levels) by 2010.
- *State Legislature.* In many cases, legislative authority is not needed to launch lead by example initiatives. However, legislative authority may be required when modifying procurement regulations (e.g., to release state agencies from mandatory low-bid requirements when purchasing green power or to enable agencies to enter into long-term energy service agreements for performance contracting). For example, Washington's Engrossed House Bill 2247 requires energy audits in state buildings, and if the audits produce opportunities to save energy, the improvements are to be accomplished by using performance

contracting. Performance contracting has been promoted by North Carolina's state legislature as a means of reaching its energy savings goals and updating facilities without using limited capital budget dollars.

- *State Energy Office.* In many states, the energy office develops and administers a range of clean energy programs and provides technical assistance and training to state and local agency staff and facility managers. State energy offices also work with other state agencies, local governments, school districts, and other public organizations to identify clean energy opportunities statewide.
- *State Department of General Services and Department of the Treasury.* One of these agencies typically serves as the custodian of state facilities. They administer state capital construction programs and establish guidelines for construction, operation, and purchasing practices.
- *State Housing and Economic Development Offices.* These agencies may operate a variety of programs, including low- and moderate-income housing and development programs, state mortgage financing programs, and enterprise zone and brownfield redevelopment initiatives.
- *Local Governments.* In many cases, local governments have initiated and adopted their own lead by example programs. For example, in Maryland, Montgomery County has developed a green power purchasing program to leverage the buying power of multiple local jurisdictions. Some states work with local governments to educate local officials about these opportunities and to coordinate, pool, and set common criteria for such initiatives. States can also provide financial assistance, education, training, and technical assistance to local governments. For example, Arizona's Municipal Energy Management Program (MEMP), administered by the Arizona Commerce Department, provides training, tools, technical assistance, and grants to municipal and tribal governments to help implement energy saving projects (Arizona Department of Commerce 2005).
- *School Districts, Colleges, and Universities.* There are many opportunities to improve energy efficiency and purchase or generate clean onsite power at K-12 schools, colleges, and universities. One option is to use efficiency savings in operating budgets to finance new energy projects, thereby freeing up capital budget dollars for other uses. In fact, some colleges and universities have found that investing in energy efficiency projects provides better yields than the market. For example, Duke University has used endowment funds to finance energy efficiency projects.
- *Utility Energy Programs.* Utilities that have energy efficiency and onsite distributed generation programs can support a state's lead by example efforts by providing technical assistance to state facility managers and new facility design teams. In some cases, utilities provide funding and incentives to state agencies for clean energy projects. Utilities that administer PBFs or that have regulated efficiency acquisition mandates are typically best positioned to provide this kind of assistance.
- *ESCOs.* ESCOs can perform energy project assessments and/or conduct full energy efficiency projects on a performance-contracting basis. In such projects, the state does not provide upfront capital; the ESCO develops and finances the project, using efficiency savings to cover the cost of capital.
- *Nonprofit Organizations.* Some states designate and work with third-party nonprofit organizations to develop and administer lead by example programs. For example, Iowa established the State of Iowa Facilities Improvement Corporation (SIFIC), a nonprofit corporation that helps state agencies implement cost-effective energy efficiency improvements. Also of note is Efficiency Vermont, which was established in 1999 by the Vermont legislature and Public Service Board as the nation's first statewide energy efficiency utility. Efficiency Vermont provides technical assistance and financial incentives to help Vermonters identify and pay for cost-effective energy-efficient building design, construction, renovation, equipment, lighting, and appliances.
- *State Treasurers and Public Pension Fund Managers.* The role of pension fund trustees and state treasurers is to provide policy direction for fund managers and are increasingly looking for opportunities to improve the value of their portfolios. Some state

treasurers and public pension fund managers invest in clean energy programs and energy audit investments to identify cost savings. For example, California's state treasurer started the Green Wave program to encourage pension fund investment in energy efficiency and renewable energy retrofits and upgrades on state property. This type of investment not only provides an opportunity for fund managers to "green" their portfolios, but also saves money and increases the value of the assets and overall portfolio.

Funding

States sometimes pay for energy efficiency and renewable energy projects with general funds allocated through the budget and appropriations process. However, because of fiscal constraints, states are developing new funding approaches for their clean energy investments. One popular underlying strategy involves redirecting the operating budget dollars saved from the utility budget when energy conservation improvements are made and using the savings to pay for the financing of the needed equipment. Several states have adopted innovative funding mechanisms to support lead by example programs, including:

- *Revolving Loan Funds.* These entities make loans and re-lend current loan payments to fund new projects. The original capitalization can come from a variety of sources including system benefits charges (SBCs) and oil overcharge refunds. They are typically low interest, long-term loans for energy conservation or renewable energy projects. They may cover all capital expenditures or may be on a cost-shared basis. The Iowa Energy Bank, described in the *State and Local Examples* section, on page 3-13, provides an example of how Iowa has structured its loan program. (For more detailed information on revolving loan funds, see Section 3.4, *Funding and Incentives*. Also see the Texas LoanSTAR program in the *State and Local Examples* section.)
- *ESPC.* The ESPC industry has developed over the past 25 years in response to the need for major new capital investments in energy efficiency, particularly in public and institutional facilities. Energy Performance Contracting is a construction method that allows a facility to complete energy-saving improvements within an existing budget by financing them with money saved through reduced utility expenditures. Facilities make no initial capital investments and instead finance projects through guaranteed annual energy savings. Several states have created enabling legislation and developed model programs, helping to develop an industry capable of bringing significant capital investment to state governments. (See Section 3.4, *Funding and Incentives*.)
- *PBFs.* PBFs are funds typically created by per kWh charges on electricity bills. Many states use PBF resources to help support clean energy programs. PBFs were initially developed during the 1990s to provide resources to help fund public benefits programs that utilities were not expected to pursue in a restructured electricity market. These funds are used to support renewable energy, energy efficiency, and low-income programs. (See Section 4.2, *Public Benefits Funds for Energy Efficiency*, and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*.)
- *Aggregated Purchasing Contracts for Green Power.* An increasing number of organizations, including state and local governments, are aggregating electricity demand to purchase green power. By combining the electrical needs of a number of agencies, state and local governments are often able to negotiate lower prices for green power. It is easier to achieve savings from aggregated green power purchases in restructured markets where there are competing energy suppliers.
- *Pension Funds.* Some states use pension funds to invest in clean energy projects. Pension fund managers seek a mix of investments that ensure stable returns for their contributors when they retire. Energy cost savings are captured over a set time period to pay off the capital investment, and generate a solid return to the pension fund.

For example, Washington Real Estate Holdings, a real estate manager for the Washington State Investment Board, which manages the state's pensions, completed a $3.5 million SMART ENERGY and energy efficiency upgrade of Union Square that lowered the building energy costs by 40% and created 30 jobs for a year (Feldman 2005).

- *Use of Life Cycle Cost Accounting for Energy Efficiency Projects.* Cost-effective energy efficiency investments more than pay for themselves in the form of reduced energy bills over the life of the investment. However, government procurement and capital budgeting practices frequently do not take life cycle costs into account. Procurement rules (e.g., applicable to small purchases, such as equipment replacement) often require states to accept the lowest bid, on a first-cost-only basis. Similarly, capital budgeting (e.g., applicable for larger investments such as new buildings or major renovations) often accounts only for the debt service obligations to the government and does not recognize operating budget savings that can more than offset the debt service payments. These practices often result in the rejection of cost-effective energy efficiency investments because the accounting rules do not fully recognize the benefits of these investments.

  To overcome these problems, states have modified procurement rules by (1) specifying minimum efficiency levels for designated types of purchases (such as requiring certain product types to be ENERGY STAR-certified), or (2) instituting a life cycle-cost bid procedure, where vendors provide both equipment investment costs and estimated lifetime energy costs for designated equipment types. For capital projects, a similar approach can be used: either requiring projects to meet specified energy performance targets or including life cycle energy costs in the project accounting analysis.

Interaction with Federal Policies

Several federal programs, described as follows, provide resources for states as they develop lead by example programs.

The ENERGY STAR Program

The U.S. Environmental Protection Agency (EPA) offers its ENERGY STAR program to governments, schools, and businesses as a straightforward way to achieve superior energy management and realize the cost savings and environmental benefits that can result. EPA's guidelines for building energy management promote a strategy that starts with the top leadership, engages the appropriate employees throughout the organization, uses standardized measurement tools, and helps an organization prioritize and gets the most from its efficiency investments. The following aspects of ENERGY STAR offer resources for states as they lead by example.

- *The ENERGY STAR Challenge.* In March 2005, EPA, in partnership with more than 20 leading associations and states, launched the ENERGY STAR Challenge—Build a Better World 10% at a Time. The ENERGY STAR Challenge calls on governments, schools, and businesses across the country to identify the many buildings where financially attractive improvements can reduce energy use by 10% or more and to make the improvements through proven methods such as low-cost building tune-ups, lighting upgrades, and replacement of old equipment. EPA estimates that if each building owner accepts this challenge, by 2015 Americans would save about $10 billion and reduce greenhouse gas emissions by more than 20 million metric tons of carbon equivalent (MMTCE)—equivalent to the emissions from 15 million vehicles.

  As participants in the ENERGY STAR Challenge, states are encouraging energy-efficient improvements in government buildings and facilities, including school districts and county and city governments, and reaching out to businesses in their communities (ENERGY STAR 2005d).

- *Targeted Assistance to States.* ENERGY STAR provides targeted information resources, technical assistance, tools, and communications and outreach support to help state and local governments improve energy efficiency within their own operations. ENERGY STAR tools include guidelines for energy management that are helpful to states in improving their energy and financial performance, as well as a portfolio manager that provides tools related to benchmarking, measurement and verification (M&V), and investment priorities (ENERGY STAR 2005b).

- *Purchasing and Procurement.* As part of its targeted assistance to states, ENERGY STAR provides a comprehensive guide to purchasing energy-efficient products. These purchasing and procurement resources include sample procurement language and energy efficiency specifications for many products. For products not covered under ENERGY STAR, EPA provides links to the U.S. Department of Energy's (DOE's) recommended energy-efficient products used by federal government procurement officials (ENERGY STAR 2005c).

EPA Combined Heat and Power Partnership

The CHP Partnership is a voluntary program to reduce the environmental impact of power generation by promoting the use of CHP. The partnership works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development of new projects and promote their energy, environmental, and economic benefits.

CHP Partner: Essex County New Jersey Correctional Facility

The CHP Partnership recently helped develop a project for the Essex County New Jersey Correctional Facility in Newark, New Jersey. This project will provide 6 MW of electricity, 3,300 tons of chilled water, 80 million Btus (MMBtu) per hour of hot water, and 20,000 pounds per hour of steam for the new facility. The CHP system has been integrated into the design of the facility to maximize energy efficiency results (EPA 2005a).

EPA Green Power Partnership

The Green Power Partnership is a voluntary program developed by EPA to boost the market for clean power sources that do not result in the environmental and health risks associated with conventional electricity generation. State and local governments participating in the partnership receive EPA technical assistance and public recognition (EPA 2005b).

Green Power Partner: California State University (CSU) at Hayward

CSU at Hayward received the 2004 Green Power Leadership Award for installing the largest solar electric system at any university in the world. The 1 megawatt (MW) system, which will deliver approximately 30% of the campus' peak energy demand during the summer months, is installed on four of the university's largest buildings and covers more than 110,000 square feet. The solar electric installation is expected to reduce electricity bills by $200,000 annually. CSU at Hayward received a rebate from the electric utility and from the California Public Utilities Commission (CPUC) for half the project cost. The remainder of the project is financed with a 15-year loan, and loan payments will be made out of the energy savings from the solar electric system production (EPA 2005b).

DOE State Energy Program

The State Energy Program is a federally funded program administered by DOE that provides funding and technical assistance resources to state energy offices. Many states have used State Energy Program resources to support their lead by example programs and activities (DOE 2005e).

DOE Federal Energy Management Program (FEMP)

FEMP works to reduce the operating costs and environmental impacts associated with federal facilities by advancing energy efficiency and water conservation, promoting the use of distributed and renewable energy, and improving utility management decisions at federal facilities. Although the program focuses mainly on federal facilities, FEMP offers online information resources, an annual training conference, and workshops that are available to state and local government energy managers (DOE 2005b). The FEMP Web site also provides a compendium of energy efficiency purchasing recommendations, interactive energy cost calculators, and other resources to help purchase energy-efficient products (DOE 2005c, DOE 2003).

DOE Building Technologies Program

The Building Technologies Program works in partnership with private and public sector organizations to improve building efficiency. This program supports research and development and provides assistance to those interested in building efficiencies through its Web site, which contains a host of tools, including guidelines, training information, and information about how to access financial resources (DOE 2005a).

The Energy Policy Act of 2005 (EPAct 2005)

EPAct 2005 (Section 125) authorizes grants of $30 million annually for each of fiscal years 2006 through 2010 to fund energy-efficient public buildings (30% above the International Energy Conservation Code [IECC]) and requires that public housing authorities purchase energy-efficient products. In addition, EPAct 2005 (Section 126) contains the Low-Income Community Energy Efficiency Pilot Program for local governments, which authorizes $20 million for each of fiscal years 2006 through 2008.

Interaction with State Policies

A variety of state programs and policies can be further leveraged by lead by example programs. Key opportunities include:

- *Procurement Policies and Accounting Methods.* Over the last 30 years, some states have modified their public procurement and accounting methods to encourage energy efficiency investments and renewable energy procurements. These innovations include:
  - Permitting long-term contracts, which are often needed for performance contracting agreements.
  - Modifying low-bid requirements, since performance contracts and other energy-saving investments might increase up-front capital costs, but produce lower overall life cycle costs.
  - Revising leasing regulations, so that private entities can be owners of equipment for tax purposes. This can be key to attracting private investment in public facilities.
  - Modifying budgeting and accounting practices, so that facilities (e.g., schools) are allowed to keep some portion of energy savings from efficiency projects. Otherwise, energy bill savings could simply result in reduced budget outlays in subsequent years and would not encourage facility managers to develop energy efficiency projects.

Best Practices: Designing Lead by Example Programs

- *Learn from Your Peers.* Consult with other states that have implemented lead by example initiatives.
- *Secure High-Level Support.* The support of top-level leadership can be critical to the successful revision of clean energy practices that affect state-owned facilities and fleets. For example, in some cases it may be appropriate for the governor (and legislature, if enabling laws are needed) to establish overall goals and/or to require specific rule changes.
- *Follow Up with Administrative Support.* While a law or executive order provides the initial structure for lead by example programs, it is also important to design a strong administrative structure. This entails (1) establishing a lead agency with the authority to implement key targets, (2) setting up a coordinating structure among affected agencies to ensure that the agencies remain involved and that targets are met, (3) developing an approach for M&V of savings, (4) developing an annual reporting system to help ensure accountability for progress and results on stated goals, and (5) ensuring that funds are available for programs that exceed current staff and budget capacities.
- *Leverage Federal Programs.* Review and assess existing federal programs to identify those that provide resources for designing and implementing a lead by example program. For example, the ENERGY STAR program provides energy efficiency specifications for products and building energy performance benchmarking tools.
- *Review and Update the Program.* Periodically (e.g., every five years or less) review and update the state's efforts to bring clean energy investments to its facilities and fleets. Expand efforts that show success and/or potential for success and revise or eliminate unproductive programs.

- Changing state budget "scoring" rules, so that performance contracting, bond issues, or other debt obligations are treated comprehensively rather than simply as costs. Even though these state obligations are often covered by guaranteed-savings agreements, legislative budget procedures often fail to give them a net savings accounting treatment.
- Requiring that state facilities procure a percentage of electricity demand from renewable resources.

- *State Bonding Authority.* States can use public financing mechanisms, such as educational, health, and environmental bond issuance authorities, to help develop clean energy projects or add clean energy features to planned facility bond issues. For example, New Jersey's Economic Development Authority, in partnership with New Jersey's Board of Public Utilities, offers a variety of incentives for renewable and energy efficiency measures.
- *Air Quality Planning.* EPA encourages states to use energy efficiency and renewable energy resources in their Clean Air Act compliance plans and related initiatives. Some states have developed specific calculation methods for quantifying the contribution that energy efficiency projects can make to emission reduction targets.

  For example, through the Texas Emissions Reduction Plan (also known as "Senate Bill 5"), Texas works with local governments to implement energy efficiency measures that will meet air quality goals through reductions in power plant emissions. (See Section 3.3, *Determining the Air Quality Benefits of Clean Energy*.)

Program Implementation and Evaluation

Because states can choose from a wide range of lead by example programs, specific design and implementation approaches might differ by program. For example, state policymakers may identify one state agency or department to administer and implement their energy efficiency programs and a different agency to lead efforts to encourage distributed generation or renewable energy. While multiple agencies may be involved in program design and implementation, the more successful state efforts typically include a multi-agency coordination structure.

Successful program implementation flows from a sound design, which in turn flows from a carefully developed overall strategy or plan. For example, some states have developed clean energy plans that set targets for percentage reductions in state facility energy use by certain dates, followed by an implementation plan that includes the specific measures, budgets, timetables, and other details needed to reach those targets.

Evaluation

Evaluation of lead by example programs is important in determining the effectiveness of an initiative. While procedures for evaluating lead by example initiatives will vary according to specific project features, the following general guidelines are applicable to all programs:

- *Develop Baselines.* Baselines will vary depending on the type of initiative. For buildings, current energy use or current building practices define baselines for energy performance. For fleets, estimated current fuel economy averages can serve as baseline data. For procurement procedures, baseline information can be based on current product specifications.
- *Measure and Verify Savings.* Develop reporting and database systems as needed to document the impacts of program initiatives. For simpler efficiency measures whose performance characteristics are well known and consistent, a deemed savings approach, which involves multiplying the number of installed measures by the estimated (or "deemed") savings per measure, is appropriate. Deemed savings values are derived from extensive field evaluations (CALMAC 2005). For larger and more complex efficiency projects, a project-specific M&V method might be more appropriate (IPMVP 2005). (For more information, see Section 4.1, *Energy Efficiency Portfolio Standards,* and Section 3.4, *Funding and Incentives*.)
- *Communicate Results.* Use monitoring and tracking information to periodically report results.

Best Practices: Implementing Lead by Example Programs

- *Coordinate Across State Agencies.* Involve multiple parties during the design, implementation, and evaluation stages of program development.
- *Assess Energy Use.* Identify opportunities for energy efficiency improvements or more efficient generation and assess the potential energy savings from these options.
- *Select Cost-Effective Measures*. Numerous handbooks and guidelines are available that provide comparative information about clean energy measures. For example, California provides sustainable building design guidelines that present both performance and prescriptive instructions regarding materials use, design principles, and construction techniques (IWMB 2005).
- *Aggregate Purchases*. When implementing an aggregated green power purchases program, the lead agency can establish contracts to procure green power or green tags. In a competitive market, suppliers can be solicited using a competitive bidding process. The selected suppliers can either provide one bill or be asked to split the billing across participants in the aggregated purchase. Purchasing green power for aggregate demand will be more effective and economically feasible in active green power markets.
- *Develop Financing Mechanisms*. A range of financing strategies is available to states for lead by example initiatives. In some cases, states may need to modify their rules to allow agencies to use certain financing mechanisms (e.g., performance contracting) or accounting methods (e.g., extended payback periods). (See Section 3.4, *Funding and Incentives,* for more detailed information on financing options.)

Present impacts in meaningful ways that document the energy, economic, and environmental benefits derived from the program.

- *Review and Reinforce Effectiveness.* Many worthy initiatives fade into inactivity after initial efforts are complete. Use evaluation efforts to ensure that innovations result in lasting changes in institutional behavior and become part of the organizational culture.

State and Local Examples

California

The California Energy Commission (CEC) administers several lead by example programs. In addition, local governments participate in state programs, and have developed their own lead by example programs.

- *California Executive Order S-20-04.* Issued in December 2004, this order requires state agencies and departments to reduce their energy consumption by 20% from 2003 levels by 2015. The order requires new and renovated state-owned facilities to meet the U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) Silver certification,[5] requires state agencies to seek office space in buildings with an ENERGY STAR rating for leases of 5,000 square feet or more, and sets procurement polices for ENERGY STAR qualified electrical equipment. The order further instructs the CEC to benchmark all state-owned buildings built by 2007 and requires buildings of 50,000 square feet or more to be retro-commissioned and then re-commissioned every five years.[6] The executive order also directs the Division of the State Architect to develop new green design guidelines for public schools. Finally, it directs CPUC to ensure that its utility sector efficiency programs encourage owners of privately owned buildings to pursue similar energy efficiency and green-design measures. Both the CEC and CPUC buildings use CHP systems in

[5] USGBC certifies new buildings based on a cumulative 69-point system at several possible levels: Certified (26-32 points), Silver (33-38 points), Gold (39-51 points), and Platinum (52-69 points). Points are based on a variety of criteria, including energy efficiency, ozone impacts, site development impacts, materials choices, and indoor air quality.

[6] Retro-commissioning is defined as adjusting energy systems to operate at their intended efficiency levels. Re-commissioning is a periodic check on system performance.

their buildings to help meet these goals. Several state prisons in California also use CHP.

Web sites:
Executive Order S-20-04:
http://www.energy.ca.gov/greenbuilding/documents/executive_order_s-20-04.html

Green Building Action Plan:
http://www.energy.ca.gov/greenbuilding/documents/background/02_GREEN_BUILDING_ACTION_PLAN.PDF

- *Energy Efficiency Financing Program.* Through this program, the CEC provides low-interest loans for public schools, public hospitals, and local governments to fund energy audits and install energy efficiency measures. The interest rate for 2005 is 4.5%, and the maximum loan per application is $3 million. Recipients who complete their projects within 12 months of the loan and meet all requirements specified in the loan application receive a reduced interest rate of 4.1%. The repayment schedule is negotiable up to 15 years and is based on the annual projected energy cost savings from the aggregated projects.

  Web site:
  http://www.energy.ca.gov/efficiency/financing/

- *Energy Partnership Program.* The CEC offers this program to help cities, counties, hospitals, and other facilities target energy efficiency improvements for existing facilities and energy-efficient options for new construction. The CEC provides a variety of services including conducting energy audits, preparing feasibility studies, reviewing existing proposals and designs, developing equipment performance specifications, reviewing equipment bid specifications, and assisting with contractor selection and commissioning. The CEC also helps identify state loans and other financing sources for project installation.

  Web site:
  http://www.energy.ca.gov/efficiency/partnership/index.html

- *Oakland Energy Partnership.* The city of Oakland established the Oakland Energy Partnership to reduce energy costs and facilitate improved energy efficiency for Oakland businesses and residents. One component of the program focuses on adjusting large building systems for optimal energy use. This program is expected to reduce electricity demand by 4.6 MW and could reduce operating costs by up to 15% or $2.4 million per year across the city. Other program components involve installing energy-efficient ballasts in outdoor lighting, providing free design expertise and energy audits, and providing air conditioning tune-ups to small residential and commercial buildings.

  Web site:
  http://www.oaklandenergypartnership.com/

- *Other Local Programs.* Local governments in California are actively involved in developing or purchasing clean energy supplies. For example, in 2001, San Francisco residents passed a $100 million bond measure to fund the installation of solar power, wind power, and energy-efficient technologies on municipal property. This amount is sufficient to finance about 11 MW of solar power and 30 MW of wind power, which would account for approximately 25% of the city government's power consumption. The bonds will be paid for with energy savings from energy efficiency improvements in city facilities, thereby alleviating the need to cover the bonds with tax increases or other sources. Many other California cities have installed renewable energy systems, primarily solar PV, to power their buildings and facilities. Examples include: PV installations in a wastewater treatment facility in Oroville, a police department in Vallejo, carports in Chico, a municipal service center and bus shelters in Fresno, the Vacaville City Hall, San Diego schools, carports and the jail in Alameda County, and county buildings in Contra Costa County. In addition, San Diego is generating electricity at its wastewater facility using methane co-generation and a low-head hydro-electric generator.

  Web site:
  http://www.californiasolarcenter.org/sfbond2001.html

Colorado

Colorado was one of the first states to pass enabling legislation in the early 1990s that authorized the performance contracting approach and financing mechanisms for local governments. The Colorado Governor's Office of Energy Management and Conservation (OEMC) is the key coordinating agency for performance contracting projects. The OEMC facilitates privately funded performance contracting projects in public facilities; no state funding or financial incentives are involved. Eligible entities include school districts, state agencies, state colleges and universities, public housing authorities, cities, counties, special districts, and some nonprofit organizations (EPA 2004b). As of June 2003, the program had completed or planned $90 million in energy efficiency upgrades, with annual energy savings of nearly $9 million (see Table 3.1.1). The performance contracting program is expected to create more than 400 jobs in Colorado.

Web site:
http://www.state.co.us/oemc/rebuildco/epc.htm

Iowa

Iowa has several financing-related programs to help public and private entities implement energy-efficient and renewable energy technologies, including a building energy management program for state agencies, a revolving loan fund, and sales tax exemptions for renewable energy equipment.

- *SIFIC.* SIFIC is a nonprofit corporation established to help state agencies make cost-effective energy efficiency improvements in their buildings. The program covers all stages of the project, including feasibility assessments, financing, construction management, and energy savings monitoring. The projects are designed to pay for themselves through reduced energy use.

  Web site:
  http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/SFP/

- *The Iowa Energy Bank Program.* This energy management program combines private funds and a small amount of state and federal funding to finance energy efficiency improvements in public and nonprofit facilities, including state facilities. The program uses saved energy costs to pay for the projects. The Energy Bank conducts an energy audit and engineering analysis and negotiates financing terms with private lenders. The program goal is to implement more than $500 million in energy efficiency improvements.

  Web site:
  http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/EBANK/

Table 3.1.1: State of Colorado Performance Contracting Results Through June 2003 *($ Millions)*

	Completed Projects		Committed Projects		Total Projects	
Type of Project	Project Cost	Annual Energy Savings	Project Cost	Annual Energy Savings	Project Cost	Annual Energy Savings
School districts	$21.28	$2.32	$4.95	$0.56	$26.23	$2.88
Colleges and universities	$4.51	$0.27	$20.50	$2.52	$25.00	$2.80
Local and state buildings	$4.51	$0.27	$29.97	$2.85	$34.48	$3.12
Housing authorities	-	-	$5.00	-	$5.00	-
Total	$30.30	$2.86	$60.41	$5.93	$90.71	$8.79

Environmental Benefits (Tons/Yr)		Economic Benefits	
• Total SO_2 savings	197	• Jobs created	408
• Total NO_x savings	226	• Local economic stimulus	$36.3
• Total CO_2 savings	158,434		

Source: EPA 2004b.

- *Executive Order 41.* Iowa is joining other states in requiring its state agencies to obtain a percentage of their electricity from renewable energy sources. Executive Order 41, adopted April 22, 2005, requires state agencies to use green power for at least 10% of their electric energy consumption by 2010. Agencies may generate their own renewable energy or participate in utility green power programs, where available. The order also directs state agencies to buy energy-efficient equipment and reduce energy use in buildings by 15% (relative to energy use in 2000) by 2010. With respect to transportation, by 2010, the state's light-duty vehicle fleets (i.e., vehicles other than heavy trucks) must consist of hybrid-electric vehicles and/or vehicles that use alternative fuels, with the exception of law-enforcement vehicles. Furthermore, bulk diesel fuel purchased by the state must contain 5% renewable fuel (such as biodiesel) by 2007, increasing to 20% by 2010 (DSIRE 2005). The state will monitor the program by requiring agencies to submit quarterly progress reports.

  Web sites:
  http://www.governor.state.ia.us/legal/41_45/EO_41.pdf

  http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=IA08R&state=IA&CurrentPageID=1

New Hampshire

The state government is the largest energy user in New Hampshire, with heating, cooling, and electricity costs of more than $18 million per year. New Hampshire has implemented several projects to measure energy efficiency, track energy savings, and fund related projects for public entities.

- *Executive Order 2005-4.* This order, issued July 14, 2005, requires state agencies to reduce energy use by 10%. State staff are required to purchase equipment with an ENERGY STAR rating. All construction and renovations of state facility design criteria must exceed the state energy code by 20%. Every state agency must also implement a Clean Fleets program, requiring that all vehicles achieve at least 27.5 miles per gallon highway fuel economy to reduce energy waste (NH Press Release 2005).
- *Executive Order 2004-7.* This order requires the New Hampshire Department of Administrative Services to develop an energy information system, which includes an energy efficiency rating system. State staff are required to conduct an inventory of annual energy use by each of the state's 1,200 facilities starting in 2001 and use EPA's Energy Performance Rating System to assess each facility's energy efficiency. Procedures for tracking and reporting energy use information by each state department are currently being developed.

  The executive order also authorizes a steering committee to develop an energy reduction goal and plan, a procedure for conducting audits of facilities that score between a 40 and a 60 on the rating system, procurement policies that require ENERGY STAR products, new energy efficiency standards for new construction, and a procedure for commissioning new facilities that ensures adoption of energy-efficient design specifications and equipment operations. The executive order also establishes specific policies for the transportation sector. The order stipulates that all new vehicles purchased by the state must achieve a highway fuel economy of 30 miles per gallon or better and an emissions classification for a Low Emission Vehicle (LEV) or better. Other efficiency measures affecting transportation include the purchase of low-rolling resistance tires, an anti-idling initiative, and the promotion of ride-sharing among agencies.

  Web site:
  http://nh.gov/oep/programs/energy/beci.htm

- *Building Energy Conservation Initiative (BECI).* Established in 1997, New Hampshire's BECI provides an innovative approach for financing and tracking energy efficiency improvements in public facilities. The BECI uses a "paid from savings" procedure (also referred to as "performance contracting") that allows agencies to pay for energy retrofits and building upgrades with the energy savings from the project, rather than depending on funding through capital appropriations. Under the BECI program, a pre-qualified group of ESCOs submits proposals to conduct the work based on a predetermined list of energy conservation measures established by the BECI. State facility managers work with performance contracting programs to analyze existing state buildings for energy and resource efficiency opportunities, such as lighting upgrades, heating, ventilation, and air conditioning (HVAC) upgrades, domestic hot water systems, energy management controls, water conservation measures, building envelope improvements, and other cost-effective measures. Measurement and verification requirements are included in each performance contracting proposal, using either a "stipulated savings" approach, in which savings are calculated before the work, or a "measured savings" approach, which involves metering and submetering to verify actual savings. Under the current arrangement, savings that exceed loan payments will revert to the state's general fund.

Building upgrades performed through the BECI have resulted in significant energy efficiency improvements and cost savings. Ten buildings have been renovated through the BECI program, including, for example, a New Hampshire Department of Justice building in Concord. Avoided energy costs for these facilities now exceed $200,000 annually (EPA 2005c). When fully implemented, it is anticipated that the BECI will be responsible for upgrades in more than 500 state-owned buildings, with energy savings of up to $4 million a year (Pew Center for Global Climate Change 2005). These energy efficiency improvements will reduce CO_2 emissions by approximately 35,000 tons per year. To date, the state has arranged two rounds of Master Lease Purchase (MLP) funding for its facilities. The latest round of $10 million brings the state's funding to approximately $25 million. Because a master lease is not considered to be additional debt, it has no negative impact on the state's credit rating (Catalyst Financial Group 2005).

Web site:
http://nh.gov/oep/programs/energy/beci.htm

New Jersey

New Jersey administers a number of programs that encourage public agencies and organizations to adopt energy efficiency and renewable energy.

- *Green Power Purchasing Program.* This program is helping to reduce the state's energy costs and support the state goal of reducing greenhouse gases to 3.5% below 1990 levels by 2005. Developed by the New Jersey Transit and the New Jersey Department of the Treasury in 1999, the innovative aggregated green power purchasing program is supplying 500 million kWh of green power to 178 state agencies. The program has expanded green energy markets in the state and encouraged increased private sector green power purchases. The reduced CO_2 emissions are equivalent to removing 32,500 cars from the road for one year.

  New Jersey formed the New Jersey Consolidated Energy Savings Program (NJCESP) to oversee and coordinate the consolidated power purchases under the Green Power Purchasing Program. This involves (1) aggregating the power purchases, both green and conventional, for the 178 public agencies, and (2) negotiating power contracts through competitive bidding in the deregulated energy market. The power supply contracts were awarded based on a fixed price per kWh. Competitive bidding allowed these agencies to obtain much lower rates than they would have independently, with an estimated $100,000 savings, and also provided economies of scale in contract administration and management. Currently, the agencies aggregating electricity purchase in New Jersey are meeting 12% of their needs with green power though green power contracts.

  Web site:
  http://www.state.nj.us/dep/dsr/bscit/GreenPower.pdf

- *Clean Energy Financing for Schools and Local Government.* This program encourages local governments and school districts to take advantage of New Jersey Clean Energy Program (NJCEP) grants and low-interest bond financing arranged by the

New Jersey Economic Development Authority (EDA) for energy efficiency and renewable energy projects. Clean Energy Financing for Schools and Local Governments offers financial incentives and low-interest financing to schools and governments. This program allows local governments and schools to develop comprehensive energy efficiency and renewable energy generation projects and to save money each month through the low-interest financing program. The program combines the traditional rebate program with incentives and financing, giving schools and local governments the flexibility to implement cost-effective projects immediately.

Web site:
http://www.njcleanenergy.com/media/CEF_Schools_and_Local_Govt_.pdf

- *Clean Energy Financing and Assistance Programs.* The New Jersey Board of Public Utilities (NJBPU), in partnership with the New Jersey Economic Development Authority, provides funding and technical assistance to New Jersey based organizations. Various programs cover grants, rebates, and project financing. For example, grants of up to $500,000 are available in the form of seed funding and commercialization assistance to assist renewable energy companies in bringing their products and technologies to market.

  Web site:
  http://www.njcleanenergy.com/html/Combined/cleanenergy_financing.html

New York

New York administers several lead by example programs, which are described as follows.

- *Executive Order 111, "Green and Clean" State Buildings and Vehicles.* This executive order, adopted in 2001, is an example of a state comprehensive energy efficiency and renewable energy program. It sets aggressive targets for reducing energy use in state buildings and vehicles, green power purchasing, and purchasing energy-efficient products. Executive Order 111 has been cited as the basis for strong state support for CHP, although CHP is not specifically mentioned in the order.

  The order requires all agencies and departments (including state and quasi-independent agencies, such as state universities and the Metropolitan Transportation Authority) to:

  - Reduce energy consumption by 35% (relative to 1990 levels) in all buildings that they own, lease, or operate, by 2010.
  - Strive to meet the ENERGY STAR building criteria for energy performance and indoor environmental quality in their existing buildings. For new construction, the order directs the agencies to follow guidelines for the construction of buildings that meet LEED certification and achieve a 20% improvement in energy efficiency performance relative to the state's building code.
  - Purchase ENERGY STAR-qualified products when acquiring new products or replacing existing equipment. In categories lacking ENERGY STAR products, products must meet New York State Energy Research and Development Authority's (NYSERDA's) target efficiency levels.
  - Purchase increasing amounts of renewable energy and "clean fuel vehicles" by 2010.
  - Purchase at least 10% of their electricity from renewable sources by 2005 and 20% by 2010. State agencies have met their renewable energy obligations through onsite generation, green power purchases from the open market, or a mix of both options.

  Web site:
  http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf

- *Energy $mart Loan Program.* The program is administered by NYSERDA and provides reduced interest loans (4% below the lender rate for 10 years) through an extensive network of local and regional lenders. Loan proceeds can be used to finance energy efficiency and renewable energy systems. Essentially, the program pays lenders interest subsidy payments on behalf of borrowers. Anyone can apply, including local and state government facilities. As of April 2005, NYSERDA had made 250 loans and provided interest subsidies of $5.3 million on total loans valued at $42 million through the Energy $mart Program. The program is funded annually and expires on June 30 of each year.

Web site:
http://text.nyserda.org/Energy_Information/evaluation.asp

- *New York City Local Law 30.* On April 11, 2003, New York City enacted legislation that codifies its practice of energy-efficient purchasing, a practice dating from 1994. Local Law 30 requires that energy-using products procured by the city of New York be ENERGY STAR-labeled, provided that there are at least six manufacturers of the ENERGY STAR product. During fiscal year 2002, New York City spent $90.8 million for ENERGY STAR-labeled products, consisting mainly of computers, monitors, printers, photocopiers, fax machines, televisions, VCRs, air conditioners, and lamps.

  Web site:
  http://www.eere.energy.gov/femp/newsevents/fempfocus_article.cfm/news_id=7214

Oregon

Oregon promotes energy efficiency and renewable energy in state and local government facilities through a variety of mandated and voluntary programs.

- *State Energy Efficiency Design Program (SEED).* The mandated SEED requires all renovation and construction projects for state facilities to exceed Oregon's energy conservation building codes by at least 20%. The state's DOE administers the program and provides technical expertise on each project, helping agencies identify and design the most cost-effective energy conservation measures.

  Web site:
  http://egov.oregon.gov/ENERGY/CONS/SEED/SEEDhome.shtml

- *State Energy Loan Program (SELP).* Oregon also administers SELP, a voluntary program that provides low-interest loans for public, commercial, and residential energy efficiency projects. Eligible projects include energy production from renewable resources, using recycled materials to create products, using alternative fuels, and installing energy saving technologies such as efficiency lighting and weatherization. As of December 2004, 643 loans totaling $363 million had been made through SELP. Of these, 215 loans were for renewable energy and 428 were for energy efficiency. Program loans have varied from $20,000 to $20 million and there is no legal maximum loan. Loan terms vary from five to 15 years. The program is self-supported, using no tax dollars, and most loans are designed so the energy savings from the project equal the loan payment.

  Web site:
  http://egov.oregon.gov/ENERGY/LOANS/selphm.shtml

- *Commissioning SB 1149 Energy-Related Capital Projects.* Under its Building Commissioning program, the Oregon DOE provides technical assistance to managers of both public and private facilities. The commissioning process helps save energy by ensuring that the lighting, heating, cooling, ventilation, and other equipment in buildings work together effectively and efficiently. The state requires commissioning or retro-commissioning for specified energy-related capital projects that are funded through the state's Public Purpose Fund (established by SB 1149). This includes HVAC and/or direct digital control (DDC) capital projects exceeding $50,000, boiler and chiller capital projects exceeding $100,000, and other energy-related capital projects (e.g., lighting and lighting controls, building envelope) exceeding $150,000.

  Web site:
  http://egov.oregon.gov/ENERGY/CONS/BUS/COMM/bldgcx.shtml

- *State Business Tax Credit for Efficiency and Renewables.* Oregon's Business Energy Tax Credit (BETC) has stimulated significant business investment in energy conservation, recycling, renewable energy resources, and less-polluting transportation fuels since 1980. Any Oregon business may qualify for the tax credit, and a wide variety of businesses have benefited from the credit, including projects in manufacturing plants, stores, offices, apartment buildings, farms, and transportation.

The tax credit is 35% of the eligible project costs (i.e., the incremental cost of the system or equipment that is beyond standard practice). The credit is taken over five years: 10% in the first and second years and 5% each year thereafter. The unused credit can be carried forward up to eight years. Recipients with eligible project costs of $20,000 or less may take the tax credit in one year. Through 2003, more than 7,400 Oregon energy tax credits have been awarded. Altogether, these investments saved or generated energy worth about $215 million a year.

A key feature of the program is its innovative "pass-through option," in which a project owner can transfer a tax credit to a pass-through partner in return for a lump-sum cash payment (the net present value of the tax credit) upon project completion. The pass-through option allows nonprofit organizations, schools, governmental agencies, tribes, and other public entities and businesses with and without tax liability to use the BETC by transferring their tax credit for an eligible project to a partner with a tax liability. Projects that use solar, wind, hydro, geothermal, biomass, or fuel cells (renewable fuels only) to produce energy, displace energy, or reclaim energy from waste may qualify for a tax credit. Renewable resource projects must replace at least 10% of the electricity, gas, or oil used.

Projects that qualify for the BETC include retrofit (including lighting and weatherization for rental properties), new construction (including energy efficiency and lighting), co-generation, renewable resource, recycled materials, and transportation projects. Retrofit projects must be 10% more energy-efficient than existing installation, and lighting retrofit must be 25% more efficient than existing lighting. For new buildings, all measures must reduce energy use by at least 10% compared to a similar building that meets the minimum requirements of the state energy code.

In 2001, the Oregon legislature added sustainable buildings to the list of measures and systems eligible for the tax credit. This addition became effective October 8, 2001 and is retroactive to January 1, 2001. In addition to several requirements set forth by the Oregon DOE, the building must meet established LEED Silver certification standards. (See Section 3.4, *Funding and Incentives*.)

Web sites:
http://egov.oregon.gov/ENERGY/CONS/BUS/BETC.shtml

http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=OR03F&state=OR&CurrentPageID=1

http://egov.oregon.gov/ENERGY/CONS/BUS/comm/commissioning.shtml

- *Local Programs*. The city of Portland, through its Office of Sustainable Development (OSD), has also been a pioneer in promoting business, residential, and government energy conservation through its City Energy Policy. Accomplishments attributable to this citywide policy include 22,000 weatherized apartment units, a 9% reduction in per capita energy use, and energy efficiency improvements installed in 40 million square feet of commercial and institutional space.

  Portland initiated the City Energy Challenge as one of its first programs to achieve the goals of its Energy Policy, to reduce energy use in city operations, and to set a good example for residents and businesses. Through projects such as innovative green power contracts, traffic signal retrofitting, and methane-powered fuel cells and microturbines, Portland has saved approximately $2 million annually, or 15% of its overall energy costs.

  Web site:
  http://www.sustainableportland.org

Texas

Texas' State Energy Conservation Office (SECO) administers and delivers a variety of energy efficiency and renewable programs in all market sectors, including state and local facilities. The Energy Systems Laboratory (ESL) at Texas A&M University provides technical assistance to SECO, local governments, and facility managers for improving energy efficiency in buildings and calculating and quantifying the energy savings and air emission reductions from energy efficiency programs (ESL 2005). ESL has developed eCalc, a Web-based calculator that helps government and building industry users design, evaluate and track a wide range of energy savings projects that result in emission reductions.

- *Alternative Fuels Program.* The Alternative Fuels Program promotes using alternative transportation fuels in Texas by demonstrating their positive environmental impact, technical feasibility, and energy efficiency.

  Web site:
  http://www.seco.cpa.state.tx.us/alt.html

- *LoanSTAR Revolving Loan Program.* The Texas LoanSTAR (Saving Taxes and Resources) Program is SECO's most visible program. Legislatively mandated to be funded at a minimum of $95 million at all times, the LoanSTAR Program has saved Texas taxpayers over $146 million to date through energy efficiency projects, financed for state agencies, institutions of higher education, school districts, and local governments. Interest rates are currently set at 3% annual percentage rate (APR). The program's revolving loan mechanism allows borrowers to repay loans through the stream-of-cost savings generated by the funded projects.

  Web site:
  http://www.seco.cpa.state.tx.us/ls.htm

- *Performance Contracting Guidelines and Reviews.* SECO is charged with assisting state agencies with achieving greater energy efficiency, and specifically with reviewing and approving guaranteed energy savings performance contracting for state agencies.

  Web site:
  http://www.seco.cpa.state.tx.us/sa_performcontract.htm

- *Energy Efficient Partnership Program.* SECO has helped more than 400 Texas school districts identify $11 million in potential annual utility savings through participation in the Texas Comptroller of Public Account's Energy Efficient Partnership Program. Annual savings range from $325,000 for a large west Texas district to $900 for a small east Texas district with less than 300 students.

  Web site:
  http://www.seco.cpa.state.tx.us/sch-gov_partner.htm

- *Senate Bill 5, the Texas Emissions Reduction Plan.* The 77th Texas legislature passed S.B.5, known as the Texas Emissions Reduction Plan, which imposes new energy efficiency requirements on political subdivisions (i.e., cities and counties) in 38 urban and surrounding counties. The affected political subdivisions must implement energy efficiency measures designed to decrease electric consumption while improving air quality. SECO provides assistance and information to the political subdivisions to help them meet their goals of reducing energy consumption by 5% each year for five years (beginning in January 2001).

  Web site:
  http://www.seco.cpa.state.tx.us/sb5compliance.htm

- *Texas Public Finance Authority (TPFA) Master Lease Purchase Program (MLPP).* This program is a lease-revenue financing program established in 1992 to finance capital equipment acquisitions or other projects by state agencies. It can be used to finance equipment purchases (including energy equipment) of at least $10,000 that have a useful life of three years or more. Under this program, the TPFA borrows money to pay for an agency's equipment by issuing tax-exempt revenue commercial paper notes. The TPFA obtains title to the equipment and leases it to the agency, which makes lease payments to TPFA. TPFA uses the lease payments to repay the principal and interest on the commercial paper notes; the agency receives title to the equipment once the lease is fully paid.

  Web site:
  http://www.tpfa.state.tx.us/MLPPOverview.asp

What States Can Do

States have chosen from a wide variety of approaches and goals in developing their lead by example programs. These programs have reduced energy costs for state agencies, increased funding for nonenergy related expenditures, and helped stimulate development of clean energy projects and resources. States have also used lead by example programs to encourage other organizations to take actions that support clean energy.

Action Steps for States

Based on the best practices and examples of effective state programs described above, states can take the following action steps when developing their lead by example programs.

- Look across the entire government to identify opportunities for the state to lead by example on clean energy. Communicate with state agencies, local governments, schools, and other public sector organizations to identify effective ways to incorporate clean energy into their activities. Engage facility managers and agency staff for program planning, implementation, training, tracking, and evaluation.
- Explore requirements that ensure that cost-effective energy efficiency improvements are implemented in both new and existing buildings, since these have provided a major opportunity for energy savings in many states. This includes:
  - *Standards for New Buildings.* Most states require that their new facilities meet the most recent version of the ASHRAE 90.1 standard. However, some states have adopted more advanced standards, such as CEC's Title 24 Building Energy Standards (CEC 2005). Voluntary advanced building energy efficiency guidelines are available from ENERGY STAR and the New Buildings Institute (NBI 2004, ENERGY STAR 2005a). Some states have adopted green building standards (USGBC is leading this effort through its LEED certification program) (USGBC 2005). (For more information on building codes, see Section 4.3, *Building Codes for Energy Efficiency*.)
  - *Performance Targets for Existing Buildings.* Typical targets have been set at 20% reduction in current energy use per square foot of floor area, using a recent base year and setting a compliance date of between five and 15 years from enactment of the target.
- Consider procurement policies for products, equipment, and green power.
- Investigate targets for using renewable energy to power state and local facilities, allowing flexibility for different agencies to either develop onsite generation or purchase green power, depending on local conditions. States can also explore opportunities to use CHP at state facilities.
- Develop and enable financing mechanisms. States have developed a range of financing methods, including adoption of legislation or rules that ensure that state facilities can use financing strategies such as performance contracting and revolving loans. (See also Section 3.4, *Funding and Incentives*.)
- Offer staffing, technical assistance, and training to facility managers and staff on developing energy efficiency programs. Some states have established accountability structures within and between agencies so that procurement, facility management, and accounting departments are all engaged in a common effort to save energy.
- Ensure that agencies are authorized to use and are using ESCOs and performance contracting to implement energy savings projects in their facilities, if internal sources of project financing are lacking. States can adopt legislation authorizing the use of performance contracting in public facilities.

Information Resources

General Information About State and Local Programs

Title/Description	URL Address
California Energy Commission: How to Finance Public Sector Energy Efficiency Projects. Describes strategies and funding sources that public sector agencies can use to finance energy efficiency projects.	http://www.energy.ca.gov/reports/efficiency_handbooks/400-00-001A.PDF
California Energy Commission's Title 24 Building Energy Standards. Describes the energy standards for residential and nonresidential buildings.	http://www.energy.ca.gov/title24
California Energy Partnership Program. Provides technical assistance to cities, counties, special districts, public or nonprofit hospitals, public or nonprofit public care facilities, and public or nonprofit colleges/universities to improve energy efficiency in new and existing facilities, and helps arrange financing to conduct projects.	http://www.energy.ca.gov/efficiency/partnership/
California Executive Order S-20-04. This order established a goal of reducing energy use in state-owned buildings by 20% by 2015 and directs compliance with the Green Building Action Plan, which provides details on how the state can achieve these goals. The commercial sector is also encouraged to comply with these two policies. They require CEC to develop a building efficiency benchmarking system and commissioning and retro-commissioning guidelines for commercial buildings.	Executive Order S-20-04: http://www.energy.ca.gov/greenbuilding/documents/background/02_GREEN_BUILDING_ACTION_PLAN.PDF Green Building Action Plan: http://www.energy.ca.gov/greenbuilding/documents/executive_order_s-20-04.html
California Tier 1 and Tier 2 Energy Efficiency and Sustainable Building Measures Checklists. These checklists ensure energy efficiency and sustainable building measures are included in new building construction and renovations. Tier 1 checklist items have been evaluated as "cost effective" and must be incorporated into projects when part of the project scope. Tier 2 checklist items may or may not be cost-effective, but should be considered for inclusion. While the checklists include some performance standards, they are primarily prescriptive in nature.	http://www.ciwmb.ca.gov/GreenBuilding/Design/Guidelines.htm#Whole
Cape Light Compact. This regional services organization provides energy efficiency programs and aggregated power cost negotiations for its members.	http://www.capelightcompact.org/doc.ccml?24,15,215609,cap215609,,,Doc,page.html
Center for Renewable Energy and Sustainable Technology Renewable Energy Policy Project (REPP). REPP supports the advancement of renewable energy technology through policy research. REPP disseminates information, conducts research, creates policy tools, and hosts online, renewable energy discussion groups. The Web site provides information on individual state initiatives.	http://www.crest.org/
Consortium for Energy Efficiency. *State and Local Government Purchasing Model Program Plan: A Guide for Energy Efficiency Program Administrators*. Provides a step-by-step guide for developing and adopting a successful state and local government procurement program.	http://www.cee1.org/gov/purch/MPP_Final.pdf
Efficiency Vermont. Vermont's statewide energy efficiency utility provides technical assistance and financial incentives to help residents as well as public and private sector organizations identify and pay for cost-effective approaches to energy-efficient building design, construction, renovation, equipment, lighting, and appliances.	http://www.efficiencyvermont.com/index.cfm
Energy Efficiency's Next Generation: Innovation at the State Level. Provides a guide for model policy measures for energy efficiency. American Council for an Energy-Efficient Economy (ACEEE). November 2003.	http://aceee.org/pubs/e031full.pdf

Title/Description	URL Address
New Jersey Clean Energy Program. The New Jersey Board of Public Utilities administers this program, which provides information and financial incentives to help New Jersey residents, business, and communities to help reduce their energy use, lower costs, and protect the environment.	http://www.njcleanenergy.com/
New Jersey's Green Power Purchasing Program. This program allows the state to aggregate electricity purchases for 200 facilities and negotiate lower costs.	http://www.state.nj.us/dep/dsr/bscit/GreenPower.pdf
New York Executive Order 111, Annual Energy Report. This report summarizes projects implemented under Executive Order 111, estimated energy savings, and energy savings and project goals for subsequent years.	http://www.nyserda.org/programs/pdfs/execorder111finalreport7-03.pdf
New York Guidelines: Executive Order No. 111 "Green and Clean" State Buildings and Vehicles: Guidelines, Second Edition. Describes how state agencies can comply with Executive Order 111, including new construction, procuring energy-efficient products, using alternative fuel vehicles, and reporting requirements.	http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf
North Carolina State Energy Office. The Resources for Government Web page describes North Carolina's Utility Savings Initiative, a comprehensive, multi-programmed approach to reducing utility expenditures and resources in state buildings.	http://www.energync.net/home/efficiency/government.html
Oregon Building Commissioning Program. Provides technical assistance to ensure that building systems are designed, installed, functionally tested, and capable of being operated and maintained according to the owner's operational needs.	http://egov.oregon.gov/ENERGY/CONS/BUS/comm/bldgcx.shtml
Oregon SEED. This program provides energy efficiency assistance for new and renovated public buildings.	http://egov.oregon.gov/ENERGY/CONS/SEED/SEEDhome.shtml
Texas A&M ESL. ESL provides tools, technical assistance, and training to help government and building industry users design and evaluate a wide range of energy savings projects.	http://energysystems.tamu.edu/ http://ecalc.tamu.edu/

Examples of Legislation and Model Language

State	Title/Description	URL Address
California	**California Executive Order S-20-04.** This executive order establishes energy conservation standards for state-owned buildings and encourages commercial building owners, local governments, and schools to take similar measures.	http://www.governor.ca.gov/state/govsite/gov_htmldisplay.jsp?sCatTitle=Exec+Order&sFilePath=/govsite/executive_orders/20041214_S-2004.html&sTitle=Executive+Order+S-20-04
	California State Administrative Manual-Energy and Water Conservation Revenue Bond Projects. This Web site describes the state Public Works Board (PWB) Lease-Revenue Bond Programs.	http://sam.dgs.ca.gov/TOC/6000/6873.htm
	California State Senate Bill ABX1 29. This bill establishes the California energy efficiency financing program.	http://info.sen.ca.gov/pub/01-02/bill/asm/ab_0001-0050/abx1_29_bill_20010412_chaptered.html
	California State Senate Bill 880 (1986). This bill helped establish the California Energy Partnership Program, which began in 1989.	http://solstice.crest.org/efficiency/irt/64.htm

State	Title/Description	URL Address
Colorado	**Colorado Energy Performance Contracting.** This Web site provides sample guidance and documents to assist with energy performance contracting.	http://www.state.co.us/oemc/rebuildco/resources/samples/default.htm
	Enabling Legislation for Performance Contracting. (See Title 29 Local Government 29-12.5-101, 29-12.5-102, 29-12.5-103, 29-12.5-104, and Title 24 State Government 24-30-2001, 24-30-2002, 24-30-2003.)	http://198.187.128.12/colorado/lpext.dll?f=templates&fn=fs-main.htm&2.0
Iowa	**Alternate Energy Revolving Loan Program: 2005 Iowa Code/Statutes.** This legislation describes program administration, eligible entities and projects, and terms of any loans made under this program.	http://nxtsearch.legis.state.ia.us/NXT/gateway.dll/moved%20code/2005%20Iowa%20Code/1?f=templates&fn=default.htm Click "Search Form" tab and enter "476.46."
	Executive Order 41. This order directs state agencies to implement cost-effective energy efficiency measures, purchase at least 10% of building energy requirements from alternative energy facilities, and use alternative fuel vehicles.	http://www.governor.state.ia.us/legal/41_45/EO_41.pdf
	Iowa Energy Bank Enabling Legislation. This bill authorizes state agencies to use lease-purchase financing for energy management improvements and authorizes loans for cost-effective energy management improvements.	http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/EBANK/LEG.PDF
	State of Iowa Facilities Investment Corporation Enabling Legislation. This legislation describes the types of energy management improvement loans SIFIC can make.	http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/SFP/files/leg.pdf
New Hampshire	**Executive Order 2004-7.** Signed in October 2004, the order requires 10% efficiency improvement in 1,200 state buildings.	http://nh.gov/oep/programs/energy/beci.htm
New York	**New York State Executive Order 111.** This order initiates a comprehensive renewable energy and energy efficiency program for New York.	http://www.gorr.state.ny.us/gorr/EO111_fulltext.htm http://www.nyserda.org/programs/exorder111orig.asp
Oregon	**Oregon State Law, ORS 276.900-915, State Agency Facility Energy Design.** This law established the Oregon SEED program in 1991. SEED helps ensure that state facilities are designed, constructed, renovated, and operated to "minimize the use of nonrenewable energy resources and to serve as models of energy efficiency."	http://www.leg.state.or.us/ors/276.html
	Senate Bill 1149. Adopted in 1999, this bill restructured the electric power industry and created a Public Purpose Fund to finance specified energy-related capital projects, including building commissioning.	http://www.leg.state.or.us/99reg/measures/sb1100.dir/sb1149.en.html
All States	**Consortium for Energy Efficiency: Model Energy Efficiency Purchasing Policy.** This document includes model language to be used by state and local governments interested in directing agencies to purchase energy-efficient products.	http://www.cee1.org/gov/purch/Purch_policy.pdf

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DOE. 2005b. FEMP.	http://www.eere.energy.gov/femp/index.cfm
DOE. 2005c. FEMP, Energy-Efficient Products.	http://www.eere.energy.gov/femp/technologies/eeproducts.cfm
DOE. 2005d. Green Power Network.	http://www.eere.energy.gov/greenpower/news/news_template.shtml?id=1046
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ENERGY STAR. 2005c. Purchasing & Procurement.	http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing
ENERGY STAR. 2005d. The ENERGY STAR Challenge-Build a Better World 10% at a Time.	http://www.energystar.gov/index.cfm?c=leaders.bus_challenge
EPA. 2004a. Aggregated Green Power Purchasing Case Study on New Jersey. U.S. EPA Office of Atmospheric Programs, EPA-430-F-04-34. December.	http://www.state.nj.us/dep/dsr/bscit/GreenPower.pdf (November 2003 version) or contact EPA.
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Executive Order No. 111 "Green and Clean" State Buildings and Vehicles: Guidelines, Second Edition. New York 2004. New York State Energy Research and Development Authority, Albany, NY. December.	http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf
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3.2 State and Regional Energy Planning

Policy Description and Objective

Summary

Energy planning is, in its broadest sense, a strategic effort to develop energy-related goals and objectives and formulate related policies and programs. As the nexus for a variety of state concerns, energy planning can serve as an umbrella mechanism for simultaneously addressing energy, environmental, economic, and other issues. Energy planning can be undertaken at both a state and regional level.

Many states have used their energy plans to support the development and use of cost-effective clean energy to help address multiple challenges including energy supply and reliability (including concerns with availability, independence, and security), energy prices, air quality and public health, and job development.

Clean energy planning (as one aspect of energy planning) has taken place in several contexts. It has been part of a broad, multi-faceted strategy that incorporates clean energy as one element (along with conventional sources and end uses), as in the New York State Energy Plan. It has been incorporated into more targeted efforts as in the California Energy Action Plan, which was developed in the wake of an electricity and natural gas crisis and sought to prioritize cost-effective, environmentally sound options. States have approached clean energy planning as an exclusive focal point, such as in the Illinois Sustainable Energy Plan. Other planning approaches have included variations of these, including government-focused lead by example strategies.

Energy planning can serve as a platform to promote or adopt significant policy initiatives including statewide clean energy goals, such as a renewable portfolio standard (RPS) or energy efficiency requirement, green power purchase levels for the state, or greenhouse gas reduction goals. The 2002 New York State Energy Plan, for example, included a renewable energy goal that helped spur the development of New York's RPS and a greenhouse gas emission reduction goal that set the stage for the governor to solicit support for a regional greenhouse gas initiative across the Northeast.

Energy planning at the state or regional level is an effective means for ensuring that clean energy is considered and used as an energy resource to help states address their multiple energy and nonenergy challenges.

Energy plans are usually developed by one or more state agencies, typically led by the state energy office. These efforts may be at the direct behest of the governor or other top official or the state legislature. Frequently, public and private sector stakeholders, such as electricity and gas utilities, environmental organizations, equipment manufacturers, and others, provide input to the plan. Implementation likewise involves a variety of agencies and stakeholders, and possibly calls for specific legislative or executive level action.

While some states require energy plans, the level of activity varies as does the scope and scale of efforts. Similarly, the inclusion of clean energy sources varies depending upon the state's circumstances. However, with all regions facing significant costs for new resources, along with heightened reliability, security, and environmental concerns, there has been increased interest in energy planning that includes consideration of the energy, economic, and environmental benefits of clean energy.

This section describes how states and regions have included clean energy in their energy planning efforts, discusses the role of various participants in the process, describes the interaction with federal and state policies or programs, and lays out several sets of best practice measures with respect to plan development, implementation, and evaluation. Chapter 2 of this Guide, *Developing a Clean Energy-Environment Action Plan*, provides additional detail on best practices for the development step, including

Examples of Clean Energy Goals from State Energy Planning Documents

Below are examples of specific, quantitative clean energy goals (including recommendations and proposed strategies) that states have included in their state energy plans or related documents:[a]

- Improve new and remodeled building efficiency by 5% and accelerate the state's RPS by adding a net average of 600 MW of new renewable generation sources annually (*California, Energy Action Plan, 2003*).
- By 2006, 2% of electricity sales generated by renewable energy; increasing annually by 1% until 2012. Reduce electricity consumption by 10% of projected annual load growth by years 2006 to 2008, rising to 25% in years 2015 to 2017 (*Illinois, Sustainable Energy*).
- Increase electricity production of solar energy in New Jersey to at least 120,000 MWh per year by 2008 (*New Jersey, Clean Energy Program Annual Report, 2003*).
- Reduce primary energy use per unit of gross state product by 25% below 1990 levels by 2010; increase renewable energy use as a percentage of primary energy use by 50% from 2002 levels to 15% by 2020; reduce greenhouse gas emissions by 5% below 1990 levels by 2010 and 10% below 1990 by 2020 (*New York, State Energy Plan, 2002*).
- State agencies and universities reduce energy consumption in existing state building to save 20% by 2008 (*North Carolina, State Energy Plan, 2003*).
- 25% of state government's total electricity needs met by new renewable energy sources by 2010 and 100% by 2025 (*Oregon, Renewable Energy Action Plan, 2005*).
- Establish a new standard for renewable energy use in the state, averaging 10% statewide by 2015 (*Wisconsin, Report to the Governor's Task Force on Energy Efficiency and Renewables, 2004*).

[a] Note that these goals are not necessarily the only ones included in a particular state plan and that additional action is generally required to implement a goal.

specifics on analytical tools, and lays out a number of action steps for states. Chapters 3 through 6 contain descriptions of 16 clean energy policies, programs, and strategies that states are pursuing and may be included in a clean energy plan. In keeping with the scope of the *Guide to Action*, this section focuses on on the electricity and natural gas sectors. The role of transportation in energy planning is an important one, however, and one that at least several states are integrating into their processes.

Objective

State and regional energy planning can further multiply state goals and leverage tools, resources, and policy opportunities from many agencies/states. States have advanced clean energy through their planning efforts by: (1) identifying and promoting a package of cost-effective options to meet energy, environment, and economic goals, (2) recognizing and assessing a full range of short- and long-term benefits from energy efficiency and renewables, (3) engaging multiple agencies and stakeholders in the state planning process and implementation, and (4) helping state agencies from different states within a region coordinate their efforts to better achieve complementary goals.

Benefits

Energy plans that incorporate environmental considerations and related cost-effective clean energy options including energy efficiency, renewable energy, and combined heat and power (CHP) have helped lay the groundwork for the efficient use of energy and state resources and helped to achieve a broad set of energy, economic, and environmental policy goals, including:

- Providing a cost-effective response to projected load growth, possibly avoiding the need for new power plants and infrastructure.
- Helping to meet challenges that load growth places on an aging system, and/or alleviating congestion and related concerns with system stability and reliability.
- Increasing energy supply diversity and security with greater reliance on domestic, regional, or in-state resources.
- Reducing energy prices and price volatility.
- Reducing the environmental footprint of energy use.

In addition, integrated energy planning efforts have yielded many policymaking benefits, including:

- Providing a framework to coordinate energy efficiency and renewable energy initiatives among state agencies and across states within a region.
- Reducing the time and costs associated with meeting existing and future environmental requirements through more efficient deployment of agency resources and efforts and adoption of least-cost and least time-intensive measures.
- Developing a climate in the state favorable to investment, innovation, and economic development of energy efficiency and renewables.
- Providing technical insights and organizational relationships that are valuable in a crisis or unexpected situation where quick decisionmaking is required.
- Conveying a sense of coherence and joint purpose to the public and other stakeholders.

State Energy Planning

States are using a variety of approaches to energy planning, ranging from establishing broad policy agendas to focusing exclusively on clean energy resources. Some states have also developed plans for how they can lead by example through government-focused initiatives. States may also look specifically at the electricity sector in their development of a clean energy plan. In addition, under the State Energy Program directed by the U.S. Department of Energy (DOE), state energy offices develop plans for how to invest support received through an annual federal funding appropriation to help promote energy efficiency and renewable energy (see *Interaction with Federal Policies* on page 3-35).

The following approaches can be adapted and combined, with the appropriate combination based on a state's priorities and resource availability:

- *Clean Energy Within a Comprehensive State Energy Plan.* Several states have developed a comprehensive energy plan that includes specific policy goals, action items, and implementation steps to increase the use of energy efficiency and renewable energy sources as one of several complementary sources. Examples include New York's State Energy Plan, Connecticut's Energy Plan, and California's Integrated Energy Policy Report and Energy Action Plan (EAP). Comprehensive energy plans have established specific targets for clean resources and identified strategies (e.g., a renewable energy and/or energy efficiency portfolio standard [EEPS]) for implementing policies and programs by a variety of state agencies. California has used its plan to prioritize clean energy as a way to meet future load growth by establishing the following "loading order" for resources: (1) conservation and energy efficiency, (2) new renewable generation, and (3) clean fossil fuel-fired central generation (CERCDC 2003). The New York State Energy Plan includes goals for improving the combined contribution of energy efficiency and renewable energy in meeting the state's energy needs.
- *Energy Plan Focused on Clean Energy.* Some states have developed a targeted energy plan that emphasizes increasing penetration of renewable resources, boosting energy efficiency, and increasing demand response. Clean energy may also be included in plans that address related issues of natural gas dependency or climate change. Examples include Illinois' Sustainable Energy Plan, New Mexico's Clean Energy Plan, Pennsylvania's Energy Harvest, and Wisconsin's Report of the Governor's Task Force on Energy Efficiency and Renewables. The Illinois plan sets a renewables goal for 2006 that at least 2% of the electricity sold to customers would come from renewables, with an annual increase of 1% until 2012. For efficiency, the goal is to reduce electricity consumption by at least 10% of projected annual load growth between 2006 and 2008, increasing to a 25% reduction from 2015 to 2017.
- *Plan for Leading by Example.* Many states have developed energy plans designed to help the state lead by example in its own use of resources. These state initiatives can jump-start the market for renewables and provide drivers for efficiency technologies and services. The lead by example

approach can be incorporated into a broad energy plan or a targeted clean energy plan, or be pursued independently. Examples of measures that a state can pursue include: adopting a renewable energy goal for the electricity consumed by the state (e.g., its office buildings, vehicle fleets), setting efficiency thresholds for the purchase of energy consuming products or equipment, and improving energy efficiency to offset projected load growth. Connecticut, Virginia, Nevada, Oregon, South Dakota, and Vermont are among the states that use this approach. Oregon has decided to increase the energy efficiency of new or remodeled state buildings by 20% or better, and existing buildings are required to reduce energy consumption by 10% relative to 2000. (See Section 3.1, *Lead by Example*, for more information.)

- *Planning by Regulated Entities.* Given their significant role in energy supply and use, states can require that regulated electricity suppliers (i.e., electric utilities or electric distribution companies) develop electricity plans that are consistent with the state's policy objectives. This effort can be connected to a broader energy planning effort or a targeted clean energy initiative, or be pursued on its own. In states where utilities are vertically integrated (the traditional approach to regulation in which generation, transmission, and distribution are provided by one entity), this takes the form of Integrated Resource Planning (IRP) (e.g., California, Minnesota, Washington). In states where the regulation of the electricity industry has been restructured, this can take the form of including clean energy in portfolio management (e.g., New Jersey, Illinois). Utilities may also develop comprehensive energy efficiency investment plans as part of their demand-side management or other efforts. IRP and portfolio management are discussed in more detail in Section 6.1, *Portfolio Management Strategies*. Utility funding for energy efficiency is discussed in Section 4.2, *Public Benefits Funds for Energy Efficiency*.

Regional Energy Planning

Regional planning typically occurs in two separate, but related, forums. Government or quasi-government entities, such as governors' associations, may develop a coordinated approach for sharing information and developing broad regional policy approaches. These planning approaches are not usually binding, with the exception of the Northwest Power Planning Council. In addition, power system operators engage in rigorous power system planning that focuses primarily on a reliable and adequate power supply for an electrical region. These regional planning approaches are described as follows.

- *Regional Plan for Policy Coordination.* In some regions, states are working together to create an energy plan that outlines shared policy goals. The Western Governors' Association (WGA) has established a Clean and Diversified Energy Advisory Council to help pursue the regional goals of 30,000 MW of clean energy by 2015 and increasing the efficiency of energy use by 20% by 2020. The New England governors have taken a coordinated approach to policy development in the areas of climate change, energy efficiency, and renewables through its New England Governors/Eastern Canadian Premiers Climate Change Action Plan, which includes the goal of increasing the amount of energy saved through conservation programs by 20% by 2025. The Coalition of Northeast Governors (CONEG) has established an Energy Working Group and is active in pursuing biomass and other renewable options.

  Regional approaches have been pursued for a variety of reasons. Some of the motivation is the regional nature of power markets and the attempt to better align policy boundaries with those of the relevant independent system operator (ISO) or similar organization (see more in the "Clean Energy in Regional Power System Planning" bullet). In addition, many regions have a long history of working collectively to pursue public policy goals, and energy policy is a natural extension of this historic relationship. Regional efforts are also attractive for states that want to move forward with the support of neighboring states to create a "level playing field" (e.g., with respect to prices) in their region. Regional approaches can also offer opportunities for economies of scale, for instance, under aggregated purchasing efforts.

- *A Federally Mandated Regional Energy Planning Process.* The Northwest Power and Conservation Council, created by Congress in 1980, develops and maintains a regional power plan to balance the Northwest's environment and energy needs. The council is explicitly charged with incorporating cost-effective measures in its plan according to the following priorities: (1) conservation, (2) renewable resources, (3) generating resources using waste heat or generating resources of high fuel conversion efficiency, and (4) all other resources (Pacific Northwest Electric Power Planning and Conservation Act 1980).

  In addition, the Northwest Power and Conservation Council provides an example of how regional state committees can examine the role of clean energy as a resource. These examples are discussed in more detail under the *State and Regional Examples* section on page 3-38.

- *Clean Energy in Regional Power System Planning.* Regional power system operators conduct detailed ongoing planning efforts to ensure the reliable and efficient operation of the interconnected bulk electricity power systems. As such, their focus is narrower than a state energy plan that is undertaken by a government entity and reflects broader public policy goals. However, these plans increasingly attempt to consider how clean energy resources can be deployed to avoid the need for other grid resources such as new power lines. Plans are typically developed on an annual basis, with regular reviews throughout the year. The plans cover a long-term planning horizon of about 10 years. Many states participate in these regional planning processes and support consideration of energy efficiency and renewables as supply resources and as alternatives to transmission system expansion.

  There have been some efforts to formalize state participation in regional power system planning processes. For example, states in the Midwest ISO region have created a new Organization of Midwest ISO States (OMS) as a coordination vehicle for state utility commissions in their response to Midwest ISO's regional planning. OMS has a small staff and bylaws, and state commissions provide staff support. OMS is intended to coordinate the information needs and state responses to Midwest ISO regional transmission plans. This is one example of a Regional State Committee that the Federal Energy Regulatory Commission (FERC) has encouraged for state input into regional planning processes that could be used to foster clean energy planning.

Designing an Effective State or Regional Energy Plan

This section describes policy issues, approaches, and best practices for designing effective clean energy plans. The issues covered in this section are built on lessons learned from states' experiences in developing and implementing energy plans. First is a discussion of important procedural issues: determining the participants that need to be involved; assessing funding necessary to support the effort; setting the planning horizon covered by the plan and related analysis; and, determining the frequency for planning, reviews, and updates. Next, this section contains insights into interactions of energy planning with other state and federal policies.

Participants

States have found that participation by a wide variety of stakeholders results in the most effective energy planning processes. Broad participation across agencies, states, and relevant external stakeholders, facilitates information sharing, promotes the consideration of a broad range of options and related tools, and enables participants to understand how their efforts fit into the broader plan. In some states, the legislature has created a board or council that includes multiple agencies and sometimes legislators and/or other stakeholders (e.g., Connecticut Energy Advisory Board, North Carolina Energy Policy Council, New York Energy Planning Board). In other states, the governor has formed a task force or council that includes state agencies, legislators, and sometimes a variety of external stakeholders (e.g., Delaware, Illinois, Iowa, Kansas, Kentucky, Oregon, Wisconsin). External stakeholders can play a role in developing the energy plan through meetings, public comment processes, and expert presentations. Many of the same state-level participants play similar roles in the development of regional energy plans.

- *Governor*. States have found that top-level commitment to clean energy policies and leadership on a coordinated approach is an important part of developing an effective energy policy and ensuring effective follow-through on implementing clean energy measures. The governor can establish priorities and policy objectives, and can ensure that appropriate agencies participate in the process. In recent years, governors have increasingly recognized the importance of energy planning and the link between energy, the environment, and the economy. For example, in their 2004 state of the state addresses, several governors recognized this linkage and proposed related programs or policies. A number of governors have created cabinet level task forces or similar bodies to study and/or implement clean energy policy goals (e.g., Delaware Energy Task Force, Iowa Energy Coordinating Council, Florida Energy 2020 Study Commission, New Mexico Solar Power Task Force, Oregon Renewable Energy Action Plan, West Virginia Energy Task Force, and Wisconsin Energy Efficiency and Renewables Task Force).
- *Legislature*. Legislatures have played a variety of roles. Many of the action items in an energy plan may require legislative approval and/or funding. In some states, the legislature has mandated an energy planning process. Such a mandate can help clarify clean energy priorities, ensure that appropriate agencies participate, and increase the likelihood that adequate resources are devoted to energy planning and associated implementation steps. Examples of legislative initiatives include the Connecticut Energy Advisory Board, the North Carolina Energy Policy Council, California Integrated Energy Policy Reports, and the New York State Energy Plan. In many instances, legislators serve on an energy board or council (e.g., Delaware and North Carolina).
- *State Agencies*. Agencies provide detailed knowledge and experience and dedicated resources. They are often looked to by the governor and/or legislature to define broad policy objectives, inform development of targets, develop policies and programs, identify feasible implementation steps, and develop action items. They are also key players in implementing specific programs and in reviewing plan implementation. Increasingly, states are looking to include the broadest array of agencies possible to enhance leveraging opportunities and harmonize efforts. States have included agencies covering a range of interests (e.g., education, energy, public utilities, environmental protection, transportation, housing, agriculture, economic development, consumer protection, human rights, government purchasing, administrative services) in the planning process. States may also provide their perspective as large end users.
- *Universities*. Frequently, universities play an important role in developing and implementing an energy plan. For instance, faculty might be able to secure grant funding for analytical modeling that is not available in state government. Universities can also provide a neutral forum to engage stakeholders. Faculty at the Appalachian State University spearheaded the development of the North Carolina Energy Plan; similarly, the Florida Solar Energy Center at the University of Central Florida played a major role in Florida's Energy Plan. The Center for Energy, Economic and Environmental Policy at Rutgers University serves as policy advisor and evaluator for the New Jersey Clean Energy Program and related planning efforts and as facilitator for the Clean Energy Council.
- *Utilities*. Utilities, including investor-owned, municipal, and cooperative utilities, provide technical expertise and are sources of customer information. Utilities sometimes provide input as stakeholders, and sometimes serve directly on a board or council (e.g., Delaware, North Carolina, and West Virginia). They also participate in regional power system planning processes. They are also involved in implementing and evaluating programs and policies.

- *ISOs and Regional Transmission Organizations (RTOs)*. These entities initiate and lead regional transmission planning processes. They provide information and analysis of the regional power system, solicit input from market participants and state entities, and develop the regional plan. They are also involved in implementing and evaluating programs and policies.
- *Independent Power Producers, Independent Transmissions Owner, and Energy Suppliers.* One or more of these entities might be involved, depending on the issues being addressed by the energy plan. They can provide information and analysis, particularly as it relates to one of their assets (e.g., a generating source, transmission line, or pipeline). They are also involved in implementing and evaluating programs and policies.
- *Environmental and Consumer Organizations.* These organizations often provide data and analysis, ideas on program design, and feedback on proposed policies, initiatives, goals, and programs.
- *Other Private Sector Entities*. Many energy plan components are geared to motivating greater investment by the private sector in energy efficiency and renewables. The private sector also plays a key role in spurring technological innovation. Large end users, manufacturers, energy efficiency providers, and other entities that are directly affected by state energy programs might be particularly helpful in developing and implementing an energy plan. Energy planning processes can also include representatives (including management and labor) of fuel, biomass, Energy Service Companies (ESCOs), or renewables industries.
- *The Public.* States involve the general public in the energy planning process by holding pubic hearings in different parts of the state and using the media and other information distribution outlets (e.g., agency Web sites and gubernatorial addresses) to raise awareness of pending issues. The public can provide feedback as well as new ideas and input to state officials.

Funding

Funding needs arise in both developing and implementing an energy plan. Developing a state energy plan can involve contributions of staff and other resources from multiple state agencies, the governor, the legislature, and sometimes private entities. Much of this support is typically in-kind because dedicated funding streams are rare. More common is a one-time appropriation. Development often calls for sophisticated energy system modeling, ideally coupled with economic and environmental analyses. This modeling can be costly to build and maintain, and funding is often a critical issue. A state may be able to fund this work through a utility gross receipts tax or other stable funding mechanism. For example, the New York State Energy Research and Development Authority (NYSERDA) is funded in part through a statutorily prescribed assessment on the intrastate sales of New York State's investor-owned electric and gas utilities.

Implementation of the plan, such as specific action items contained in the energy plan, could require special appropriations or mechanisms for funding (e.g., through a surcharge on electricity consumers or investment from the private sector such as for an RPS). For example, the plan could include recommendations for legislative action on financing renewable energy projects, energy tax credits, and other tax incentives or for allocating funding to data collection and research.

On a regional basis, if there is an RTO, the governing board may approve the use of a wholesale tariff to help support energy planning activities.

An energy plan can also direct investment by state agencies to meet specific purchasing targets for energy efficiency and renewables. For example, specific agencies can be charged with expanding cost/benefit analyses to include benefits of renewables and efficiency, allocating agencies' funds to particular types of projects, ensuring agency incentives are consistent with overall policy, or pursuing specific demonstration projects.

Planning Horizon

Planning horizons included in energy plans vary from a few years to 15 or 20 years. A state may choose to limit the time frame based on a concern about achieving the greatest accuracy. Other states extend the horizon so that they can consider how long-term needs might be met and to more fully realize the costs and benefits of different energy resources.

Timing and Duration

There is a great variety in the timing and duration of energy planning. Some states have a regular planning cycle (ranging from once every year to once every five years) that may include a provision for updating and/or evaluating the plan in off-years (e.g., Connecticut, California, Iowa, New York, Oregon). Other states develop energy plans on a more ad-hoc basis, based on the perceived need, resource constraints, or other factors. Some states have become recently active after waiting 10 or more years before revising their energy plan (e.g., Delaware, Wisconsin, North Carolina, Florida).

Interaction with Federal Policies

Several federal programs can help support the integration of clean energy into state and regional energy planning:

- *DOE.* DOE administers the State Energy Program, which provides grants to states and directs funding to state energy offices from DOE's technology programs. States use grants to address their energy priorities and program funding to deploy emerging clean energy technologies. As part of the State Energy Program, states are required to have an energy strategy in place that describes how they will use their annual appropriation to help promote energy efficiency and renewable energy. In addition, DOE has been working with the U.S. Environmental Protection Agency (EPA) to explore how to reflect clean energy in state air quality planning (e.g., through a number of Air Quality Energy Efficiency/Renewable Energy [EE/RE] Integration Pilots and other efforts).
- *EPA*. EPA supports energy planning efforts through technical assistance, analytical tools, and outreach support on a number of clean energy topics. Key programs include the Clean Energy-Environment State Partnership Program, Green Power Partnership, Combined Heat and Power Partnership, and ENERGY STAR program. Under the Clean Energy-Environment State Partnership Program, EPA helps partner states develop a *Clean Energy-Environment Action Plan*, which is a detailed, implementation-oriented strategy document aimed at identifying, assessing, and prioritizing energy policies, programs, and measures that can achieve cost-effective environmental benefits. This *Guide to Action* helps states with their assessment by providing information, data, case studies, and guidance on relevant tools and resources for 16 clean energy policies. Specific guidance on developing a state *Clean Energy-Environment Action Plan*, including related efforts to convene a state collaborative, are presented in Chapter 2, *Developing a Clean Energy-Environment Action Plan*.
- *FERC.* FERC requires RTOs, or ISOs, to be responsible for regional transmission planning. As part of this effort, FERC has enabled the creation of Regional State Committees for states to have input into regional transmission planning. FERC has taken steps toward working on facilitating transmission access for renewables, particularly wind. For example, it has held public technical conferences on assessing the state of wind energy in wholesale electricity markets. In addition, FERC is also supporting efforts to examine the role of distributed energy resources.
- *The Energy Policy Act of 2005 (EPAct 2005).* EPAct 2005 (Section 140) authorizes grants of $5 million annually for each of fiscal years 2006 through 2010 for a pilot program for three to seven states with statewide plans for reducing electricity and natural gas consumption. The grants would be dependent on states proving independent verification of energy savings.

Interaction with State Policies

By its nature, state energy planning is often an umbrella function, providing an opportunity and mechanism to address multiple state policy objectives with participation from a full range of government and private entities. As such, it is the nexus for a variety of state policies. Many states have used energy planning as a tool for addressing environmental policy objectives simultaneously with energy policy objectives. Indeed, it is when energy objectives are considered alongside environmental and economic development objectives that clean energy can take on a more prominent role in the energy plan.

Best Practices: Developing and Adopting an Energy Plan

The best practices identified below will help states develop an energy plan that incorporates clean energy and related environmental considerations. These best practices are based on the experiences of states across the country that have developed energy plans. (See Chapter 2, *Developing a Clean Energy-Environment Action Plan,* for more detail.)

- *Create a Collaborative.* Create an advisory group to identify and assess resources and tools developed by other organizations, including state agencies, legislatures, universities, and the private sector. This group can inform the establishment of a multi-agency, multi-stakeholder collaborative process to develop a plan. At the regional level, work with ISOs and RTOs to establish processes, set policy goals, and implement programs.
- *Establish Quantitative and Other Goals.* Identify policy objectives and specific goals, including areas for agency coordination as well as specific, quantitative clean energy goals, to help guide the work of the planning agency and provide the public and other stakeholders with expectations for the outcomes. Setting a quantitative goal may be tied to one or more of the analytical steps below.
- *Forecast Energy Demand.* Develop forecasts of energy demand that are based on end uses (i.e., using detailed information on energy-using appliances/equipment, including model, size, and operating characteristics) rather than econometric drivers (i.e., "top down" drivers such as population, economic activity, weather, and more general assumptions on appliance and equipment use/penetration).
- *Assess Clean Energy Potential.* Assess the technical, economic, and achievable potential for clean energy resources to help meet forecasted demand and integrate clean energy resources fully into the analysis.
- *Examine Policy Options.* Consider how new and existing policies and programs can help expand the use of cost-effective clean energy. The *Guide to Action* describes each of the 16 clean energy policies, programs, and strategies that states have found particularly promising and may include in their state or regional clean energy plans. States may develop several scenarios, based on a range of clean energy goals or policy variations. An important element of policy development is the equitable treatment of all energy resources in any recommendations/provisions for utility cost recovery decisions (i.e., avoid potential bias toward supply-side resources and transmission investments, and avoid policy recommendations that may inadvertently set a ceiling on clean energy investments). (See Section 6.2 for a broader discussion of utility regulations and incentives, and Sections 4.2 and 5.2 for information on public benefits funds [PBFs] for energy efficiency and energy supply, respectively.)
- *Evaluate Impacts of Policy Scenarios.* Develop forecasts of energy use that include a full range of impacts for each scenario (e.g., environmental, economic, system reliability, and price).
- *Link Plan to Action.* Develop steps for plan adoption and implementation, and make action items enforceable where appropriate. Identify specific action items and schedules for individual agencies, as well as for inter-agency coordination.
- *Coordinate Implementation.* Provide for coordination of program administration and delivery—including coordination with enacting bodies (e.g., the legislature or executive branch) and implementing agencies (e.g., Public Utility Commissions [PUCs], state energy offices).

Several states have identified economic development or climate change concerns as key drivers in the shaping of their energy plan (e.g., Connecticut, Florida, Illinois, New York, Oregon, West Virginia, Wisconsin, Iowa, North Carolina, Vermont). For example, the Massachusetts Climate Protection Plan is premised on the interrelated nature of energy, environment, housing, and transportation issues. Similarly, Connecticut cites its Climate Change Action Plan as one of the key factors affecting its energy policy. State climate change action plans often include a number of clean energy policies that can help achieve greenhouse gas reductions, such as energy efficiency goals or targets, renewable energy portfolio standards, building energy codes, and provisions to increase the use of clean distributed generation. Energy plans are frequently linked to economic development and job creation. Regulatory policies that address decoupling utility profits from energy sales, portfolio management, demand response, and utility planning are also related and are discussed in Section 6.1, *Portfolio Management Strategies.*

Some states have taken specific actions to ensure that utilities provide adequate access to transmission and distribution for renewables. Many utilities are determining how best to incorporate energy efficiency and distributed generation (DG) into distribution system planning. For example, New York has been evaluating DG in distribution system planning through several regulatory proceedings. Similarly, the Massachusetts DG Collaborative has a working group on DG distribution system planning.

Program Implementation and Evaluation

Roles and Responsibilities of Implementing Organizations

- *State Agencies.* Energy plans usually include specific actions for a number of state agencies including energy offices, public utility commissions (PUCs), environmental agencies, administrative agencies (or other agencies charged with purchasing), and economic development agencies. For example, PUCs are often involved in developing efficiency plans and developing rules that specify actions regulated utilities must take to implement the policies and goals adopted in the plan. Agencies are key players in the implementation of specific programs and the review of plan implementation.

- *Legislature.* Legislative action may be required to implement certain steps of a plan, such as special tax treatment or development of funding sources. The legislature also often oversees the implementation of plans and may intervene to make course corrections or to clarify ambiguities.

- *Universities.* Universities often play a key role in energy research and development relating to clean energy options and are sometimes looked to as partners in initiatives to foster specific technologies.

- *Utilities.* Utilities (both vertically integrated and distribution-only) are essential to the implementation of certain programs, such as efficiency programs, integrating renewables into power systems, portfolio procurement, and IRP. They also participate in regional power system planning processes. Even utilities that are not regulated by the state, including municipal utilities and cooperatives, may have roles to play in program implementation.

Best Practices: Implementing Energy Plans

States can use the best practices below to implement their energy plan. These best practices are based on the experiences of states that have energy plans.

- Designate specific implementation tasks to specific agencies and staff.
- Create an entity or working group to monitor plan implementation.
- Link implementation to other policies so that state activities overall are compatible with the energy plan, including provisions that bind agencies to conduct certain activities, such as procuring certain resources or conducting key studies.
- Require each agency to develop a plan for implementing the portions of the plan for which it is responsible and to demonstrate that its activities support the goals of the plan.

Evaluation

Energy plan evaluation practices span a range of approaches from very broad review, to detailed program by program review and evaluation.

Some energy plans are primarily tools to enunciate policies and do not include a specific mechanism or procedure for reviewing and evaluating the implementation of the plan. In contrast, some plans include specific reporting requirements (e.g., to the legislature or the governor). Energy plans also can include feedback loops to guide future iterations of the plan. For example, in New York, the Energy Coordinating Working Group, comprising staff representatives of the agencies on the Energy Planning Board, issues an annual Report and Activities Update that evaluates progress toward the goals of the most recent energy plan. Similarly, Oregon's Biennial Energy Plan (2003–2005) includes a section on achievements, reviewing the results of the previous years' energy programs. Oregon's Renewable Energy Action Plan specifically charges a working group with evaluating implementation of the plan. The 2005 Connecticut Energy Plan reviews the success in implementing the 2004 Energy Plan, and includes a section on evaluating and providing a progress report as part of the energy plan. The Iowa Department of Natural Resources (DNR) prepares a comprehensive energy plan update every two years, reporting on energy consumption as well as progress in improving energy efficiency and expanding renewable energy use.

Best Practices: Evaluating Energy Plans

The best practices identified below will help states evaluate their energy plans. These best practices are based on the experiences of states that have an energy plan.

- Identify a specific schedule and steps for plan evaluation.
- Designate an entity or working group responsible for monitoring plan implementation.
- Develop a process for evaluating individual action items and success in achieving the stated objective.
- Select appropriate measures to determine the success of programs (e.g., metrics can include kWh saved, appliances sold, dollars spent, and new renewables installed) and include metrics about environmental and economic benefits and results, such as emissions saved or jobs created.
- Prepare a comprehensive report that examines all aspects of the energy plan as a whole.
- Recommend adjustments to respond to new opportunities or barriers identified in the evaluation process.

A thorough and well-documented evaluation process can help build confidence in the benefits associated with clean energy. In addition, evaluation results can help planners understand instances where projections did not materialize as expected and point to ways to address potential barriers to full policy success.

State and Regional Examples

California

As directed by the state legislature in 2002, the California Energy Commission (CEC) prepares a biennial Integrated Energy Policy Report (IEPR). The IEPR addresses issues uncovered in an integrated assessment of major energy trends and challenges facing California's electricity, natural gas, and transportation fuel sectors. It makes policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy resources; enhance the state's economy; and protect public health and safety. This includes recommendations to further the goals included in the state's EAP, described in the next paragraph. The IEPR includes a chapter dedicated to the issue of climate change and the related interactions with energy.

The EAP is a brief blueprint developed by the CEC, along with the California Public Utilities Commission (CPUC), as a "living document" to guide energy related actions throughout the state. The goal of the EAP is to ensure that energy is available and affordable, with minimal environmental risks and impacts, when and where it is needed. Other participants involved in preparing the EAP include the State Business, Transportation, and Housing Agency; the Resources Agency; the State and Consumer Services Agency; the California Independent System Operator (CAISO); the California Environmental Protection Agency (Cal EPA); and other agencies with energy-related responsibilities.

The EAP II: Implementation Roadmap for Energy Policies, released in 2005, notes that California's energy efficiency efforts, particularly efficiency requirements for appliances and new buildings, have already reduced peak capacity needs by more than 12,000 MW and continue to save about 40,000 gigawatt-hours (GWh) of electricity annually. It adds that in 2004, the CPUC adopted further energy savings goals for electricity and natural gas. In meeting these targets, investor-owned utilities (IOUs) will save an additional 5,000 MW and 23,000 GWh per year of electricity and 450 million therms per year of natural gas by 2013. The EAP II asserts that there is more to be done and lays out a series of key actions in the areas of energy efficiency, demand response, electricity adequacy, electricity market structure, and other areas.

The original EAP, released in 2003, identifies a "loading order" for energy resources that requires (1) optimizing all strategies in conservation and energy efficiency to minimize demand increase, (2) meeting new generation needs first by renewable energy and distributed generation, and (3) supporting clean fossil fuel-fired central station generation. This loading order has since been codified in state legislation and extends the application to local publicly owned (i.e., municipal) utilities.

Web site:
http://www.energy.ca.gov/energypolicy/index.html

Connecticut

The Connecticut Legislature reconstituted the Connecticut Energy Advisory Board in 2003. The Board includes leaders from multiple state agencies who identify and coordinate state energy needs and recommend strategies and solutions. The Board provides an Annual Energy Plan to the legislature that includes specific strategies to support energy efficiency and renewable resources. The Board's 2004 Plan included a detailed assessment of energy supply and demand options and an overview of related policy opportunities and challenges. It also presented 10 energy-related strategies (and related examples of possible actions) including: continuing to support energy efficiency and conservation, supporting renewable energy technologies, supporting demand response, and supporting transportation and land use policies that reduce energy use and increase fuel diversity.

The 2005 plan reiterates the importance of those strategies and identifies several related goals including: (1) initiating and implementing by year-end 2005 a statewide public education and awareness program about the Board's recommended strategies to reduce dependence on fossil fuels, and (2) initiating legislative efforts related to the strategies identified in 2004. The 2005 plan also reported on the progress of the governor's Steering Committee (GSC) on Climate Change and the related Connecticut Climate Change Stakeholder Dialogue as a significant energy-related activity. It noted the governor's adoption of 38 recommendations made by the stakeholder group, including implementing measures to create a voluntary clean energy "choice" program for Connecticut electricity users, developing new emissions standards for cars, and using energy-efficient materials and design concepts in the construction of new state buildings.

Web site:
http://www.cerc.com/pdfs/ceabenergyplan_final05.pdf

New Mexico

The governor of New Mexico articulated a goal for New Mexico to become a leader in renewable energy and clean energy technologies. The state is also pursuing economic development goals through development of clean energy. Executive Order 2004-019 declared New Mexico the "Clean Energy State" and established an internal Clean Energy Development Council (CEDC) consisting of cabinet secretaries. The CEDC established task forces on concentrating solar power, electricity transmission, biomass, distributed solar, utility energy efficiency, and green building.

Web site:
http://www.emnrd.state.nm.us/ecmd/

New York

The New York State Energy Planning Board was created by the legislature to oversee the development and adoption of the Annual State Energy Plan. The Energy Planning Board comprises several agencies: NYSERDA, the New York State Department of Transportation (DOT), the New York State Public Service Commission (PSC), the New York State Department of Economic Development (DED), and the New York State Department of Environmental Conservation (DEC). While legislation creating the Energy Planning Board has expired, there are draft bills in both houses of the legislature to reauthorize it.

The Energy Plan includes specific goals for the contribution of energy efficiency and renewables. The 2002 Energy Plan included the following goals: (1) reduce primary energy use per unit of gross state product to 25% below 1990 levels by 2010, (2) increase renewable energy use as a percentage of primary energy use by half from 2002 levels to 15% by 2020, and (3) reduce greenhouse gas emissions 5% below 1990 levels by 2010 and 10% below 1990 levels by 2020.

An annual report provides updates documenting progress in implementing policies and recommendations contained in the plan. This report provides an update to the Energy Planning Board on actions and initiatives the state has taken to implement the strategies and recommendations in the Energy Plan. It also summarizes the data and information filed with the board by major energy suppliers in 2004, under regulations promulgated by the board. An appendix to the report contains an extensive matrix that catalogs specific initiatives and programs undertaken in response to strategies in the 2002 plan. Policy objectives for the Energy Plan include increasing energy diversity (including energy efficiency and renewables) and promoting and achieving a cleaner and healthier environment. NYSERDA conducts comprehensive tracking of energy plan implementation, including specific actions by the government and private sectors.

Web site:
http://www.dps.state.ny.us/State_Energy_Plan.html

Oregon

Under the leadership of its governor, Oregon has developed a Renewable EAP (issued April 2005). The goals of the plan are to encourage and accelerate renewable resources, stimulate economic development (particularly in rural areas), and improve the environmental future of the state. The plan is intended to be central to progress on the governor's initiatives on sustainability and global warming.

The plan establishes long-term and short-term goals. The long-term goals include: (1) new post-1999 renewables account for 10% of load by 2015—a growth rate of about 1% per year, and (2) 25% of state government electricity needs will be met using renewables by 2010, and 100% of electricity needs will be met with renewables by 2025. The short-term goals, to be achieved by 2006, include: (1) developing 300 new wind energy resources, (2) finding and implementing five solutions to transmission bottlenecks to provide access to load centers for renewables and other resources, (3) implementing specific targets for solar photovoltaic (PV), biomass, biogas, efficient CHP, fuel cells, and environmentally sound hydro, (4) ensuring that utilities offer stable price renewable products, (5) conducting a feasibility study of an RPS, and (6) meeting state government purchasing goals and others.

The plan includes specific action items for the following entities in the state: Governor's Office, Renewable Energy Working Group, Department of Energy, Economic and Community Development Department, Department of Administrative Services, Public Utility Commission, Department of Agriculture, Department of State Lands, Department of Consumer and Business Services' Building Codes Division, Oregon University System and Community Colleges, and Oregon Solutions team. The Renewable Energy Working Group is specifically charged with guiding plan implementation.

Web site:
http://egov.oregon.gov/ENERGY/RENEW/docs/FinalREAP.pdf

New England Governors' Conference (NEGC)

Governors of the six-state New England region, an informal alliance since colonial days, formally established the NEGC in 1937. The conference's goal is to promote New England's economic development. In 1981, the conference incorporated as a nonpartisan, nonprofit, tax-exempt 501(c)(3) corporation. The region's six governors serve as its board of directors. The NEGC coordinates regional policy programs in the areas of economic development, transportation, environment, energy, and health, among others. Through these efforts, the conference seeks to effectively and cost-efficiently coordinate regional policies that reflect and benefit the states.

In 2001, the NEGC and the Eastern Canadian Premiers announced a Climate Change Action Plan. This plan contains short-term, medium-term, and long-term goals for reducing greenhouse gases and includes several specific measures to promote clean energy The short-term goal is to reduce greenhouse gas emissions to 1990 levels by 2010; the medium-term goal is to reduce emissions 10% below 1990 levels by 2020; and the long-term goal is to reduce emissions by 75 to 85% below 2001 levels. To achieve these broad objectives, the plan includes goals to reduce greenhouse gas emissions from the electricity sector through clean energy options: (1) by 2025, to reduce carbon dioxide (CO_2) emissions per kilowatt-hour (kWh) of electricity by 20% from current emissions through a combination of renewable energy sources, lower carbon fuel, energy efficiency, and efficient DG, and (2) by 2025, to increase the amount of energy saved by 20% from current levels.

Web site:
http://www.negc.org/documents/NEG-ECP%20CCAP.PDF

Northwest Power and Conservation Council

Created by Congress in 1980 to coordinate the federal power system in the Northwest, the Northwest Power and Conservation Council includes two representatives from each of the four states of Idaho, Montana, Oregon, and Washington. The council develops a 20-year electric power plan for reliable energy at the lowest economic and environmental cost. The energy plan gives highest priority to cost-effective conservation, followed by renewable resources, to the extent they are cost-effective. The current plan includes specific targets and action items for conservation, demand response, and wind resources. The target for conservation is 700 average megawatt (MW) between 2005 and 2009, and 2,500 average MW over the 20-year planning horizon. (An average MW is the amount of energy delivered or saved over a year's time.) The plan also calls for over 1,100 MW of wind from system benefits charge (SBC) programs and utility integrated resource plans.

The Northwest Power and Conservation Council has created a Regional Technical Forum to develop standards to verify and evaluate energy conservation savings for system planning purposes, and assess how energy efficiency is increasingly being used as a hedging strategy to reduce risks associated with volatile electricity prices.

Web site:
http://www.nwcouncil.org/energy/powerplan/plan/Default.htm

Western Governors' Association (WGA)

The governors of the 18 states in WGA created the Clean and Diversified Energy Advisory Committee (CDEAC) in 2004 to oversee the work of the following eight task forces associated with the Clean and Diversified Energy Initiative:

- Advanced Natural Gas
  http://www.westgov.org/wga/initiatives/cdeac/Advanced Coal-full.pdf
- Biomass
  http://www.westgov.org/wga/initiatives/cdeac/biomass.htm
- Clean Coal
  http://www.westgov.org/wga/initiatives/cdeac/coal.htm
- Energy Efficiency
  http://www.westgov.org/wga/initiatives/cdeac/Energy%20Efficiency.htm
- Geothermal
  http://www.westgov.org/wga/initiatives/cdeac/geothermal.htm
- Solar
  http://www.westgov.org/wga/initiatives/cdeac/solar.htm
- Transmission
  http://www.westgov.org/wga/initiatives/cdeac/transmission.htm
- Wind
  http://www.westgov.org/wga/initiatives/cdeac/wind.htm

The governors are examining the feasibility of actions that would be needed to develop 30,000 MW of clean energy in the West by 2015, ensure adequate transmission capacity, and increase energy efficiency 20% by 2020. The Energy Efficiency Task Force of the CDEAC recently released an analysis of the potential for improving energy efficiency in the 18-state WGA region; a review of barriers inhibiting greater investment in energy efficiency; and recommendations for how the region can increase energy efficiency through policy actions such as state appliance standards, building codes, enhanced electricity and natural gas DSM, utility pricing/rate structure adjustments, public sector initiatives, and education and outreach. The analysis found that a combination of current state and utility energy efficiency policies and programs and widespread adoption of best practice policies and programs would achieve the WGA's goal of reducing electricity consumption in 2020 by 20%. The absolute electricity savings projected by 2020 are equivalent to the electricity supply of 100 baseload power plants.

Web site:
http://www.westgov.org/wga/initiatives/cdeac/

Western Interstate Energy Board (WIEB)

The WIEB is an organization of 12 western states and three Canadian provinces that operate under the auspices of WGA. WIEB conducts a broad menu of clean energy activities, including (1) helping develop a western renewable energy tracking system (Western Renewable Energy Generation Information System or WREGIS), (2) helping foster policies to enable wind energy siting and operation, and (3) developing transmission protocols that incorporate clean energy options.

Web site:
http://www.westgov.org/wieb/

What States Can Do

States and regions have approached clean energy planning in a number of ways, including as part of a broad, multi-faceted strategy that incorporates clean energy as one element of a larger energy plan, as a targeted effort, and as an exclusive focal point. Clean energy planning has also involved variations of these three approaches, including government-focused lead by example strategies. The information in this guide describes best practices for design, implementation, and evaluation; summarizes a wide range of state experiences with energy planning; and offers a variety of information resources on energy planning strategies. Based on these state examples, action steps for states that want to establish their own energy planning programs or strengthen and expand existing programs are described in the following section.

Action Steps for States

States interested in state or regional energy planning can take the following steps:

- *Create a Collaborative*. Identify and assess resources and tools developed by other organizations, including state agencies, legislatures, universities, and the private sector. This group can inform the establishment of a multi-agency, multi-stakeholder collaborative process to develop a plan. At the regional level, work with ISOs and RTOs to establish processes, set policy goals, and implement programs.
- *Identify Policy Objectives and Specific Goals.* These goals and objectives can include areas for agency coordination as well as specific, quantitative clean energy goals, to help guide the work of the planning agency and provide the public and other stakeholders with expectations for the outcomes.
- *Analyze and Evaluate Opportunities to Incorporate Clean Energy Within State and Regional Energy Plans.* Develop forecasts of energy demand that are based on end-uses (i.e., using detailed information on energy-using appliances/equipment, including model, size, and operating characteristics), assess the technical, economic, and achievable potential for clean energy resources to help meet forecasted demand and integrate clean energy resources fully into the analysis, and consider how new and existing policies and programs can help expand the use of cost-effective clean energy. Integrate environmental and economic, as well as energy, benefits into the analysis to help further support the use of clean energy.
- *Link Plan to Action and Coordinate Implementation Across Agencies.* Develop steps for plan adoption and implementation and make action items enforceable where appropriate. Identify specific action items and schedules for individual agencies, as well as for inter-agency coordination. Provide for coordination of program administration and delivery–including coordination with enacting bodies (e.g., the legislature or executive branch) and implementing agencies (e.g., PUCs, state energy offices).

Information Resources

Information About State and Regional Plans

The following are links to individual state energy (or related) plans or planning processes. The list covers many states, but it might not contain a link to every energy plan or process available.

State	Title	URL Address
Alaska	Rural Energy Plan	http://www.akenergyauthority.org/publicationAREP.html
Arizona	Arizona Energy Infrastructure 2002	http://www.azcommerce.com/pdf/prop/sesreports/energy.pdf
California	Integrated Energy Policy Reports	http://www.energy.ca.gov/energypolicy/index.html
	EAPs	http://www.energy.ca.gov/energy_action_plan/index.html
Connecticut	Energy Plan for Connecticut	http://www.cerc.com/pdfs/ceabenergyplan_final05.pdf
Delaware	Executive Order	http://www.state.de.us/governor/orders/webexecorder31.shtml
Florida	Florida's Energy Future: Opportunities for Our Economy, Environment and Security	http://www.dep.state.fl.us/energy/pdf/fl_energy_future04.pdf
Hawaii	Hawaii Energy Strategy 2000	http://www.hawaii.gov/dbedt/ert/hes2000sum/index.html
Illinois	Sustainable Energy Plan	http://www.icc.state.il.us/ec/ecEnergy.aspx
Iowa	Iowa Energy Plan	http://www.state.ia.us/dnr/energy/MAIN/PUBS/CEP/
Kansas	2004 Kansas Energy Plan	http://www.kansasenergy.org/sercc_energyplan_2004.htm
Kentucky	Kentucky's Energy Opportunities for Our Future: A Comprehensive Energy Strategy	http://www.energy.ky.gov/energyplan/
Maine	Energy Resources Council: 2005 Work Plan and Report to the Legislature	http://www.maineenergyinfo.com/docs/erc2005workplan.pdf
Massachusetts	Climate Protection Plan	http://www.mass.gov/ocd/climate.html
Michigan	Nonprofit energy corporation to advance alternative energy technology	http://www.nextenergy.org/
Missouri	Integrated Strategic Plan	http://www.dnr.mo.gov/energy/strategicplan.htm
Montana	Montana Vision 2020	http://www.cte.umt.edu/MTFutures/mv2020.doc

State	Title	URL Address
Nevada	State of Nevada Energy Conservation Plan	Energy in state office buildings: http://dem.state.nv.us/necp2.pdf
	2003 Status of Energy in Nevada	Status of Energy in Nevada: http://energy.state.nv.us/2003%20Report/2003%20Report.htm
New Hampshire	New Hampshire's 10 Year State Energy Plan	http://www.nh.gov/oep/programs/energy/StateEnergyPlan.htm
New Jersey	An Energy Plan for the 21st Century	http://www.bpu.state.nj.us/governor/smartGrid.shtml
	New Jersey's Clean Energy Program: 2003 Annual Report	http://www.njcleanenergy.com/media/2003_NJCEP_Annual_Report.pdf
New Mexico	Governor's policy priorities	http://www.governor.state.nm.us/priorities-energy.php?mm=4
New York	New York State Energy Plan—June 2002	http://www.nyserda.org/Energy_Information/energy_state_plan.asp
North Carolina	North Carolina State Energy Plan 2003	http://www.energync.net/sep/docs/sep03.pdf
Oklahoma	Oklahoma's Energy Future: A Strategy for the Next Quarter Century	http://www.iogcc.oklaosf.state.ok.us/MISCFILE/oklahomaenergystrategy.pdf
Oregon	Renewable Energy Action Plan	http://egov.oregon.gov/ENERGY/RENEW/RenewPlan.shtml
	State of Oregon Energy Plan 2005–2007	http://egov.oregon.gov/ENERGY/docs/EnergyPlan05.pdf
South Carolina	South Carolina Energy Office, Strategic EAP 2002–2003	http://www.state.sc.us/energy/PDFs/strategic_plan_02_03.pdf
South Dakota	Statewide Energy Management, but no clean energy development plan.	http://www.state.sd.us/boa/EnergyMgt.htm
Tennessee	Report of Governor's Interagency Policy Workgroup	http://www.state.tn.us/ecd/pdf/energy/energy_policy.pdf
Texas	Energy Planning Council	http://www.rrc.state.tx.us/tepc/
Utah	State Energy Program Plan	http://www.energy.utah.gov/sep/sep.htm
Vermont	Comprehensive Energy Plan	http://publicservice.vermont.gov/pub/state-plans-compenergy.html
Virginia	The Virginia Energy Plan, December 2001	http://www.mme.state.va.us/de/chap2b.html
Washington	2005 Biennial Energy Report	http://www.cted.wa.gov/_CTED/documents/ID_1872_Publications.pdf
West Virginia	West Virginia's Energy Roadmap, 2001–2020	http://www.wvenergyroadmapworkshops.org/reports/WestVirginiaEnergyRoadmap 08-20-02.pdf

State	Title	URL Address
Wisconsin	State of Wisconsin 2001 Energy Policy	http://www.wtpeople.com/energy/energypolicy062101.pdf
	Report of the Governor's Task Force on Energy Efficiency and Renewables	http://energytaskforce.wi.gov/section.asp?linkid=33
Regional Planning Organizations or Efforts	New England Governor's Conference (NEGC's) Climate Change Action Plan	http://www.negc.org/documents/NEG-ECP%20CCAP.PDF
	Northwest Power and Conservation Council	http://www.nwcouncil.org/
	Northwest Power and Conservation Council Regional Technical Forum	http://www.nwcouncil.org/energy/rtf/about.htm
	WGA Clean and Diversified Energy Initiative	http://www.westgov.org/wga/initiatives/cdeac/
	Western Interstate Energy Board (WIEB)	http://www.westgov.org/wieb/

General Articles About State and Regional Energy Planning

Title/Description	URL Address
Plugging in Renewable Energy, Grading the States. Union of Concerned Scientists. May 2003. This report evaluates the progress of individual states in renewable energy.	http://www.ucsusa.org/clean_energy/clean_energy_policies/plugging-in-renewable-energy-grading-the-states.html
Powerful Solutions: Seven Ways to Switch America to Renewable Energy, as well as State Supplements, Union of Concerned Scientists. January 1999.	http://www.ucsusa.org/clean_energy/clean_energy_policies/powerful-solutions-7-ways-to-switch-america-to-renewable-electricity.html
Powering the South: A Clean and Affordable Energy Plan for the Southern United States. Renewable Energy Policy Project. January 2002.	http://www.poweringthesouth.org/report/
Repowering the Midwest: The Clean Energy Development Plan for the Heartland. Environmental Law and Policy Center et al., 2001.	http://www.repowermidwest.org
Transmission Planning and Wind Energy. National Wind Coordinating Committee. August 2004.	http://www.nationalwind.org/publications/transmission/transbriefs/Planning.pdfs

References

Title/Description	URL Address
CERCDC. 2003. EAP. California Energy Resources Conservation and Development Commission (CERCDC), CPUC.	http://www.energy.ca.gov/energy_action_plan/
Pacific Northwest Electric Power Planning and Conservation Act. 1980. 839b(e)(1). 16 United States Code Chapter 12H (1994 & Supp. I 1995). Act of December 5, 1980, 94 Stat. 2697. Public Law No. 96-501, S. 885.	http://www.nwppc.org/library/poweract/poweract.pdf

3.3 Determining the Air Quality Benefits of Clean Energy

Policy Description and Objective

Integrating energy efficiency and renewable energy in air quality planning offers states many opportunities and strategies to estimate emission reductions from clean energy programs.

Summary

Meeting energy demand through clean energy sources can reduce emissions from fossil-fueled generators and provide many environmental and economic benefits. Some states are estimating emission reductions from their clean energy programs and incorporating those reductions into documentation for air quality planning efforts, energy planning, and clean energy program results.

States are demonstrating a number of methods to quantify the emission reductions from clean energy policies. Approaches most useful to policymakers are cost-effective, rigorous, and address relevant emission market issues.

Quantifying the precise environmental impact of a particular clean energy project can be challenging. To determine how clean energy affects air emissions, states first estimate how much generation would be displaced at which power plants. Then they can pinpoint the type and quantity of emissions that are avoided as a result of using clean energy sources. There are many opportunities and strategies for developing adequate quantification methods, depending on the purpose and scope of the clean energy program or policy.

Several states are assessing the potential for clean energy to help meet air quality requirements within their State Implementation Plans (SIPs). A SIP is the official plan a state submits to the U.S. Environmental Protection Agency (EPA) that details how the state will attain or maintain the national ambient air quality standards. States are using a variety of approaches to estimate emissions benefits, based on the characteristics of their energy resources. These relatively new efforts are identifying opportunities to overcome traditional barriers to quantification, namely complexity and cost. Recent efforts are beginning to form the "best practices" for quantifying the air quality benefits of clean energy resources.

Objective

States are estimating emission reductions from clean energy programs for a number of purposes, including:

- Incorporating emission reductions in air quality planning documents.
- Evaluating the benefits of energy programs, such as renewable portfolio standards (RPS) and public benefits funds (PBFs), and in designing new programs. (See Section 4.2, *Public Benefits Funds for Energy Efficiency*, Section 5.1, *Renewable Portfolio Standards*, and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs.*)
- Complying with legislative requirements for reporting the effectiveness of energy programs.
- Standardizing the methods used by energy market participants who are calculating emission reductions.

Benefits

There are many benefits to calculating the emission reductions of clean energy. These efforts:

- *Add New Options for Environmental Solutions.* If an agency gains information about the air quality benefits of clean energy, the agency can choose clean energy solutions from among a list of options designed to improve the environment.
- *Potentially Reduce Compliance Costs*. Knowing the benefits and costs of alternative clean energy solutions allows an agency to better rank these programs to achieve the greatest benefits for the least

costs. This analysis can help enable an agency to determine the best way to design its programs to comply with both existing and prospective regulations.

- *Help Agencies Choose the Best Investment.* For a particular clean energy program, an agency can use information about emission reductions to determine the best investment opportunities.

States Are Determining the Air Quality Benefits of Clean Energy

Agencies in several states are working with EPA to develop methods for quantifying air emission reductions from clean energy policies and projects. States such as Texas and Wisconsin, states in the Western Regional Air Partnership (WRAP), as well as states in the Northeast have developed estimation methods appropriate for several objectives, including incorporating clean energy into air quality planning, providing comprehensive cost/benefit analyses, meeting legislative reporting requirements, and ensuring that clean energy measures are consistent with existing regulations.

- *Incorporating Clean Energy into Air Quality Planning*. State and local air quality districts are increasingly seeking emission reductions from clean energy in their plans to achieve ambient air quality standards. Air quality plans that include the impacts of energy efficiency and renewable energy are more comprehensive than plans that ignore these resources. In addition, these resources can provide cost-effective emission reductions for regions that are attempting to attain air quality standards. In some areas, the air quality benefits may not occur unless they are clearly linked to clean energy policies that are specifically added as part of the air quality planning process.

  EPA issued guidance documents in 2004 that provide clarification on how clean energy measures can fulfill the requirements of a SIP. These documents set a flexible framework for quantifying clean energy policies and address many related issues. The documents outline two approaches a state may take to include clean energy in the SIP. The first approach is to include the clean energy measure in the projected future year emission baseline. The second approach is to include the clean energy as a discrete emission reduction measure. (For more information about these guidance documents, see the *Information Resources* section on page 3-60.)

  For example, Montgomery County, Maryland, incorporated nitrogen oxide (NO_x) emission reductions associated with a renewable energy purchase into the SIP for the Washington D.C. nonattainment area and committed to retire NO_x emission allowances to ensure the emission reductions actually occur. (For more information, see *State Examples* on page 3-54.)

- *Providing Comprehensive Cost/Benefit Analyses*. Policymakers can make better decisions about air quality program design when they have complete information about the programs' costs and benefits. Different types of energy efficiency programs can result in different levels of emission reductions, and this information can guide policymakers in selecting the appropriate suite of programs for their regions. Similarly, when selecting supply-side resources, utilities and regulatory agencies need to understand the benefits of various renewable resources. For example, New Jersey disburses some of its PBFs (see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*) to pay for solar energy. State officials determined that the benefit of solar energy providing electricity on sunny summer days, when demand peaks and concentration levels tend to be high, justifies the cost of incentives for the photovoltaic (PV) systems.

- *Meeting Legislative Reporting Requirements*. Some regulatory agencies are under legislative mandates to periodically report on the results of their energy policies. For example, some legislatures require reporting on the cost and benefits of RPS or PBFs (see Section 4.2, *Public Benefits Funds for Energy Efficiency*, Section 5.1, *Renewable Portfolio Standards*, and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*), and in some cases, they require cost/benefit reports before they reauthorize the RPS or PBF. The New York State Energy Research and Development

Authority (NYSERDA) includes emission reductions as part of its reports detailing how the performance of PBFs helps achieve the state's goal to reduce environmental impacts of energy production and use.

- *Ensuring Clean Energy Measures Are Consistent with Existing Regulations*. Standardized methods for estimating emission reductions from clean energy will ensure that estimates made by different parties are accurate and comparable. They also help ensure that the estimates are consistent with other regulations such as cap and trade programs. For example, the Independent System Operator (ISO) New England's Marginal Emission Rate Analysis and the Ozone Transport Commission's (OTC's) Emission Reduction Workbook were developed so that the emission impacts of different projects and programs could be evaluated in a consistent manner (OTC 2002, ISO New England 2004).

Quantifying Air Emission Reductions from Clean Energy

Estimating the air emissions that will be avoided by clean energy programs and projects involves three key steps:

- Establishing the operating characteristics of the program or project in terms of when and how much it will reduce demand for conventional energy.
- Determining which generating units will be displaced and to what extent due to the program or project.
- Calculating the avoided emissions using the emission factors associated with the generating units.

Determining the load impact of the clean energy resource requires estimating at which times it will operate and at what levels. For example, will the energy efficiency savings be taking place on hot summer daylight hours or will it be occurring 24 hours per day, seven days a week, 52 weeks per year? Different renewable resources have different operating profiles based on the availability of, for example, wind and sunlight. Knowing the load shape of the clean energy resource is helpful in predicting which generators would most likely be backed down and, consequently, where and how many emission reductions would occur. There also may be an accounting of emissions associated with the clean energy source, such as for biomass and landfill gas.

The next step is estimating emission changes, typically by calculating the likely emission reductions based on either a model to assess which generating units will reduce generation due to the clean energy or historical trends.

- *Dispatch and Planning Models.* Dispatch models estimate the air emission effects of clean energy by identifying the marginal generating units—the units that are assumed to be displaced by the clean energy program or project. States that use this approach estimate reductions by identifying the marginal units during the hours that the clean energy resources operate and applying the expected emission rate of the units to the displaced generation. An example is the analysis performed for the Montgomery County, Maryland, wind purchase (for more information, see *State Examples* on page 3-54).

  A dispatch model is a comprehensive way to approximate plant dispatch, using software to simulate the operation of all the plants in the region. Because these models are designed to simulate all of the constraints facing power system operators, they provide realistic estimates of reduced emissions.

  Planning models are used for longer time horizons and can help discern the effect of clean energy on the construction of new plants and the retirement or modification of existing plants. For example, WRAP used the Integrated Planning Model (IPM) to analyze its renewable energy goals (for more information, see *State Examples* on page 3-54).

  Dispatch and planning models can be expensive to operate and maintain. Therefore, these models might not be an option for some uses.

- *Historic Trends Analysis.* When resources are not available to run a dispatch model, states approximate plant dispatch by looking at historical plant

How Is Electricity Dispatched?

Deciding when and how to direct power plants to operate is a complex process. As a result, calculating the air emission reductions associated with displacing some of these plants with clean energy projects is also challenging.

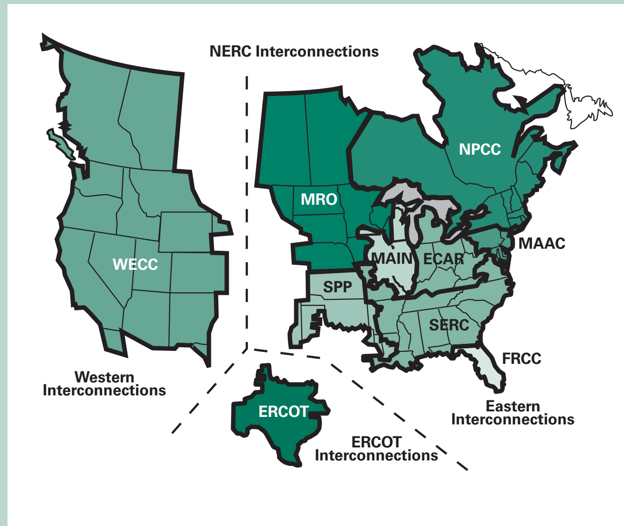
Understanding how electricity is dispatched and which power plants would be backed off at the margin by clean energy involves some key information about the U.S. electricity system. The continental United States is divided into three interconnected grids (the Eastern, Western, and Electric Reliability Council of Texas [ERCOT] Interconnections), shown in Figure 3.3.1. Within each of these grids, electricity can be imported or exported relatively easily between the numerous power control areas. However, it is difficult to transmit energy across the boundaries of these three interconnections.

The demand for electricity varies by season and by time of day. Some power plants, known as baseload units, operate almost continuously. The output of other generators rises and falls throughout the day, responding to changing electricity demand. Other generators are used as "peaking" units; these are operated only during the times of highest demand. A group of system operators across the region decides when and how to make each power plant operational or "dispatch" them according to the demand at that moment. System operators decide which power plants to dispatch next based on the cost or bid price. The power plants that are least expensive to operate are dispatched first (the baseload plants). The most expensive generating units are dispatched last (the peaking units). The fuels, generation efficiencies, control technologies, and emission rates vary greatly from plant to plant. For example, Figure 3.3.2 shows how the SO_2 and NO_x emission rates in the New York power control area vary as a function of load. Note that hydro and nuclear generators that have no air emissions meet about 7,000 megawatts (MW) of demand. To meet the need for the additional demand, system operators dispatch fossil-fired power plants that have varied NO_x and SO_2 emissions.

Other conditions also affect dispatch. Transmission constraints, when transmission lines become congested, can make it difficult to dispatch power from far away into areas of high electricity demand. Extreme weather events can decrease the ability to import or export power from neighboring areas. "Forced outages," when certain generators are temporarily not available, can also shift dispatch to other generators.

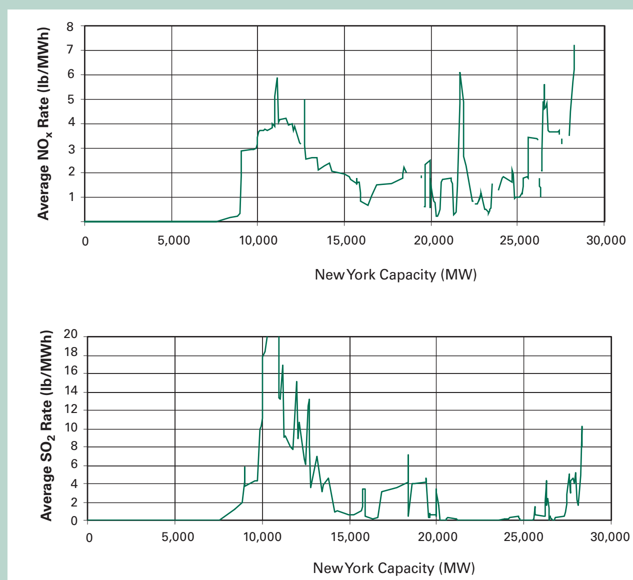
System operators must keep all these issues in mind when dispatching power plants. States can also take these issues into consideration by using dispatch models or other approaches to estimate which generators would likely reduce their output and their emissions in response to the use of clean energy.

Figure 3.3.1: Map of Interconnections



Source: NERC 2005.

Figure 3.3.2: NO_x and SO_2 Emissions by Capacity



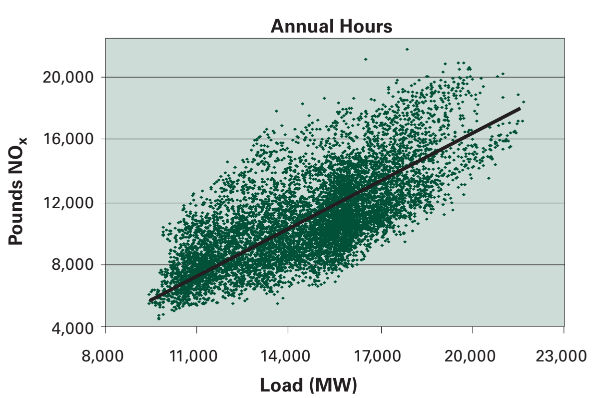
Source: Keith et al. 2002.

operations. Data on historical plant use are available from the EPA eGRID database (EPA 2005) and from the U.S. Department of Energy's (DOE's) Energy Information Administration (http://www.eia.doe.gov). Additionally, by reviewing hourly data collected by emission monitoring devices, states reconstruct how system emissions changed as loads changed during a given day or season. This approach is especially effective for assessing historical emission reductions (see Figure 3.3.3) (Keith et al. 2005). Historical analysis can also be used to project how plant emissions might be reduced in the future by clean energy.

It is possible to combine the two approaches to generate a more complete view of the power system. For example, ISO New England uses both historical information and dispatch modeling to generate its annual reports on marginal emission rates in the New England Power Pool (NEPOOL).

Finally, after considering the characteristics of clean energy projects and calculating marginal emission rates, the emission reductions can be estimated. The emission reductions are calculated by applying the emission rates of each of the electric generating units to the displaced generation at each generator.

Figure 3.3.3: Historical Emissions Data
(New England 2000)



Note: Plots of power system emissions as a function of load can be used to develop marginal emission rates during different time periods. This plot is for the New England region in 2000.

Source: Synapse Energy Economics (Date unknown).

Issues to Consider

States are developing and evaluating ways to quantify how clean energy reduces air emissions. Their efforts have highlighted a number of important issues and strategies:

- *Purpose of Quantification.* It is important to note that the proper quantification method and documentation will vary for different purposes. For example, when estimating emission reductions for use in an air quality plan (such as an SIP), a high level of rigor and comprehensive documentation are needed to meet public health and regulatory needs. To ensure that appropriate methods and documentation are used, states may contact EPA early in the process if assistance is needed. In contrast, for a report summarizing the benefits of clean energy programs, states tend to use less resource-intensive methods of quantification and documentation.
- *Prospective vs. Retrospective Analyses.* Estimates of emission reductions from both existing projects and expected new projects are useful. States have much more information about existing projects than about future projects. This information includes data about the clean energy projects and the operation of the regional power grid. With this information, states can create accurate estimates of historical emission reductions. States face more uncertainty when projecting how future clean energy projects will contribute to air quality improvements. Thus, they have found that it is important to periodically review and revise estimates related to these projects. In addition, when states perform a prospective analysis, they consider how new emission control requirements for fossil fuel generators affect their calculations. If the clean energy displaces fossil fuel generation governed by future emission control requirements, then the clean energy will have less impact on emissions in the future. For example, the analysis performed for the Texas Emission Reduction Plan updates its estimates annually and accounts for NO_x control programs imposed on the electric generators (for more information, see *State Examples* on page 3-54).

- *Power System Dispatch.* Power plants in regional electric systems are dispatched in order of increasing costs or bids. Generally, the least expensive power plants are dispatched first, and the more expensive units are directed to operate in order of cost when needed. This process is described on page 3-50, *How Is Electricity Dispatched*? Estimating dispatch is a critical and complex component to estimating emission reductions. As new methods are being demonstrated by states, new opportunities for others to use or refine the successful methods are created.
- *Energy Imports and Exports.* One of the key complexities in assessing emission reductions (either via dispatch/planning models or historical emissions analysis) lies in accounting for energy transfers between control areas. A control area is a geographic region in which most or all of the power plants are dispatched by a single set of system operators. Energy is commonly transferred among control areas via major transmission interfaces. The magnitude and pattern of energy transfers can affect the kind of emission reductions that a clean energy resource will provide. For clean energy resources located in control areas that do not import or export significant amounts of energy, energy transfers can be ignored. However, in control areas where significant amounts of energy are transferred, addressing these transactions may be an important part of the emission reduction calculations.
- *Load Pockets.* Load pockets are places within a control area where transmission constraints make it difficult to meet peak electricity loads. In a load pocket, older, less efficient generation often operates because physical constraints prevent delivery of energy from newer units. Because a clean energy resource located within a load pocket will often reduce the operation of such units, the clean energy project may have different emission impacts than other resources. Additionally, clean energy resources can reduce or delay the need for new transmission and distribution equipment. For example, for the Southwest Connecticut Clean Demand Response Pilot Project, a clean distributed generation overlay tool was envisioned to help locate ideal placement of clean technologies. The map would identify locations where technologies or applications could be most effective at addressing reliability concerns within the load pocket. It also would identify which areas would benefit most from an air quality perspective. The tool would examine the area's infrastructure, zoning, and existing developments to find areas that could be economically practical as well as technically feasible (GETF 2002).

Designing an Effective Process

This section identifies several key issues that states need to consider when quantifying emission reductions. These issues include participants, duration, evaluation, and interaction with federal policies. When designing an effective process, it is important to engage key participants, and match the purpose of the quantification with the level of rigor and cost associated with the quantification method.

Participants

- *EPA.* EPA is investigating several methods for estimating emission reductions and is working with a number of state agencies to test and compare these methods.

  EPA is working to assist states in defining potential emission reductions associated with the programs and policies outlined in this *Guide to Action* and to help states use the information to meet their environmental and energy goals. EPA is working to:

  - Identify clean energy projects and programs that may provide cost-effective emission reductions that states could capture.
  - Review methods that states can use to quantify emission reductions from clean energy and move toward best practice standards.
  - Provide states with guidance and assistance in their efforts to incorporate clean energy into air quality planning and other state initiatives.
- *DOE.* In 2004, DOE's Office of Energy Efficiency and Renewable Energy initiated pilot projects to

help states quantify the emission reductions from various clean energy programs to a level of rigor that would satisfy inclusion in air quality planning documents. These pilot projects provide the resources of DOE's contractors and national laboratories to assist states.

- *State Energy Offices.* State energy offices are involved in the design, implementation, and tracking of a variety of clean energy programs. They often track the performance of energy efficiency programs and renewable energy, and they are often required to report on these programs to legislatures. Information on emissions is an important component of energy program assessment. Data on emissions are also important to the long-term energy plans many energy offices develop.
- *State Air Pollution Control Agencies.* State air pollution control agencies are working toward including emission reductions from clean energy in air pollution control plans. This process generally starts with several case studies. State regulatory agencies also work with EPA to establish methods of quantifying emission reductions. Working with state energy office staff provides the additional expertise that may be needed for a successful process.
- *State Utility Commissions.* By involving utility commissions, states ensure that data are available for evaluating efficiency programs and the output of renewable generators. Also, coordination between utility commissions and air regulatory agencies ensures that clean energy policies are consistent with air quality regulations.
- *State Legislatures.* Lawmakers in many states have adopted clean energy programs as a way to achieve multiple goals, including air quality improvements. Based on information from utility commissions, air regulatory agencies, and energy offices, lawmakers have adopted clean energy goals, such as RPS and PBFs, designed specifically to achieve air emission reductions.
- *Electricity Market Participants.* Several market participants have an interest in quantifying emission reductions from clean energy, including energy service providers, renewable energy developers, and end users. These participants often work with state agencies to quantify and document emission reductions from clean energy.
- *Utilities.* Utilities work with air and energy regulatory agencies to review the performance of clean energy programs and to help design programs that meet both energy and air quality goals. In particular, utilities have access to information on energy generation and use that is critical to program design and review.
- *Other Researchers.* Nonprofit organizations and other groups are also evaluating how to quantify emission reductions from clean energy. Groups involved include the National Renewable Energy Laboratory (NREL), World Resources Institute (WRI), Lawrence Berkeley National Laboratory (LBNL), the National Association of Regulatory Utility Commissioners (NARUC), WRAP, and State and Territorial Air Pollution Program Administrators (STAPPA).

Timing and Duration

Electric power systems change over time. New plants and transmission lines are added and old ones are retired. These changes affect system emissions. There are two ways to address these changes when estimating emission reductions from clean energy projects. First, emission reductions can be quantified for the short term—for example, three to five years—and then updated as the power system changes. Second, states and others can make long-term projections of emission reductions using assumptions about how the power system is likely to change over time. Of course, long-term projections will only be as good as the assumptions on which they are based, so it is prudent to review these projections periodically and revise them if market conditions diverge from important assumptions.

Clean energy programs such as RPS and PBFs also include uncertainties. States quantifying the emission reductions from an RPS, for example, will include an assumption about the technologies that would generate the new renewable energy. Further, policymakers may change the RPS after several years, perhaps increasing or decreasing the target energy levels. For both of these reasons, states periodically review projections of emission reductions from clean energy programs and make adjustments when necessary.

Evaluation

States periodically evaluate their clean energy programs to ensure that predicted emission reductions are being realized. For example, a state might assume that an RPS will result in 100,000 megawatt-hours (MWh) of new renewable energy generation each year. The state would then verify this assumption once the data become available. To accomplish this, states typically use established measurement and verification (M&V) techniques for clean energy. Energy production is measured either at the point of generation (gross generation) or at the connection point to the electric grid (accounting for any in-plant use). There are various standard protocols to evaluate the performance of energy efficiency projects, including some that use customers' energy consumption records.

Understanding the types of clean energy program evaluations that will be needed helps a state determine the appropriate methods to perform both the initial prospective estimates of emission reductions and the retrospective evaluation of actual emission reductions. For example, legislatively mandated policies may require more rigorous evaluation than voluntary efforts. Policies that address energy supply may require different data to be collected and evaluated than policies that address energy demand. Considering the need for future evaluation ensures that the initial estimates will be sufficient to provide a basis for evaluation.

Interaction with Federal Policies

Some states are working with EPA to include clean energy as an emission reduction measure in a SIP. EPA released several documents that address how to accomplish this. These documents are: *Guidance on State Implementation Plan (SIP) Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures* and *Incorporating Emerging and Voluntary Measures in a State Implementation Plan* (for more information, see *Information Resources* on page 3-60).

States quantifying emission reductions from energy efficiency and renewable energy consider the effects of any applicable cap and trade programs. Under these programs, air regulatory agencies cap total emissions within a region. Allowances are allocated to generators. Generators may buy and sell allowances, but they must hold one allowance for each ton of pollution emitted. Typically, the level of the cap declines over time to meet air quality objectives. Subsequently, generators need to adopt more emission control strategies over time.

Because emission allowances can be traded in a cap and trade area, it is important to consider two main issues: how much clean energy is implicitly assumed to occur in the design of the cap and trade program and how many allowances need to be retired to ensure the emission reductions from clean energy programs actually occur and endure.

State Examples

The Texas Emission Reduction Plan

In 2001, the 77th Texas Legislature passed Senate Bill 5 (S.B.5), the Texas Emissions Reduction Plan, calling for energy efficiency and reduced electricity consumption to help the state comply with U.S. Clean Air Act standards. Forty-one urban and surrounding counties were required to:

- Implement all cost-effective energy efficiency measures to reduce electric consumption by existing facilities.
- Adopt a goal of reducing electric consumption by 5% a year for five years, beginning January 1, 2002.
- Report annually to the State Energy Conservation Office.

In 2002 and 2003, the Texas Commission on Environmental Quality (TCEQ) revised SIPs for the Houston-Galveston and Dallas-Ft. Worth areas. Early energy savings and emission reductions estimates relied on assumptions about the communities' level of commitment to the 5% per year goal. Projects eligible for inclusion in the SIP include efficiency and renewable projects such as: building code upgrades, energy efficiency retrofits, renewable energy installations, and green power purchases.

The TCEQ worked with EPA, ERCOT, and Texas A&M University's Energy Systems Laboratory (ESL) to develop a methodology for quantifying the NO_x emission reductions associated with energy savings from clean energy projects. The methodology was used to prepare emission reduction estimates for each power plant in the ERCOT region. The groups then submitted these estimates to relevant counties. EPA's eGRID provided much of the data about electricity production, source, fuel mix, and emissions. This information was used to estimate demand and emission reductions in Texas (Haberl et al. 2003).

The purpose of the air emission reduction estimates was to include the NO_x emission reductions as discrete emission reduction measures in the air quality planning process for ground level ozone. The estimate is a prospective analysis. The analytic approach was based on historic trends analysis of operational data with modifications based on future emission controls, planned plant shutdowns, and planned new plants. The few imports and exports outside the ERCOT were ignored. The historic trends analysis was not able to accommodate explicit consideration of load pockets. Ultimately, the Houston area reductions were not included in the SIP due to a local cap and trade program.

Web site:
http://www.tnrcc.state.tx.us/oprd/sips/mar2003dfw.html#revision

Western Regional Air Partnership

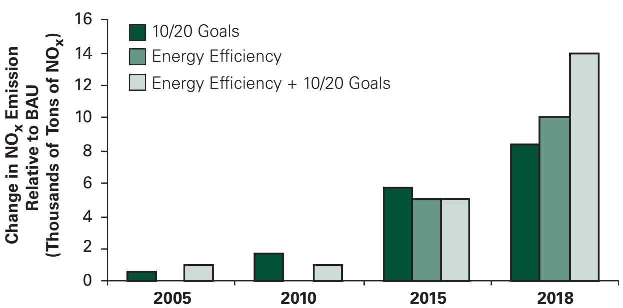
In 1996, the Grand Canyon Visibility Transport Commission (GCVTC) issued a report saying states that contribute to regional haze in the West should incorporate 10% renewable energy into their resource mix by 2005 and 20% by 2015.

In 1997, western states and tribes established WRAP to help implement the GCVTC's recommendations. In 1999, EPA's Regional Haze Rule required nine western states to prepare SIPs addressing regional haze. The rule specifically allowed those states to develop and implement regional approaches to improve visibility. Five states in the Transport Region (Arizona, New Mexico, Oregon, Utah, and Wyoming) chose to implement this regional approach and submitted their SIPs in December 2003.

As part of its SIP, each state lists policies and programs at the regional and state levels that will help achieve the 10 and 20% goals (often indicated as the 10/20 goals). These programs include RPS, PBFs, renewable energy purchases, net metering (when excess electricity produced by an electricity customer will spin the electricity meter backwards), green power marketing, as well as tax credits and other financial incentives. In addition, states may pursue clean energy initiatives that are not included in the SIP submissions.

The Air Pollution Prevention forum of WRAP commissioned a detailed study of the impacts of policies that achieve the 10/20 goals. When both the 10/20 goals and the energy efficiency recommendations are implemented, NO_x emissions are expected to be reduced by about 14,000 tons in 2018 (see Figure 3.3.4), and carbon dioxide (CO_2) emissions by about 56 million metric tons. These impacts represent about a 2% reduction of NO_x emissions and about a 14% reduction of CO_2 emissions. The net avoided cost savings is expected to increase to about $1.8 billion in 2018. Annual electricity production costs through 2022 will be reduced by about $751 million.

Figure 3.3.4: Estimated NO_x Reductions from Energy Efficiency/Renewable Energy (EE/RE)



Source: WRAP 2003.

Although energy efficiency and renewable energy reduce conventional electric generation requirements, they do not necessarily yield SO_2 reductions. In this case, the regional SO_2 cap and trade program was assumed to be in effect. As such, the renewable energy and energy efficiency was projected to reduce the cost of complying with the cap and trade program and reduce allowance prices rather than reduce emissions significantly. In this context, increasing the use of EE/RE reduces the costs of complying with the SO_2 milestones in the Annex to the Regional Haze Rule developed by WRAP (APPF 2002, WRAP 2003).

The purpose of the air emission reduction estimates was to determine the how much the GCVTC's recommendations would help the region achieve its regional haze goals. The estimates are a prospective analysis. The analytic approach was based on a planning model. Imports and exports within the western grid were considered. The large regional planning model analysis was not able to accommodate explicit consideration of load pockets. Cap and trade program analysis was an integral part of the planning model.

Web site:
http://www.wrapair.org/forums/ap2/

Analyzing Efficiency Programs in Wisconsin

The Wisconsin Department of Administration (DOA) recently funded an analysis of the emission impacts of the state's energy efficiency programs. Recognizing that efficiency programs have multiple impacts (i.e., energy savings, demand reductions, and emission reductions), the DOA wanted to obtain better information about how programs could be targeted toward certain objectives.

To analyze how efficiency programs affected air emissions, the evaluation team used EPA continuous emission monitoring data on historical plant operations and emissions to estimate which generating plants were "on the margin" during different time periods. These are the plants scheduled to become operational next—when the less expensive plants are running at full capacity.

In this case, the DOA identified the units "on the margin" for given hours. These units are important in calculations because they are the units that are displaced by energy efficiency or clean energy.

The DOA developed emissions factors for the marginal generating units for different time periods (e.g., peak and off-peak hours during winter and summer). The DOA then used these factors to analyze the effects of different energy efficiency programs.

The study found that the marginal units' emission rates tend to be higher during off-peak hours than on-peak hours, particularly winter off-peak hours (see Figure 3.3.5). This suggests that energy savings in off-peak hours produce the largest emissions savings in Wisconsin (Erickson et al. 2004). This is valuable information, given that savings during peak hours are considered to be most valuable to the power system (because peak savings reduce demand during high-demand periods). With this information, policymakers are better able to refine the state's efficiency programs to meet different objectives as the power system evolves.

Figure 3.3.5: Marginal Emission Rates in Wisconsin

Season and Hour	Pounds /MWh			Pounds /GWh	Percent of Yearly Value			
	NO_X	SO_X	CO_2	Mercury	NO_X	SO_X	CO_2	Mercury
Yearly	5.7	12.2	2.215	0.0489				
Broad Peak Scenario								
Winter Peak	5.9	13.9	2.027	0.0427	104%	114%	91%	87%
Winter Off-peak	5.8	14.5	2.287	0.0536	102%	119%	103%	110%
Summer Peak	4.6	9.8	1.788	0.0346	81%	80%	81%	71%
Summer Off-peak	5.4	11.1	2.233	0.0524	95%	91%	101%	107%
Narrow Peak Scenario								
Winter Peak	No Winter Peak Hours							
Winter Off-peak	5.1	11.0	2.078	0.0461	39%	90%	94%	94%
Summer Peak	2.9	6.0	1.476	0.0181	51%	49%	67%	37%
Summer Off-peak	5.4	11.2	2.073	0.0431	95%	92%	94%	88%

Source: Erickson et al. 2004.

The purpose of this analysis was to update emission reduction factors being used to evaluate the PBF program in Wisconsin. The analytic approach as a load-duration curve dispatch model. The estimates are a retrospective analysis. The analysis includes consideration of dispatch within the Mid-Atlantic Interconnected Network (MAIN) and Midwest Reliability Organization (MRO) (previously named Mid-Continent Area Power Pool [MAPP]) North American Electric Reliability Council regions (see Figure 3.3.1 on page 3-50). The model did not explicitly define load pockets. The affect of cap and trade systems was not included in the emission reduction estimates.

Web site:
http://www.doa.state.wi.us/docs_view2.asp?docid=2404

Performance Contracting in Shreveport, Louisiana

As part of its SIP revision under sections 110 and 116 of the Clean Air Act and in support of control measures for the purpose of attaining and maintaining the 8-hour ozone standard, the Louisiana Department of Environmental Quality (DEQ) submitted an Early Action Compact SIP for the Shreveport area to EPA on December 28, 2004. The SIP included the emission reductions expected to be achieved from performance contracting at particular municipal buildings in Shreveport. The performance contract is expected to save the city 9,121 MWh of electricity per year and achieve NO_x emission reductions of 0.041 tons per ozone season-day.

The city arrived at this figure after employing several different methods of determining the emissions avoided through its programs (Chambers et al. 2005). EPA Region 6 published proposed approval of this SIP revision in the *Federal Register* at 70 FR 25000, May 12, 2005, and published final approval at 70 FR 48880, August 22, 2005.

The purpose of this emission reduction analysis was to include the emission reductions within its SIP. The analytic approach was a comparison of results from an economic dispatch model and two historic trends analysis. The analysis is retrospective (year 2000). The economic dispatch analysis included consideration of dispatch within two power control areas that provide electricity in the Shreveport area. The model did not explicitly define load pockets. The affect of cap and trade systems was not included in the emission reduction estimates.

Wind Power Purchase in Montgomery County, Maryland

Montgomery County, Maryland, committed to purchase 5% of its municipal electricity from wind power through renewable energy credits (RECs). It incorporated the emission reductions for ground-level ozone in the SIP for the Washington D.C. metropolitan area.

The county made the business case for purchasing the renewable energy by demonstrating that the energy savings realized by very low cost energy efficiency measures would offset the incremental cost of the renewable energy purchase. The county also demonstrated that the emission reductions from the renewable energy purchase were less expensive on a dollar per ton basis than other measures.

The expected emission reduction for the 30,000 MWh per year of renewable energy is estimated to be 0.05 tons of NO_x per day during the ozone season. To arrive at this estimate, the county employed a dispatch model covering the electricity grid in the western part of PJM Interconnection, which is the regional transmission organization that coordinates the dispatch of wholesale electricity in the region.

As mentioned previously, the state of Maryland committed to retire the NO_x allowances associated with the claimed emission reductions (i.e., to permanently remove the allowances from the market and prevent their use). This is how the county met the requirements of the SIP measure (MWCOG 2004). EPA Region 3 published final approval of this revision to the SIP in the *Federal Register* (70 FR 24987, May 12, 2005).

The purpose of this quantification procedure was to provide NO_x emission reduction figures to be used in the Washington, D.C. SIP. The analytic approach was based on an economic dispatch model. The analysis is prospective. The economic dispatch analysis included consideration of dispatch within the power control area of the region. The model did not explicitly define load pockets. Although cap and trade systems were not included in the emission reduction estimates, the retirement of emission allowances equivalent to the estimated emission reductions were included in the SIP.

Web site:
http://www.mwcog.org/environment/air/SIP/default.asp

On the Horizon

Some state air quality officials are beginning to express interest in environmental dispatch of electricity generators. This concept would alter the way electricity generators are dispatched from a purely economic basis to one that incorporates some consideration of environmental emissions into the dispatch order. Emissions analysis coupled with air quality modeling could provide useful analytical information to help evaluate the conditions under which environmental dispatch may achieve significant benefits for the least cost. For example, if there are periods of time when the air quality is most vulnerable to additional emissions from power generation, the benefits of dispatching cleaner yet more expensive units may outweigh the additional cost. Additionally, if such conditions occur infrequently during the entire year, the overall cost increase to retail electricity customers could be negligible.

Some states are also interested in tracking emission reductions of CO_2 in addition to criteria air pollutants. The quantification methods discussed in the *Guide to Action* will be critical to these efforts. Unlike technologies to control air pollutants like NO_x and SO_2, technologies are currently not widely used to capture and control CO_2 emissions from the emission stacks of electricity generators. Therefore, for the near future, most CO_2 emission reductions will generally come from renewable energy sources and improved efficiency.

A number of states are developing voluntary CO_2 reduction goals, and a growing number of companies are developing voluntary greenhouse gas strategies. They are working with the Greenhouse Gas Protocol Initiative, states, and EPA to document their efforts. Other states are incorporating CO_2 reduction into long-term planning requirements for utilities, or requiring utilities to offset their greenhouse gas emissions from power plants with investments in renewable energy, energy efficiency, and other measures such as carbon sequestration. Several states are developing tracking programs to support such requirement and companies' voluntary tracking efforts. Table 3.3.1 briefly describes CO_2 reductions efforts under way.

Table 3.3.1: Existing Policies to Reduce CO_2 Emissions

Policy/Description	For More Information
Tracking Progress Toward State Goals. New York and New Jersey have both adopted goals for greenhouse gas reductions, as have groups of states in New England and on the West Coast.	• New Jersey Department of Environmental Protection (DEP), *New Jersey Sustainability Greenhouse Gas Action Plan,* April 2000. http://www.state.nj.us/dep/dsr/gcc/gcc.htm • *New York State Energy Plan,* 2002. http://www.nyserda.org • New England Governors and Eastern Canadian Premiers (NEG/ECP): *Climate Change Action Plan: 2001,* August, 2001.
CO_2 Offset Requirements. Massachusetts and New Hampshire require large, fossil-fueled power plants to offset a portion of their CO_2 emissions. Massachusetts, Oregon, and Washington require new power plants to offset emissions.	• MA DEP, Emission Standards for Power Plants (310 CMR 7.29). • *New Hampshire Clean Power Act* (HB 284) approved May, 2002. • Oregon Climate Trust. http://www.climatetrust.org
CO_2 Adders in Resource Planning. The California Public Utility Commission (CPUC) has developed an "imputed" cost for greenhouse gas emissions for use in utility planning. In addition, several utilities (PG&E, Avista, Portland General Electric, Xcel, Idaho Power, and PacifiCorp) have voluntarily used CO_2 cost adders in resource planning.	• CPUC, Decision 04-12-048, December 16, 2004. http://www.cpuc.ca.gov/PUBLISHED/AGENDA_DECISION/42314.HTM
Voluntary Quantification Efforts. Many companies have begun tracking their annual greenhouse gas emissions and taking steps to reduce emissions. These companies are using a variety of methods for calculating emission reductions.	• EPA's Climate Leaders program offers inventory guidance for companies that voluntarily participate in the program. http://www.epa.gov/climateleaders • Information on these efforts and tracking protocols used is available from the Greenhouse Gas Protocol Initiative. http://www.ghgprotocol.org • Information in voluntary efforts in California is available from the California Climate Action Registry. http://www.climateregistry.org

What States Can Do

To begin capturing the benefits of clean energy programs, states can identify ways to use emission reduction data, quantify emission reductions, identify programs and policies that provide reductions, and document reduction estimates.

Action Steps for States

- *Begin Identifying Ways to Use the Air Emission Reductions That Result from Clean Energy Programs.* Emission reduction data can be included in air quality plans and used in evaluating existing clean energy programs, developing new clean energy programs, and preparing reports to legislatures and the public. These different uses may require different quantification and documentation methods; thus, it is important to identify possible uses before developing emission reduction data.
- *Identify Clean Energy Programs That May Provide Emission Reductions.* Many states have a range of clean energy policies (e.g., energy efficiency goals, RPS, PBFs, and appliance standards) that may result in emission reductions. Other programs may also provide emission reductions. These include enhanced building codes, green power purchases, net metering, tax incentives, and other financial incentives. The information resources on page 3-60

present data on clean energy programs that states have focused on to date.

- *Quantify Emission Reductions from Clean Energy Projects and Programs.* States can use a number of methods to quantify emission reductions from clean energy, including simple approaches that are based on estimates of average fossil generation emission rates. More resource-intensive approaches are based on system dispatch modeling. The previous section on quantifying emission reductions provides a general overview of the key issues involved in quantification. The information resources provided below document a number of quantification efforts. States can talk with EPA to help identify the appropriate methods. As discussed, the proper quantification method and documentation requirements will vary, depending on the purpose of the effort.
- *Document Emission Reduction Estimates.* Documenting emission reduction estimates in as much detail as possible is an important step. When developing emission reduction estimates for an air quality plan, contact EPA early in the process to discuss methods and documentation requirements (see EPA's *Incorporating Emerging and Voluntary Measures in a State Implementation Plan* [EPA 2004] for guidance). States are encouraged to seek information from other states and disseminate emission reduction studies widely to facilitate the movement toward standardized best practices. Documenting and publishing reports on emission reduction quantification efforts is one way to advance the art of quantification methods.

Information Resources

The resources cited as follows provide more information about methods of quantifying emission reductions and the types of programs states are targeting.

EPA Guidance

Title/Description	URL Address
Guidance on State Implementation Plan (SIP) Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures. EPA Office of Air and Radiation, August 2004. In this document, EPA provides detailed information on quantifying emission reductions from electric-sector programs.	http://www.epa.gov/ttn/oarpg/t1/meta/m25362.html
Incorporating Emerging and Voluntary Measures in a State Implementation Plan. EPA Office of Air and Radiation, September 2004. In this guidance document, EPA lays out a basic methodology for approving nontraditional measures in a SIP through notice-and-comment rulemaking.	http://www.epa.gov/ttn/caaa/t1/meta/m8507.html
Integration Pilots: Improving Air Quality through Energy Efficiency & Renewable Energy Technologies. EPA Concept Paper, August 26, 2004. This paper describes a DOE/EPA initiative pilot initiative demonstrating how states can use energy efficiency and renewable energy technologies to improve air quality while addressing energy goals.	http://www.eere.energy.gov/regions/mid-atlantic/cleanenergy_pres.html
Incorporating Bundled Emissions Reduction Measures in a State Implementation Plan. August 2005. This guidance document describes how states can identify individual voluntary and emerging measures and "bundle" them in a single SIP submission. For SIP evaluation purposes, EPA considers the performance of the entire bundle (the sum of the emission reductions from all the measures in the bundle), not the effectiveness of any individual measure.	http://www.epa.gov/ttn/oarpg/t1/meta/m10885.html

Information About States

Title/Description	URL Address
Comparison of Methods for Estimating the NO_x Emission Impacts of Energy Efficiency and Renewable Energy Projects: Shreveport, Louisiana Case Study. Chambers, A. et. al. NREL, revised July 2005, NREL/TP-710-37721. This report describes three methods for estimating emission reductions from electric-sector programs and provides a quantitative comparison of the methods.	http://www.nrel.gov/docs/fy05osti/37721.pdf
Estimating Seasonal and Peak Environmental Emission Factors—Final Report. Prepared by PA Governmental Services for the Wisconsin DOA, May 2004. This report summarizes work done in Wisconsin to evaluate the air emissions avoided by energy efficiency programs.	http://www.doa.state.wi.us/docs_view2.asp?docid=2404
Prospective Environmental Report for Clipper Wind Power. Prepared by the Resource Systems Group, Inc. for Clipper Wind Power under contract with Environmental Resources Trust, April 2003. This report quantifies the air emissions reduced by the operation of a wind plant located in the Mid-Atlantic United States.	http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/wpa/sips_model.pdf
Renewable Energy and Energy Efficiency as Pollution Prevention Strategies for Regional Haze. Prepared by the air pollution prevention forum for the Western Regional Air Partnership, April 2003. This report summarizes the renewable energy and energy efficiency goals adopted in several western states and projects the emission reductions that would result from the attainment of the goals.	http://www.wrapair.org/forums/ap2/documents/WRAP_AP2_Policy.doc

General Articles About Quantifying Emission Reductions

Title/Description	URL Address
2003 NEPOOL Marginal Emission Rate Analysis. Prepared for the NEPOOL Environmental Planning Committee, December 2004. ISO New England performs system modeling each year to estimate system marginal emission rates.	http://www.iso-ne.com/genrtion_resrcs/reports/emission/index.html
Emerging Tools for Assessing Air Pollutant Emission Reductions from Energy Efficiency and Clean Energy. Global Environment & Technology Foundation, January 31, 2005. This report presents a comparison of emission modeling tools that are currently under development.	http://www.4cleanair.org/EmissionsModelingPhaseIIFinal.pdf
Estimating Carbon Emissions Avoided by Electricity Generation and Efficiency Projects: A Standardized Method (MAGPWR). LBNL, LBNL-46063, September 1999. This report describes a spreadsheet model developed for estimating emission reductions from electric-sector programs.	http://eetd.lbl.gov/EA/EMS/reports/46063.pdf
Methods for Estimating Emissions Avoided by Renewable Energy and Energy Efficiency. Prepared for EPA's State and Local Capacity Building Branch, available in July 2005. This paper assesses quantification methods based on dispatch analysis and historical emissions and provides a quantitative comparison of the two approaches.	http://www.synapse-energy.com
National Assessment of Emissions Reduction of Photovoltaic Power Systems. Prepared for EPA's Air Pollution Prevention and Control Division by Connors, S. et al. This paper lays out a method of estimating emissions avoided by small PV systems based on the analysis of historical emissions data.	http://esd.mit.edu/symposium/pdfs/papers/connors.pdf (provides information about this article)

Tools and Analyses

Title/Description	URL Address
Clean Air and Climate Protection Software (CACPS). The State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) have developed a software tool designed for use in creating emission reduction plans targeting greenhouse gas emissions and air pollution.	http://www.4cleanair.org/InnovationDetails.asp?innoid=1
ECalc. The eCalc tool was developed to assess emission reductions from energy efficiency in Texas.	http://ecalc.tamu.edu/
Energy Efficiency/Renewable Energy Impact In The Texas Emissions Reduction Plan (TERP). The Energy Systems Lab conducts this annual report of the energy savings and NO_x reductions resulting from the statewide adoption of the Texas Building Energy Performance Standards and from energy code compliance in new residential construction in 41 Texas counties.	Summary (Volume I): http://energysystems.tamu.edu/sb5/documents/tceq-report-2-14-2005-vol-I.pdf Technical (Volume 2): http://energysystems.tamu.edu/sb5/documents/tceq-report-2-14-2005-Vol-II.pdf Appendix (Volume 3): http://energysystems.tamu.edu/sb5/documents/tceq-report-2-14-2005-III.pdf
OTC Emission Reduction Workbook 2.1, November 12, 2002. The OTC developed a spreadsheet tool, based on system dispatch modeling, for assessing emission reductions from EE/RE in the northeastern United States.	http://www.otcair.org/document.asp?fview=Report Excel File: http://www.otcair.org/download.asp?FID=68&Fcat=Documents&Fview=Reports&Ffile=OTC%20Workbook%20version%202.1.xls Description and User's Manual: http://www.otcair.org/download.asp?FID=69&Fcat=Documents&Fview=Reports&Ffile=Workbook%202.1%20Manual.pdf
Power System Dispatch Models. Models that can be used to assess displaced emissions include: • GE MAPPS (GE Strategic Energy Consulting) • IPM (ICF Consulting) • NEMS (U.S. Energy Information Administration) • PROSYM (Global Energy Decisions)	MAPPS: http://www.mapps.l-3com.com/L3_MAPPS/Products_and_Services/Power_Systems_and_Simulation/Power_Solutions/ppsim.shtml IPM: http://www.icfconsulting.com/Markets/Energy/energy-modeling.asp#2 NEMS: http://www.eia.doe.gov/oiaf/aeo/overview/index.html PROSYM: http://www.globalenergy.com/pi-market-analytics.asp

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Title/Description	URL Address
APPF. 2002. Final Draft Report on Energy Efficiency and Renewable Energy. Prepared by the Air Pollution Prevention Forum for WRAP. December.	http://www.wrapair.org/forums/ap2/documents/draft/Final_Draft_Report-AP2EE-RE.pdf
Chambers, A., D.M. Kline, L. Vimmerstedt, A. Diem, D. Dismukes, and D. Mesyanzhinov. 2005. Comparison of Methods for Estimating the NO_x Emission Impacts of Energy Efficiency and Renewable Energy Projects: Shreveport, Louisiana Case Study. NREL/TP-710-37721. Revised July 2005. NREL.	http://www.nrel.gov/docs/fy05osti/37721.pdf
EPA. 2004. Incorporating Emerging and Voluntary Measures in a State Implementation Plan. EPA's Office of Air and Radiation. September.	http://www.epa.gov/ttn/caaa/t1/meta/m8507.html
EPA. 2005. eGRID-Emissions and Generation Resource Integrated Database Web site. Accessed July 2005.	http://www.epa.gov/cleanenergy/egrid/index.htm
Erickson, J., C. Best, D. Sumi, B. Ward, B. Zent, and K. Hausker. 2004. Estimating Seasonal and Peak Environmental Emission Factors—Final Report. Prepared by PA Governmental Services for the Wisconsin DOA. May 21.	http://www.doa.state.wi.us/docs_view2.asp?docid=2404
GETF. 2002. Southwestern Connecticut Clean Demand Response Pilot Project, Phase I Report. Prepared for the OTC by the Global Environment & Technology Foundation. November.	http://www.opm.state.ct.us/swct/SWCTPhase1-Report-Final.pdf
Haberl, J., C. Culp, B. Yazdani, T. Fitzpatrick, J. Bryant, and D. Turner. 2003. Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), Volume I—Summary Report. Annual Report to TCEQ, September 2003–August 2004. ESL-TR-04/12-01. ESL.	http://energysystems.tamu.edu/sb5/documents/tceq-report-2-14-2005-vol-I.pdf
ISO New England. 2004. 2003 NEPOOL Marginal Emission Rate Analysis. Prepared for the NEPOOL Environmental Planning Committee. December.	http://www.iso-ne.com/genrtion_resrcs/reports/emission/index.html
Keith, G. 2005. Methods for Estimating Emissions Avoided by Renewable Energy and Energy Efficiency. Prepared for EPA's State and Local Programs. Capacity Building Branch. July 14.	http://dep.state.ct.us/air2/siprac/2005/emissionreduction.pdf
Keith, G., D. White, and B. Biewald. 2002. The OTC Emission Reduction Workbook 2.1: Description and Users' Manual. Volume 2.1. Prepared for the OTC by Synapse Energy Economics, Inc. November 12.	http://www.otcair.org/download.asp?FID=69&Fcat=Documents&Fview=Reports&Ffile=Workbook%202.1%20Manual.pdf
MWCOG. 2004. Plan to Improve Air Quality in the Washington, D.C-MD-VA Region. Appendix J. Metropolitan Washington Air Quality Committee. February 9.	http://www.mwcog.org/uploads/committee-documents/yFZaVg20040217142920.pdf.
NERC. 2005. Regional Reliability Councils. North American Electric Reliability Council Web site. Accessed July 2005.	http://www.nerc.com/regional/NERC_Interconnections_color.jpg
OTC. 2002. Emission Reduction Workbook 2.1, November 12, 2002. OTC. November 12.	http://www.otcair.org/document.asp?fview=Report
Synapse Energy Economics. Date unknown. Unpublished emissions data, Synapse Energy Economics, Inc., Cambridge, MA.	N.A.
WRAP. 2003. Renewable Energy and Energy Efficiency as Pollution Prevention Strategies for Regional Haze. Prepared by the Air Pollution Prevention Forum for WRAP. April.	http://www.wrapair.org/forums/ap2/docs.html

3.4 Funding and Incentives

Policy Description and Objective

Summary

States are achieving significant energy and cost savings through well-designed, targeted funding and incentives for clean energy technologies and services. Key types of financial incentives programs states offer include:

- Loans
- Tax incentives
- Grants, buy-downs, and generation incentives
- Nitrogen oxide (NO_x) set-asides
- Energy performance contracting
- Supplemental Environmental Projects (SEPs)

States have achieved additional savings by coordinating financial incentives with other state programs and by leveraging utility-based clean energy programs.

Over the past three decades, states have diversified their programs from grants or loans into a broader set of programs targeted at specific markets and customer groups. This diversification has led to portfolios of programs with greater sectoral coverage, a wider array of partnerships with businesses and community groups, and an overall reduced risk associated with programmatic investments in energy efficiency and clean supply options.

Objective

State-provided funding and incentives meet the public purpose objectives of supporting technologies and products that are new to the market and encouraging and stimulating private sector investment. Funding and incentives can also reduce market barriers by subsidizing higher "first costs," increasing consumer awareness (the programs are often accompanied by education campaigns and the active promotion of products to help achieve a state's energy efficiency goals), and encourage or "jump-start" private sector investment.

States have developed a range of targeted funding and incentives strategies that are bringing clean energy to the marketplace, including loans, tax incentives, grants, buy-downs, performance contracting, set-asides for energy efficiency/renewable energy (EE/RE), and supplemental environmental projects (SEPs). These programs help governments, businesses, and consumers invest in a lower cost, cleaner energy system.

Benefits

States provide funding and incentives through a combination of sources (i.e., state and federal funds, utility programs, and ratepayers), to support a broad range of cost-effective clean energy technologies, including energy efficiency, renewable energy, and combined heat and power (CHP). State funding and incentive programs, some of which are self-sustaining (e.g., revolving loan funds), deliver energy and cost savings for governments, businesses, and consumers. Program results vary depending on the configuration of funding and incentives used by each state. In Texas, the revolving loan fund has resulted in $152 million in savings since 1989 on an investment of $123 million (DOE 2005). In Oregon, more than 12,000 tax credits worth $243 million have been issued since 1980, which save or generate energy worth about $215 million per year (Oregon DOE 2005b).

Providing funding and incentives for clean energy can offer the following environmental, energy, and economic benefits:

- Reduces energy costs by supporting cost-effective energy efficiency improvements and onsite generation projects.
- Ensures that clean energy is delivered, specifies which technologies are used, and offers incentives to install technologies. Providing funding and incentives also accelerates the adoption of clean energy technologies by improving the project economics and offsets market, institutional, or regulatory barriers until those barriers can be removed.

- Establishes a clean energy technology or project development infrastructure to continue stimulating the market after the incentives are no longer in effect.
- Leverages federal incentives and stimulates private sector investment by further improving the economic attractiveness of clean energy. A small investment may lead to broad support and adoption of a clean energy technology or process.
- Stimulates clean energy businesses and job creation within the state.
- Supports environmental protection objectives, such as improving air quality.

States with Funding and Incentive Programs

States offer a diverse portfolio of financing and incentive approaches that are designed to address specific financing challenges and barriers and help specific markets and customer groups invest in clean energy. These programs include:

- Revolving loan funds
- Energy performance contracting
- Tax incentives
- Grants, rebates, and generation incentives
- NO_x set-asides for energy efficiency and renewable energy projects
- SEPs

Revolving Loan Funds

Revolving loan funds provide low-interest loans for energy efficiency improvements, renewable energy, and distributed generation (DG). Seven states currently operate a total of seven revolving loan programs that support energy efficiency, and 25 states have a total of 51 loan programs (including programs administered by the state, local government agencies, and utilities) that support clean generation (DSIRE 2005a, DSIRE 2006).

Texas LoanSTAR Program

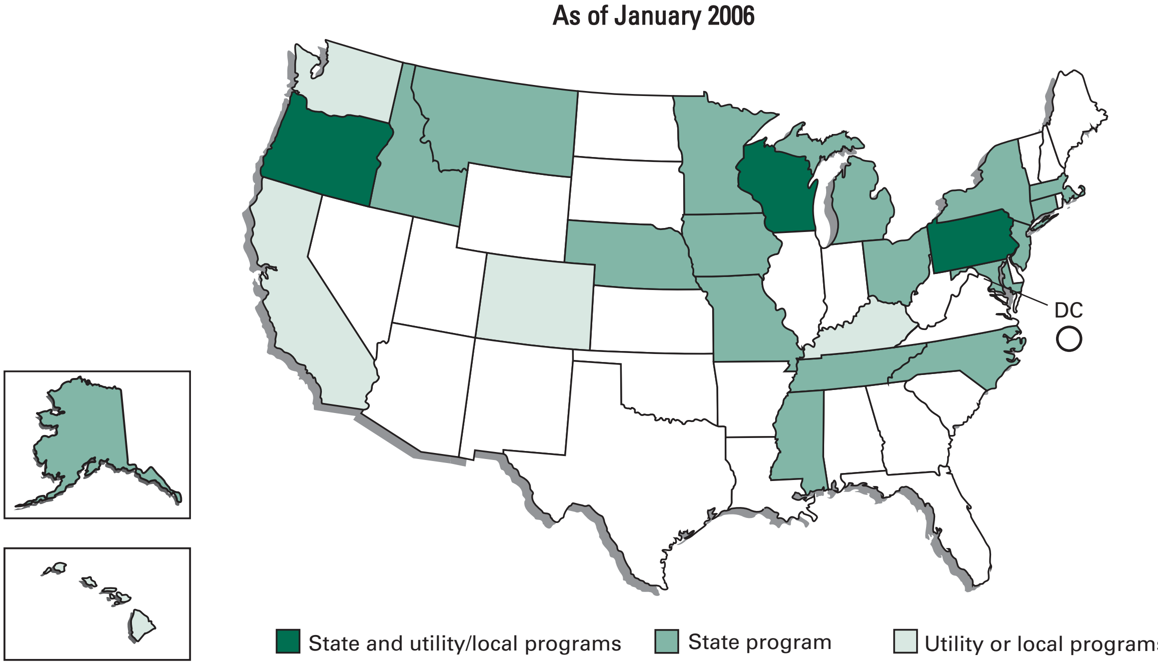
The Texas LoanSTAR program is designed to provide low-interest loans to finance energy conservation retrofits in state public facilities. Loans are repaid in four years or less, depending on expected energy savings. Loans are often repaid using cost savings from reduced energy costs. Energy savings are verified by benchmarked energy use before retrofits are installed, followed by monthly energy use analysis for each building.

The funds are designed to be self-supporting. States create a pool of capital when the program is launched. This capital then "revolves" over a multiyear period, as payments from borrowers are returned to the capital pool and are subsequently lent anew to other borrowers. Revolving funds can grow in size over time, depending on the interest rate that is used for repayment and the administrative costs of the program.

Revolving loan funds can be created from several sources, including public benefits funds (PBFs), utility program funds, state general revenues, or federal funding sources. The largest state energy efficiency revolving fund, the Texas LoanSTAR program, provides loans for energy efficiency projects in state public facilities. The fund is based on a one-time capital investment of $98 million from federal oil overcharge restitution funds and is funded at a minimum of $95 million annually. Loan funds are typically created by state legislatures and administered by state energy offices.

States have used revolving funds primarily for efficiency investments in publicly owned buildings or for facilities with a clear public purpose that are appropriate for any type of borrower. To contribute to state energy goals and be self-sustaining, states establish revolving funds that are either well-capitalized (e.g., large enough to meet a significant portion of the market need) or long-term (e.g., to allow funds to fully recycle and be re-loaned to a sizable number of borrowers). Ideally, revolving loan

Figure 3.4.1: States with Revolving Loan Funds for Renewable Energy



Source: DSIRE 2006a.

funds are both well-capitalized and long-term; however, it can be difficult to assemble the large pool of capital required to achieve both of these elements. In order to maintain a large pool of capital, it is important for states to consider several tradeoffs, including, for example, determining the balance between private and public sector loans, and between short-term and long-term loans. Additionally, if a fund holds only a few loans made to very similar types of commercial and industrial borrowers, it may be highly exposed to default; a fund with many diverse loans spreads the risks.

Energy Performance Contracting

Energy performance contracting allows the public sector to contract with private energy service companies (ESCOs) to provide building owners with energy-related efficiency improvements that are guaranteed to save more than they will cost over the course of the contracting period. ESCOs provide energy auditing, engineering design, general contracting, and installation services. They help arrange project financing and guarantee that the savings will be sufficient to pay for the project, where necessary, over the financing term (EPA 2004). (See Section 3.1, *Lead by Example,* for more information.) The contracts are privately funded and do not involve state funding or financial incentives. They have been used extensively by federal, state, and local facilities to reduce utility and operating costs and to help meet environmental and energy efficiency goals. These energy efficiency improvement projects can include the use of CHP. Twenty states have implemented performance contracting activities (ESC 2005), primarily through legislation. With the help of ESCOs, which provide energy efficiency expertise for project implementation, many facilities have experienced energy savings of 10% to 40% or more.

Tax Incentives

State tax incentives for energy efficiency, renewable energy, and CHP take the form of personal or corporate income tax credits, tax reductions or exemptions (e.g., sales tax exemptions on energy-efficient appliances, such as the sales tax holidays offered by some states), and tax deductions (e.g., for construction programs). Tax incentives aim to spur innovation by the private sector by developing more energyefficient technologies and practices and increasing consumer choice of energy-efficient products and services (Brown et al. 2002). Thirty-eight states currently have tax incentive programs for renewable energy (DSIRE 2005a).

State tax incentives for renewable energy are a fairly common policy tool. While state tax incentives tend to be smaller in magnitude than federal tax incentives, they are often additive and can become significant considerations when making purchase and investment decisions. The most common types of state tax incentives are (1) credits on personal or corporate income tax, and (2) exemptions from sales tax, excise tax, and property tax. In addition, some states have established production tax credits. For example, New Mexico offers a $0.01 per kilowatt-hour (kWh) production tax credit for solar, wind, and biomass that can be taken along with the federal Production Tax Credit (PTC). Because different tax incentives are suitable to different taxpayers' circumstances, states may want to consider using a range of tax incentives to match these circumstances. For example, property tax exemptions might be more attractive for large wind projects, while homeowners might prefer to claim an income tax credit for the purchase of a solar photovoltaic (PV) system.

Several states provide tax incentives for CHP, including Connecticut, Idaho, Iowa, Nevada, New Mexico, North Carolina, Oregon, South Dakota, and Utah. The majority of these states also provide property tax credits that apply to renewable energy and CHP systems (e.g., Connecticut, Iowa, Nevada, North Carolina, Oregon, and South Dakota). Idaho offers a sales tax rebate on CHP equipment. New Mexico and Utah offer income tax credits for energy production from CHP systems. Iowa, Nevada, New Mexico, and North Carolina limit their tax incentives to biomass projects, while the other states allow a broader range of CHP system designs (EPA 2005b).

Oregon Tax Incentives

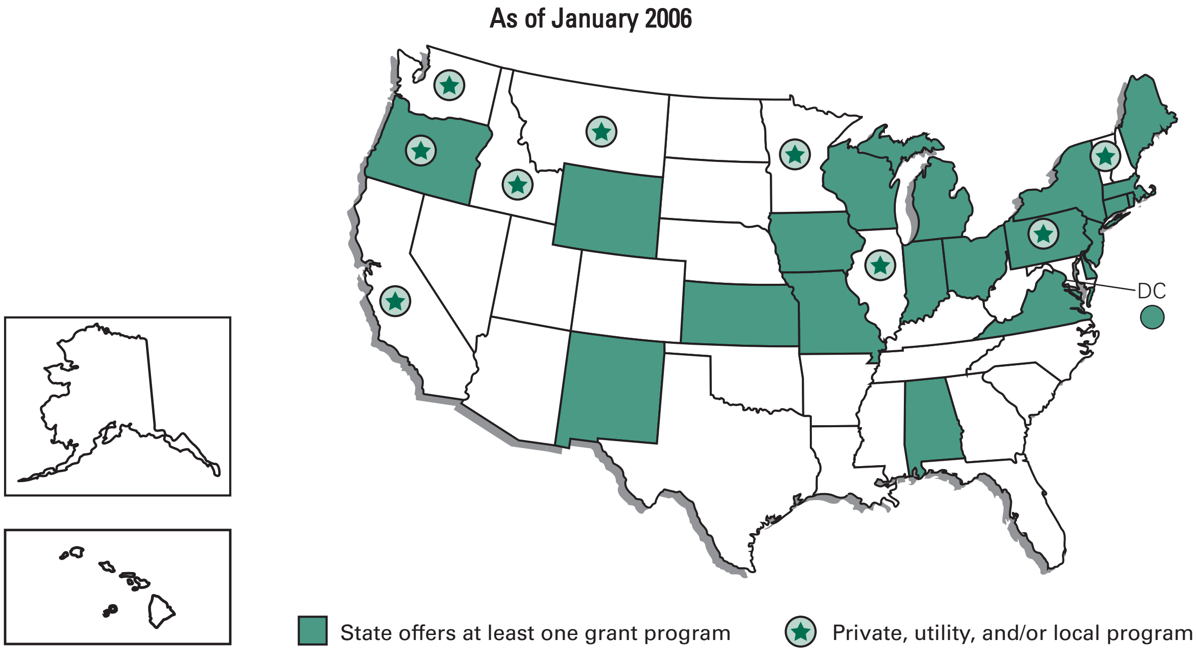
The Oregon Department of Energy offers the *Business Energy Tax Credit (BETC)* and *Residential Energy Tax Credit (RETC)* to Oregon businesses and residents that invest in qualifying energy-efficient appliances and equipment, recycling, renewable energy resources, sustainable buildings, and transportation (e.g., alternative fuels and hybrid vehicles). Through 2004, more than 12,000 Oregon energy tax credits worth $243 million have been awarded. All together, those investments save or generate energy worth about $215 million a year (Oregon DOE 2005a).

States also offer tax incentives for energy efficiency investment. These incentives are typically offered as state income tax credits or deductions, but can also be structured as exemptions from state sales taxes on appliances or titling taxes on vehicles. The most active state in terms of tax incentives is Oregon, which maintains a set of business and residential tax incentives for energy efficiency measures. Other states with tax incentives for energy efficiency investment include Maryland, Indiana, Minnesota, New York, and Hawaii. (See the *State Examples* section on page 3-79 for more information.)

Grants, Buy-Downs, and Generation Incentives

Grants, buy-downs, and generation incentives provide funding and incentives for developing energy efficiency and clean generation technologies. Typically, states promote energy efficiency measures through buy-downs (also known as rebates), and support clean generation through both buy-downs and generation incentives. Although a major source of funding for efficiency activities comes from PBFs, states also fund these activities through alternative sources including direct grants, and rebates and generation incentives provided by utilities. States administer their own funding and incentives programs designed to leverage utility programs and promote

Figure 3.4.2: States with Grant Programs for Renewable Energy



Source: DSIRE 2006b.

additional private sector investment. (For information about grants, buy-downs, and generation incentives funded through PBFs, see Section 4.2, *Public Benefits Funds for Energy Efficiency* and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs.*)

Grants. With respect to renewable energy, state grants cover a broad range of activities and frequently address issues beyond system installation costs. To stimulate market activity, state grants cover research and development, business and infrastructure development, system demonstration, feasibility studies, and system rebates. Grants can be given alone or leveraged by requiring recipients to match the grant or to repay it. Grants can also be bundled with other incentives, such as low-interest loans. Grant programs promoting renewable energy technologies are administered by states, nonprofit organizations, and/or private utilities in 28 states (DSIRE 2005a).

State-appointed agencies are also finding ways to use limited funding for grants. For example:

- Massachusetts uses grant funding to stimulate residential green power purchases. For every dollar a residential green power purchaser spends on the incremental cost of green power, the state grants up to $1 to the resident's local government for use in renewable energy projects and up to $1 for renewable energy projects that serve low-income residents throughout the state. Renewable energy grants can range from tens of thousands to millions of dollars. In New Jersey, for example, the Renewable Energy and Economic Development program is funded at $5 million, from which it provides grants ranging from $50,000 to $500,000 for market development activities.
- Pennsylvania's Energy Harvest program provides $5 million annually for clean and renewable energy projects. Since its inception in May 2003, the Pennsylvania Energy Harvest Grant Program has awarded $15.9 million for 34 advanced or renewable energy projects, and leveraged another $43.7 million in private funds (PA DEP 2005). The 34 Energy Harvest projects will produce or conserve

the equivalent of 37,800 megawatts per hour a year (enough to power 5,000 homes) and will avoid 85,000 pounds of nitrogen oxide (NO_x), 131,000 pounds of sulfur dioxide (SO_2), 2,700 pounds of carbon monoxide (CO), and 10 million pounds of carbon dioxide (CO_2) (PA DEP 2005).

Many programs also include grants for energy efficiency investment (and in some cases in-kind contributions such as direct installation of equipment or trade-in programs). Typically, the consumer does not directly invest in these programs. In California, the city of San Francisco's Peak Energy Program (SFPEP) provides funding for torchiere trade-in programs, multi-family direct installation of hard-wired compact fluorescent lighting (CFL) fixtures, and free replacement of refrigerator gaskets at grocery stores. Some states award financial grants directly. For example, the Oregon Energy Trust provides incentives of up to $10,000 for homeowners and $35,000 for businesses for the purchase of rooftop PV systems.

Rebates (Buy-Downs). Rebates, also called buy-downs, are provided by the state to the end user and are a common form of state financial incentive. Typically, rebates are funded by utility customers and administered by utilities, state agencies, or other parties, with oversight from public utility commissions (PUCs) or other state agencies.[7] Many states support their rebate programs through PBFs (see Section 4.2, *Public Benefits Funds for Energy Efficiency* and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*).

Rebate levels vary by technology and state. Twenty-two states administer renewable energy rebate programs or have utility- or locally administered rebate programs in the state (DSIRE 2005b). In addition to rebates for renewable energy, states also offer rebates for a wide range of energy efficiency measures, including lighting, refrigeration, air conditioning, agricultural, and gas technologies. About 20 states conduct energy efficiency programs, and most of these states offer rebates or similar kinds of incentives.

States frequently provide rebates for solar PV, but rebates are also provided for other technologies, such as wind, biomass, and solar thermal hot water. In general, rebates are provided on a per-watt basis, with the total rebate amount expressed either as maximum dollar amount or a maximum percentage of total system cost. In New York, the New York State Energy Research and Development Authority (NYSERDA) provides a $4.00 to $4.50 per watt rebate for solar PV and will cover up to 60% of the system's total installed cost. In California, the Emerging Renewables Program provides rebates for systems up to 30 kilowatts (kW). Rebates are $2.80 per watt for PV systems and $3.20 per watt for solar thermal and fuel cells. For wind systems, rebates are $1.70 per watt for the first 7.5 kW with $0.70 per watt thereafter. Rebates are provided only for equipment that is certified by the state (CEC 2005a).

Nevada offers a rebate program of $3 per watt (2006 program year) for grid-connected PV installations on residences, small businesses, public buildings, and schools. Nevada's utilities, Nevada Power and Sierra Pacific Power, administer the rebate program. The renewable energy credits (RECs) produced by their customers' PV systems count towards the utilities' solar goals under Nevada's renewable portfolio standards (RPS) (DSIRE 2005b).

States have coordinated their rebate programs with those offered by municipal utilities, governments, and others. For example, in California, rebate programs administered by investor-owned utilities (IOUs) are often tied directly to the values contained in the Database for Energy Efficient Resources (DEER) Measure Cost Database. This database provides statistically averaged cost differentials between baseline equipment and the energy efficiency measure designed to replace it (for example, T-8 fluorescent lamps with electronic ballasts vs. T-12 lamps with magnetic ballasts). The incremental energy savings of each measure in the database is also provided (CEC 2005b). These data provide program planners with the necessary information to forecast energy savings

[7] A database of state utility sector efficiency programs can be found at: http://aceee.org/new/eedb.htm.

Massachusetts Provides Grants and Rebates for Renewable Energy

The Massachusetts Technology Collaborative (MTC) administers grants and rebates in Massachusetts. With approximately $25 million per year, the MTC manages programs that target a broad range of recipients. Eligible technologies include wind energy, fuel cells, hydroelectric, PV, landfill gas, and low emission advanced biomass power. The project site must be a customer of one of the investor-owned utilities in Massachusetts. In addition, it must be grid-connected and use 50% of the power on site. Programs include the following:

- *The Small Renewable Energy Rebate Program* provides rebates for PV, wind, and micro-hydro systems. Rebate levels vary by technology and system size.
- *The Green Building and Infrastructure Program* provides grants to support the installation of clean energy, particularly solar PV, in buildings such as schools. Initial grants of $25,000 are provided for studies, followed by up to $500,000 grants for system installation.
- *The Clean Energy Choice Program* provides tax incentives for customers' green power purchases and provides matching grants that benefit consumers' communities and low-income residents.
- *The Industry Support Program* makes direct investments to catalyze new product commercialization, works to build networks and provide services that better enable companies to access capital and other vital resources, and strives to lower barriers to success for entrepreneurs in the state.

of planned efficiency efforts, depending on market penetration levels. This helps provide stability and predictability in rebate programs, helping to create conditions for long-term market development and growth. However, in order to encourage and institutionalize renewable energy technologies and energy-efficient equipment and to provide industry with the stability required for market transformation, it is important for states to institute a gradual and predictable reduction in rebates over time.

In addition to rebates for renewable energy, states also offer rebates for a wide range of energy efficiency measures, including lighting, refrigeration, air conditioning, agricultural, and gas technologies. About 20 states conduct energy efficiency programs, and most of these states offer rebates or similar kinds of incentives. Typically, these rebates are funded by utility customers and administered by utilities, state agencies, or other parties, with oversight from PUCs or other state agencies. In most cases, utility bill charges are placed in a PBF; in a few states, programs are funded by utilities directly under utility commission directives. For example, Minnesota's Conservation Improvement Program (CIP), is funded by the state's utilities. (A database of state utility-sector efficiency programs can be found at: http://aceee.org/new/eedb.htm.)

Generation Incentives. In contrast to incentives that help finance initial capital costs (e.g., rebates and sales tax exemptions), states provide generation incentives on the basis of actual electricity generated. In their most straightforward form, generation incentives are paid on a per kWh basis. For example, in 2005, California began a pilot performance-based incentive (PBI) that provides incentive payments of $0.50/kWh over the first three years of PV system operation. The rebate is based on the actual electricity generated by PV systems. System performance is measured using a revenue-quality meter. Participants report their system performance either through their utility or a Web-based, third-party reporting provider. The total dollar amount reserved for a system is based on the array capacity, PTC rating, and a 25% capacity factor. This reserve amount is likely to be higher than actual system performance, but any power generated above the actual amount will not be paid. In Pennsylvania, the Energy Cooperative, a nonprofit organization that is licensed as an electricity supplier by the Pennsylvania PUC, offers a Solar Energy Buy-Back program that pays its 6,500 members with 1 kW to 5 kW PV systems $0.20/kWh for the output of their systems. The program purchased 70,740 kWh in 2004 (Energy Cooperative 2005).

NO_x Set-Asides for Energy Efficiency and Renewable Energy Projects

Under the NO_x Budget Trading Program in effect as of 2003 (Clean Air Act 1990 Part 96), 22 eastern states and Washington, D.C. allocate NO_x allowances to large electric generating and industrial combustion units within state budgets. States may reserve allowances from the budget to address new units or to provide incentives for certain activities.

States can use one type of incentive, an EE/RE set-aside, to award NO_x allowances for EE/RE and CHP projects. The allowances provide a financial incentive for projects that reduce energy demand or increase the supply of clean energy. To date, six states (Indiana, Maryland, Massachusetts, New Jersey, New York, and Ohio) have developed an EE/RE set-aside program, and Missouri has proposed a set-aside program. Thus, about one-third of the 22 affected states have elected to include an EE/RE incentive program. The size of the set-aside in each state ranges from 454 tons (Ohio) to 1,241 tons (New York) and from 1% to 5% of each state's NO_x trading program budget (EPA 2005c).

Each state determines the projects that are eligible for allowance awards. Typical projects include:

- Installation of a new CHP system project (provided allowances have not already been distributed to the project from the new source set-aside).
- Renewable energy projects, including wind, solar, biomass, and landfill methane.
- Demand-side management actions either within or outside the source's facility (EPA 2005d).

As in the NO_x budget trading program, states have the flexibility to include a NO_x set-aside for EE/RE as part of their NO_x allocation approach for the Clean Air Interstate Rule (CAIR) (EPA 2005e). CAIR establishes a cap and trade system for SO_2 and NO_x in 28 states and Washington, D.C. Under CAIR, states may craft their allocation approach to meet their state-specific policy goals (EPA 2005e).

Supplemental Environmental Projects

An SEP is an environmentally beneficial project implemented through an environmental enforcement settlement. Under a settlement, a violator voluntarily agrees to undertake an SEP as a way to offset a portion of its monetary penalty. SEPs are commonly implemented through both federal and state enforcement actions. State SEPs can be a significant source of funding for new clean energy projects. There are many opportunities for states to implement clean energy SEPs through large and small enforcement settlements. Knowing the flexibility of a state's SEP policy (which may be different from EPA's SEP policy), making SEPs a routine part of the enforcement settlement process, and being aware of the opportunities for clean energy projects as SEPs are key ingredients for successfully increasing the number of clean energy projects funded through state SEPs. Depending on state and local needs, SEPs can involve the violator's facilities or can be a project that provides local benefits. For example, in response to a violation of air quality standards, a Colorado manufacturer agreed to fund an energy efficiency assessment at its facility and implement some of the assessment recommendations. In Maryland, in response to a violation of visible emissions standards, a utility installed PV systems on three public buildings in the county.

EPA's SEP toolkit provides information for state and local governments on undertaking energy efficiency and renewable energy projects. The toolkit includes information on general SEP requirements at federal and state levels, potential benefits from EE/RE SEPs, project examples, and general implementation guidance (EPA 2005a). (The toolkit is available at: http://www.epa.gov/cleanenergy/pdf/sep_toolkit.pdf.)

Designing Effective Funding and Incentive Programs

When developing and implementing effective funding and incentive programs, states consider a variety of key issues including design principles, identifying key participants, assessing the level of funding, and determining program timing and duration. It is also important to consider interactions with federal and state policies and opportunities to coordinate and leverage programs.

Design Principles

States have developed extensive experience in funding and incentives programs. While program design considerations are somewhat specific to the markets and technologies involved, four general design principles have emerged:

- Develop specific target markets and technologies based on technical and economic analyses of clean energy markets and technologies.
- Use financing and incentives as part of a broader package of services designed to encourage investments.
- Establish specific technical and financial criteria for clean energy investments.
- Track details of program participation, costs, and energy savings and production to enable evaluation and improvement.

In designing their funding programs, states assess their intended markets and other funding sources, particularly the competitive commercial financing options that are available to their target customers. State programs have been most successful when they target markets that currently receive little or no attention from the commercial financing industry, rather than competing with these private offerings. Alternatively, states can seek to augment the incentives offered through private financing by working with the financial industry to design effective programs that address market barriers other than lack of capital alone.

States have found that coordinating funding and incentives with other program policies results in more effective programs and creates opportunities to leverage investments. For example, New Jersey offers a package of financial incentives, combined with its RPS and an REC program, which has reduced the payback period for solar home systems to less than five years (New Jersey 2005). Other program features that states bundle with financing and incentives include customer education and outreach, standardized and streamlined interconnection and permitting processes for clean energy production, and creation of effective partnerships with financial institutions, equipment providers, and installers.

Participants

Participants include both public and private sector organizations. Public sector participants include state and local government agencies, school districts, and nonprofit organizations. Private sector participants include large corporations, small businesses, and individual residents. Depending on a state's energy-efficiency goals, budgets, and general policy acceptance, certain stakeholders might be targeted more directly than others during the initial policy rollout phase or over the entire life of the program.

Participants in funding and incentives programs and their typical roles and responsibilities include:

- *State Legislatures.* State legislatures pass bonds, authorize appropriations, and authorize incentives. They also authorize changes to state tax laws and state accounting and procurement rules that enable clean energy funding programs. State legislatures or executive branches can give authority to outsource or conduct performance contracting in any facilities under their fiscal authority.
- *State Energy Offices and PUCs.* Energy offices and PUCs administer financing programs, provide technical assistance, and measure and evaluate state-funded projects to ensure that intended results are being achieved.
- *Utilities.* Utilities administer related programs that states and energy customers can leverage, such as rebates and buy-downs.
- *Third Parties.* Third parties such as nonprofit organizations serve as financing centers to manage

funds (e.g., the Iowa Energy Investment Corporation) and can also serve as "trade allies" (e.g., equipment installers and ESCOs) and lending institutions.

- *Businesses.* Businesses apply for funding and incentives and purchase and/or use clean energy technologies.
- *Residents and Other Consumers.* Consumers apply for funding and incentives and purchase and/or use clean energy technologies.

Funding

State clean energy programs that offer financing or financial incentives have used a wide range of funding sources, including:

- *Utility Budgets*. In states that have established utility incentives for demand-side resources, utilities provide funding support for clean energy as part of their responsibility to deliver least-cost reliable service to their customers. Utilities can fund these resources in different ways, such as within their resource planning budgets or as a percent of total revenues, as directed by state policy.
- *Petroleum Violation Escrow (PVE) Funds.* Legal settlements stemming from 1970s-era oil pricing regulation violations generated billions of dollars, which states used primarily during the 1980s and 1990s for clean energy programs.
- *PBFs.* These are typically funded by small charges on utility customer bills (see Section 4.2, *Public Benefits Funds for Energy Efficiency* and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*).
- *Annual Appropriations.* Some states support energy financing and incentive programs with general state revenues appropriated through the annual budget process.
- *Bonds.* States have used their bond issuance authority to raise capital for lending programs. In some cases, loan repayments are applied to bond debt service.
- *Environmental Enforcements and Fines.* States that collect fines and penalties from environmental enforcement actions can use the proceeds to support clean energy financing and incentives. Alternatively, funds can come directly from a violator, through a supplemental environmental project.
- *CO_2 Offset Programs. S*tates have used their CO_2 offset programs as a source of funding. For example, Oregon's 1997 state law HB 3283 required new power plants in the state to offset approximately 17% of their CO_2 emissions. Power plants can do this directly or by paying the Oregon Climate Trust, which uses the funds to support offset projects, including sequestration, renewable energy projects, and energy efficiency projects. The program currently does not recognize CHP as an efficiency technology either in calculating the required offsets or in the generation of offsets. Washington and Massachusetts have similar offset funding programs.

Funding Levels

When designing financing and incentive programs, states have found that it is important to determine the financing limits and incentive levels that are appropriate to market conditions. Ideally, incentives provide just enough inducement to generate significant new market activity and limit financial risk.

For loans or other credit-related incentives such as loan guarantees, public financing typically pays for just enough of the project cost to motivate private investment. If public financing covers too much of a project, it can promote projects that are not financially sound. It is believed that if investors invest a significant amount of their own money in the project, they will be motivated to make it succeed. Another method is to buy down the interest rates. This is often attractive to both businesses and homeowners. While different than loan guarantees, buydowns can help put monthly payments within budgetary reach.

For financial incentives such as grants or rebates, the amount offered is often set at a level just large enough to induce private investment. Incentives that are too high can distort market behavior so that the technology does not sustain market share after the incentives end.

Timing and Duration

Another key consideration when developing funding and incentives programs is determining how long the program will be in effect and whether funding will be available on a consistent year-to-year basis. State incentive and funding programs have been more effective when they have been sustained and consistent over time (e.g., the Texas LoanSTAR program) (Prindle 2005). Several years are typically required for a significant effort to become known and accepted in the marketplace. States with effective programs typically have established five- to 10-year authorizations for their programs. In some markets, especially where projects require long lead times for design, permitting, construction, and underwriting, program cycles may be longer. In other cases—for example, in Oregon where faster-turnover consumer products are involved—programs can be conducted on a shorter time frame. Programs involving incentives, loans, or other forms of financial assistance that have been offered on a short-term basis have failed to allow time for markets to respond (Prindle 2005).

The appropriate duration of an incentive or financing program also depends on the characteristics of the target market and the goals of the program. A revolving loan program can continue indefinitely, since the fund typically requires a single initial capitalization. If the size of the target market is large relative to the size of the fund principal, the program can run productively for many years. In other cases, an incentive effort might be targeted at acquiring a specific level of resources in a given time frame; in such cases, funding levels would tend to be higher and the program duration shorter. Incentives are gradually reduced and ultimately eliminated when the technology or practice becomes standard practice in the target market.

Interaction with Federal Policies

Several kinds of federal policies and programs can interact with incentive and financing programs. These programs offer technical assistance, technical specifications for eligible products or projects, federal funding, and opportunities to coordinate delivery of state efforts with regional and national programs. Examples of federal initiatives with which state programs can form partnerships or otherwise interact include:

- *ENERGY STAR.* States have used ENERGY STAR equipment and product specifications as the basis for qualification for incentives or financing. Since the late 1990s, EPA and DOE have worked with utilities, state energy offices, and regional nonprofit organizations to help them leverage ENERGY STAR messaging, tools, and strategies and to enhance their local energy efficiency programs. By working with EPA and DOE and using ENERGY STAR as their local platform, these organizations initiate their programs more quickly; increase their program uptake and impact; help drive local market share for ENERGY STAR-qualified products, homes, buildings, and related best practices; contribute to long-term change in the market for these products and services; and deliver on local objectives to increase energy efficiency, maintain electric reliability, and improve environmental quality. For example, states such as Texas, New Jersey, and Vermont have used the ENERGY STAR Homes program as the basis for financial incentives to home builders. In the Northeast, several states have used the ENERGY STAR criteria for clothes washers as the basis for a regionally coordinated network of incentive programs (for more information, see http://www.energystar.gov/).
- *Green Power Partnership.* The Green Power Partnership is a voluntary program developed by EPA to boost the market for clean power sources. Although the program does not provide funding for green power purchases, state and local governments that participate in the partnership receive technical assistance and can use the program's

Best Practices: Designing Clean Energy Funding and Incentive Programs

The best practices identified below address common design elements for developing clean energy funding and incentives programs, based on experiences of states that have implemented successful programs.

- Conduct robust technical and economic analyses to screen technologies and program designs and to ensure that the program is designed to achieve significant impacts and is cost-effective.
- Conduct market research to understand customer preferences, market structures, and other factors that will affect program success, as appropriate.
- Set technical requirements for eligible equipment and practitioners to encourage significant energy savings and system performance (for renewables and CHP) and to ensure that measures and projects receive appropriate quality control.
- Consider how financial incentives can complement or leverage other state programs and policies and federal financial incentives.
- Provide ongoing public education about clean energy technologies and available incentives.
- Provide stable, long-term program funding where appropriate and plan for decreasing funding as markets change.
- Keep program design and procedures as simple as possible, and make it easy to participate.
- Cooperate with utilities, industry allies, and market participants to reach key market "gateways."
- Establish a consistent but cost-effective quality assurance mechanism.
- Incorporate incentives into an overall market development strategy; include installer training and certification.
- Develop a coordinated package of incentives and other services, including:
  - For energy efficiency: customer promotions, industry ally partnerships for marketing, training, and education.
  - For renewable energy: interconnection standards and net metering.
- Provide for hard-to-reach market segments, including public facilities, low-income households, small businesses, and nonprofit organizations.
- Design the program to be valuable, by creating program tracking and reporting systems that allow review of completed projects.
- Allow flexibility for program modifications.

Green Power Purchasing Guide to inform their green power purchasing decisions. (For more information, see http://www.epa.gov/greenpower/index.htm.)

- *The Energy Policy Act of 2005 (EPAct 2005)* provides tax credits for energy-efficient appliances and vehicles, and extends the PTC for renewable energy generation to 2007. EPAct 2005 also authorizes funding to support state energy efficiency programs, although many of the provisions will require congressional appropriations.

  The Energy Efficient Appliance Rebate Program authorizes matching appliance rebates to be operated by state energy offices. Through this program, states have an alternative source of funds and a state rebate program to purchase ENERGY STAR appliances to replace existing appliances.

  Under the Federal Production Tax Credit, defined renewable power technologies, such as wind, geothermal, and other grid-scale technologies, are eligible for federal credits for each kWh generated. State incentives have been designed to coordinate with the PTC to help spur renewable energy development in the state (LBNL 2002). For example, MTC invests in renewable energy in the state (for more information, see: http://www.mtpc.org).

Interaction with State Policies

States have combined their financial incentives with other state clean energy programs and policies to deliver even greater energy and cost savings. Funding and incentives programs interact with many state policies, including:

- *PBF Programs.* PBFs can be used as a source of direct incentives, such as rebates, and also as a source of financing assistance. PBFs are funds typically created by levying a small fee on customers' utility bills. PBFs in 17 states and Washington, D.C. support energy efficiency programs, and PBFs in 16 states are used to promote renewable energy. (See Section 4.2, *Public Benefits Funds for Energy Efficiency,* and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs.*)
- *Portfolio Management.* Portfolio management refers to an electric utility's energy resource planning and procurement strategies. Effective portfolios are diversified and include a variety of fuel sources and generation and delivery technologies and financial incentives to encourage customers to reduce their consumption during peak demand periods. Portfolio management delivers clean air benefits by shifting the focus of procurement from short-term, market-driven, fossil fuel-based prices to long-term, customer costs and customer bills by ensuring the consideration of energy efficiency and renewable generation resources. (See Section 6.1, *Portfolio Management Strategies.*)
- *Environmental Enforcement Cases.* Under a settlement, a violator may voluntarily agree to undertake an SEP (an environmentally beneficial project) as a way to offset a portion of its monetary penalty (see *Supplemental Environmental Projects,* on page 3-83).
- *Lead by Example Programs.* Many states lead by example through the implementation of programs that achieve energy cost savings within their own facilities, fleets, and operations. Lead by example programs include innovative financing mechanisms, such as revolving loan funds, tax-exempt master lease-purchase agreements, lease revenue bonds, performance contracting, and procurement policies and accounting methods (for more information, see Section 3.1, *Lead by Example*).
- *RPS.* In states with RPS requirements, financial incentives can be used strategically to support the development of more renewable energy generation in the state. Some states have decided to use financial incentives to support only renewable energy generation that occurs in addition to the state's RPS requirements. States can also add efficiency to the RPS, as in Pennsylvania, or create a separate efficiency performance standard, as in Connecticut. (See Section 5.1, *Renewable Portfolio Standards.*)
- *Interconnection, Net Metering, and Standby Rates.* Some states have modified their interconnection standards, net metering rules, and/or standby rate structure to facilitate easier interconnection for renewable energy systems, increase their profitability, and provide incentives for clean energy. In states where interconnection issues have not been addressed, renewable energy generators may face hurdles with connecting to the grid and may not have the financial incentives required to ensure the system is sufficiently profitable. Net metering rules enable renewable energy system owners to sell excess production to the utility at retail rates rather than wholesale rates, effectively providing a per-kWh incentive (see Section 5.4, *Interconnection Standards*). Some states are also reviewing utility standby rates to ensure that they are reasonable and appropriate and do not unnecessarily limit the development of clean and efficient onsite generation. (See Section 6.3, *Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation.*)
- *Encouraging Green Power.* Some states stimulate the green power market by establishing mandates for state government facilities to satisfy a percentage of their electricity demands with green power (e.g., RECs or green power electricity products). (See Section 3.1, *Lead by Example*, and Section 5.5, *Fostering Green Power Markets.*)

Implementation and Evaluation

Implementing and Administering Funding and Incentives Programs

The most appropriate agency to implement and administer funding and incentive programs varies, depending on the state and type of incentive program offered. In most states, the state energy office manages the program. Other agencies involved in program implementation include the state department of general services, treasury department, and others. In some states (e.g., Oregon and Iowa), a private nonprofit organization implements and evaluates funding and incentives programs.

Objectives for the agency administering the incentives program include (Brown et al. 2002):

- Create sufficient budget authorizations and appropriations to ensure the effectiveness of the program, measured against actionable performance criteria where possible.
- Allow for an adequate time period (typically five to 10 years) for the funding to influence the market.
- Determine an appropriate incentive level for targeted technologies and markets (e.g., incentives should be large enough to generate the investment needed to meet program goals and moderate enough to stay within the budget).
- Establish funding caps per project and per customer to keep programs affordable and sustainable.
- Focus on high-efficiency technologies and practices by setting technical criteria that target the high end of the target market.
- Be flexible with respect to who receives the incentives so that the most appropriate parties can participate.
- Incorporate sufficient reporting requirements to document program results accurately and prevent program abuse.
- Budget adequately for evaluation and conduct evaluations on regular cycles. Allow for selected detailed audits of larger and more complex projects.

The implementing/administering agency is also responsible for ensuring that an adequate program support structure is in place. This might entail the following actions:

- Allocate sufficient personnel and time for program administration.
- Collaborate with other agencies.
- Establish agreements with equipment installers, manufacturers, and service providers.
- Collaborate with utilities.
- Conduct public outreach and education campaigns.
- Conduct periodic program evaluations and take corrective measures, if necessary.

Best Practices: Implementing Funding and Incentive Programs

- Consult with other states to gain the benefit of their experiences with program implementation details.
- Select the most appropriate delivery organization(s) for program delivery.
- Approve long-term funding cycles (five to 10 years) to enable programs to achieve significant market acceptance and impacts.
- Maintain stakeholder communications via working relationships and advisory groups.
- Provide for adequate program tracking and reporting systems to enable effective evaluation and mid-course program corrections.

Evaluation

In general, states evaluate their state financial incentives programs based on quantitative metrics, such as the amount of money granted, energy savings, and the number of systems installed. In addition, the administrative process is frequently evaluated to track data such as the number of days it takes the state to process an application. While more challenging, states also attempt to determine if financial incentives have the desired effect on the marketplace (i.e., understanding the causal relationship between the incentives and the changes occurring in the market, accounting for "free riders" and estimating the net energy savings impacts achieved by incentives). Standardized reporting requirements and independent measurement and verification (M&V) of program impacts provide the information required to redirect future investment dollars for optimal effectiveness.

States have found that M&V methods are critical to ensuring that sufficient projected savings are realized to determine if funding and incentive investments provide their expected return. For simpler measures with well-established savings performance records, a "deemed savings" approach can be used. For more complex measures, newer technologies, and larger projects, a project-specific M&V approach is warranted. (For more information on M&V methods, see Section 4.1, *Energy Efficiency Portfolio Standards,* and Section 4.2, *Public Benefits Funds for Energy Efficiency.*) Several states have established detailed procedures and technical support documents describing "deemed savings" methods, including:

- The California Measurement Advisory Council (CALMAC) (CALMAC 2005).
- *Efficiency Vermont Technical Reference Users Manual*, published by Efficiency Vermont (2004).

For project-specific M&V methods, the following resources are helpful:

- *The International Program Measurement and Verification Protocol* (IPMVP) (IPMVP 2005).
- The Texas PUC's *Measurement and Verification Guidelines* (Texas PUC 2005).
- DOE Federal Energy Management Program (FEMP) guidelines, Measurement & Verification Resources and Training Opportunities (Webster 2003).

Several states have conducted evaluations of their funding and incentives programs. For example, the California Public Utilities Commission (CPUC) evaluates the Self-Generation Incentive Program (SGIP) each year to assess process, impact, and cost-effectiveness (CPUC 2005b). Part of the state's 2004 evaluation included interviews with 47 SGIP cogeneration system owners regarding their system implementation and operations experiences during the year. The evaluation found that, while the SGIP is very well subscribed, and program participants are on average satisfied with their SGIP systems, many cogeneration systems do not appear to be performing as well, or operating for as many hours, as originally expected (CPUC 2005b).

NYSERDA evaluated its DG/CHP program to understand how the internal processes of the program have progressed, assess the progress of and barriers to technology transfer, and determine end users' and consultants' levels of satisfaction with the program. The evaluation involved a review of current savings procedures and data tracking, interviews with DG/CHP program managers, and a review of data summaries for projects. The evaluation results revealed that staff and participants are enthusiastic about the program and that many nonparticipants also have positive feelings about it. Several recommendations for improvements were received, including making the proposal and selection process

Best Practices: Evaluating Funding and Incentive Programs

Evaluating funding and incentives programs requires tracking program use, cost, and energy savings, as well as providing easy public access to program information.

- Evaluate programs regularly, rigorously, and cost-effectively.
- Use methods proven over time in other states, adapted to state-specific needs.
- Provide "hard numbers" on quantitative impacts and process feedback on the effectiveness of program operations and ways to improve service delivery.
- Use independent third parties, preferably with reputations for quality and unbiased analysis.
- Measure program success against stated objectives, providing information that is detailed enough to be useful and simple enough to be understandable to nonexperts.
- Provide for consistent and transparent evaluations across all programs and administrative entities.
- Communicate results to decisionmakers and stakeholders in ways that demonstrate the benefits of the overall program and individual market initiatives.

less confusing, initiating better communication with utilities about interconnection and standby rate charges, and developing an incentive program with stable funding to allow for replication of projects (NYSERDA 2004).

State Examples

The following examples illustrate effective state programs, innovative approaches, and program results for each of the key types of financing and incentive programs.

Revolving Loan Funds

Texas LoanSTAR

Texas LoanSTAR, also known as the Loans to Save Taxes and Resources program, began in 1988 as a $98.6 million retrofit program for energy efficiency in buildings (primarily public buildings such as state agencies, local governments, and school districts). The program is now funded at a minimum of $95 million annually. The original funding for the program was from PVE funds. The Texas State Energy Conservation Office (SECO) administers the funds through DOE's State Energy Program.

SECO provides extensive program oversight and documentation, ensuring that the data used to establish claims for energy savings are accurate. SECO develops procedures and guidelines that allow LoanSTAR to prove that the financed energy retrofits would pay for themselves. As part of its quality control, SECO:

- Issues energy assessment guidelines.
- Trains energy engineering consulting firms on audit techniques and LoanSTAR guidelines.
- Develops protocols to meter and monitor each LoanSTAR project to track pre- and post-retrofit energy consumption.
- Develops new methods to analyze energy savings from retrofits.

Public agencies in Texas have realized substantial savings on their energy bills through LoanSTAR that continue to accrue year after year. As measured from the beginning of the program through December 2004, total savings amount to almost $152 million, on an investment of $123 million. This amount reflects measured savings from 1989, when the first loan was funded, through 2000, and stipulated savings from 2001 through December 2004. Total savings are calculated directly from metered and monitored energy consumption data collected before and after the energy retrofits. Stipulated savings are used for buildings where the energy-saving measures contribute year after year at an established level but where monitoring equipment is no longer in place (DOE 2005).

Web site:
http://www.seco.cpa.state.tx.us/ls.htm

Iowa Energy Bank

Iowa's Energy Bank program provides technical and financial assistance to public and nonprofit facilities for installing cost-effective EE/RE improvements. This energy management program uses energy cost savings to repay financing for energy management improvements. It targets public schools, hospitals, private colleges, private schools, and local governments. The Iowa Energy Bank helped finance $150 million in energy efficiency improvements in state and local facilities from 1989 through 2001.

The Iowa Energy Bank program starts with an initial energy audit. This assessment may be an extensive energy audit, or for small facilities, a simpler assessment of energy consumption and potential improvements by Energy Bank program staff. If necessary, an engineering analysis is completed for the facility by a qualified consultant. A six-month, interest-free loan is available to pay the up-front expense of the energy audit and engineering analysis. Full-term, municipal lease-purchase agreements or capital loan notes from private lending institutions are available at interest rates negotiated for the client by the Iowa Department of Natural Resources (DNR). All clients of the program are eligible for financing of cost-effective energy management improvements.

Web site:
http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/EBANK/index.html

Montana Alternative Energy Loan Fund

Montana's revolving loan fund, established in May 2001, initially provided up to $10,000 (at a 5% interest rate in 2004) to individuals and small businesses for small renewable energy systems up to 1 MW in size. In March 2005, the Montana Legislature passed a bill that amended the loan program, raising the maximum loan amount to $40,000 and extending the repayment period from five years to 15 years. As of 2004, the Alternative Energy Loan Fund has more than $425,000 available for disbursement to loan applicants. Financial interest accruing to the fund, as well as interest generated from loan repayments, is re-deposited into the fund to sustain the program.

The fund is managed by the Montana Department of Environmental Quality (DEQ) and is supported by penalties from air quality violations in Montana. Eligible resources include wind, solar, geothermal, fuel cells, biomass, hydroelectric, and solid waste methane. Montana also provides a 35% investment tax credit for businesses that manufacture alternative energy generating equipment, use energy from alternative energy generating equipment, or install net metering equipment for connecting alternative energy generation systems to the electrical grid (Montana DEQ 2005). The 2005 law also added local government agencies, universities, and nonprofit organizations to the list of eligible sectors.

Web site:
http://www.deq.state.mt.us/energy/Renewable/altenergyloan.asp

Energy Performance Contracting

Washington

In 2001, the Washington legislature adopted legislation requiring all state facilities to conduct energy audits to identify energy savings opportunities and to use performance contracting as their first option for achieving those savings (Washington HB 2247 2001). This law has led to a surge in performance contracting activity: $100 million has been invested in project implementation by the private sector, with net savings of over $8.3 million annually.

The Washington Department of General Administration (DGA) energy team has designed an energy performance contracting (EPC) program specifically for state agencies, colleges and universities, cities and towns, counties, school districts, ports, libraries, hospitals, and health districts. The EPC program provides assistance to public facilities in completing energy performance contracting projects and includes free preliminary audits and consulting services. The program complies with competitive statutory requirements to save time and money. The DGA helps state agencies qualify for the low-interest state treasury financing that is available for EPC projects.

Tax Incentives

Oregon

The Oregon DOE offers BETCs and RETCs to Oregon businesses and residents that invest in qualifying energy-efficient appliances and equipment, recycling, renewable energy resources, sustainable buildings, and transportation (e.g., alternative fuels and hybrid vehicles). The BETC is for 35% of the eligible project costs and applies to the incremental cost of the system or equipment that is beyond standard practice. The RETC varies depending on the type of equipment purchased and amount of energy savings. Through 2004, more than 12,000 Oregon energy tax credits worth $243 million have been awarded. Altogether, those investments save or generate energy worth about $215 million a year (Oregon DOE 2005a). Business owners who pay taxes for a business site in Oregon are eligible for the tax credit. Oregon nonprofit organizations, tribes, or public entities that partner with an Oregon business are also eligible, as are residents who have an Oregon tax liability.

The BETC offers an innovative pass-through option, which allows a project owner to transfer the 35% BETC project eligibility to a pass-through partner for a lump-sum cash payment. The pass-through option rate for five-year BETCs (effective October 1, 2003) is 25.5%. The pass-through option rate for one-year BETCs (those with eligible costs of $20,000 or less) is

30.5%. The Oregon Department of Energy sets these pass-through option rates (Oregon DOE 2005a).

Web site:
http://egov.oregon.gov/Energy/CONS/BUS/BETC.shtml

New York

New York operates three individual tax credit programs in addition to its suite of PBF-funded programs. The state began its Green Building Tax Credit Program in 2002. The income tax incentive is intended to spur growth of the green buildings market, including energy efficiency measures and incorporation of solar energy. This was the first state program of its kind and has been adapted by several other states. NYSERDA and the New York State Department of Environmental Conservation (DEC) administer the program. $25 million is available annually for the tax credit for buildings greater than 20,000 square feet (Brown et al. 2002). The PV credit is for 100% of the incremental cost of "building-integrated" PV modules (20% every year over a five-year period) with a cap of $3 per watt.

In addition, New York provides a personal income tax credit for solar PV systems. The credit is for 25% of equipment and installation costs, with qualified expenditures capped at $6 per watt. Any portion of the system cost that is funded by a grant (from any source) cannot be counted toward the tax credit.

New York also provides a 15-year property tax exemption for solar, wind, and biomass systems installed before January 1, 2006.

Web site:
http://www.dec.state.ny.us/website/ppu/grnbldg/

Grants, Buy-Downs, and Generation Incentives

Grants, buy-downs, and generation incentives provide funding and incentives to invest in energy efficiency and clean generation technologies. Typically, energy efficiency measures can be promoted through buy-downs (also known as rebates), while clean generation is supported through buy-downs and generation incentives.

California

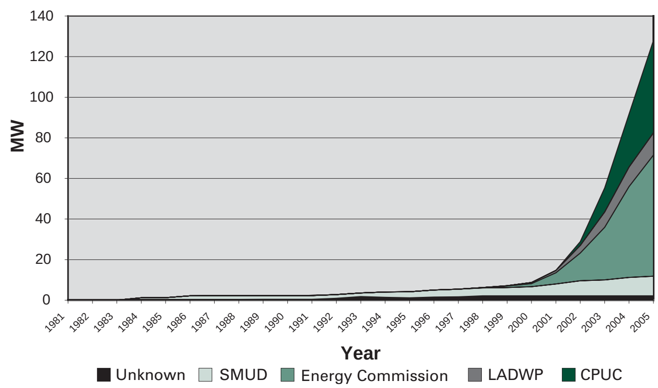
California operates a rebate program and a generation incentive program that, together with its PBF-funded Emerging Renewables Program, cover a broad range of renewable energy technologies from small customer-sited PV systems to large commercially owned wind and biomass facilities. (For more information on California's generation incentives program, the Supplemental Energy Payments program, and Emerging Renewables Program supply, see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*.)

The SGIP provides rebates for systems over 30 kW and up to 5 MW in size, including microturbines, small gas turbines, wind turbines, PV, and fuel cells. The program was authorized in 2001 by the CPUC and extended in 2003 by the state legislature. It provides $125 million per year for program administration and customer incentives. Funds are collected through an electricity distribution charge that is separate from the public goods charge and administered by the state's four investor-owned utilities. The rebate amounts vary depending on the technology. The rebate for solar PV, for example, is $3.50 per watt. As with the Emerging Renewables Program (see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*), the SGIP is available for service customers in investor-owned utility territories. The SGIP offers incentives to encourage customers to produce electricity with microturbines, small gas turbines, wind turbines, PV, fuel cells, and internal combustion engines. The incentive payments range from $1 per watt to $4.50 per watt, depending on the type of system. CHP systems are eligible for the lowest incentive payment. CHP systems must be between 30 kW and 5 MW to qualify. The SGIP has been instrumental in the increasing the number of small PV (between 30 kW and 1 MW) and CHP systems (5 MW or smaller) in the state. As of 2004, the program has supported 388 systems (235 PV, 1 wind turbine, 2 fuel cells, and 150 CHP systems) with a total online capacity of 103 MW, including 82 MW of PV capacity (CPUC 2005b). As shown in Figure 3.4.3, the total grid-connected PV capacity installed in California in 2005 was more than 130 MW (CEC 2005c).

Web sites:
http://www.ora.ca.gov/distgen/selfgen/sgips/index.htm

http://www.cpuc.ca.gov/static/energy/electric/050415_sceitron+sgip2004+impacts+final+report.pdf

Figure 3.4.3: Grid-Connected PV Capacity Installed in California *(cumulative)*



Source: CEC 2005c.

New York

NYSERDA implements a grant program to assist companies in developing, testing, and commercializing renewable energy technologies manufactured in New York. The program focuses on product and technology development rather than on installation of individual renewable energy systems. Projects are selected based on whether they will be commercially competitive in the near term and the ability of the company to achieve specific performance and quality milestones. Eligible technologies include solar thermal, PV, hydro, alternative fuels, wind, and biomass.

Web site:
http://www.nyserda.org/

Washington

Senate Bill 5101 (S.B.5101), signed in May 2005, established a base production incentive of $0.15/kWh (capped at $2,000 per year and roughly tailored to the yearly market output of a typical 3.5 kW PV system) for individuals, businesses, or local governments generating electricity from solar power, wind power or anaerobic digesters—the first use of this approach in a U.S. state. The incentive amount paid to the producer is adjusted based on how the electricity was generated by multiplying the incentive ($0.15/kWh) by the economic multipliers shown in Table 3.4.1.

The economic multipliers favor equipment manufactured in Washington, with the goal of developing a renewable manufacturing industry in the state. The incentives apply to power generated as of July 1, 2005 and remain in effect through June 30, 2014.

The Washington Department of Revenue (DOR) is responsible for submitting a report measuring the impacts of this legislation, including any change in the number of solar energy system manufacturing companies in Washington and the effects on job creation (e.g., the number of jobs created for Washington residents).

Publicly and privately owned utilities in Washington will pay the incentives and earn a tax credit equal to the cost of those payments. The credit may not exceed $25,000 or 0.025% of a utility's taxable power sales, whichever is larger. Increased sales tax revenues from an expanded renewable energy industry are expected to offset reductions in revenues from utility taxes (Broehl 2005, Washington 2005).

Table 3.4.1: Economic Multipliers Used for Washington's Production Incentive Program

Solar modules manufactured in Washington	2.4
Solar and wind generation equipped with inverters manufactured in Washington	1.2
Anaerobic digester and other solar equipment or wind generator equipment with blades manufactured in Washington	1.0
All other electricity generated by wind	0.8

Source: Washington 2005.

NO_x Set-Asides

New York

The New York State DEC administers the NO_x Budget Trading Program and allocates the state's NO_x emission allowances, which are partially set aside for energy-efficient projects. In 2003, the size of the set-aside was 3% of the state's NO_x trading program (1,241 tons). Sites that meet the emissions allowances criteria may apply for the allowances and then sell them to other NO_x-emitting sources for cash. Eligible sites include end-use energy efficiency projects, renewable energy projects, in-plant energy efficiency projects, and fossil fuel-fired electricity generating units that produce electricity more efficiently than the annual average heat rate attributable to all fossil fuel-fired electricity generated within New York State.

Web site:
http://www.dec.state.ny.us/

Supplemental Environmental Projects

Colorado

The state of Colorado adopted an SEP policy as part of its environmental enforcement and compliance assurance strategy. Colorado's Department of Public Health and Environment (CDPHE) uses decision criteria on a case-by-case basis to determine whether an SEP is appropriate. During routine inspections in 2000, a large Denver-based industrial gas compression company was found in violation of chlorofluorocarbon (CFC) emission regulations. The company was assessed a noncompliance fee of $30,000 and a civil penalty of $395,000. Through a settlement agreement with CDPHE, the company agreed to implement an SEP to reduce air pollution.

Under the settlement agreement, the company agreed to pay a mitigated civil penalty—80% of the total, or $303,360—into an interest-bearing escrow account managed by Public Service of Colorado. The SEP will now fund five years of wind energy purchases, or approximately 2,426,880 kWh of electricity. The agreement also stipulates that the energy comes from new wind generation facilities. Public Service of Colorado must use funds remaining in the escrow account after the fifth year (2005) to continue purchasing wind power. Interest that accrues on the escrow account is similarly invested.

Environmental and health benefits include avoided emissions of:

- 3,640 metric tons of CO_2
- 73 metric tons of SO_2
- 97 metric tons of NO_x

These emission reductions are equivalent to avoiding 58.2 million vehicle miles per year (NREL 2003).

The SEP wind purchase also instituted a process for streamlining future renewable energy purchases at the Public Service of Colorado. This will provide substantial administrative savings to both providers and customers.

Web site:
http://www.cdphe.state.co.us/el/cross_media/seps.html

What States Can Do

States have diversified what were originally simple grant or loan programs into a broader set of funding and incentive programs that encourage specific markets and customer groups to invest in energy efficiency and clean supply projects. The information in this *Guide* describes best practices for design, implementation, and evaluation; summarizes a wide range of state experiences with funding and incentive programs; and offers a variety of information resources on funding and incentive strategies. Based on these state examples, action steps for states that want to establish their own funding and incentives programs or strengthen and expand existing programs are described below.

Action Steps for States

States interested in creating or expanding clean energy funding and incentive programs can take the following steps:

- *Develop an Inventory of Current Financing and Incentive Programs.* Review existing programs and identify the need for new or expanded offerings. Conduct market research, as necessary, to identify these needs.
- *Design Funding and Incentive Programs Based on the Best Practices Developed by Other States.* States' experiences with funding and incentive programs provide a rich source of information on how to develop successful programs.
- *Identify and Secure Funding Sources*. This can be done via legislative and administrative initiatives, as appropriate. Seek to coordinate program targets and information collection efforts to avoid overlap and duplication.
- *Conduct Rigorous Evaluation*. Upon completion, report the results to policymakers, industry, and the public.

Information Resources

Information About States

Title/Description	URL Address
The Database of State Incentives for Renewable Energy (DSIRE). This database contains information on federal, state, and local incentives that promote renewable energy and energy efficiency. It provides information for all 50 states and is updated regularly.	http://www.dsireusa.org
Innovation, Renewable Energy, and State Investment: Case Studies of Leading Clean Energy Funds. This Lawrence Berkeley National Laboratory (LBNL) Web site contains case studies of various state clean energy funds.	http://eetd.lbl.gov/ea/EMS/reports/51493.pdf
The National Renewable Energy Laboratory (NREL), Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy. This NREL report presents state case studies on financial incentives for renewable energy. NREL/SR-620-32819. Gouchoe, S., V. Everette, and R. Haynes. 2002. NREL, DOE. September (vi).	http://www.nrel.gov/documents/profiles.html
Performance Contracting Legislation By State. This Oak Ridge National Laboratory Web site contains information on performance contracting legislation by state. The site includes links to legislation and state performance contracting legislation.	http://www.ornl.gov/info/esco/legislation/
State Environmental Resource Center Energy Efficiency Standards. This Web site offers the tools to bring energy efficiency standards to individual states. These tools include a model bill, talking points, press clips, a fact pack, links, and other background information.	http://www.serconline.org/efficiencystandards/pkg_frameset.html
Union of Concerned Scientists. This report assigns grades to each of the 50 states based on their commitment to supporting wind, solar, and other renewable energy sources. 2003. Plugging In Renewable Energy: Grading the States. May. Accessed September 14, 2005.	http://www.ucsusa.org/clean_energy/clean_energy_policies/plugging-in-renewable-energy-grading-the-states.html

General Information

Title/Description	URL Address
Designing Financial Incentives	
CESA Year One: A Report on Clean Energy Funds in the U.S. 2003–2004. Clean Energy States Alliance. August 2004.	http://www.cleanenergystates.org/library/Reports/CESA Year One Report Final.pdf
Energy Efficiency's Next Generation: Innovation at the State Level. This American Council for an Energy-Efficient Economy (ACEEE) report describes state energy efficiency activities. ACEEE, 2003. W. Prindle, N. Dietsch, R. Neal Elliot, M. Kushler, T. Langer, and S. Nadel. Report No. E031. ACEEE.	http://aceee.org/pubs/e031full.pdf
State Initiatives for Clean Energy Development. Final Project Report. October 2001. Prepared for Mainewatch Institute, Hallowell, ME by Ed Holt and Associates. The Maine Center for Economic Policy.	http://www.mecep.org/cleanenergy/initiatives_for_clean_ener.html
Revolving Loan Funds	
Iowa Energy Bank. This Iowa DNR Web site contains information about the Iowa Energy Bank.	http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/EBANK/index.html
Texas Revolving LoanSTAR. The Texas SECO administers the LoanSTAR program. Additional information about the program is available at SECO's Web site.	http://www.seco.cpa.state.tx.us/ls.htm
Texas Revolving LoanSTAR Conservation Update Feature Story. This DOE, EE/RE Web page presents a case study describing the Texas revolving loan fund program. January–February 2005.	http://www.eere.energy.gov/state_energy_program/feature_detail_info.cfm/start=1/fid=45
Energy Performance Contracting	
Energy Performance Contracting. The Energy Services Coalition is a nonprofit organization that promotes energy service performance contracting.	http://www.energyservicescoalition.org/
The National Association of Energy Service Companies (NAESCO). NAESCO is a trade association in the energy services industry, representing ESCOs, distribution companies, distributed generation companies, engineers, consultants, and finance companies. The Web site contains information on energy efficiency for buildings.	http://www.naesco.org
Performance Contracting Activities by State. This section of the Energy Services Coalition Web site provides information and resources about performance contracting programs by state.	http://www.energyservicescoalition.org/resources/states/activities.htm
Performance Contracting Legislation by State. This Oak Ridge National Laboratory Web site contains information on performance contracting legislation by state. The site includes links to legislation and state performance contracting legislation.	http://www.ornl.gov/info/esco/legislation/
Tax Incentives	
The Database of State Incentives for Renewable Energy. This Web site provides information on state, local, utility, and selected federal incentives that promote renewable energy and energy efficiency.	http://www.dsireusa.org/
State Environmental Resource Center Issue: Energy Efficiency Tax Incentives. This site includes a variety of examples of tax incentives and legislation that have been introduced by different states to decrease energy use.	http://www.serconline.org/energytaxincentives.html

Title/Description	URL Address
Tax Incentives *(continued)*	
State Taxation in a Changing U.S. Electric Power System: Policy Issues and Options. This paper includes an overview of state tax incentives related to electricity generation and describes options for designing incentives to support energy efficiency and renewable energy. M.H. Brown and C. Rewey. National Conference of State Legislatures, December 2004.	http://www.ncsl.org
Tax Credits for Energy Efficiency and Green Buildings: Opportunities for State Action. This ACEEE report analyzes state tax energy efficiency tax incentives provided by the states for the private sector. ACEEE, 2002. E. Brown, P. Quinlan, H.M. Sachs, and D. Williams. Report #E021, March. ACEEE.	http://aceee.org/pubs/e021full.pdf
Designing Financial Incentives	
Incentives, Mandates, and Government Programs Promoting Renewable Energy. This paper discusses major financial incentives used by federal and state governments and their effectiveness in promoting renewable energy.	http://www.eia.doe.gov/cneaf/solar.renewables/rea_issues/incent.html
U.S. Combined Heat and Power Association (USCHPA). This Web site provides information on federal policies, including tax incentives, designed to promote more widespread use of CHP systems.	http://uschpa.admgt.com/PolicyFed.htm
Grants, Buy Downs, and Generation Incentives	
ACEEE. ACEEE Energy Efficiency Program Database.	http://aceee.org/new/eedb.htm
California Energy Commission (CEC), Emerging Renewables Program. This site provides information about the Emerging Renewables Program (formerly called the "Emerging Renewables Buy-Down Program"), which was created to stimulate market demand for renewable energy systems by offering rebates to reduce the initial cost of the system to the customer.	http://www.energy.ca.gov/renewables/emerging_renewables.html
Connecticut Light and Power (CL&P). The CL&P Energy Efficiency at Work Web site describes the utility's Express Rebate Program. The programs offer CL&P business customers an opportunity to improve the energy efficiency of their stores or buildings.	http://www.cl-p.com/clmbus/express/indexexpress.asp#lighting
CPUC. The CPUC Web site provides information on CPUC activities and regulations.	http://www.cpuc.ca.gov/
CPUC Self-Generation Incentive Program. This site provides information about this California program to provide rebates to encourage distributed generation technologies.	http://www.ora.ca.gov/distgen/selfgen/sgips/index.htm
The New York State DEC. This Web site describes energy efficiency projects it administers, including details on the Green Building Initiative tax credits.	http://www.dec.state.ny.us/
Northwest Solar Center Web site. This site provides information on the use of solar energy in the Northwest. It contains information on Washington's production incentive program.	http://northwestsolarcenter.org/
NYSERDA. This Web site provides information on NYSERDA's projects, including those promoting energy efficiency.	http://www.nyserda.org/
Renewable Resources Development Report. This report by the CEC provides details on actions the state is taking to promote development of renewable energy generation, with particular focus on RPS.	http://www.energy.ca.gov/reports/2003-11-24_500-03-080F.pdf

Title/Description	URL Address
NO_x Set Asides for Energy Efficiency and Renewable Energy Projects	
Creating an Energy Efficiency and Renewable Energy Set-Aside in the NO_x Budget Trading Program (Draft, April 2000 EPA-430-K-00-004). This EPA guidance document contains additional details on designing the set-aside application process, allocating to eligible projects, translating energy savings into emission reductions, determining a time frame for implementation and awards, and establishing documentation and reporting procedures.	http://www.epa.gov/cleanenergy/stateandlocal/guidance.htm
Designing Measurement and Verification Requirements. This EPA document is under development and will provide additional guidance to states on options for measuring and verifying the potential emission reductions resulting from EE/RE projects.	URL not available.
Guidance on Establishing an Energy Efficiency and Renewable Energy (EE/RE) Set-Aside in the NO_x Budget Trading Program. March 1999. This EPA guidance document discusses the elements that a state may consider when deciding whether to establish an EE/RE set-aside and how it should be designed (e.g., the size of the set-aside, eligibility, and the length of awards).	http://www.epa.gov/cleanenergy/stateandlocal/guidance.htm
Supplemental Environmental Projects	
A Toolkit for States: Using Supplemental Environmental Projects (SEPs) to Promote Energy Efficiency and Renewable Energy. This EPA toolkit is intended to help state and local governments pursue energy efficiency or renewable energy projects through SEPs. It presents the case for pursuing energy efficiency and renewable energy within settlements, provides examples in which SEPs have been used to support such projects, offers additional ideas for projects, and includes a step-by-step regulatory “road map” for pursuing SEPs.	http://www.epa.gov/cleanenergy/pdf/sep_toolkit.pdf
Measurement and Verification (M&V)	
CALMAC Web Site. California’s statewide CALMAC evaluation clearinghouse contains resources for deemed savings and project-specific M&V techniques.	http://www.calmac.org/
Efficient Vermont Technical Reference User Manual. TRM 4-19, published by Efficiency Vermont, 255 S. Champlain Street, Burlington, VT 05401-4717 phone (888) 921-5990. Vermont provides a set of deemed-savings methods in this manual.	http://www.efficiencyvermont.org/ or contact Efficiency Vermont at 1-888-921-5990.
International Performance Measurement and Verification Protocol (IPMVP) Web Site. IPMVP Inc. is a nonprofit organization that develops products and services to aid in the M&V of energy and water savings resulting from energy/water efficiency projects—both retrofits and new construction. The site contains the IPMVP, a series of documents for use in developing an M&V strategy, monitoring indoor environmental quality, and quantifying emission reductions.	http://www.ipmvp.org
M&V Resources and Training Opportunities. DOE FEMP, Revision 5, June 16, 2003. This document describes and provides links to numerous resources on the engineering techniques and tools used for verification of energy savings.	http://ateam.lbl.gov/mv/docs/MV_Resource_ListR6

Examples of Legislation

State	Title/Description	URL Address
Revolving Loan Funds		
Iowa	**State Facilities Legislation** is the enabling legislation for state buildings energy management program.	http://www.state.ia.us/dnr/energy/MAIN/PROGRAMS/BEM/EBANK/LEG.PDF
Montana	**Senate Bill 506 in 2001** established an Alternative Energy Loan Fund.	http://data.opi.state.mt.us/bills/2001/billhtml/SB0506.htm
	Senate Bill 50 in 2005 amended the Alternative Energy Loan Fund.	http://data.opi.state.mt.us/bills/2005/billhtml/SB0050.htm
Texas	**Texas Administrative Code.** Subchapter Loan Program for Energy Retrofits. This subchapter describes the Texas revolving loan program for energy efficiency retrofits.	http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=5&ti=34&pt=1&ch=19&sch=D&rl=Y
Tax Incentives		
Maryland	**2001 Clean Energy Incentive Act** established tax incentives for energy-efficient equipment.	http://mlis.state.md.us/PDF-documents/2000rs/bills/hb/hb0020e.pdf
	2001 Green Building Tax Credit provides tax credits for buildings meeting aggressive energy efficiency standards. See text of House Bill 8.	http://mlis.state.md.us/2001rs/bills/hb/hb0008e.rtf
New York	**The New York Assembly** passed the Green Building Tax Credit legislation in May 2000.	http://www.dec.state.ny.us/website/ppu/grnbldg/a11006.pdf
Oregon	**1980 legislation** established the BETC. In 2001, green buildings were added to the BETC. See Oregon Revised Statute 469.	http://www.leg.state.or.us/ors/469.html
Performance Contracting		
Colorado	**Enabling legislation for performance contracting.** (See Title 29 Local Government 29-12.5-101, 29-12.5-102, 29-12.5-103, 29-12.5-104, and Title 24 State Government 24-30-2001, 24-30-2002, 24-30-2003.)	http://198.187.128.12/colorado/lpext.dll?f=templates&fn=fs-main.htm&2.0.
Washington	**Engrossed House Bill 2247-Energy Audits, 2001** is that state's enabling legislation for performance contracting.	http://www.leg.wa.gov/pub/billinfo/2001-02/House/2225-2249/2247_pl_09252001.txt
Grants and Rebates (Buy Downs)		
California	**The California Solar Center** tracks some of the legislation passed for financial incentives for solar in California.	http://www.californiasolarcenter.org/legislation.html
	Legislation for the Supplemental Energy Payments Program.	http://www.dsireusa.org/library/docs/incentives/CA22F.pdf (Senate Bill No. 1038) http://www.dsireusa.org/library/docs/incentives/CA22Fa.pdf (Senate Bill No. 078)
Massachusetts	**MTC's Commercial, Industrial, and Institutional Initiative (CI3).**	http://www.masstech.org/renewableenergy/CI3.htm

State	Title/Description	URL Address
Grants and Rebates (Buy Downs) *(continued)*		
New York	**The New York State Environmental Conservation Law** (§§ 1-0101, 3-0301, 19-0103,19-0105, 19-0305, 19-0311) provides the New York DEC's authority.	http://www.dec.state.ny.us/website/regs
	NYSERDA has information about its funding program.	http://www.powernaturally.com/Funding/funding.asp?i=2
Washington	**Senate Bill 5101 Providing Incentives to Support Renewable Energy.** This bill establishes production incentives and economic multipliers for renewable energy.	http://www.leg.wa.gov/wsladm/billinfo1/dspBillSummary.cfm?billnumber=51018year=2005

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EPA 2005c. Fact Sheet: The Federal NO_x Budget Trading Program, EPA web site.	http://www.epa.gov/airmarkets/fednox/fnbtp-fact.pdf
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Washington HB 2247. 2001. Washington's Engrossed House Bill 2247—Energy Audits.	http://www.leg.wa.gov/pub/billinfo/2001-02/House/2225-2249/2247_pl_09252001.txt
Webster, L. 2003. Measurement & Verification Resources and Training Opportunities. Prepared for DOE FEMP. Revision 5, June 16.	http://ateam.lbl.gov/mv/docs/MV_Resource_ListR5a.htm#_Toc43606797

Chapter 4. Energy Efficiency Actions

Saving energy through energy efficiency improvements can cost less than generating, transmitting, and distributing energy from power plants and provides multiple economic and environmental benefits. States have adopted a number of policies that support cost-effective energy efficiency programs by removing key market, regulatory, and institutional barriers that hinder investment in cost-effective energy efficiency by consumers, businesses, utilities, and public agencies. This chapter presents in-depth descriptions of four policies that states have used to support greater investment in and adoption of energy efficiency.

The policies summarized in Table 4.1 on page 4-2 were selected from among a larger universe of energy efficiency strategies because of their proven effectiveness and their successful implementation by a number of states. The information presented in each policy description is based on the experiences and best practices of states that are implementing the programs, as well as on other sources, including local, regional, and federal agencies and organizations, research foundations and nonprofit organizations, universities, and utilities.

Table 4.1 also lists examples of some of the states that have implemented programs for each policy. States can refer to this table for an overview of the policies described in this chapter and to identify other states that they may want to contact for additional information about their energy efficiency programs. The *For More Information* column shows the *Guide to Action* section where each in-depth policy description is located.

In addition to these four policies, there are a number of other policies that states are adopting to (1) ensure energy efficiency programs are adequately funded, (2) allow energy efficiency to compete in the energy marketplace, (3) integrate energy efficiency measures into energy and air quality planning, and (4) lead by example by improving energy efficiency and lowering energy costs within state government operations. These policies are addressed in other sections of the *Guide to Action* as follows.

Clean Energy Policies

Type of Policy	For More Information
State Planning and Incentive Structures	
Lead by Example	Section 3.1
State and Regional Energy Planning	Section 3.2
Determining the Air Quality Benefits of Clean Energy	Section 3.3
Funding and Incentives	Section 3.4
Energy Efficiency Actions	
Energy Efficiency Portfolio Standards	**Section 4.1**
Public Benefits Funds for Energy Efficiency	**Section 4.2**
Building Codes for Energy Efficiency	**Section 4.3**
State Appliance Efficiency Standards	**Section 4.4**
Energy Supply Actions	
Renewable Portfolio Standards	Section 5.1
PBFs for State Clean Energy Supply Programs	Section 5.2
Output-Based Environmental Regulations to Support Clean Energy Supply	Section 5.3
Interconnection Standards	Section 5.4
Fostering Green Power Markets	Section 5.5
Utility Planning and Incentive Structures	
Portfolio Management Strategies	Section 6.1
Utility Incentives for Demand-Side Resources	Section 6.2
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	Section 6.3

- *Lead by Example* programs provide opportunities to improve energy efficiency within state buildings, fleets, and equipment purchases (see Section 3.1).
- *State and Regional Energy Planning* activities help states identify opportunities to incorporate energy efficiency measures as a way to meet future load growth and address other energy related concerns (see Section 3.2).
- *Determining the Air Quality Benefits of Clean Energy* describes how to incorporate the emission reductions from energy efficiency into air quality planning and related activities (see Section 3.3).
- *Funding and Incentives* describes additional ways states provide funding for energy efficiency through loans, tax incentives, and other funding mechanisms (see Section 3.4).
- *Portfolio Management Strategies* include proven approaches, such as Integrated Resource Planning (IRP), that place a broad array of supply and demand options on a level playing field when comparing and evaluating them in terms of their ability to meet projected energy demand. These strategies highlight and quantify the value of energy efficiency and clean distributed generation as a resource to meet projected load growth (see Section 6.1).
- *Utility Incentives for Demand-Side Resources* presents a number of approaches (including decoupling and performance incentives) that remove disincentives for utilities to consider energy efficiency, renewable energy, and clean distributed generation (DG) equally with traditional electricity generation investments when making electricity market resource planning decisions (see Section 6.2).

Table 4.1: Energy Efficiency Policies and Programs

Policy	Description	State Examples	For More Information
Energy Efficiency Portfolio Standards (EEPS)	Similar to Renewable Portfolio Standards (see Section 5.1), EEPS direct energy providers to meet a specific portion of their electricity demand through energy efficiency. Seven states have direct or indirect EEPS requirements.	CA, IL, NJ, NV, PA, TX	Section 4.1
Public Benefits Funds (PBFs) for Energy Efficiency	PBFs for energy efficiency are pools of resources used by states to invest in energy efficiency programs and projects and are typically created by levying a small charge on customers' electricity bills. Seventeen states and Washington, D.C. have established PBFs for energy efficiency.	CA, NY, OR, WI	Section 4.2
Building Codes for Energy Efficiency	Building energy codes establish energy standards for residential and commercial buildings, thereby setting a minimum level of energy efficiency and locking in future energy savings at the time of new construction or renovation. More than 40 states have implemented some level of building codes for residential buildings and/or commercial buildings.	AZ, CA, OR, TX, WA	Section 4.3
State Appliance Efficiency Standards	State appliance efficiency standards set minimum energy efficiency standards for equipment and appliances that are not covered by federal efficiency standards. Ten states have adopted appliance standards.	CA, CT, NJ, NY	Section 4.4

4.1 Energy Efficiency Portfolio Standards

Effectively designed Energy Efficiency Portfolio Standards (EEPS) can help ensure that cost-effective energy efficiency opportunities are pursued to help manage electricity demand growth, lower overall and peak electricity prices, cut emissions, and address reliability concerns.

Policy Description and Objective

Summary

A growing number of states are adopting EEPS,[8] or similar provisions, to ensure that cost-effective energy efficiency measures are used to help offset growing electricity demand. Similar to renewable portfolio standards (RPS) already in place in 21 states and Washington, D.C. (see Section 5.1, *Renewable Portfolio Standards*), EEPS require that energy providers meet a specific portion of their electricity demand through energy efficiency. EEPS are intended to help overcome the various barriers that keep utilities and other players from investing in cost-effective energy efficiency that several studies predict could meet up to 20% of the nation's energy demand, or about half of the expected demand growth (Nadel et al. 2004). States have found that establishing explicit targets, based on sound analysis of technical and economic potential, can help reduce energy demand as well as lower electricity prices, cut emissions, help address concerns with system reliability, and provide other energy-related benefits (see Chapter 1, *Introduction and Background*, for more on the benefits of energy efficiency).

EEPS designs vary by state and include targets that range from the equivalent of a 10% to a 50% reduction in energy demand growth. EEPS were first set in Texas as energy efficiency goals under their 1999 restructuring rules. Texas required utilities to use energy efficiency to meet 10% of their demand growth in by 2004. California adopted annual energy savings goals for 2004 to 2013 for their four largest utilities covering both electricity and natural gas providers (the only state to include both). California's targets, set in terms of kilowatt-hours (kWh) and therms saved based on percentages of total sales, are expected to reduce demand growth by more than 50% for electricity and more than 40% for natural gas. Connecticut recently required its energy providers to meet a portion of their supply (i.e., 1% in 2007 growing to 4% by 2010) from distributed resources, including energy efficiency from commercial and industrial facilities, load management, and combined heat and power (CHP). Illinois recently adopted voluntary EEPS that call for energy efficiency to meet 25% of electricity demand growth by 2015. New Jersey is examining EEPS based on kWh saved as a component of its public benefits fund (PBF) program (see Section 4.2, *Public Benefits Funds for Energy Efficiency).* Pennsylvania includes energy efficiency as one option for meeting its Alternative Energy Portfolio Standard. In at least two states, Hawaii and Nevada, utilities can use energy efficiency to meet some or all of their requirements under an RPS (see Section 5.1, *Renewable Portfolio Standards*).

While the benefits of energy efficiency measures are well documented, Texas is the one state in which standards have been in place long enough to measure results from an EEPS approach. The 10% reduction in load growth goal was exceeded in 2004 and, in that year, Texas saved more than 400 million kWh at a cost of $82 million, for a net benefit of $76 million to date (Gross 2005b). The cumulative effect of California's 10-year EEPS is estimated, by 2013, to result in annual savings of over 23,000 gigawatt-hours (GWh) electricity and 400 million therms natural gas. Peak electricity demand savings are expected to top 4,800 megawatts (MW) (CPUC 2004).

8 In this *Guide to Action,* the term "Energy Efficiency Portfolio Standards" covers a variety of terms including portfolio standards and resource acquisition requirements and goals.

The Illinois EEPS is estimated to save more than 5,600 GWh by 2017. The energy savings will reduce energy costs for consumers, including significant reductions in prices for natural gas.

Objective

EEPS are intended to overcome barriers to investing in cost-effective energy efficiency. A number of recent studies have indicated that technically feasible, economically viable, but as yet untapped, energy efficiency measures could meet up to 20% of the nation's energy demand, or about half of the expected demand growth (Nadel et al. 2004). However, in many states, market barriers, regulatory disincentives, or insufficient information about the benefits of energy efficiency keep utilities and other players from investing in cost-effective energy efficiency to its full potential. States have found that establishing an explicit, mandatory target, based on sound analysis of technical and economic potential, can help overcome these barriers. In some cases, states have combined EEPS with additional policy measures such as PBFs and rate adjustments that decouple utility sales and profits to help further address these barriers. (See Section 6.2, *Utility Incentives for Demand-Side Resources*.)

Benefits

By increasing investments in cost-effective energy efficiency, EEPS can achieve modest to significant reductions in both electricity and natural gas (depending upon the level of the target). Associated with the reduction in power demand are additional benefits including: lower energy bills, reduced air pollutant and greenhouse gas emissions, reduced strain on power grids, and lower wholesale energy prices (see Chapter 1, *Introduction and Background*, for more on the benefits of energy efficiency). Beyond the benefits tied to reduced energy use, states have found EEPS have a number of particular advantages as a policy approach including: simplicity, cost-effectiveness, specificity, economies of scale, and economies of scope.

- *Electricity Savings*. The amount of electricity savings from EEPS depend on the level and timing of the EEPS targets, how the target is expressed, the actual level of demand growth, and other market forces. In the electricity sector, EEPS goals currently range from 10% of forecast electricity sales *growth* (e.g., in Texas) to almost 1% of total electricity *sales* annually (e.g., in California where this amounts to more than 50% of projected growth). See Table 4.1.1 on page 4-6 for a summary of current targets.
- *Natural Gas Savings.* EEPS for natural gas providers, such as the one adopted by California, will help reduce direct natural gas use. In addition, EEPS for electricity can help reduce natural gas used in electricity generation. In general, one unit of electricity saved through energy efficiency saves about three units of natural gas used for electricity generation due to generation and transmission losses. This makes saving natural gas through electric energy efficiency very cost-effective. A recent study shows that the majority of cost-effective natural gas savings would come through electricity end-use efficiency investments (Elliot et al. 2003).
- *Simplicity.* EEPS create a straightforward resource acquisition target for energy providers.
- *Cost-Effectiveness*. Setting an energy efficiency requirement without explicitly setting aside a pool of funds challenges electricity providers to meet the goal in the most cost-efficient manner. This can be reinforced through appropriate funding and cost recovery mechanisms, as noted on page 4-8.
- *Specificity.* By articulating a specific, numeric target, EEPS can be effective in illuminating how much energy efficiency will contribute to reaching goals of energy demand reduction as well as emission reductions and other public policy goals.
- *Economies of Scale.* The macro-level targets inherent in EEPS allow energy providers to aggregate savings across enough end-uses and sectors to meet the overall savings goals cost-effectively. This helps address a fundamental barrier to energy efficiency resource development: the distributed nature of energy efficiency resources. Securing substantial energy efficiency gains in every end-use and use sector involves millions of homes, offices, factories, and other facilities and thus can

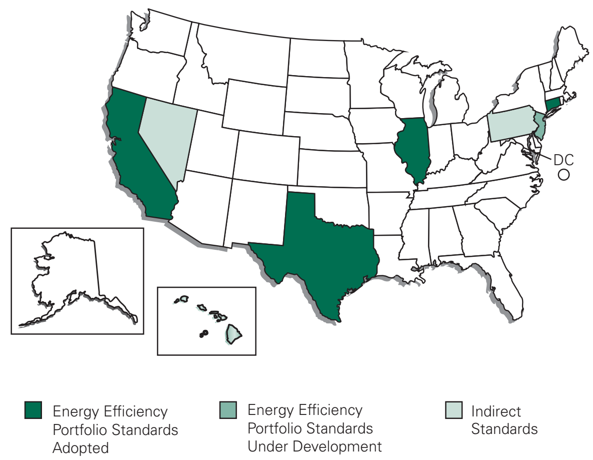
be difficult when approached at a micro-level. States sometimes designate an aggregator, such as a distribution utility, with the responsibility for reaping these savings as a means of overcoming this obstacle. On the administration side, EEPS allow a state to bundle energy efficiency opportunities, and set overall goals for procuring energy efficiency within the state, coordinating the process and simplifying compliance evaluation.

States with Energy Efficiency Portfolio Standards

As noted in the previous section, EEPS designs vary by state and include targets that range from the equivalent of a 10% to a 50% reduction in energy demand growth. Seven states have adopted EEPS, either directly or indirectly (see Figure 4.1.1). Texas and California have EEPS in place; Connecticut recently enacted a distributed RPS that includes energy efficiency, load management, and CHP; Illinois recently adopted a voluntary EEPS; New Jersey is examining EEPS as a component of its PBF program; Pennsylvania includes energy efficiency as one option for meeting its Alternative Energy Portfolio Standard (AEPS); and in Hawaii and Nevada, utilities can use energy efficiency to meet some or all of their requirements under an RPS. In addition, several states with PBFs have conducted energy efficiency analyses, potential studies, and goal-setting exercises, but energy efficiency goals have not been prominently featured. See Table 4.1.1 on page 4-6 for more details.

EEPS policies have been developed primarily in states with restructured utility markets, generally as a partial replacement for the Integrated Resource Planning (IRP) requirements that were removed as part of restructuring. California, which suspended its restructuring policy after its 2001 electricity experience, is an exception, as are Hawaii and Nevada. In restructured markets, the EEPS approach is being integrated into broader energy resource planning activities such as portfolio management, described in Section 6.1, *Portfolio Management Strategies*. Under the IRP framework in place in most traditionally regulated states, efficiency investment levels are typically based on the total level of savings that can be acquired within the bounds of economic criteria. States use similar kinds of economic analysis to develop estimates of efficiency potential in the process of setting EEPS goals. The difference is that the EEPS process tends to set goals in an aggregate, top-down fashion, whereas regulated utility programs are typically developed on an individual, bottom-up basis.

Figure 4.1.1: States That Have Adopted or Are Developing EEPS



Source: EPA 2005.

Designing an Effective EEPS

A number of key design issues have emerged from EEPS efforts to date or are central to the design of any efficiency program, including: who participates in different aspects of the process; how to set a target, including its coverage, timing, and duration as well as what analysis to consult; potential funding sources; and how the policy interacts with federal and other state policies. Although there are only a few EEPS in place, they share a number of characteristics that other states have considered when designing a program. States have also drawn upon their own past experience with designing and administering energy efficiency programs.

Participants

- *State Legislatures.* In many states, legislation is required to enable the setting of EEPS targets.

Table 4.1.1: Current and Pending State EEPS Policies

State	EEPS Description	Applies to	Savings Target	Time Frame
California	Sets specific energy and demand savings goals	Investor-owned utilities (IOUs)	Savings goals set for each program year from 2004 to 2013 The savings target for program year 2013 is: • 23,183 GWh 4,885 MW peak • 444 million therms	2004-2013 Annual megawatt-hours (MWh), MW, and therm savings adopted for each of these years
Connecticut	Includes energy efficiency at commercial and financial facilities as one eligible source under its Distributed RPS (also includes combined heat and power and load management programs)	IOUs	Savings goals set for the beginning of each program year:	
			1%	2007
			2%	2008
			3%	2009
			4%	2010 and thereafter
Hawaii	Allows efficiency to qualify as a resource under RPS requirements	IOUs	20% of kWh sales (overall RPS target, energy efficiency portion not specified)	2020
Illinois	Will set goals as percentage of forecast load growth	IOUs	10%	2006–2008
			15%	2009–2011
			20%	2012–2014
			25%	2015–2017
New Jersey	Will set energy and demand goals for overall PBF program	PBF program administrators (based on competitive solicitation; originally it was IOUs)	1814 GWh (four-year total)	2005–2008
Nevada	Redefines portfolio standard to include energy efficiency as well as renewable energy	IOUs	Energy efficiency can meet up to 25% of the energy provider's portfolio standard:	
			6%	2005–2006
			9%	2007–2008
			12%	2009–2010
			15%	2011–2012
			18%	2013–2014
			20%	2015 and thereafter
Pennsylvania	Includes energy efficiency as part of a two-tier AEPS	IOUs	4.2%	Years 1–4
			6.2%	Years 5–9
			8.2%	Years 10–14
			10.0%	Years 15 and thereafter
Texas	Sets goals as percentage of forecast load growth	IOUs	10%	2004 and thereafter

Note: See *Examples of Legislation/Regulation* for each state on page 4-16.

Legislatures have either set EEPS targets in legislative language or directed an executive agency to do so. In either case, states have clearly designated an executive agency to work out details and administer implementation of the targets.

- *Public Utility Commissions (PUCs).* PUCs in many other states have the authority to set EEPS directly. PUCs are a likely agency to administer EEPS, given their oversight role of utility markets.
- *Utilities.* Given the direct impact on the utility sector, legislatures and PUCs have sought input on the impacts on utility profitability and ongoing operations when designing an EEPS, as well as developing accompanying ratemaking and other regulatory policies. Utilities may directly implement the ensuing energy efficiency programs or states may require them to utilize energy service companies. Efforts typically include standard offer or market transformation programs (see description of Texas program on page 4-13 for more detail).
- *Customers/General Public.* States have created public comment processes to help inform topics such as potential costs/economic impacts and benefits, including health benefits and other effects of reduced emissions.
- *Public Interest Organizations.* Groups representing consumers, environmental interests, and other public interests have been involved to offer technical expertise as well as public perspectives.

Setting a Target

Under EEPS, a state utility commission or other regulatory body specifies numerical energy savings targets that electricity service providers must meet, on an annual and sometimes cumulative basis. EEPS can be set as a percentage of load growth or base year sales, or as a fixed number of units of energy savings (e.g., kWh), the latter having the advantage of the actual energy savings being known in advance. Targets can also cover peak electricity demand (e.g., MW capacity). The appropriate EEPS target depends upon a number of factors including the economically achievable energy efficiency potential, funding availability, emission reduction goals, and other issues including how to treat any existing energy efficiency requirements (e.g., if a robust PBF program or utility program is in place). Key issues to consider include determining how and what analysis to conduct, establishing coverage, deciding the timing and duration of the targets, and addressing funding and related cost recovery issues.

Analysis of Efficiency Potential and Benefits

States have set EEPS based on solid analysis and program experience within the state or in states believed to be comparable. The analysis typically has included a robust study of energy efficiency potential (technically, economically, and practically achievable)[9], combined with a review of past program experience with energy efficiency measures. California's electricity EEPS are designed to capture 70% of the economic potential for electric energy savings over their 10-year period. California's natural gas EEPS are designed to capture approximately 40% of the maximum achievable potential, in recognition that the need to ramp up efforts may take longer than on the electric side.

In addition to estimating efficiency resource potential, states have estimated other benefits such as expected emission reductions, reduced power prices and total power costs, and net economic benefits such as increased gross state product and increased jobs and wages, using power-sector models and economic impact models (see Chapter 2, *Developing a Clean Energy-Environment Action Plan*, and Section 3.3, *Determining the Air Quality Benefits of Clean Energy*). California's goals were established by considering both per capita energy reduction goals and cost-effectiveness at various reduction levels.

9 These are tiers that represent what is first, technically achievable, and of that subset, what is second, economically achievable, and of that subset, finally, what is practically achievable. For more information, see Appendix B, *Energy Efficiency Program Resources*.

Coverage

The coverage of an EEPS depends on the entities under the state's jurisdiction. In the majority of states, state utility commissions typically do not have authority to set requirements for municipal, federally owned, or rural cooperative utilities (although many states do have authority). For this reason, EEPS requirements tend to be assigned to investor-owned utilities. Most EEPS have covered electric utilities alone, although California has set savings goals for both electric and gas utilities.

States have sometimes included provisions to ensure that the energy efficiency measures used (and hence the energy bill savings) are distributed among customer classes (e.g., residential, industrial, commercial) and income levels.

Timing and Duration

Determining the timing and duration of EEPS includes considering the time it can take to achieve energy savings. Generally only a portion of the total energy savings potential can be realized in a given year because of the length of market cycles, limits on funding, and other real-world considerations. Reviewing regulatory compliance deadlines and the achievable efficiency potentials for specific years can help inform these considerations.

Funding

Establishing regulatory mechanisms and/or funding sources for utility or public programs to help achieve the efficiency resource goals is another key issue states have encountered. Different approaches have included one or more of the following: utilizing resources under a state PBF, allowing for cost recovery as part of utility rates, providing direct funding, and establishing regulatory provisions that decouple utility profits from sales volumes (see Section 4.2, *Public Benefits Funds for Energy Efficiency*, and Section 6.2, *Utility Incentives for Demand-Side Resources)*.

Program design may or may not involve defining how funds will be raised, spent, and accounted for in meeting EEPS goals. In California, for example, the PUC requires the utilities to invest in cost-effective energy efficiency as a procurement resource using procurement funds that would otherwise go to purchase power; the utilities also use PBFs and efficiency resource acquisition funds to meet the overall goals.

Best Practices: Designing an EEPS

While states have had limited experiences with EEPS as a top-level policy mechanism to date, they have accumulated numerous experiences related to the technologies, programs, and implementation issues related to EEPS goals. In this context, best practices include:

- Obtain top-level commitment to EEPS as a state policy goal, through the legislature, utility commission, or other cognizant bodies.
- Involve key stakeholders early in the development process and provide for continuing stakeholder involvement.
- Use sound analysis, including emissions modeling, economic analysis, and efficiency potential studies, to provide a strong quantitative basis for the EEPS goal.
- Set energy savings goals linked to available, cost-effective potential, based on both quantitative analysis and stakeholder input.
- Use a clear basis for stating goals. Most states specify EEPS goals as a percentage of base-year energy sales or of forecast energy sales growth. Convert EEPS goals to annual energy savings goals and establish methods for converting energy savings to emission reductions.
- Establish an appropriately long time frame to overcome longer market cycles, funding limits and practical considerations, and set annual and cumulative savings goals (e.g., California uses a 10-year time frame with a three-year update cycle).
- Ensure that workable funding methods are available to meet the EEPS goal. The state PUC (or other oversight body) typically performs this task.
- Specify the entities that are responsible for meeting the target and the procurement rules they must follow.

Interaction with Federal Policies

A variety of federal programs, partnerships, and technical assistance are available to help states achieve their energy efficiency goals. The ENERGY STAR program, for example, offers technical specifications, certification processes, and market development assistance to states and other partners for a range of products and whole-building solutions. (See Section 4.2, *Public Benefits Funds for Energy Efficiency*, for a broader discussion of ENERGY STAR activities.)

As with other energy efficiency measures, to the extent that EEPS produce verifiable capacity savings, they can have favorable reliability and resource adequacy implications reflected in federally jurisdictional wholesale markets overseen by Federal Energy Regulatory Commission (FERC), North American Electric Reliability Council (NERC) and the regional reliability organizations, regional transmission organizations (RTOs), and transmission owning companies.

Interaction with State Policies

EEPS can complement other energy efficiency policies and serve as a framework for a suite of policies and programs. EEPS can be goals for PBF-supported programs or can be additional resource goals beyond savings realized through PBF programs. In addition, some states with EEPS have allowed utilities to recover costs through ratemaking procedures (see Texas example on page 4-13). In some cases, states have pursued decoupling policies to address adverse revenue and profit impacts on investor-owned utilities from EEPS implementation (see Section 6.2, *Utility Incentives for Demand-Side Resources*).

Program Implementation and Evaluation

The implementation of an EEPS occurs primarily through designated utilities and other energy services providers. However, continued state involvement is important in overseeing the development of implementation rules and may be important in ensuring the necessary funding is available. In Texas, for example, where the electric distribution utilities must meet the EEPS goals, the utility commission is actively involved in determining how resources can be acquired, including defining the means by which covered entities are allowed to comply with goals; defining and implementing reporting requirements; and defining measurement, verification, and other evaluation methods by which compliance will be determined.

Measurement and verification (M&V) is a key aspect in evaluating EEPS. In particular, where EEPS are tied to tradable (energy efficiency) credits, robust measurement and verification is critical to maintaining credibility for the market and commodity. (See the *Approaches to Measurement and Verification [M&V]* box on page 4-10 for more detailed information on the approaches states are using for M&V.)

Oversight

It is also likely that some form of oversight will be needed in the implementation of EEPS. States have decided to establish official oversight or advisory bodies, typically composed of stakeholders who periodically review the EEPS program to determine whether its goals are being met, whether its goals should be renewed or adjusted, and whether other aspects of implementation need modification.

Best Practices: Implementing an EEPS

- Use a clear basis for assessing compliance.
- Update goals on a regular basis (e.g., California uses a three-year cycle) to adjust for changes in economic growth, actual savings, and results of measurement and evaluation studies.
- Ensure additionality (e.g., net new energy savings) by stipulating that savings allowed to qualify for EEPS goals must be over and above any existing program commitments.
- Coordinate EEPS with market transformation programs, PBFs, and other programs to facilitate the market changes that are needed to reach EEPS goals.
- Ensure that electricity and natural gas demand forecasts used in supply-side resource filings reflect the energy savings goals.

Approaches to Measurement and Verification (M&V)

The two principal approaches for measuring and verifying energy efficiency measures are the "deemed savings" approach and the project-specific approach. The deemed savings approach involves estimating energy savings by combining verification that the energy efficiency measure has been installed and can be attributed to the program with the pre-calculated or "deemed" savings from using that measure. This approach can provide an accurate estimate of avoided consumption while minimizing the complexity and cost of M&V by drawing on the extensive field experience from other states. However, it is most appropriate for use with simpler measures whose performance characteristics are consistent in varying applications: a residential lighting retrofit is a typical example.

Deemed savings are calculated by subtracting the energy use of the energy-efficient fixture from the energy use of the baseline fixture. Baseline energy usage and reduced energy usage can be easily calculated based on the deemed savings per fixture, hours of use, and number of installed fixtures. It is also possible to build factors into deemed savings methods to account for persistence of savings, failure rates, free riders, spillover effects, and other issues that can modify total energy impacts. Field evaluation data on many types of efficiency measures are available and can be used to estimate discount factors for a given sample of efficiency measures.

A project-specific M&V method is most widely used for larger and more complex energy efficiency investments. The most well known and referenced M&V document is the International Performance Measurement and Verification Protocol (IPMVP). The IPMVP provides an overview of current best practice techniques available for verifying results of energy efficiency, water efficiency, and renewable energy projects in commercial and industrial facilities. The IPMVP was developed with sponsorship of the U.S. Department of Energy (DOE) and is currently managed by a nonprofit organization that is continually developing new sections for publication as publicly available documents (IPMVP 2005).

Some states use their own project-based M&V system. For example, Texas provides detailed guidance on how to prepare and execute an M&V plan (Texas PUC 2005). California also maintains project-specific M&V resources on its California Measurement Advisory Council (CALMAC) Web site (CALMAC 2005).

Best Practices: Evaluating EEPS Policies

- Design programs under the EEPS policy with evaluation in mind, by building in key tracking and reporting practices that establish baselines for affected markets and technologies and provide the data needed to assess program impacts.
- Draw on other states' experiences to establish rigorous and workable measurement, verification and reporting protocols (e.g., proof of installation, deemed savings, IPMVP). California uses statewide evaluation guidelines for this purpose (see California Public Utilities Commission [CPUC] Web site).
- In addition to quantitative impact evaluation, provide for a qualitative evaluation process that enables program administrators to obtain useful feedback and improve program effectiveness over time.
- Evaluate programs operated under an EEPS policy at appropriate intervals, so that agency overseers can gauge compliance with energy savings goals.
- Utilize an independent, third-party verifier to help build confidence in results. (See text box, *Approaches to Measurement and Verification [M&V].*)
- Provide for adequate program funding.
- Based on evaluation results, provide feedback to oversight agencies, program administrators, and other participants. Adjust future energy savings goals, as needed.

State Examples

California

California's EEPS emerged from the state's "post-restructuring" resource planning process. Following the state's 2001 electricity problems, the Legislature and the CPUC reviewed the state's overall utility resource planning process and decided to re-engage investor-owned utilities in managing a portfolio of resources to meet customers' needs, including procurement of energy efficiency resources. The CPUC also adopted "decoupling" ratemaking mechanisms that break the link between the utilities' revenues and sales, removing disincentives for utility investments in energy efficiency. (See Section 6.2, *Utility Incentives for Demand-Side Resources.*)

The California EEPS sets ambitious energy savings goals for both electric and gas utilities. Taking direction from the California Energy Action Plan (EAP) and extensive analysis of the economic and achievable potential for energy efficiency, as well as considerations of extensive stakeholder input, the CPUC adopted annual energy savings goals for the state's four largest IOUs. Utility procurement funds are allocated, in addition to California's existing PBF, to achieve these goals and goals for cost-effective efficiency resources. Each IOU acts both as a portfolio manager and program administrator. In doing so, the IOUs assemble their respective portfolios and seek approval for them from the CPUC. The energy efficiency portfolio of programs must meet California's cost-effectiveness tests, and funding source (procurement vs. public benefits) is not a determining factor in approval by the CPUC. The rules that govern all aspects of portfolio management and program administration are found in the CPUC policy manual. The energy savings goals were adopted by the CPUC and established through a collaborative effort with the California Energy Commission (CEC) and with input from key stakeholders (e.g., utilities, environmental groups, and businesses) (CPUC 2004).

Energy efficiency goals are targeted for each year from 2004 to 2013. The cumulative effect of the programs funded from 2004 to 2013 is estimated to result in annual savings in program year 2013 of 23,183 GWh; 4,885 MW of peak demand; and 444 million therms natural gas. These 10-year goals are projected to meet 54% to 59% of the IOUs' electricity sales growth by 2013 and 44% of natural gas sales growth. Program administrators from each IOU are required to submit energy efficiency program plans and funding levels to the PUC.

Also included in the EAP adopted by the CPUC and the CEC, a "loading order" for energy resources was established in which cost-effective energy efficiency and conservation resources are to be selected first, followed by renewable generation. Fossil-fired generation is acquired to meet any remaining resource needs. The EEPS policy and PBF programs were merged, and are largely administered by utilities and implemented by a wide range of both utilities and non-utilities. Utilities supplement PBFs through utility procurement funding to ensure that the EEPS goals are met. The utilities are required to reduce their demand forecasts to reflect the adopted energy efficiency savings goals and so are further motivated to ensure the reductions are achieved. The utilities' achievements will be subject to rigorous evaluation, measurement, and verification overseen by the CPUC.

Web sites:
http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/rulemaking/eegoals.htm

http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/40212.htm

http://www.cpuc.ca.gov/PUBLISHED/REPORT/28715.htm

Illinois

The Illinois Sustainable Energy Plan recommends an energy efficiency portfolio standard that will meet 25% of projected annual load growth by 2015–2017. The Illinois Commerce Commission (equivalent to a state PUC) recently adopted a resolution adopting the proposed plan with some modifications, including moving the start date from 2006 to 2007, to allow for more time to develop market-ready resources and to better align the effort with the timing of related regulatory provisions (the plan itself is voluntary). It has been estimated that the Illinois Sustainable Energy Plan, including the EEPS, will save more than 5,600 GWh, generate more than $2 billion in investments in Illinois, and create about 2,000 construction jobs and hundreds of permanent jobs (ASE 2005, ICC 2005).

The Illinois EEPS is part of a broader effort that includes an RPS requirement and is intended to gain the combined benefits of reduced demand growth and increased clean generation. This twin approach has broad support from utilities, environmental and consumer groups, and other stakeholders.

Web site:
http://www.icc.illinois.gov/en/ecenergy.aspx

Nevada

The Nevada RPS was established as part of the state's 1997 restructuring legislation. In an effort to provide greater flexibility under the RPS, the Nevada legislature adopted Assembly Bill 3 (A.B.3) during a special session in June 2005 to allow electricity providers to meet a portion of their RPS requirements through energy efficiency measures and renewable resources. The bill increases the percentage of energy to come from energy efficiency and renewable sources from 5% (under the original RPS) to 6% from 2005 to 2006 and expands this percentage to 15% from 2011 to 2012 and 20% for 2015 and thereafter. Eligible energy efficiency measures can meet up to 25% of the requirement. Eligible measures include those that are installed on or after January 1, 2005; are located at a retail customer's location; reduce the consumption of energy by the retail customer; and are directly subsidized, in whole or in part, by the electric utility.

In response to this adjustment, two utilities, Nevada Power Company and Sierra Pacific Power Company, have requested approval from the Nevada PUC for additional funding for their 2005 and 2006 demand-side management (DSM) programs. This is the second increase proposed by the utilities since passage of A.B.3. The utilities now plan to spend $16.2 million on 2005 DSM programs and $30.5 million in 2006. The 2006 budget will include more than $2 million for ENERGY STAR appliances and lighting rebates; $1.9 million for recycling of old, inefficient refrigerators; and $185,000 for ENERGY STAR New Construction programs.

Web site:
http://www.newrules.org/electricity/rpsnv.html

New Jersey

New Jersey's PBF program was initially established by restructuring legislation in 1999. Based on a recent reevaluation of the program's design and administration, New Jersey is adding specific resource goals to its PBF program (NJBPU 2004). This is a hybrid approach, in that the overall program is limited by the public benefits charge levels set in the authorizing legislation and is funded like other public benefits programs. In the past, program administrators were not required to meet specific resource goals—their programs were driven primarily by available funding. Under the new Clean Energy Program model, the New Jersey Office of Clean Energy will use energy efficiency to meet overall energy and demand savings goals within the available funding limits.

In another revision to the New Jersey PBF program, administration and delivery of programs will be solicited competitively (originally, electric utilities provided program administration and ran the programs directly), with the winning bidders agreeing to meet the specific energy savings goals. In this sense, the New Jersey program has added an EEPS component (i.e., the energy savings goals) to a PBF program. However, the EEPS requirement is not imposed directly on utilities, but on whatever entity wins the bid to administer PBF funds.

Web site:
http://www.bpu.state.nj.us/home/BOCleanEn.shtml
Click on BPU order EX04040276 (12/23/04).

Pennsylvania

Pennsylvania is pioneering another variation of EEPS. The legislature passed the Alternative Energy Portfolio Standards Act (AEPS) in late 2004. It creates a two-tier set of resource goals for electric utilities. Tier 1 requires 8% of utility energy to come from renewable energy sources (e.g., wind power and solar energy). Tier II calls for a 10% "advanced energy resource" target that can be met by a mix of other types of energy resources, including energy efficiency as well as waste coal generation and hydropower. AEPS represents a new "hybrid" form of EEPS, in that energy efficiency is one of several resources listed in Tier II. In this setting, energy efficiency must compete against the other resource types in Tier II. There is no minimum level of energy efficiency resources that must be acquired (Black & Veatch 2004).

The Pennsylvania AEPS design, in which energy efficiency is included as one of a list of resource options, does not ensure that energy efficiency resources will be acquired. Energy efficiency's contribution to the resource portfolio depends on the availability and relative cost of the resources included in the portfolio. Thus, in theory, if energy efficiency is less expensive than other resource options, it would be acquired in whatever volume is available at the competitive price. However, limited energy efficiency networks, including providers, and other factors may prevent energy efficiency from competing effectively in such a framework. In addition, a lack of mechanisms to decouple utility profits from sales of electricity presents a regulatory disincentive. (See Section 6.2, *Utility Incentives for Demand-Side Resources.*)

While a specific assessment of the energy efficiency aspect of the AEPS has not been conducted, one estimate indicates it could provide cumulative economic benefits of $2.7 billion in electric savings; 70,000 jobs over 20 years (an average of 3,500 new jobs annually); and $2.5 billion in additional earnings (Pletka 2004). Another study identifies 16,000 GWh of potential savings from efficiency measures including energy conservation and energy efficiency measures. The AEPS requires that energy conservation measures save energy; thus, direct load control is not included in the potential total for energy conservation (Black & Veatch 2004).

Web site:
http://www.puc.state.pa.us/electric/electric_alt_energy_port_stnds.aspx

Texas

Texas was the first state to adopt energy efficiency goals for utilities as part of its 1999 restructuring law, Senate Bill 7 (S.B.7). This law called for electric distribution utilities to offset 10% of their forecasted load growth through energy efficiency by January 2004. Following enactment, the PUC worked with stakeholders to determine the specific programs through which this target would be reached. Program templates included the following "standard offer"[10] and "market transformation"[11] measures:

- *Standard Offer.* Commercial and industrial customers, residential and small commercial customers, load management projects, and hard-to-reach customer (customers with an annual household income at or below 200% of the federal poverty guidelines).
- *Market Transformation.* ENERGY STAR homes, residential ENERGY STAR windows, air conditioner distributor, and air conditioner installation information and training.

These programs were funded through a bill charge included in each utility's transmission and distribution rates, collecting about $80 million for annual efficiency program expenditures. Utilities were thus able to recover costs associated with the program, including incentive payments and program administration (capped at 10% of total).

Evaluations indicate that the goal of offsetting 10% of load growth is being exceeded. Load growth has averaged about 2% per year; 10% of this level of growth amounts to about 0.2% of total annual sales (Gross 2005a). Leading state efficiency programs are showing impacts as high as 1% of total annual sales. Projected results include 7,300 tons in nitrogen oxide (NO_x) reductions over 10 years, which Texas estimates is equivalent to removing 140,000 motor vehicles from the roadway, and energy savings valued at $25 million per year.

In addition to the statewide EEPS directed specifically at utilities, Texas broadened its efforts to encompass local governments, in part because Texas contains two severe nonattainment areas for ground-level ozone and sees energy efficiency as an important, cost-effective element of its air quality strategy. In 2001, Texas set energy efficiency goals for local government through Senate Bill 5 (S.B.5)—known as the Texas Emissions Reduction Plan.

10 Refers to programs where a utility administers a contract with an energy service provider that specifies a standard payment based on the amount of energy saved through the installation of energy efficiency measures.

11 Refers to strategic efforts, including incentives and education, to reduce market barriers for energy efficiency.

S.B.5 requires 38 local governments to reduce electricity consumption by 5% a year for five years and report annually to the State Energy Conservation Office (SECO). The Texas PUC and SECO are working with local governments and utilities to implement efficiency improvement programs and projects, measure and verify energy savings, and incorporate emission reductions into local air quality plans. The Dallas-Fort Worth nonattainment area is including efforts under S.B.5 in its State Implementation Plan (SIP) for ozone attainment. (See Section 3.3, *Determining the Air Quality Benefits of Clean Energy*.)

Web sites:
1999 Texas Electricity Restructuring Act:

http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=76&SESS=R&CHAMBER=S&BILLTYPE=B&BILLSUFFIX=00007

S.B.7:

http://www.centerpointefficiency.com/about/

http://www.mccombs.utexas.edu/research/bbr/bbrpub/tbr/pdf/Aug.99.zar.pdf

S.B.5:

http://www.seco.cpa.state.tx.us/sb5report2004.pdf

http://www.texasenergypartnership.org/

What States Can Do

States with either restructured or traditional utility markets have set EEPS goals for utilities. These goals can be administered in association with PBFs or regulated utility efficiency programs. Because the EEPS approach can support multiple purposes, including Clean Air Act compliance plans, utility-sector resource plans, and climate action plans, states can set EEPS goals within the context of broad energy and environmental policy goals.

Action Steps for States

The key steps to establishing EEPS are:

- Conduct background analysis, including assessing historical experience and results from past energy efficiency programs and conducting a robust analysis of energy efficiency potential, an economic assessment of potential benefits and costs, and a determination of the range of savings targets that would be realistic for an EEPS.
- Design and develop the EEPS program by determining the appropriate goals, the sectors covered by the goals, the kinds of resources that can be acquired, and the time frame.
- Define an implementation process that sets rules and procedures for how resources can be acquired in the program, M&V requirements, evaluation procedures, and general oversight.
- Provide for periodic evaluation and program review at specified intervals.

Information Resources

Information About States

Title/Description	URL Address
California Action Plan. This Web site contains the text of the California EAP. CEC and CPUC. 2003. California EAP, May 8, 2003. CEC and CPUC.	http://www.energy.ca.gov/energy_action_plan
California Integrated Energy Policy Report. This CEC report lays out policy recommendations for electricity, natural gas, transportation, and the environment. CEC. 2003. California Integrated Energy Policy Report, December. CEC.	http://www.energy.ca.gov/reports/100-03-019F.pdf
CPUC Energy Efficiency Goals Web site. This Web site contains information on energy efficiency potential, including KEMA-Xenergy efficiency potential studies and the Hewlett Foundation "Secret Energy Surplus" report. CPUC. 2005. Evaluation, M&V. CPUC.	http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/rulemaking/eegoals.htm
Illinois Sustainable Energy Plan. This Web site contains the Illinois Sustainable Energy Plan, as submitted to the Illinois Commerce Commission on February 11, 2005.	http://www.icc.illinois.gov/en/ecenergy.aspx
Midwest Energy Efficiency Alliance (MEAA) Comments to Illinois Commerce Commission on the Illinois Sustainable Energy Plan. MEAA is a collaborative network whose purpose is to advance energy efficiency in the Midwest in order to support sustainable economic development and environmental preservation. It is a leader in raising and sustaining the level of energy efficiency in the Midwest region.	http://www.icc.state.il.us/ec/docs/050309ecCommentsMidwest1.pdf
The Pennsylvania PUC AEPS Web site, 2005. This Web site contains information on legislation, technical conferences, work groups, and general information about alternative energy sources.	http://www.puc.state.pa.us/electric/electric_alt_energy_port_stnds.aspx
Promoting Energy Efficiency in California. State EE/RE Technical Forum, May 18, 2005. Presentation by Brian C. Prusnek, Advisor to Commissioner Susan P. Kennedy, CPUC.	http://www.epa.gov/cleanenergy/pdf/keystone/PrusnekPresentation.pdf

Information About Measurement and Verification

Title/Description	URL Address
Applications Team: Energy-Efficient Design Applications. This Web site provides numerous resources, ranging from implementation guidelines to checklists and other resources, to help organizations implement an M&V program.	http://ateam.lbl.gov/mv/
ASHRAE Guideline 14-2002. Measurement of Energy and Demand Savings. ASHRAE, June 2002. This document provides guidelines for reliably measuring energy and demand savings of commercial equipment.	http://resourcecenter.ashrae.org/store/ashrae/newstore.cgi?categoryid=310&categoryparent=156&loginid=6294016 Click on the link to Guideline 14-2002—Measurement of Energy and Demand Savings.
Section III Measurement and Verification Guidelines. This document provides general guidelines for preparing an M&V plan, choosing an M&V option and method, defining and adjusting baselines, and collecting and submitting M&V data.	http://search.pge.com/cs.html?url=http%3A//www.pge.com/docs/pdfs/biz/rebates/spc_contracts/2000_on_peak_incentive/III-m%26v.pdf&qt=M%26V&col=pge&n=1
CALMAC Web site. California's statewide CALMAC evaluation clearinghouse contains resources for deemed savings and project-specific M&V techniques.	http://www.calmac.org

Title/Description	URL Address
Efficiency Vermont Technical Reference User Manual. Vermont provides a set of deemed-savings methods in this manual.	TRM 4-19, published by Efficiency Vermont 255 S. Champlain Street, Burlington, VT 05401-4717, phone 888-921-5990.
Electric and Gas Conservation Improvement Program Biennial Plan for 2005 and 2006. This plan was submitted to the Minnesota Department of Commerce by Xcel Energy, June 1, 2004. Docket No. E, G002/CIP-04.	URL not available.
EPA report: Creating an Energy Efficiency and Renewable Energy Set-Aside in the NO_x Budget Trading Program: Measuring and Verifying Electricity Savings. This forthcoming EPA report describes key M&V resources.	Contact EPA.
Evaluation, Measurement and Verification Workshop. The CPUC held several workshops on evaluation, measurement, and verification. The primary purpose of these workshops was to discuss the performance basis, metrics, and protocols for evaluating and measuring energy efficiency programs, including incentive, training, education, marketing, and outreach programs.	http://www.fypower.org/feature/workshops/workshop_5.html The final Decision can be found at: http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/45783.htm
IPMVP Web Site. IPMVP Inc. is a nonprofit organization that develops products and services to aid in the M&V of energy and water savings resulting from energy/water efficiency projects—both retrofits and new construction. The site contains the IPMVP, a series of documents for use in developing an M&V strategy, monitoring indoor environmental quality, and quantifying emission reductions.	http://www.ipmvp.org
New York State Energy Research and Development Authority (NYSERDA) Standard Performance Contracting Program Measurement and Verification Guideline. M&V guidelines are included in NYSERDA's request for applications for performance contracting.	http://www.nyserda.org/funding/855PON.html http://www.nyserda.org/wms/docs_funding/909PON.pdf
Northwest Power Planning Council: 5th Power Plan. 2005–2009 Targeted Conservation Measures and Economics.	http://www.nwppc.org/energy/powerplan/draftplan/Default.htm
Oncor Commercial & Industrial Standard Offer Program 2003. Measurement and Verification Guidelines. (Includes retrofit and new construction and default savings values for lighting, motors, and air-conditioning equipment.)	http://www.oncorgroup.com/electricity/teem/candi/default.asp
PA Knowledge Limited 2003: Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report. June 16, 2003 (sponsored by National Grid, NSTAR Electric, Northeast Utilities, Unitil and Cape Light Compact). This report is used by Massachusetts utilities to estimate free ridership and spillover effects.	Contact PA Consulting at: http://www.paconsulting.com
Southern California Edison (SCE), December 04 Program Summary Reports.	http://www.sce.com/AboutSCE/Regulatory/eefilings/MonthlyReports.htm

Examples of Legislation/Regulation

State	Title/Description	URL Address
California	**California Interim Opinion: Administrative Structure for Energy Efficiency (Decision 05-01-055).** This CPUC rule sets the administrative structure and process for energy efficiency programs.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/43628.htm
	California Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond (Decision 04-09-060). This CPUC rule sets energy efficiency goals for the state.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/40212.htm

State	Title/Description	URL Address
California (cont.)	**California Ruling: Instructions for Filing Proposals on Energy Efficiency Administrative Structure.** This CPUC ruling sets the requirements and process for proposals recommending an energy efficiency administration structure. The ruling includes helpful background documents, including an overview of energy efficiency administration structures in place in other states and a framework for administrative roles and responsibilities.	http://www.cpuc.ca.gov/PUBLISHED/RULINGS/35120.htm
Connecticut	**Energy Independence Act.** This act establishes a Distributed RPS that includes energy efficiency from commercial and industrial facilities, and combined heat and power and commercial and industrial load management programs.	http://www.cga.ct.gov/2005/TOB/h/pdf/2005HB-07501-R00-HB.pdf
Hawaii	**Hawaii's Renewable Portfolio Standard Act.** This act requires electric utilities to meet an RPS of 15% in 2015 and 20% in 2020.	http://www.hawaii.gov/dbedt/ert/rps.html
Illinois	**Illinois Sustainable Energy Plan.** This Web site contains the Illinois Sustainable Energy Plan, as submitted to the Illinois Commerce Commission on February 11, 2004.	http://www.renewableenergyaccess.com/assets/download/IllinoisGov_RPS.pdf
Nevada	**Nevada A.B.3.** This bill redefines the portfolio standard to include energy efficiency and renewable energy.	http://www.leg.state.nv.us/22ndSpecial/Reports/history.cfm?ID=2546 http://leg.state.nv.us/22ndSpecial/bills/AB/AB3_EN.pdf
New Jersey	**Clean Energy Board Order—In The Matter of the New Jersey Clean Energy Program Policies and Procedures (12/09/04).**	http://www.bpu.state.nj.us/wwwroot/cleanEnergy/EO02120955_20041209.pdf
	The State of New Jersey Board of Public Utilities (NJBPU) rule. This rule establishes PBF goals, December 22, 2004. Docket No. EX0404276.	http://www.bpu.state.nj.us/home/BOCleanEn.shtml Click on BPU order EX04040276 (12/23/04).
Pennsylvania	**Pennsylvania Alternative Energy Legislation.** This Web site contains the text of Pennsylvania's Alternative Energy Portfolio Standards Act of 2004 (Senate Bill 1030).	http://www.legis.state.pa.us/WU01/LI/BI/BT/2003/0/SB1030P1973.HTM
Texas	**The Center for Energy Efficiency and Renewable Technologies.** Texas Cleans Up Its Act, article reprinted from the Clean Power Journal. This article details the passage and key provisions of Texas S.B.7, which encourages the development of renewable energy.	http://www.ceert.org/pubs/cpjournal/99/summer/texas.html
	Emission Reduction Incentive Grants Reports. Prepared for the Texas Natural Resource Conservation Commission for a Joint Report to the 78th Legislature. In this report the Texas PUC has quantified the results of legislated energy efficiency programs designed to reduce electric power production and air emissions.	http://www.tnrcc.state.tx.us/oprd/sips/PUC_report.pdf
	PUCOT Rules for Texas Electric Restructuring Act § 25.181. The Texas PUC rules set out implementation strategies for utilities and local governments energy efficiency programs.	http://www.puc.state.tx.us/rules/subrules/electric/25.181/25.181.doc
	Texas S.B.5 and S.B.7. These laws establish energy savings goals for utilities and local government. S.B.7 is the Texas Electric Restructuring Act of 1999, Legislative Session 76.	http://www.puc.state.tx.us/electric/projects/20970/20970arc/sb7rules.doc See also: http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=76&SESS=R&CHAMBER=S&BILLTYPE=B&BILLSUFFIX=00007

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4.2 Public Benefits Funds for Energy Efficiency

Policy Description and Objective

Summary

Many states are finding PBFs to be an effective mechanism for securing investment in cost-effective energy efficiency, resulting in lower cost and cleaner energy. PBFs in 17 states and Washington, D.C. provide nearly $1 billion annually for energy efficiency and related programs. States with restructured as well as traditional electricity markets are using PBFs as a component of their clean energy policy portfolios.

PBFs, also known as system benefits charges (SBCs) or clean energy funds, are typically created by levying a small charge on every customer's electricity bill. These funds provide an annual revenue stream to fund energy efficiency programs. The charges range from 0.03 to 3 mills[12] per kilowatt-hour (kWh) and are equivalent to about $0.27 to $2.50 on a residential customer's monthly energy bill (ACEEE 2004b). Where there are comprehensive, statewide programs in place, funding levels range from about 1 to 3% of total utility revenues.

PBFs were originally developed during the 1990s to help fund public benefit programs for energy efficiency, clean energy supply, and low-income electricity bill assistance. Utilities had become hesitant to invest in clean energy activities, anticipating restructuring of electricity markets that would shift incentives and alter requirements. In many cases, states that restructured their electricity markets instituted PBFs to address the critical needs exposed by this decline in utility investments. Despite the creation of PBFs, funding for energy efficiency and diversified energy supply in many states is still below the funding levels of the early 1990s, but has increased overall in recent years (ACEEE 2004b, ACEEE 2004c, ACEEE 2005a).

A well-designed and administered public benefits fund (PBF) increases public and private sector investments in cost-effective energy efficiency, resulting in reduced energy costs for electricity customers, emission reductions, and enhanced reliability.

Total ratepayer-funded electric energy efficiency program spending (including PBF programs and other programs funded via customer bills) reached $1.35 billion in 2003. In nominal dollars, this was the highest level spent on electric energy efficiency programs since 1996 (ACEEE 2005a). However, in real dollars, the level of funding in nearly every state is still below the levels of the early 1990s.

States are finding that PBFs provide significant reductions in electricity demand and related emissions at a relatively low cost. For just 12 of the states with energy efficiency PBFs, total annual investments of about $870 million in 2002/2003 yielded nearly 2.8 million MWh of electricity savings. Emission reductions from nine of these states included a total of 1.8 million tons of carbon dioxide (CO_2). The median program cost was $0.03 per kWh saved, which is one-half to three-quarters of the typical cost of new power sources and less than one-half of the average retail price of electricity (ACEEE 2004a, ACEEE 2004b, EIA 2005).

Seventeen states and Washington, D.C. have adopted PBFs that provide nearly $1 billion in support annually for energy efficiency and have yielded over 2.8 million MWh in annual electricity savings (ACEEE 2004b).

Objective

The objectives of PBF programs for energy efficiency include:

- Saving energy and avoiding new generation through long-lasting improvements in energy efficiency.

[12] 1 mill = one-tenth of a cent.

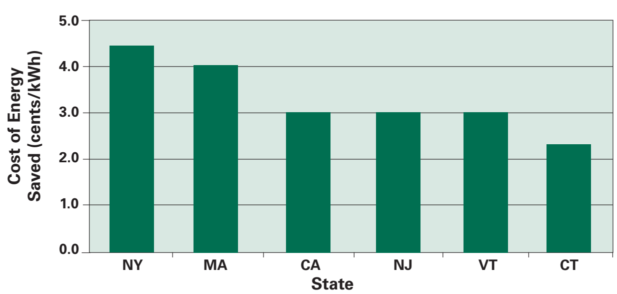
- Lowering energy demand and reducing air pollutant and greenhouse gas emissions.
- Reducing customers' energy costs.

Most states also use their PBFs to support development of clean energy supplies, such as renewable energy and combined heat and power (CHP), provide assistance to low-income consumers, support consumer education, and support research and development of new clean energy technologies (see Chapter 5, *Energy Supply Actions*).

Benefits

Well-designed and administered PBFs have been shown to reduce energy demand at a lower cost (see Figure 4.2.1) than new supply and deliver a variety of benefits. They reduce energy costs for utility customers by reducing average bills and by limiting future energy price increases. They also improve the reliability of the electricity grid and reduce emissions. Some states use PBF dollars to support research and development related to clean energy technologies and processes.

Figure 4.2.1: Cost of Energy Saved (cents/kWh) for Six State Public Benefits Funds



Source: ACEEE 2004b.

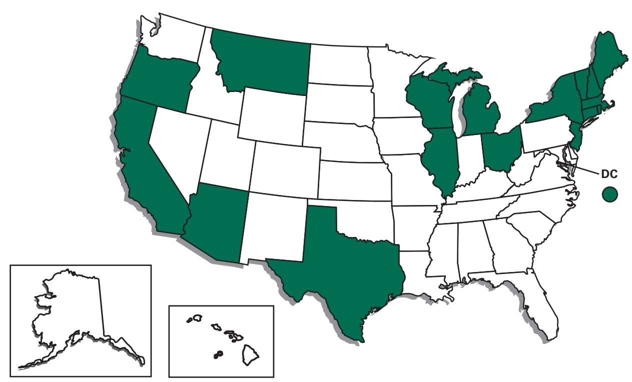
Funding levels for comprehensive programs generally range from 1 to 3% of total utility revenues. On average, each percent of revenues invested yields about 5% in cumulative energy savings over five years and 10% over 10 years (ACEEE 2004b). While the percent of revenues spent is not the only factor affecting the impact of efficiency programs, it provides an indication of the magnitude of savings that states can expect.

PBFs have also been shown to help create jobs by lowering energy costs and stimulating new public and private sector investments. Recent analyses of the New York Energy $mart Program show that the program creates and sustains 4,700 jobs, increases labor income by $182 million per year, and increases economic output by $224 million per year (NYSERDA 2004a).

States with Energy Efficiency PBFs

Seventeen states and Washington, D.C. (shown in Figure 4.2.2) have established PBFs to support energy efficiency at various levels of funding. Eleven of the states have programs that are actively promoting energy efficiency, making investments at or above the median level of about 1 mill/kWh.

Figure 4.2.2: States with PBFs for Energy Efficiency



Sources: ACEEE 2004b, ACEEE 2004c.

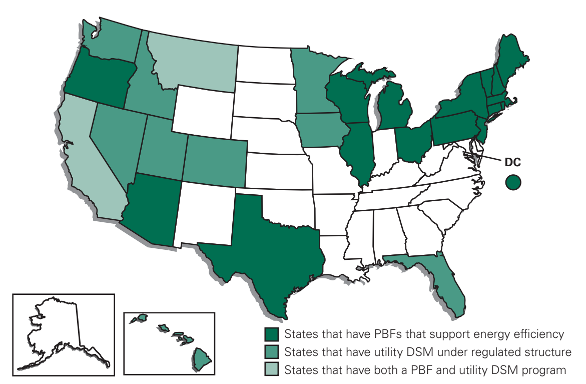
Notes: Nevada's program, originally introduced under a now-repealed electricity restructuring process, is not technically a PBF. As of 2003, energy efficiency funding is approved as part of utility IRP (ACEEE 2004b).

Texas's program is tied to the state's utility energy efficiency savings targets and costs are covered through a non-bypassable charge in transmission and distribution rates. (See Section 4.1, *Energy Efficiency Portfolio Standards*.) The utilities submit rate filings to the utility commission to cover estimated costs (ACEEE 2004b).

Figure 4.2.3: Ratepayer-Funded Energy Efficiency Programs

PBFs are the most prevalent mechanism for supporting ratepayer-funded energy efficiency programs. States also support energy efficiency through utility demand-side management,[a] including the approval of tariff riders or the inclusion of energy efficiency program costs in the rates supervised by the public utility commission (PUC) or equivalent regulatory body. Some states, such as California and Montana, undertake a combination of these approaches. Most of the PBFs for energy efficiency were created as part of a state's electricity market restructuring process. Some states (e.g., California and Nevada) have repealed the restructuring process, at least in part, leading to a hybrid or modified approach to funding energy efficiency. Public benefit funds were also created in states that did not restructure, including Wisconsin and Vermont. (See also *Interaction with State Policies, Utility Policies,* on page 4-27.)

The following map illustrates the different funding arrangements that states are using to support energy efficiency.[b, c]



a Utility DSM programs included in the map are for states where energy efficiency spending as a percentage of revenues is greater than 0.25% (ACEEE 2005a).

b Nevada's program, originally introduced under a now-repealed electricity restructuring process, is not technically a PBF; as of 2003, the energy efficiency funding is approved as part of utility Integrated Resource Planning (IRP) (ACEEE 2004b).

c Texas's program, created as part of a restructuring process, is tied to the state's utility energy efficiency savings targets and costs are covered through a non-bypassable charge in transmission and distribution rates. (See Section 4.1, *Energy Efficiency Portfolio Standards*.) The utilities submit rate filings to the PUC to cover estimated costs (ACEEE 2004b).

Sources: ACEEE 2004b, ACEEE 2004c, ACEEE 2005a, ACEEE 2005b.

Most of the states have implemented electricity restructuring. However, restructuring is not a prerequisite for establishing a PBF. Some states, including Wisconsin, Vermont, and Oregon, have kept retail markets largely regulated and have also created PBFs to provide the public benefits described above. California has rescinded its restructuring process but continues to use PBFs. In some states, moving to a PBF model from traditional regulated efficiency programs reflects the changing roles of utilities in retail markets, while delivering the benefits of efficiency through other channels. This mixture of approaches to ratepayer-funded energy efficiency programs is described in Figure 4.2.3.

Designing an Effective PBF Program

This section identifies several key issues that states consider when designing an effective PBF. These issues include identifying key participants and their roles; determining appropriate funding levels; and determining the appropriate duration of a PBF, what portfolio of activities to choose, and interaction with other state and federal policies.

Participants

- *State Legislatures.* In most states, the state legislature authorizes and periodically reviews PBFs program implementation status, funding levels, and results. They enact legislation to set up the PBF, identify goals and objectives, determine the charge, specify implementing and oversight organizations, and review program authorization at specified intervals.
- *Ratepayers.* PBFs are funded by ratepayers, typically through a "non-bypassable" charge on distribution services, so that all customers pay irrespective of the supplier. A handful of states (i.e., Montana, Oregon, Vermont) have included limited provisions for large industrial customers to obtain a credit or refund based on documented spending on efficiency (ACEEE 2004b).
- *Utilities.* Utilities play a role in processing the charges, potentially administering the fund, and in many cases implementing energy efficiency

measures. They also are important sources of data for reporting results.

- *PUCs and Third-Parties.* Depending on the state, PUCs or nonprofit organizations may also play a role by administering and/or evaluating the PBFs.
- *Public and Private Sector Organizations.* State PBF investments also leverage additional public and private sector energy and efficiency investment. Studies indicate that each $1 spent from the fund leverages roughly $3 in related business and consumer investment (ACEEE 2004c).

Funding

- *Mechanism.* Most states apply a system-wide charge (usually in mills/kWh) that applies to all electricity customers. Some states have developed alternative funding structures, including flat monthly fees, utility-financed programs, and performance goals. The mills/kWh mechanism is the most common, the simplest, and the most transparent.
- *Funding Level.* The funding level for energy efficiency-related programs ranges between 0.033 and 3 mills/kWh in the most active states (ACEEE 2004b). Table 4.2.1 shows the funding level by state, and total annual funding for energy efficiency for the 11 most active states (those whose spending is at or above the median of about 1 mill/kWh).
- *Allocation of PBF Resources*. The degree to which the program administrator will be able to reallocate program dollars within the portfolio once it has been approved by the PUC or other oversight authority has been an important issue for states. This flexibility has proven important because field experience often indicates needs to adjust the program portfolio in terms of design, funds allocation, or both. If an administrator has to obtain approval for any change in use of funds, program operations could be delayed, or could result in reduced impacts or eroded cost-effectiveness. For instance, California has provided utilities with more flexibility in recent administrative rulings.

Table 4.2.1: Comparison of 11 State PBFs for Energy Efficiency
(sorted by charge level at 1 mill/kWh and greater)

	CT	VT	MA	RI	NH	ME	CA	NJ	OR	WI	NY
Administrative mechanism											
State			●			●	●	●		●	●
Utility	●		●	●	●		●				
Third-party		●							●		
Funding level (mills/kWh)	3.00	2.90	2.50	2.30	1.80	1.50	1.30	1.30	1.26	1.15	1.02
Annual funding for energy efficiency ($ millions)	$87	$17	$117	$15	$15	$15	$280	$89	$40	$62	$87
% of revenue to energy efficiency programs	3.0	3.4	2.5	2.3	1.52	1.3	2.3	1.35	2.0	2.3	0.75
Total funding—all programs ($ millions)	$118	$17	$141	$15	$25	$21	$580 (includes procurement)	$129	$70	$115	$150

Key: ● = primary fund administrator.

Sources: ACEEE 2004c, CEC 2005.

- *Administration and Cost Recovery.* A PBF essentially serves as a means for cost recovery in place of the traditional rate case that utilities undergo for a demand-side management (DSM) program. There are two basic approaches for administering the funding collected under a PBF, both of which can affect how costs are recovered. Under the first and most common approach, money is collected and spent during the current year, in an expenses-based mode. If there is an under- or over-collection, it floats in an account, and is adjusted in the following year. This account may be controlled by a utility or a third-party administrator, depending upon the type of administering body. (See also *Administering Body* on page 4-28.) The second approach is to use the money collected in the PBF to capitalize a revolving fund for grants and loans, which is replenished or expanded with new PBF collections.

Timing and Duration

Some states leave the duration of the fund open-ended, while others stipulate operational periods ranging from three to 10 years. None of the states have discontinued their PBFs, even when the initial implementation period ended.

In the past, it was not uncommon to have short, even annual, program approval cycles. This short cycle took substantial time and resources away from program delivery, and created uncertainty in customer markets. More recently, the trend is toward multi-year approval cycles. Many states have found that longer cycles reduce administrative costs and allow programs to operate more effectively in the market.

PBFs are sometimes redirected to meet other state needs during the budget process in lean years. While there is no foolproof method to avoid funding being shifted to other purposes, some states have used legislative language to avoid it. For example:

- *Vermont.* "Funds collected through an energy efficiency charge shall not be funds of the state, shall not be available to meet the general obligations of the government, and shall not be included in the financial reports of the state" (State of Vermont 1999a).
- *Washington, D.C.* "All proceeds collected by the electric company...shall not at any time be transferred to, lapse into, or be commingled with the General Fund of D.C. or any account of D.C." (Washington, D.C. 2004).

One way states are keeping PBFs targeted to energy efficiency is to use statistical information to educate stakeholders about the energy, economic, and environmental benefits of the PBF. Ensuring adequate, consistent, and stable funding is critical for the success of the program and to ensure the continuing participation of the private sector.

Developing a Portfolio of Activities

Targeting Efficiency Investments

States use PBFs to support a variety of program approaches to increasing the use of energy-efficient products and technologies and reducing energy consumption. Approaches include rebate (or "buy-down") programs for energy-efficient appliances and equipment, programs that offer technical assistance and financial incentives to encourage investment in energy-efficient technologies and assist with installation, and efforts at market transformation including disseminating information to increase consumer energy awareness and permanently change energy-related decisionmaking. (See Section 3.4, *Funding and Incentives*, for more detail on some of these options.)

States may also use PBFs to support load management programs that encourage reductions in energy use and shifts from on-peak to off-peak periods, to address concerns with prices and system reliability, but such shifts may not be accompanied by net reductions in energy use (NYSERDA 2005).

States use several criteria for choosing which energy efficiency measures are supported by their PBF program. They include the following:

- Customer classes served by the measure.
- Distribution of benefits across customer classes and service territories.

- Cost-effectiveness of individual measures and the overall program portfolio.
- Other social and environmental benefits (e.g., serving low-income customers, reducing criteria pollutants, and managing load and improving reliability of the electricity grid).

Factors such as whether an efficiency measure also delivers energy reductions at peak times, reduces water consumption, or offers other nonenergy benefits are also taken into consideration. Many efficiency PBFs also invest a portion of their funding in research and development programs to identify and verify the performance of emerging technologies, practices, or innovative program models.

PBF programs seek to benefit all customers and customer classes. However, resource limitations typically result in programs targeting the most cost-effective opportunities for energy savings. States served by multiple utilities may also need to ensure that customers in each utility's service territory receive direct benefits, proportional to the amount their customers have paid into the system.

In addition to benefit-cost analysis, PBF administrators also use other criteria to guide program design and investments, such as customer equity and serving hard-to-reach customer markets. The least expensive energy savings are often found in large commercial and industrial customers. However, for customer equity reasons, most PBF program portfolios seek to reach a range of customer groups, including low-income, small business, and other submarkets where lowering energy costs is especially important.

In addition to needing to serve multiple customer classes, some of which are harder or more expensive to reach, program administrators typically balance their efficiency programs based on the same principles that one would use in evaluating a stock portfolio.

- How reliable is the investment?
- When will it achieve savings?
- How long will those savings last?
- What other investments/strategies need to be considered to offset risk?
- Is it wise to include some long-term investments?

Some states target a portion of their efficiency investments to heavily populated areas or business districts to help alleviate transmission congestion and offset or postpone transmission infrastructure investments. For example, Connecticut's Conservation and Load Management Fund targets funding to address transmission congestion problems in southwest Connecticut. By linking actions to load management programs, states can use PBFs to help prevent brownouts and ensure reliable energy supply, which benefits all electricity customers.

Determining Cost-Effectiveness

Many states incorporate cost-effectiveness analysis into the design and evaluation of their programs. This helps ensure the effective use of public funds and can be used to compare program and technology performance with the aim of developing effective future programs. Cost-effectiveness tests commonly used by states are shown in Table 4.2.2. Many states use a Total Resource Cost (TRC) Test as the basic economic assessment tool. The TRC Test assesses the net lifetime benefits and costs of a measure or program, accounting for both the utility and program participant perspectives. As with other cost-effectiveness tests, if the benefit-cost ratio is greater than one, it is deemed to be cost-effective. If applied at a portfolio level, individual measures and programs can then be further screened based on the extent to which benefits exceed costs and on other portfolio considerations mentioned previously.

Sometimes states use a combination of tests to examine the program impacts from different perspectives. States wishing to consider the non-electric implications for energy use and energy savings may use the Societal Test, which incorporates a broader set of factors than the TRC Test. The Program Administrator and Participant Tests are sometimes used to help design programs and incentive levels, rather than as a primary screen for overall cost-effectiveness.

Table 4.2.2: Common Cost-Effectiveness Tests

Type of Test	Description
Total Resource Cost Test	Compares the total costs and benefits of a program, including costs and benefits to the utility and the participant and the avoided costs of energy supply.
Societal Test	Similar to the TRC Test, but includes the effects of other societal benefits and costs such as environmental impacts, water savings, and national security.
Program Administrator Test	Assesses benefits and costs from the program administrator's perspective (e.g., benefits of avoided fuel and operating and capacity costs compared to rebates and administrative costs).
Participant Test	Assesses benefits and costs from a participant's perspective (e.g., reductions in customers' bills, incentives paid by the utility, and tax credits received as compared to out-of-pocket expenses such as costs of equipment purchase, operation, and maintenance).
Rate Impact Measure	Assesses the effect of changes in revenues and operating costs caused by a program on customers' bills or rates.

Source: UNEP 1997.

If using only one test, states are moving away from the Rate Impact Measure (RIM) test because it does not account for the interactive effect of reduced energy demand from efficiency investments on longer-term rates and customer bills. Under the RIM test, any program that increases rates would not pass, even if total bills to customers are reduced. In fact, there are instances where measures that increase energy use pass the RIM test.

While many utilities and PUCs express program performance in terms of benefit-cost ratios, expressing program costs and benefits in terms of $/kWh is also useful because it is easy to relate to the cost of energy. Consumers and legislators can easily relate this metric to the cost of energy in their own area, while utilities and regulators can compare this value to the cost of other resources, such as new generation. When expressed this way, the annual levelized TRC in $/kWh captures the net program and customer costs divided by the projected lifetime savings of the measure or program. Resource costs can also be calculated in $/kW to illustrate the value during periods of peak demand. (See also Section 6.1, *Portfolio Management Strategies.*)

Interaction with Federal Policies

Several federal programs can help support the programs administered through PBFs.

The ENERGY STAR Program

ENERGY STAR is a voluntary, public-private partnership designed to reduce energy use and related greenhouse gas emissions. The program, administered jointly by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), has an extensive network of partners including equipment manufacturers, retailers, builders, energy service companies, private businesses, and public sector organizations.

Since the late 1990s, EPA and DOE have worked with utilities, state energy offices, and regional nonprofit organizations to help them leverage ENERGY STAR messaging, tools, and strategies and enhance their local energy efficiency programs. Today more than 350 utilities and other efficiency program sponsors, servicing 60% of U.S. households, participate in the ENERGY STAR program.

EPA and DOE invest in a portfolio of energy efficiency efforts that state and utility run energy efficiency programs can leverage to further their PBF programs, including:

- *Education and Awareness Building.* ENERGY STAR sponsors broad-based public campaigns to educate consumers on the link between energy use and air emissions and to raise awareness about how products and services carrying the ENERGY STAR label can protect the environment while saving money.
- *Establishing Performance Specifications and Performing Outreach on Efficient Products.* More than 40 product categories include ENERGY STAR-qualifying models, which ENERGY STAR promotes through education campaigns, information

exchanges on utility-retailer program models, and extensive online resources. Online resources include qualifying product lists, a store locator, and information on product features.

- *Establishing Energy Efficiency Delivery Models to Existing Homes.* ENERGY STAR assistance includes an emphasis on home diagnostics and evaluation, improvements by trained technicians/building professionals, and sales training. It features online consumer tools including the Home Energy Yardstick and Home Energy Advisor.
- *Establishing Performance Specifications and Performing Outreach for New Homes.* ENERGY STAR offers builder recruitment materials, sales toolkits and consumer education, and outreach that helps support builder training, consumer education, and verification of home performance.
- *Improving the Performance of New and Existing Commercial Buildings.* EPA has designed an Energy Performance Rating System to measure the energy performance at the whole-building level, to help go beyond a component-by-component approach that misses impacts of design, sizing, installation, controls, operation, and maintenance. EPA uses this tool and other guidance to help building owners and utility programs maximize energy savings.

The State Energy Program

DOE offers a range of financial and technical assistance programs that support state efficiency programs. The State Energy Program administered by DOE offers grants to states to implement energy programs. State energy offices can leverage PBFs by coordinating activities with state energy programs. DOE's Weatherization Assistance Program (WAP) enables low-income families to permanently reduce their energy bills by making their homes more energy efficient.

Interaction with State Policies

PBFs can be used to leverage existing state-administered programs, such as traditional utility-based energy efficiency programs, and support other state policies, such as building codes.

Best Practices: Developing and Adopting a PBF Policy

The best practices identified below will help states develop effective PBF programs. These best practices are based on the experiences of states that have highly effective PBFs for energy efficiency.

- Determine the cost-effective, achievable potential for energy efficiency in the state.
- Start with low-cost, well-established programs and efficiency investments, and build the program over time.
- Assess the level and diversity of support for a PBF. Engage key stakeholders (i.e., utilities; residential, commercial and industrial customers; municipalities; and environmental groups) and experts collaboratively to help design the program—including its administering organization, funding, duration, and evaluation methods.
- Design PBF legislation that sets a universal, nonbypassable SBC on utility bills. Set the charge at a rate that captures the available energy efficiency potential in the state. Consider specific language to prevent PBF funds from being commingled with general state budget funds, and to clarify that the SBC establishes a minimum level of investment in energy efficiency, not a cap on investments.
- Ensure that the PBF program serves the needs of diverse customer classes and stakeholder groups.
- Take care to select the most appropriate administering organization. The options include utilities, state agencies, or independent organizations. Each can be effective under the right conditions. Having a single entity administer the program statewide can maximize resource efficiency.
- Set the duration of the PBF for an extended period (five to 10 years is becoming common). This provides the continuity and certainty needed to attract private sector investment.
- Establish effective evaluation methods that build on proven approaches. Evaluation methods should be rigorous enough to estimate program impacts and other benefits, and simple enough to minimize administrative costs.

States that are concerned that their PBFs do not capture all of the cost-effective energy efficiency that is available are exploring how procurement requirements, portfolio management, or establishing energy efficiency portfolio standards (EEPS) (see Section 4.1, *Energy Efficiency Portfolio Standards*) can help maximize the savings for their businesses and residents.

Utility Policies

PBFs can complement other state energy efficiency investments. In many states, PBFs supplanted energy efficiency programs that had been required by state utility commissions under IRP requirements. Some states, mostly those that have not restructured their electricity markets, still practice IRP and require regulated DSM programs for energy efficiency as utility resource investments. Washington still practices IRP and DSM, and Wisconsin and Oregon—while not restructuring retail markets—have shifted to a PBF efficiency program model. These non-restructured states are using PBFs to enhance funding for energy efficiency programs and ensure that programs are equitably distributed across customer classes.

In some states, a hybrid regulatory approach called portfolio management (PM) is evolving from traditional integrated resource plans. PM recognizes that utilities, under commission oversight, act as resource portfolio managers on behalf of its many customers. Under PM, a commission might elect to use a PBF to provide customers additional choices for energy efficiency investment and to balance the state's overall resource "portfolio" (see Section 6.1, *Portfolio Management Strategies*).

PBFs can also be combined with other resource acquisition strategies to ensure that cost-effective energy efficiency is pursued as part of the resource mix. California, for example, despite no longer operating as a restructured market, sustained its PBF and also developed new efficiency procurement requirements for utilities. The California Public Utilities Commission (CPUC), through the energy action plan (EAP), has established a "loading order" of energy resources for meeting future load growth. The loading order (1) minimizes increases in electricity and natural gas demand through energy efficiency and conservation measures, and (2) prioritizes renewable energy and clean distributed generation for meeting future load growth, followed by clean fossil-fired generation. The four investor-owned utilities (IOUs) are required to procure future energy supply for the state using a combination of utility resource procurement funds and revenues from the PBF.

In addition, states are examining how PBFs may serve as the "ceiling" level for energy efficiency, rather than the "floor." In at least one state, the legislature capped energy efficiency funding at the level of the PBF. The concern is that this places artificial limits on the level of energy efficiency investments and may reduce opportunities for additional measures that are cost-effective and serve other public purposes (e.g., reliability support, job development). The Vermont legislature recently removed its "ceiling" provision (State of Vermont 2005).

Building Codes

PBF programs can be coordinated with energy codes for new and renovated buildings. For example, some states are using PBFs to support code implementation and enforcement. The New York State Energy Research and Development Authority (NYSERDA) offers financial incentives to building owners and leaseholders to improve the energy efficiency of new and existing construction. Other states, such as Illinois and Wisconsin, are using PBF resources to enhance voluntary new and existing buildings programs used to document code compliance. (See Section 4.3, *Building Codes for Energy Efficiency*, for more information.)

Program Implementation and Evaluation

State policymakers are responsible for determining who will implement the PBF and evaluate the program. The responsibilities of the administering organization include the following:

- Establish program goals, in terms of both process and outcomes.
- Set detailed funding levels for each program area (e.g., energy efficiency, renewable energy, CHP, low-income).
- Deliver energy efficiency field programs, and any related activities, such as research and development activities.

- Practice fiscal and project management that keep programs accountable and support attainment of objectives.

Program evaluation is either overseen by the program administrator, the PUC or other oversight authority, or a combination of the two. In most cases, these organizations outsource evaluation activities to independent third-party experts to minimize potential conflict of interest.

Administering Body

PBFs are placed under the control of an administrator, often with advisory oversight by an internal or external board. The organizational structures used to administer the PBF vary by state (see Table 4.2.1 on page 4-22). The administrative approaches used include:

- Utility (e.g., Arizona, Massachusetts, Rhode Island).
- State government agency (e.g., Illinois, Maine, Michigan, New Jersey, New York, Ohio, and Wisconsin).
- Nonprofit (third-party) organization (e.g., Oregon, Vermont). Oregon established a nonprofit organization based on action by the Oregon PUC; Vermont selected a nonprofit organization as part of a competitive process that included for-profit bidders.
- Hybrid category involving more than one of the preceding organizations. For example, a utility may administer the program with guidance and oversight by a state agency (e.g., California, Connecticut, and Montana).

States have developed effective programs using each administrative model; institutional history typically determines the entities best suited to administer programs. In many states, utilities have the capital, personnel, and customer relations channels that enable them to reach broad customer markets effectively. Thus, they are the most common administering entity.

However, in some states utilities might have little or no institutional history with energy efficiency. In others, state legislatures or utility commissions might express strong views toward other types of program delivery. In such situations, state agencies or nonprofit organizations may be an appropriate administrator.

Best Practices: Implementing PBF Programs

- Learn from other states' experiences to identify most cost-effective ways to achieve energy efficiency through PBF programs.
- Consider a range of potential organization(s) for program delivery and select the most appropriate.
- Approve long-term funding cycles (five to 10 years) to let programs build market experience.
- Involve key stakeholders and experts in a collaborative design effort.
- Base program designs on market characteristics and customer needs.
- Keep program designs simple and clear.

Some states have looked to independent organizations to administer PBFs. This decision may reflect a sense that this will help obtain maximum performance from program funds and avoid potential conflicts of interest (i.e., utilities whose revenues remain tied to sales may be reluctant to promote energy efficiency programs that may reduce their revenues). In some states, commissions are breaking the link between utilities' revenues and sales, thereby removing utilities' disincentive for investments in energy efficiency (see Section 6.2, *Utility Incentives for Demand-Side Resources*). Some states are also finding that it is appropriate to have different organizations administer specific energy efficiency programs funded by the PBF based on the market being served.

Evaluation

Evaluation is important for sustaining success and support for the PBF program and for helping determine future investment strategies. Unless program overseers show concrete and robust results in line with stated objectives, decisionmakers may not reauthorize the program, or it may become vulnerable to funding shifts or other forms of erosion. State policymakers have incorporated evaluation requirements as they develop their PBF program and after the program has been implemented. When evaluating PBFs, several states have examined the TRC of the aggregated programs supported by the PBF (see section on *Determining Cost-Effectiveness* on page 4-24).

New York conducts an extensive evaluation of its PBF program. NYSERDA recently conducted a rigorous evaluation of its PBF program, including the following activities (NYSERDA 2004a):

- Identifies program goals and key output and outcome measures that provide indicators of program success.
- Reviews measurement and verification (M&V) protocols used to evaluate programs and verifies energy savings estimates to determine if they are reasonably accurate.
- Evaluates the process to determine how and why programs deliver or fail to deliver expected results.
- Characterizes target markets, determines changes observed in the market, and identifies to what extent these changes can be attributed to PBF-funded programs.
- Regularly communicates the benefits of the overall program and results of individual programs to decisionmakers and stakeholders.
- Refines program delivery models based on evaluation findings.

Other states that have conducted comprehensive evaluations of their PBF programs include California, Connecticut, Oregon, and Wisconsin. Key elements of these and other state evaluation programs are shown in the box on *Best Practices: Evaluating PBF Programs*.

Having access to detailed databases has also been a useful tool for evaluating current investments and determining future investments. For example, Efficiency Vermont maintains a database that records information on customer participation over time and allows for reporting on geographic and customer class results. Developing an arrangement to allow administrators to have access to this utility information can help improve the overall program.

Best Practices: Evaluating PBF Programs

- Evaluate programs regularly, rigorously, and cost-effectively.
- Use methods proven over time in other states, adapted to state-specific needs.
- Provide both "hard numbers" on quantitative impacts, and process feedback on the effectiveness of program operations and methods for improving delivery.
- Use independent third parties, preferably with strong reputations for quality and unbiased analysis.
- Measure program success against stated objectives, providing information that is detailed enough to be useful and simple enough to be understandable to nonexperts.
- Provide for consistent and transparent evaluations across all programs and administrative entities.
- Communicate results to decisionmakers and stakeholders in ways that demonstrate the benefits of the overall program, as well as individual market initiatives.
- Maintain a functional database that records customer participation over time and allows for reporting on geographical and customer class results.

State Examples

California

California has been a leader in energy efficiency policy and programs since the 1970s. It established the first major utility efficiency programs in the 1980s, and the first PBF in 1996. CPUC provides policy oversight of the state PBF. CPUC approves plans for efficiency programs in each of the utility service areas and also coordinates statewide activities. Further, CPUC requires utilities to use procurement funding to supplement the PBF in order to maximize cost-effective savings achieved through energy efficiency programs. The PBF is one part of a broader energy efficiency program entailing several policy initiatives, noted as follows.

As of 2004, California was the first state to establish cost-effective energy efficiency as the first option for acquiring new resources to meet future energy demand, under its "loading order" rule. In January 2005, the CPUC adopted a new administrative structure in which the state's four IOUs are responsible for program selection and portfolio management, with input from stakeholders through Program Advisory Groups (CPUC 2005). This is a return to a pre-electric industry restructuring model, in which each IOU was responsible for procuring energy efficiency resources on behalf of their customers, subject to Commission oversight.

The CPUC has established energy efficiency goals to achieve a cumulative savings of 23,183 gigawatt-hours (GWh) per year; 4,885 MW of peak demand; and 444 million therms per year for the IOUs combined, by 2013 (see Section 4.1, *Energy Efficiency Portfolio Standards*).

In September 2005, the CPUC authorized $2 billion in funding for its 2006 to 2008 energy efficiency and conservation initiative. This represents the single largest funding authorization for energy efficiency in U.S. history. CPUC authorized funding levels and energy efficiency portfolio plans for Pacific Gas and Electric, Southern California Edison, San Diego Gas & Electric, and Southern California Gas. These portfolios include a mix of proven and new, innovative program designs and implementation strategies to be supported through ratepayer investments.

The measures associated with the approved funding are expected to avoid the equivalent of three large power plants (totaling 1,500 MW) over the next three years and over the life of the measures, yield an estimated $2.7 billion in net savings to consumers, and reduce greenhouse gas emissions by 3.4 million tons of CO_2 in 2008, or the equivalent of taking about 650,000 cars off the road.

The state's efficiency program design and administration approaches have been among the most detailed and innovative although initially they struggled with the complexity and coordination of multiple implementers. While utilities have remained administrators and portfolio managers of the programs with input from stakeholder working groups, program implementation is done by both utility and non-utility implementers, and statewide approaches to program design and evaluation have improved program performance.

Web site:
http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/ee_funding.htm

New York

The New Yorks SBC program—administered by NYSERDA—is a leading example of a well designed and effectively administered state PBF program. The PBF was established in 1996 with four specific policy goals:

- Improve system-wide reliability and increase peak electricity reductions through end-user efficiency actions.
- Improve energy efficiency and access to energy options for underserved customers.
- Reduce the environmental impacts of energy production and use.
- Facilitate competition in the electricity markets to benefit end users.

NYSERDA has invested more than $350 million in energy-efficiency programs and brought about an estimated additional investment of $850 million, for a total of $1.2 billion in public and private sector energy and efficiency related investments in the state. Over the eight-year implementation period (1998 to 2006), the program is expected to result in a total of $2.8 billion in new public and private investment in New York.

NYSERDA measures and tracks its PBF investments and conducts quarterly and annual evaluations of the Energy $mart program. It uses the findings to communicate the benefits of the program to its customers and stakeholders. NYSERDA analyzes the cost-effectiveness of the program, permanent and peak-load energy and cost savings to customers, economic impacts (including leveraged public and private sector investment and jobs created), and reductions of greenhouse gases and criteria pollutants. As of September 2004, the program had:

- Reduced electricity use by about 1,340 GWh per year; annual savings are expected to reach 2,700 GWh annually when the program is fully implemented.
- Generated $185 million in annual energy bill savings for participating customers, including electricity, oil, and natural gas savings from energy efficiency and peak load management services.
- Created 3,970 jobs annually, and is expected to result in an average net gain of 5,500 jobs per year during the eight years of program implementation from 1998 to 2006.
- Reduced nitrogen oxide (NO_x) emissions by 1,265 tons, sulfur-dioxide (SO_2) emissions by 2,175 tons, and CO_2 emissions by 1 million tons (the equivalent amount of energy required to power about 850,000 homes) (NYSERDA 2004b).

Web site:
http://www.nyserda.org

Oregon

Oregon is an example of a state that has not restructured its electricity markets, but has created a public benefits program designed to serve public needs for energy efficiency services. Rather than using utilities as the primary administrator for programs, Oregon uses the nonprofit Energy Trust of Oregon as a dedicated organization to coordinate program design, evaluation, and delivery across the state. The Trust administers the state PBF in coordination with the PUC, providing cash incentives and financial assistance to promote energy efficiency and renewable energy.

While the PBF program is relatively new in Oregon, it builds on the success of other programs, such as Vermont's nonprofit delivery model, and the Northwest Energy Efficiency Alliance's market transformation programs. While utility administration is the most common model used in state PBFs, Oregon and Vermont have shown that a nonprofit structure can be equally effective.

The Energy Trust's programs, which started later than many states' efforts, saved 280 million kWh and 208,000 therms of gas by 2003, enough energy to power 23,000 homes. Its 2012 goal is to save 26 billion kWh and 19 million therms, enough to power over 200,000 typical homes.

Oregon is also one of the few states that supports both electricity and natural gas efficiency programs, and that complements its PBF program with ratemaking policies that maintain utility revenues while promoting energy use reductions.

Web site:
http://www.energytrust.org/

Wisconsin

Focus on Energy is a public-private partnership funded by the state PBF. The program's goals are to encourage energy efficiency and use of renewable energy, enhance the environment, and ensure the future supply of energy for Wisconsin.

A recent independent evaluation of the Wisconsin's Focus on Energy program showed the program is delivering the following energy, environmental, and economic benefits:

- The Focus on Energy program realized a total lifetime energy savings of $214.5 million during fiscal year 2004 for a program benefit:cost ratio of 5.4 to 1. These benefits were achieved through an annual electric energy savings of 235.6 million kWh ($113.1 million in lifetime savings), a reduction in electricity demand of 35.5 megawatts ($36.4 million in lifetime savings), and savings of 14.4 million therms from natural gas efficiency measures ($65 million in lifetime savings). See the *Evaluation* section on page 4-28 for more information.
- Wisconsin environmental benefits include estimates of the following avoided emissions: 1.5 million pounds of NO_x, 2.9 million pounds of sulfur oxides (SO_x), 687.3 million pounds of CO_2, and 12 pounds of mercury (Hg) (WI DOA 2004).

Economic benefits from the Wisconsin program include the creation of 1,050 full-time jobs. Wisconsin businesses saved almost $14.6 million and increased sales by $76.7 million. Wisconsin residents saved almost $20 million and increased their personal income by $18.3 million.

Web site:
http://www.focusonenergy.com/

What States Can Do

Experience from the states with PBFs for energy efficiency demonstrates that PBFs can be an effective mechanism for securing investment in cost-effective energy efficiency programs and thereby meeting important state energy objectives. Other states can improve their energy efficiency investments by examining the role PBFs can play in helping capture a significant portion of the cost-effective clean energy in their state. States can use the best practices and information resources in this guide to establish a new PBF or strengthen existing programs to deliver even greater benefits.

Action Steps for States

The following four steps can be used both by states interested in developing a new PBF program or those interested in strengthening an existing program.

- *Assess Energy Efficiency Potential.* States can begin the process by assessing current levels of energy efficiency spending within their state, analyzing all of their options for achieving greater levels of efficiency, and analyzing the energy and cost savings that a PBF would offer.
- *Determine Program Funding Needed to Capture Cost-Effective Energy Efficiency.* Consider appropriate PBF funding levels, and avoid diversion of funds for other purposes. Studies show energy efficiency spending could be increased significantly and still be used cost-effectively. Conduct an efficiency potential analysis and economic screening process to identify the most cost-effective mix of new program targets. Include consideration of energy efficiency's role as a potential reliability tool and how its costs in that context compare to other options.
- *Leverage Federal and State Programs.* Explore opportunities to work with federal programs such as ENERGY STAR and to coordinate PBF implementation with other state programs, such as resource planning and portfolio management.
- *Measure and Communicate Results.* Measure results, evaluate the effectiveness of the PBF, and report progress annually. Communicate the benefits of PBF-funded energy efficiency programs to state legislatures, PUCs, and other stakeholders. Document lessons learned and opportunities to enhance the program's effectiveness.

Information Resources

Information About States

Title/Description	URL Address
California Measurement Advisory Council (CALMAC). This Web site provides access to independent evaluation reports on energy efficiency programs in California and elsewhere.	http://www.calmac.org/
California Order Instituting Rulemaking to Examine the Commission's Future Energy Efficiency Policies, Administration and Programs: Interim Opinion on the Administrative Structure for Energy Efficiency: Threshold Issues (Rulemaking 01-08-028). This order addresses threshold issues on administrative structure including planning, oversight, and management of energy efficiency programs, including decisions on what programs to fund with ratepayer dollars.	http://www.cpuc.ca.gov/word_pdf/FINAL_DECISION/43628.doc
California PUC Energy Efficiency Program Funding. This site provides information on the state's public goods charge with links to legislative language and the Web sites of California's four utilities.	http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/ee_funding.htm

Title/Description	URL Address
California Standard Practice Manual: Economic Analysis of Demand Side Programs and Projects. This document provides standardized procedures for evaluating cost-effectiveness of demand-side programs and projects in California.	http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/rulemaking/resource5.doc
Cost-Effectiveness Policy and General Methodology for the Energy Trust of Oregon. In this paper, the Energy Trust of Oregon, Inc. describes its methodology for comparing the cost of energy efficiency to conventional sources of electric energy from three perspectives (i.e., consumer, utility system, and societal).	http://www.energytrust.org/Pages/about/library/policies/costeffectiveness_030414.pdf
Energy Programs Consortium: Options for Developing a Public Benefits Program for the State of Kansas. The purpose of this report was to explore options for establishing a PBF to support the delivery of energy efficiency and renewable energy programs to help reduce the state's need to import energy resources and thereby strengthen the state's economy.	http://www.kansasenergy.org/KEC/KsPubBenFundStudy2004.pdf
Energy Trust Annual Report, 2004. This document reports on state PBF savings and generation, revenues and expenditures, performance measures, and specific projects around the state.	http://www.energytrust.org/Pages/about/library/reports/2004_Annual_Report.pdf
Nevada Energy Efficiency Strategy. Nevada has taken a number of steps to increase energy efficiency. This report provides 14 policy options for further increasing the efficiency of electricity and natural gas, and reducing peak power demand.	http://www.swenergy.org/pubs/Nevada_Energy_Efficiency_Strategy.pdf
NYSERDA Energy $mart^{SM} Evaluation Reports. This Web site contains program evaluation reports developed by NYSERDA and its contractors.	http://www.nyserda.org/Energy_Information/evaluation.asp
A Proposal for a New Millennium. This proposal includes a summary of the California Energy Commission's (CEC's) key recommendations for energy efficiency program priorities, funding levels, and administrative structure.	http://www.energy.ca.gov/reports/1999-12_400-99-020.PDF
Regulatory—Energy Efficiency Filings. This Web site contains monthly program reports on energy efficiency filed by SCE, Rosemead, CA.	http://www.sce.com/AboutSCE/Regulatory/eefilings/MonthlyReports.htm
State of Wisconsin Department of Administration—Focus On Energy Evaluation Reports. This site provides a number of recent evaluation reports that enumerate energy, environmental, and economic benefits from the Focus on Energy program.	http://www.doa.state.wi.us/section_detail.asp?linkcatid=288&linkid=8
System Benefits Charge. Proposed Operating Plan for New York Energy $mart Programs (2001–2006). This report outlines NYSERDA's operating plan for administering the PBF program in New York.	http://www.cleanenergystates.org/library/ny/NYSERDA_SBC_2001-2006.pdf
Wisconsin Public Benefits Programs Annual Report July 1, 2003 to June 30, 2004. This report includes an evaluation of Focus on Energy, the Wisconsin PBF for energy efficiency.	http://www.cleanenergystates.org/library/wi/2004FocusAnnualReport.pdf

General Articles About PBFs

Title/Description	URL Address
Clean Energy Initiative. This report explores the potential for joint investment in clean energy by foundations, state funds, and private investors.	http://www.cleanenergystates.org/library/Reports/CEI_Final_July03.pdf
Clean Energy States Alliance—CESA Member States and Funds. This Clean Energy States Alliance (CESA) Web site provides links to the state PBF sites.	http://www.cleanenergystates.org/Funds/
An Examination of the Role of Private Market Actors in an Era of Electric Utility Restructuring. The report by the American Society for an Energy-Efficient Economy (ACEEE) examines the role of the private sector in promoting energy efficiency and briefly discusses the influence of PBFs.	http://www.aceee.org/pubs/u011full.pdf
Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies. This ACEEE report provides an in-depth discussion and evaluation of PBF policy and implementation at the state level.	http://www.aceee.org/pubs/u041.pdf
A Framework for Planning and Assessing Publicly Funded Energy Efficiency. The primary objective of this report is to discuss the assessment of the cost-effectiveness of market transformation interventions.	http://www.pge.com/docs/pdfs/rebates/program_evaluation/evaluation/EE_Report_Final.pdf
Options for Developing a Public Benefits Program for the State of Kansas. This white paper describes current models of PBFs with recommendations for the state of Kansas on developing a PBF.	http://www.kansasenergy.org/KEC/KsPubBenFundStudy2004.pdf
Ratepayer-Funded Energy-Efficiency Programs in a Restructured Electricity Industry: Issues and Options for Regulators and Legislators. This report by Ernest Orlando, Lawrence Berkeley National Laboratory (LBNL) and ACEEE, discusses features of PBFs and provides recommendations for designing a PBF and choosing an administering body.	http://eetd.lbl.gov/ea/EMS/reports/41479.pdf
Summary Table of Public Benefit Programs and Electric Utility Restructuring. This site provides information, compiled by ACEEE, in tables on energy efficiency and renewable energy PBFs by state. It includes information on funding levels, the charge per kWh, the percentage of revenue, and the administering organization.	http://aceee.org/briefs/mktabl.htm
System Benefits Funds for Energy Efficiency. This report by the National Conference of State Legislatures (NCSL) describes how states can use system benefits funds to support energy efficiency investments. It provides sample legislative language for SBC legislation.	http://www.ncsl.org/print/energy/SystemBenefit.pdf
Trends in Utility-Related Energy Efficiency Spending in the United States. This presentation, at an AESP Brown Bag Lunch Series, shows general trends as well as specific state examples of energy efficiency spending.	http://www.raponline.org/Slides/AESP04kushler.pdf

Examples of Legislation

State	Title/Description	URL Address
California	**Assembly Bill 1890 on restructuring.** This bill, enacted in September 1996, established California's PBF.	http://www.leginfo.ca.gov/pub/95-96/bill/asm/ab_1851-1900/ab_1890_bill_960924_chaptered.html
Massachusetts	**Massachusetts Electricity Restructuring Act of 1997.** This act established the PBF program in Massachusetts.	http://www.mass.gov/legis/laws/seslaw97/sl970164.htm
New York	**A New York Public Service Commission Order and Opinion (PSC Case No. 94-E-0952: Opinion No. 96-12, May 1996).** This order established the PBF program in New York.	http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/ArticlesByCategory/E05EBC3E5C3E79B385256DF10075624C/$File/doc886.pdf?OpenElement
	A New York Public Service Commission Order and Opinion (PSC Case No. 94-E-0952: Opinion No. 98-3, January 1998). This order discusses PBF implementation issues and identifies NYSERDA as the administering organization.	http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/ArticlesByCategory/86EBE0283819224285256DF100755FE5/$File/doc3640.pdf?OpenElement
Oregon	**Oregon Senate Bill 1149.** This bill contains legislative language outlining restructuring and establishing a PBF.	http://www.leg.state.or.us/99reg/measures/sb1100.dir/sb1149.en.html
Wisconsin	**New Law on Electric Utility Regulation—The "Reliability 2000" Legislation (Part of 1999 Wisconsin Act 9).** This informational memorandum describes the provisions in 1999 Wisconsin Act 9 (the 1999–2001 Biennial Budget Act), relating to public utility holding companies, electric power transmission, public benefits, and other aspects of electric utility regulation.	http://www.legis.state.wi.us/lc/3_COMMITTEES/JLC/Prior%20Years/jlc99/pubs/im99_6.pdf

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ACEEE. 2005a. Third National Scorecard on Utility and Public Benefits Energy Efficiency Programs: A National Review and Update of State-Level Activity. Dan York and Marty Kushler, October 2005. Report # U054. ACEEE.	http://www.aceee.org/pubs/U054.htm
ACEEE. 2005b. Issues and Emerging Policy and Program Trends in Energy Efficiency. Dan York, PhD. Presented at Efficiency Maine Forum, October 20, 2005.	http://www.efficiencymaine.org/pdf/EMForum10-20-05/NationalPerspective-DYork.pdf
CEC. 2005. Funding and Savings for Energy Efficiency Programs for Program Years 2000–2004. Cynthia Rogers, Mike Messenger and Sylvia Bender, Energy Efficiency, Demand Analysis and Renewable Energy Division, California Energy Commission. July 11, 2005.	http://www.energy.ca.gov/2005_energypolicy/documents/2005-07-11_workshop/presentations/2005-07-11_FUNDING+SAVINGS.pdf

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NYSERDA. 2004a. New York Energy $mart Program Evaluation and Status Report. Report to the System Benefits Charge Advisory Group. Final Report. NYSERDA, Albany. May.	http://www.nyserda.org/Energy_Information/04sbcreport.asp
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NYSERDA. 2005. New York Energy $mart Program Evaluation and Status Report. NYSERDA, Albany. May.	http://www.nyserda.org/Energy_Information/05sbcreport.asp
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State of Vermont. 2005. An Act Relating to Renewable Energy, Efficiency, Transmission and Vermont's Energy Future. General Assembly of Vermont. June 14, 2005.	http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2006/acts/ACT061.htm
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Washington, D.C. 2004. District of Columbia Code Title 34, Public Utilities Subtitle III, Electricity. Chapter 15. Retail Electric Competition and Consumer Protection. D.C. Code § 34-1514.	http://www.dsireusa.org/documents/Incentives/DC05R.htm
WI DOA. 2004. Wisconsin Public Benefits Programs Annual Report July 1, 2003 to June 30, 2004. Department of Administration (DOA), Division of Energy, Madison, WI.	http://www.cleanenergystates.org/library/wi/2004FocusAnnualReport.pdf

4.3 Building Codes for Energy Efficiency

Policy Description and Objective

Building energy codes for residential and commercial buildings lock in the benefits of cost-effective energy efficiency in new construction and major renovation of existing buildings.

Summary

Building energy codes require new and existing buildings undergoing major renovations to meet minimum energy efficiency requirements. Well-designed, implemented, and enforced codes can help eliminate inefficient construction practices and technologies with little or no increase in total project costs. Codes typically specify requirements for "thermal resistance" in the building shell and windows, minimum air leakage, and minimum heating and cooling equipment efficiencies. These simple measures can reduce energy use by 30% or more, resulting in cost savings for businesses and consumers. Building energy codes also reduce peak energy demand, air pollution, and greenhouse gas emissions. Recognizing these benefits, a majority of states have adopted building energy codes in some form for residential and commercial construction (DOE 2005).

Broadly speaking, building codes include an array of specifications and standards that address safety and functionality. In 1978, California became the first state to include energy requirements in its code. Today, 43 states (including Washington, D.C.) use a version of the Model Energy Code (MEC), the International Energy Conservation Code (IECC), or their own equal-or-better energy codes for residential buildings. Forty-one states (including Washington, D.C.) use the ASHRAE or IECC standard for commercial buildings (Prindle et al. 2003, BCAP 2005a).

While state and local governments have made progress in improving building efficiency through codes, there continue to be cost-effective opportunities for further efficiency savings. States with existing codes are conducting periodic updates and finding ways to improve compliance by monitoring, evaluating, and enforcing their codes. States without building energy codes are initiating stakeholder discussions and formal studies to evaluate whether codes make sense in their area. In some cases, local governments are adopting or modifying codes specific to their jurisdictional boundaries.

The potential energy savings from further state action can be significant. If all states adopted the most recent commercial and residential model energy codes, improved compliance levels, and applied model energy codes to manufactured housing, the United States would reduce energy use by about 0.85 quads annually, with cumulative savings through 2020 of about five quads. (One quad is about equal to the amount of energy contained in 167 million barrels of crude oil.) In 2020, annual consumer energy bill savings would be almost $7 billion, and the construction of 32 new 400 megawatt (MW) power plants could be avoided. Of course, each state's savings depends on many factors: the efficiency of its current building practices; the stringency of the code it adopts; its population, climate, and building construction activity; and the effectiveness of code training and enforcement (Prindle et al. 2003).

Objective

Building energy codes establish a minimum level of energy efficiency for residential and commercial buildings. This can reduce the need for energy generation capacity and new infrastructure while reducing energy bills. States are also finding that energy codes lock in future energy savings during the building design and construction process. In contrast, achieving post-construction energy savings can be comparatively expensive and technically challenging. Codes become even more cost-effective during periods of high heating and cooling fuel prices.

States and municipalities are updating existing codes, adopting new codes, and expanding code programs to improve compliance and achieve real energy and financial savings. With energy consumption expected to rise 20% in the residential sector and 19% in the commercial sector by 2020, enacting building codes is a key strategy for dampening growth in energy consumption across the buildings sector. Some states are promoting "beyond code" building programs to achieve additional cost-effective energy efficiency.

Benefits

State and local governments are seeing a range of benefits from building codes, including lower energy use, an improved environment, and economic growth. Each is discussed as follows.

Energy codes provide minimum levels of energy efficiency in commercial and residential buildings. This lowers overall energy consumption, provides energy bill savings, and can reduce peak energy demand and resulting pressure on the electric system. For example, California's building standards have helped save businesses and residents more than $15.8 billion in electricity and natural gas costs since 1975, and these savings are expected to climb to $59 billion by 2011 (CEC 2003). In addition, California's new 2005 building efficiency standards are expected to yield peak energy use reductions of 180 MW annually—enough electricity to power 180,000 average-sized California homes (Motamedi et al. 2004).

Why Building Energy Codes Help

Economic theory suggests that today's high energy prices should drive the new building market towards high levels of energy efficiency. However, states and municipalities are finding that market barriers sharply limit these effects, including:

- *Split Incentives*. Whereas builders typically bear the capital cost of energy efficiency improvements, homeowners and tenants see the benefits of lower energy bills. Since most builders do not occupy the building and pay energy bills, they lack an incentive to incorporate efficiency features that result in cost savings.
- *Customer Preferences*. Most home purchase decisions and feature selection is driven by nonenergy factors. In selecting optional features for the home, buyers often focus on amenities like kitchen upgrades, extra bathrooms, and new flooring. Efficiency competes with these priorities.

In the presence of multiple barriers, energy codes can ensure that new buildings achieve a basic level of energy efficiency performance that is cost-effective and delivers related benefits.

Residential and Commercial Building Energy Codes

The energy code that applies to most *residential* buildings is the IECC, which supersedes the MEC. The 2000 IECC is the most recent version for which DOE has issued a positive determination. However, different versions of the MEC/IECC have been adopted by states, creating a patchwork of residential codes across the country. The federal Energy Conservation and Production Act (ECPA) was amended in 1992 to require states to review and adopt the MEC (and its successor, the IECC), or submit to the Secretary of Energy its reasons for not doing so.

Most *commercial* building energy codes are based on ASHRAE/IESNA Standard 90.1, jointly developed by ASHRAE and the Illuminating Engineering Society (IES). ECPA requires states to adopt the most recent version of ASHRAE Standard 90.1 for which DOE has made a positive determination for energy savings, currently 90.1-1999. The IECC also contains prescriptive and performance commercial building provisions. By referencing Standard 90.1 for commercial buildings, IECC offers designers alternate compliance paths.

The American Council for an Energy-Efficient Economy (ACEEE) estimates that upgrading residential building codes could save an "average" state about $650 million in homeowner energy bills over a 30-year period (Prindle et al. 2003).

States and municipalities are also finding that energy codes improve the environment by reducing air pollution and greenhouse gases. For example:

- The New York Energy Conservation Construction Code (ECCC) reduces carbon dioxide (CO_2) emissions by more than 500,000 tons annually and reduces sulfur dioxide (SO_2) by nearly 500 tons per year (DOE 2002).

- The 2001 Texas Building Energy Performance Standards are projected to reduce nitrogen oxide (NO_x) emissions statewide by more than two tons each peak day and over one ton each average day, which helps the state meet Clean Air Act requirements for nonattainment areas (Haberl et al. 2003).

Building energy codes can also help grow the economy. States and municipalities benefit from greater investment in energy-efficient capital equipment and new jobs installing equipment and monitoring building compliance. While spending on energy services typically sends money out of state, dollars saved from efficiency tend to be re-spent locally (Kushler et al. 2005, Weitz 2005a).

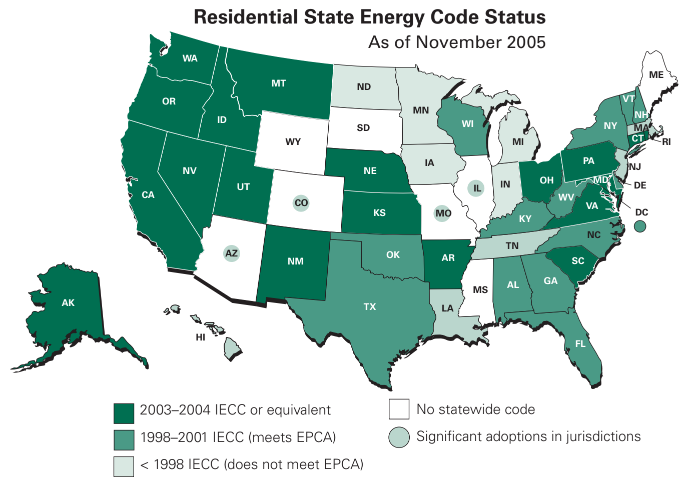
States with Building Energy Codes

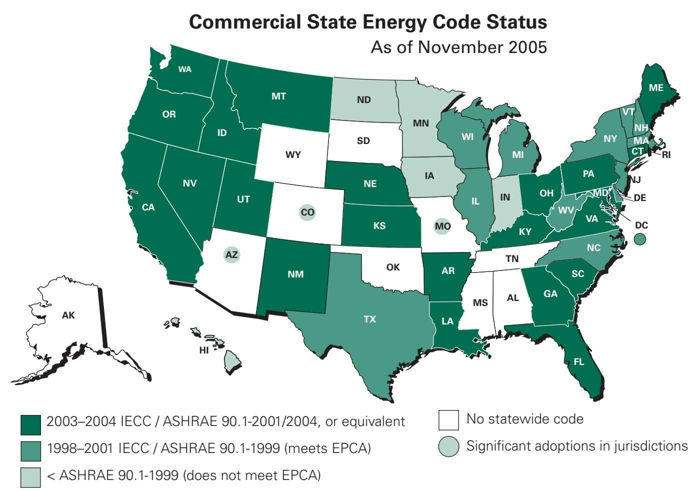
As of November 2005, 43 states (including Washington, D.C.) use a version of the MEC, the IECC, or their own equal-or-better energy codes for residential buildings. Thirty-three of these 43 states are using the latest IECC version that the U.S. Department of Energy (DOE) has determined would improve the energy efficiency of residential buildings, or better. Only 10 states have not adopted a statewide code, although many jurisdictions in four of these states have adopted the 2003 IECC (Prindle et al. 2003, BCAP 2005a, Weitz 2005b).

A total of 41 states (including Washington, D.C.) use a version of the ASHRAE or IECC standard for commercial buildings. Thirty-six states are using the latest ASHRAE 90.1 standard for which DOE has made an energy efficiency determination, or better. Ten states have not adopted a commercial building code, although many jurisdictions within three of these states have adopted the 2003 IECC. While substantial progress has been made, many states and municipalities are regularly finding new opportunities to incorporate new technologies and features into their codes (Prindle et al. 2003, BCAP 2005a, Weitz 2005b).

State and local government experience demonstrates that policy adoption is only the first step—proper

Figure 4.3.1: States with Residential and Commercial Building Energy Codes





Source: BCAP 2005a.

implementation, evaluation, and enforcement are also necessary. In states where these components are missing, full compliance rates can fall short. For example, a 2001 study showed that compliance of less than 50% in the new homes market can occur even in states with strong code training programs (XENERGY 2001).

Leading states are not only monitoring and evaluating their energy codes, but also using the findings from these analyses to take corrective action. In California, a field evaluation of air conditioning units found that incorrect levels of "refrigerant charge" were compromising energy performance. The 2005 Title 24 Standards correct this problem by requiring verification of proper charge quantities by a home energy rater or documentation that a thermal expansion valve was installed (CEC 2005b). This illustrates the importance of maintaining active support for a range of evaluation and enforcement programs after codes are adopted into law.

Most states and municipalities periodically update their building energy codes, some more frequently than others. This process ensures that codes reflect changes in technology and design that offer increased energy efficiency and cost-effectiveness. Across states, it is common for code reviews to be triggered by the release of a new national model code or DOE's determination of improved energy efficiency. Some jurisdictions even introduce state- or local-specific requirements into the model code development process, sharing their experiences nationally.

Designing an Effective Building Code

Actions that states take when adopting new or updating existing codes include identifying key participants, analyzing cost considerations, determining a time frame for action, and evaluating interactions with other state and federal policies.

Participants

- *Government Officials*. Model building energy codes for the residential and commercial sectors are developed at the national level by model code organizations, such as the International Code Council (ICC) and ASHRAE. States and large local jurisdictions have been the predominant backers and participants in maintaining these model codes. DOE is required by the ECPA to participate in the review and modification of the codes. Code implementation is conducted at the state and local levels and enforced by local governments (DOE 2005). States often modify the national model codes to account for needs and opportunities specific to their climate, geography, and economy.

ECPA requires DOE to make determinations regarding national model codes. This means that DOE periodically evaluates new editions of the model codes (the IECC and Standard 90.1) and determines whether the new edition will improve the efficiency of residential or commercial buildings. If DOE makes a positive determination on a new residential model code, states must *consider* adopting it within two years. If they elect not to adopt the code, state officials are required to submit their reasoning to the U.S. Secretary of Energy. In contrast, if DOE makes a positive determination on a new commercial sector code, states are required to adopt it within two years. In practice, however, states demonstrate compliance through a self-certification process and there are no major repercussions for failing to adopt new commercial codes.

Under ECPA, DOE also provides technical and grant assistance to states to facilitate building code adoption and implementation. DOE operates through centers of expertise such as the Pacific Northwest National Laboratory (PNNL) to help states chart a course of action. Examples of PNNL technical assistance include conducting studies of current building practices (to develop baselines), quantitative analysis of potential benefits, legislative and regulatory assessments, training and technical assistance for builders and code officials, and other services available at: http://www.energycodes.gov.

More recently, the Energy Policy Act of 2005 (EPAct 2005) amended ECPA to authorize DOE to provide funding for states that implement a plan to achieve 90% compliance with residential (IECC 2004) and commercial (ASHRAE 90.1-2004) building codes. In states without a building code, DOE is authorized to provide similar funding to local governments that are taking action on building codes.

While most states have the authority to adopt energy codes statewide, some states have "home rule" laws that limit their ability to impose building requirements on municipalities. In these states, local governments can adopt their own codes. For example, two Arizona cities, Phoenix and Tucson, are taking this approach (and thereby affecting a large portion of the state's overall building stock). Alternatively, home rule states can revise existing law to allow for statewide building energy codes. Texas followed this approach, primarily in an effort to improve the state's air quality.

- *Builders, Developers, and Building Owners.* Builders, developers, and building owners are responsible for implementing provisions in the code language. States and municipalities are finding that active collaboration with these groups improves understanding, creates buy-in, and can lead to greater levels of compliance. States such as California, Minnesota, and Florida have a history of working closely with the building community (Prindle et al. 2003).
- *Code Developers.* In the United States the ICC, ASHRAE, and the National Fire Protection Association (NFPA) develop model energy codes and standards. The ICC develops the IECC for residential buildings, while ASHRAE maintains the 90.1 standards for commercial buildings and 90.2 for residential buildings. Both ICC and NFPA provide a reference to ASHRAE Standard 90.1 as an alternate compliance path for commercial buildings. To facilitate ease-of-adoption by states, these documents are written as model codes that can be adopted as is, or modified to suit state or local needs. Another role for code developers is to provide training and technical support to code officials. The ICC serves in this capacity to assist with interpretation and implementation of residential codes.
- *Nongovernment Organizations.* Nongovernment organizations support building energy code adoption and implementation by fostering peer exchange, serving as information sources, and providing expert assistance. For example, the Building Codes Assistance Project (BCAP) offers tailored technical assistance to states and municipalities. In states seeking to adopt the IECC or ASHRAE 90.1, BCAP provides services such as educational support for code officials and legislators, as well as implementation assistance. The organization is a joint initiative of the Alliance to Save Energy (ASE), ACEEE, and the Natural Resources Defense Council (NRDC).

The Residential Energy Services Network (RESNET) promotes codes by fostering national markets for home energy rating systems and energy-efficient mortgages that go beyond codes. RESNET develops home energy rating systems, accredits home energy rating trainers and providers, promotes residential energy efficiency financing products, and conducts educational programs. To encourage consistency across rating systems, the organization works to align its standards to the IECC.

Cost Considerations

Upgrading the energy efficiency of new homes and commercial buildings is very cost effective. A recent study estimated that upgrading the energy efficiency of a typical new home to comply with the model energy code in Nevada would cost about $1,500 on average but would result in about $400 in annual energy bill savings, meaning a simple payback of less than four years. Likewise, this study estimated that upgrading the energy efficiency of commercial buildings to comply with the code would cost about $1.60 per square foot but would result in about $0.68 per square foot of energy bill savings per year, meaning a simple payback of about 2.4 years (Geller et al. 2005).

The efforts of national code development organizations ensure that each state does not incur the full cost of developing its own codes. The ICC, ASHRAE, and NFPA offer model energy codes that are developed with stakeholder input and written to promote transferability. However, some states (e.g., California and Florida) and municipalities choose to initiate their own code development process. Although most find that using model codes saves the expense and time of developing a new code, it is common for states to initiate a review-and-modification process that amends the model codes to reflect state-specific considerations. Another way that state and local governments lower costs is by using technical and grant assistance from DOE and nongovernment organizations to fund their code development, adoption, or enforcement process.

When adopting a model code, states typically provide resources to municipalities to support implementation and enforcement. Local funds are used to help code officials and builders understand and comply with the code's requirements. Municipalities also lower costs by using home energy rating systems (HERS) to demonstrate compliance with the energy code. These systems indicate the energy efficiency of a home and are typically funded by the local government or the builder.

However, even where state and federal resources are available to municipal code officials, cities are finding that staff coverage for code enforcement is often stretched thin. To overcome this barrier, some local governments collaborate with state officials to help meet resource and assistance needs. For example, the Texas Energy Partnership is a consortium of state, federal, and local agencies—as well as universities and other non-government partners—created to help municipalities throughout Texas establish procedures for administration and enforcement of code requirements adopted under Senate Bill 5 (S.B.5). The partnership offers technical assistance and access to state and federal experts that help municipalities comply with code provisions and save money on energy bills (AACOG 2005).

Timing and Duration

State and local experience with building energy codes shows that the time of building design and construction represents a low-cost opportunity to integrate energy efficiency into a structure. Decisions made at this time often cannot be remedied later or can only be revised at significant cost.

States are also finding they can increase code effectiveness by regularly updating code specifications. A periodic review of energy code requirements is a strategic way to ensure that opportunities associated with new building sector technology are captured. States often time their reviews to coincide with updates of national-level model codes by the code development organizations or the issuance of a DOE determination. This approach offers regular opportunities for states and municipalities to simultaneously provide input to the model code development process and to update their own codes. Other states call for updates on a regular basis. For example, Massachusetts reviews its code every five years while some other states do so every three years (e.g., California, Idaho, Maryland, Montana, New Mexico, and Pennsylvania). As a rule of thumb, states take action if the code is more than five years old, if there is no evidence of consistent enforcement, or if there is no state energy code.

When code development organizations release a new version of a model code (and DOE makes a positive determination about its effectiveness), states are required by the Energy Conservation and Production Act (EPCA) to respond accordingly. On the residential side, new versions of the IECC are released every three years with an interim supplement released in between. While adoption is not required for residential codes, it is mandatory for new versions of the commercial sector ASHRAE 90.1 code. ASHRAE 90.1 has historically been revised and republished less frequently than the IECC (there was a decade gap between the 1989 and 1999 versions). It is now scheduled for release on a three-year cycle. The most recent version is 90.1-2004.

State experience with the review and update process demonstrates that it is important to anticipate and plan for the education and training needs of code officials, builders, contractors, and other affected parties. Each participant requires a period of time to identify and understand new requirements and changes to existing regulation. Code changes also affect product manufacturers and suppliers, who need lead-time to clear current inventories and ensure that newly compliant products are available when the revised code takes effect.

Interaction with Federal Programs

State and local governments are finding that voluntary programs such as ENERGY STAR can help the building community move beyond code-mandated efficiency levels in the new housing stock. An ENERGY STAR-qualified new home is at least 30% more efficient than a home built to the model energy code

Best Practices for Developing and Adopting Building Codes

States and municipalities have identified the following best practices to help states update existing building energy codes and adopt new codes:

- *Do Your Homework.* Evaluate current building energy code laws, as well as options for implementation and enforcement. If there is no state energy code, if it is more than five years old, or if there is no evidence of consistent enforcement, it may be time to act:
  - Conduct an analysis of the benefits and costs of code adoption and implementation.
  - Talk with key stakeholders—including local officials and builders—to hear their concerns, assess their experience with energy codes, and gauge their perspectives.
  - Assess resources for training and other forms of technical support for code officials, builder associations, and building supply organizations.
  - Contact materials suppliers to learn about availability of compliant products.
- *Obtain Outside Help.* Implementing and enforcing codes requires a high level of engineering expertise that many code officials do not have. Several organizations provide resources to help. For example, DOE's Pacific Northwest National Laboratory, the Building Codes Assistance Project, and the New Buildings Institute can assist in charting a course of action. This action might include quantitative assessments of potential benefits, baseline building practice studies, legislative and regulatory assessments, training and technical assistance for builders and code officials, and other services.
- *Create a Stakeholder Process.* Involve key stakeholders early and regularly. Include them in reviews of studies, proposal regulations, and other aspects of the process. Involving stakeholders helps ensure the codes are appropriately designed. This process increases the chances of code adoption and minimizes enforcement problems.

and 15% more efficient than one built to local code. To certify an ENERGY STAR home, the builder may guide construction to this performance specification—as verified by a HERS—or build to a prescribed set of requirements outlined in a Builder Option Package (BOP). BOPs contain requirements for insulation levels, air infiltration, windows, and heating and cooling equipment. The relevant set of BOP requirements depends on climate conditions and is third-party verified.

To encourage the construction of ENERGY STAR-qualified new homes, state and local governments are using marketing and outreach campaigns, training builders, and assisting builders in rating their homes. New York's Energy $mart initiative has an active ENERGY STAR new homes program that emphasizes education and training for builders, local officials, and other stakeholders. Since its inception in 2001, more than 4,000 homes have been constructed and qualified in the state. New York is finding that voluntary above-code programs complement and go beyond traditional regulatory approaches to ensure a continuous stream of building energy savings (New York Energy $mart 2005).

Interaction with State Policies

State and local policymakers are leveraging other state clean energy policies to support building energy codes. For example, some states are using public benefits funds (PBFs) to support code implementation and enforcement. The New York State Energy Research and Development Authority (NYSERDA) offers financial incentives to building owners and leaseholders to improve the energy efficiency of new and existing construction (NYSERDA 2004). Other states, such as Illinois and Wisconsin, are using PBF resources to enhance voluntary new and existing buildings programs used to document code compliance (MEEA 2002).

Several state and local governments are investigating the extent to which building codes improve air quality, and whether this benefit can be incorporated into their air quality planning process. Codes improve air quality by reducing energy consumption in buildings, thereby lowering electricity generation and resulting pollution from power plants. In some states and cities, code officials are beginning to collaborate with air quality planners on how these benefits can be captured in State Implementation Plans (SIPs) for regulated air pollutants. S.B.5 in Texas is an example of legislation mandating building energy efficiency for the explicit purpose of improving the state's ozone air quality (see *State Examples* section on page 4-46).

Program Implementation and Evaluation

Implementation

States and municipalities are finding innovative ways to implement building codes and achieve significant savings. By addressing the following commonly encountered barriers, they can increase their likelihood of success:

- *The Size and Fragmentation of the Building Industry Slows Technology Advancement.* While there are fewer than a dozen U.S. manufacturers of automobiles, home appliances, and light bulbs, there are approximately 150,000 home building companies in the United States. And in contrast to highly automated sectors of the U.S. economy, the building sector remains largely a craft industry dependent on the integration of hundreds of components from various manufacturers by onsite crews and subcontractors. To overcome this barrier, many states provide training and education services to these groups. For example, the Texas State Energy Conservation Office (SECO) works in partnership with the Texas Association of Builders to provide classroom and online training for homebuilders and subcontractors. Their program focuses on the importance of well-designed and properly installed energy and moisture management systems. Outreach materials are available in both Spanish and English.
- *Energy Efficiency Is Typically Not a Top Customer Preference.* This can serve as a barrier to code implementation and enforcement (though not necessarily code adoption). Most home purchase decisions and feature selection are driven by non-energy factors. For example, buyers are often more focused on amenities like kitchen upgrades, extra bathrooms, or new flooring. Efficiency features compete with these highly visible priorities.

  In states where energy efficiency is not a top customer preference, it is often because awareness is low. Evidence from a Massachusetts energy code evaluation indicates that homebuyers rarely ask builders about the beneficial energy efficiency characteristics of their prospective homes (XENERGY 2001). By inquiring about measures such as proper heating, ventilation, and air conditioning (HVAC) equipment sizing and duct insulation, consumers can avoid problems such as high utility bills, poor ventilation, differential heating and cooling of rooms in the house, and reduced comfort. Since consumers drive the market, some states are turning to education as an important component of code implementation efforts.
- *Surveys Indicate That Mandatory Energy Codes Are Often Not Complied With Because They Are Too Complex and Difficult to Understand.* As a result, states are finding that having an energy code in place is no guarantee that energy savings will be achieved. Code-development organizations are responding to this barrier by simplifying new versions of the ASHRAE 90.1 standards and IECC. For example, the 2004 version of ASHRAE Standard 90.1 included updated HVAC equipment efficiency levels that reflect new federal manufacturing standards. In the residential sector, the 2006 IECC is about one-half the size of the 2003 edition. In addition, there is no longer a "window-to-wall ratio" requirement, a provision that many found overly complex. Instead, the envelope criteria (i.e., amount of insulation and window characteristics) are independent of the amount of glazing. Another change to both codes is that they now contain a simplified approach to characterizing climate zones, reducing the overall number from 19 to 8. Each zone is now a distinct geographic block aligned by political boundaries to facilitate code implementation and enforcement (ICC 2005).
- *States Are Also Taking Steps to Reduce the Complexity of Their Codes.* They are finding that effective prescriptive codes—such as the model adopted by Oregon and Washington—are written in straightforward language that emphasizes simple measures with high energy savings potential. Code officials are also pursuing a range of best practices (see text box, *Best Practices for Energy*

Code Implementation) that minimize the additional learning and time requirements imposed on code officials.

- *According to the National Science Foundation and the Lawrence Berkeley National Laboratory (LBNL), Many States Do Not Possess the Necessary Resources to Monitor, Evaluate, and Enforce Their Energy Code.* Some states have less than one full-time-equivalent staff person dedicated to enforcement, and many states simply do not pursue monitoring and evaluation (DOE 2005). As a result, self-enforcement of building energy code provisions is the norm in many states. New York accomplishes this by requiring a licensed design professional to complete an official form attesting to code compliance.

  Other states are using PBF funds to address the challenge of moving from the process of code adoption to widespread compliance. For example, California's Public Interest Energy Research (PIER)—funded by ratepayer dollars to conduct energy research and development for the state—works to identify candidate technologies and practices for improving the energy efficiency of new buildings in California. Currently, PIER is funding projects to support the development of California's 2008 Residential Building Energy Efficiency Standards (Eash 2005, CEC 2005a). In the face of resource shortages, other states rely on self-enforcement mechanisms such as home energy rating systems and the ENERGY STAR program.

Evaluation

State and municipal experience demonstrates that evaluating energy savings, conducting compliance surveys, and assessing the process by which program information is distributed are key elements of a successful building energy code. Evaluation of energy and peak demand savings data helps ensure requirements are followed and that stated goals are achieved. Information about the "co-benefits" of energy savings (e.g., financial savings and reductions in air pollution), implementation levels, and code awareness is used by code officials to evaluate progress, suggest strategies for improvement, and enhance overall program effectiveness.

Best Practices for Energy Code Implementation

States and municipalities have identified the following best practices for energy code implementation:

- Educate and train key audiences:
  - Build strong working relationships with local building officials, homebuilders, designers, building supply companies, and contractors for insulation, heating, and cooling equipment.
  - Hold regular education and training sessions before and after the effective date of the new energy code requirements. Maintain an ongoing relationship with homebuilders and building officials associations, even between code change cycles. This encourages both familiarity and trust and is an opportunity to share concerns.
- Provide the right resources, including:
  - An overview of energy code requirements, opportunities, and related costs and benefits.
  - Basic building science concepts. Practical compliance aids can range from laminated information cards for simple prescriptive methods to software packages for performance-based codes.
  - Information on how to inspect plans and site features for compliance.
  - Who to contact and resources for more information and technical assistance.
- Provide budget and staff for the program. Assign staff personnel with appropriate training and experience to support the code adoption and implementation processes. Provide this person with sufficient budgets to do the necessary homework, involve stakeholders, and support implementation.

Similarly, states are conducting studies of prospective energy savings from codes prior to adoption and implementation. Measuring the range of potential benefits—energy, economic, and environmental—can build the case for energy codes by assessing both positive and negative costs. If results show promise, studies of prospective benefits can also broaden stakeholder support for energy codes.

State and local officials are finding value from the following kinds of evaluation tools:

- *Energy Savings Evaluation*. Even though theoretical energy savings from building codes can be estimated with computer software, it is important to evaluate whether codes are actually saving energy and meeting goals. Information from energy savings evaluations can be used to determine if certain portions of the code perform better than others or if overall savings are meeting expectations. With this insight, states can focus their implementation and enforcement efforts on addressing priority concerns. For example, a 2002 study in Fort Collins, Colorado found that measured energy savings from a code change in 1996 were approximately half of pre-implementation estimates. By conducting a code evaluation, the city was able to identify problem areas and focus its resources accordingly (City of Fort Collins 2002).
- *Compliance Surveys*. These are used to determine whether buildings are being built in compliance with code. If they are not, additional enforcement and training initiatives may be needed. Another purpose of surveys is to assess the overall state of building technology and practice. Survey results might show, for example, that certain beyond-code energy features are gaining wide acceptance in the market due to improved cost-effectiveness.
- *Process Evaluation.* State programs that offer technical assistance and related services benefit from a process evaluation to assess and suggest improvements to these offerings. These evaluations look less at what is being built than at the ways information is delivered to key stakeholders such as builders and code officials. Improving service delivery can help improve code compliance and overall stakeholder acceptance of the code. Process evaluation is also used to determine the effectiveness of a state's enforcement efforts.

State Examples

The following states have implemented successful building codes programs using varying approaches.

California

California's Title 24 standards for residential and commercial buildings are among the most stringent and best-enforced energy codes in the United States. The building code provisions of Title 24 are notable for:

- *Stringency.* The Title 24 standards typically exceed IECC and ASHRAE efficiency levels.
- *Performance-Based Provisions.* California's building efficiency standards are organized into three basic components: mandatory features, prescriptive package requirements, and performance guidelines.
- *High Compliance Rates*. Field verification studies for Title 24-compliant buildings show that 70% of homes meet all code requirements.
- *Flexibility.* California is one of a few states that includes a performance-based approach that permits a wide variety of combinations of energy efficiency measures to meet code requirements.
- *Receiving Active Support.* The California Energy Commission (CEC) maintains an expert staff that manages the code development process and provides technical assistance in code interpretation and enforcement.
- *A Forward-Looking Orientation*. California periodically expands the scope and stringency of its energy codes to ensure that they capture available "potential savings" and works with its utilities on research and development to incorporate proven technologies.

California's new 2005 building efficiency standards are expected to yield $43 billion in electricity and natural gas savings by 2011. Forecasts estimate that the standards will reduce annual energy demand by 180 MW, equivalent to the electricity requirements of 180,000 average-sized California homes (CEC 2003). The CO_2 savings in the residential sector alone is 49,000 tons per year, a figure equivalent to 9,600 passenger cars not driven for one year (USCTCG 2005).

Web site:
http://www.energy.ca.gov/title24/

Oregon and Washington

Compared to California, the states of Oregon and Washington take a simpler and more prescriptive approach to building energy efficiency. Their strategy is closely aligned to the Model Conservation Standards (MCS) developed in the Northwest region during the 1980s. The MCS were originally disseminated as voluntary standards under utility programs that offered incentives, education, and other support to builders. As builders came to accept the MCS, states in the region moved to incorporate them into building codes.

The simplicity and consistency across local jurisdictions of Oregon and Washington's prescriptive approach has achieved a high level of code compliance. A recent construction practice survey found that 94% of homes surveyed in Washington and 100% in Oregon met or exceeded code requirements for the building envelope (Ecotope 2001).

Residential energy codes in Oregon saved 857 million kilowatt-hours (kWh) and 40 million therms of natural gas in 2000 (Oregon Office of Energy 2001).

Web sites:
http://egov.oregon.gov/ENERGY/CONS/Codes/codehm.shtml

http://www.energy.wsu.edu/code/default.cfm

Texas

Texas is a "home rule" state that passed legislation in 2001 requiring local governments to follow a single statewide building energy code. It is also the first state to adopt an energy code primarily for Clean Air Act compliance reasons. After extensive stakeholder consultation, the state elected to adopt the IECC, including a solar heat gain standard for windows that results in significant cooling and peak load energy savings. The following are key features of the Texas code:

- The IECC's cooling energy savings are substantial. Electricity reductions from the solar heat gain standard alone will total 1.8 billion kWh over 20 years and avoid 1,220 MW of peak demand at the end of the 20-year period (Tribble et al. 2002).
- The Texas energy code is approved for 0.5 tons per day of NO_x emissions credits from EPA in the SIP for ozone pollution. This is the first time that an energy code has been adopted by a state specifically to improve air quality.
- Because Texas is a home rule state, it has limited ability to impose regulatory requirements on local jurisdictions. Successful implementation of a single statewide energy code is a political milestone.

Web site:
http://www.trcc.state.tx.us

Arizona

Arizona is another home rule state where energy codes are adopted and enforced at the local level. As such, several communities—including Pima County and the city of Tucson—have emerged as local leaders in building code adoption. Both jurisdictions now have codes based on the 2000 IECC. Another Arizona municipality, the city of Phoenix, recently conducted a comprehensive review and technical comparison of the national model building codes. After initiating a process to solicit stakeholder input, Phoenix pursued and adopted residential and commercial codes, making it the first city in the United States to adopt the IECC 2004 supplement for residential construction and the ASHRAE 90.1 2004 standard for commercial construction.

The successful experience of these municipalities has encouraged other local governments in Arizona to consider adopting an energy code. The Maricopa Association of Governments, a Council of Governments that serves as the regional agency for the Phoenix metropolitan area, is currently assessing the possibility of adopting building energy requirements for the more than 30 localities included within its jurisdiction (Panetti 2005).

Projected results from building codes programs include:

- By adopting the 2004 IECC, Phoenix is expected to reap an 18% reduction in residential energy consumption, a 21% reduction in electricity use, and a 10% in natural gas use.
- It is estimated that while a new home built to the IECC will cost an average of $1,517 more than a home built without the code, the difference will be repaid to homebuyers in 3.9 years (based on simple payback). The life cycle cost savings associated with improved energy efficiency from adopting the IECC is $11,228 per home (BCAP 2005b).

Web site:
http://www.commerce.state.az.us/energy/state%20energy%20code.asp

What States Can Do

States with energy codes can consider updates and improvements to the implementation process. States with no energy code in place can examine the costs and benefits of implementing a code and consider initiating a code adoption process.

Action Steps

States that already have an energy code can:

- Implement a rigorous enforcement program that ensures local building code departments have proper training and resources, including adequate staff coverage.
- Review the version of the document currently in force. If it is more than five years old, consider an updated version. The latest available IECC code version is the 2006 version, which was released in October 2005. The most recent ASHRAE Standard 90.1 is the 2004 version.
- Conduct analysis on the effect of potential code updates on energy and cost savings for building owners, on the effect on energy generation and distribution, and on air pollutant and greenhouse gas emissions levels. Balance these benefits against any added construction costs.
- Initiate a stakeholder process to review the data, obtain participant input, and decide whether to adopt a new code.
- If a new version of the energy code is adopted, initiate administrative and educational processes. Implementation tools and other resources are available at no charge from DOE.
- If a state-specific energy code training program exists, review it and consider an update that describes new codes not currently covered.

States that are considering adopting an energy code can:

- Review all available model codes and standards and learn about other states' experiences. Conduct research and analysis to determine which codes best match the needs of the area under consideration.
- Establish a baseline building prototype against which to assess the benefits of an energy code. This may require a field survey of homebuilders, suppliers, and contractors, including onsite inspections and interviews.
- Conduct an analysis of the effect of the new code on energy and cost savings for building owners, power system reliability, and reduced air pollutant and greenhouse gas emissions. Balance these benefits against any added construction codes.
- Initiate a stakeholder process to review the data, obtain stakeholder input, and decide whether to adopt the energy code under consideration.
- After a decision to adopt an energy code, initiate administrative and educational processes, as appropriate.
- Develop a code implementation process that includes training and technical assistance. Reach out to affected industries and audiences across the state.

Information Resources

Information About Individual State Codes

Title/Description/Contact Information	URL Address
BCAP. A nonprofit organization, BCAP is dedicated to helping states adopt and implement up-to-date building energy codes. The BCAP Web site includes maps, data on code status for all states, and information on training opportunities.	http://www.bcap-energy.org
Building Energy Codes Program Web Site: Case Study: Massachusetts Commercial Energy Code. This Web site includes highlights of the Massachusetts Commercial Energy Code and details of the collaborative code adoption process along with projected energy and cost savings and pollution reduction.	http://www.energycodes.gov/implement/case_studies/massachusetts.stm
Building Energy Codes Program Web Site: Case Study: New York Energy Conservation Construction Code. This Web site includes an overview of the New York Energy Conservation Construction Code and the code adoption process, and also details some of the reasons for the code's success.	http://www.energycodes.gov/implement/case_studies/new_york.stm
California: CEC. Phone: 916-654-5106 or 800-772-3300 (toll free in California). E-mail: title24@energy.state.ca.us.	http://www.energy.ca.gov/title24
DOE Status of State Energy Codes. This Web site provides data for each state on state contacts, current code status, code history, and construction data.	http://www.energycodes.gov/implement/state_codes/index.stm
Florida: Department of Community Affairs. Codes & Standards Office 2555 Shumard Oaks Blvd. Tallahassee, FL 32399-2100 Phone: 850-487-1824.	http://www.floridabuilding.org
Minnesota: Building Codes and Standards Division 408 Metro Square Building 121 7th Place East St. Paul, MN 55101 Phone: 651-296-4639.	http://www.state.mn.us/cgi-bin/portal/mn/jsp/home.do?agency=BCSD or http://www.state.mn.us/cgi-bin/portal/mn/jsp/content.do?subchannel=-536886620&id=-536886617&agency=BCSD
Oregon Office of Energy 625 Marion St. NE Salem, OR 97301-3737 Phone: 503-378-4040 or 800-221-8035 / Fax: 503-373-7806 E-mail: energyweb.incoming@state.or.us.	http://egov.oregon.gov/ENERGY/CONS/Codes/codehm.shtml
Texas A&M Energy Systems Laboratory (ESL) ESL Senate Bill 5 Program Room # 053 Wisenbaker Engineering Research Center Bizzell Street Texas A&M University College Station, TX 77843-3581 Phone: 979-862-2804 / Fax: 979-862-2457.	http://165.91.209.42/sb5/workshops/training.htm
Washington State Energy Extension Service 925 Plum Street SE Bldg No 4 Box 43165 Olympia, WA 98504-3165 Phone: 360-956-2000 / Fax: 360-956-2217.	http://www.energy.wsu.edu/code/default.cfm

Other Resources for Building Code Information

Title/Description	URL Address
ASHRAE. ASHRAE provides technical standards and other technical information.	http://www.ashrae.org/
BCAP. A nonprofit organization, BCAP is dedicated to helping states adopt and implement up-to-date building energy codes.	http://www.bcap-energy.org/
Codes and Standards: MEC. The MEC is published and maintained by the ICC. The 1998 IECC is the successor to the 1995 MEC.	http://www.energycodes.gov/implement/pdfs/modelcode.pdf
DOE BECP. Operated by PNNL, BECP provides compliance tools, technical assistance, and other code information and support.	http://www.energycodes.gov
ICC. The ICC provides code documents, technical assistance, training, and other services.	http://www.iccsafe.org
New Buildings Institute (NBI). A nonprofit organization, NBI develops leading-edge commercial building standards and related research and technical information.	http://www.newbuildings.org/
RESNET. RESNET accredits home energy rating organizations, and provides a variety of technical information on home energy ratings and home energy performance.	http://www.natresnet.org/

Compliance and Analytical Tools

Title/Description	URL Address
DOE Building Energy Tools Directory. This is the DOE directory of building energy analysis tools.	http://www.eere.energy.gov/buildings/tools_directory/
DOE COMcheck-EZ and REScheck Software. Provided through the DOE codes program, these simple programs offer an easy way to check whether a wide variety of building designs meet energy code requirements.	http://www.energycodes.gov/compliance_tools.stm
DOE EnergyPlus. This public-domain software provides accurate building energy simulation capabilities.	http://www.eere.energy.gov/buildings/energyplus/
ENERGY STAR Portfolio Manager. This tool allows users to track energy use of a portfolio of buildings online. It includes functions for benchmarking, managing a single building or group of buildings, assessing investment priorities, and verifying building performance.	http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager
ENERGY STAR Target Finder. This tool rates the energy performance of a building design using information about energy use per-square-foot derived from building design simulation tools. EPA's energy performance rating system uses a 1 to 100 scale, where an ENERGY STAR target rating is 75 or higher.	http://www.energystar.gov/index.cfm?c=target_finder.bus_target_finder

Examples of Code Language

State	Title/Description	URL Address
Arizona	**Arizona State Energy Code; Advisory Commission (voluntary).**	http://www.azleg.state.az.us/ars/41/01511.htm
	Proposed Amendments to IECC.	http://phoenix.gov/DEVSERV/ieccamd.pdf
	Sustainable Energy Standard for the IECC, 2000 edition, regionally specific for the Tucson Metropolitan Area.	http://www.ci.tucson.az.us/dsd/Codes___Ordinances/Building_Codes/2000IECCSES_sustainable_energy.pdf
California	**California State Legislature, AB 970, Section 25553.**	http://www.leginfo.ca.gov/pub/99-00/bill/asm/ab_0951-1000/ab_970_bill_20000907_chaptered.html
	2001 Energy Efficiency Standards for Residential and Nonresidential Buildings.	http://www.energy.ca.gov/title24/2001standards/2001-10-04_400-01-024.PDF
Oregon	**Oregon Revised Statutes, 455.525.**	http://www.leg.state.or.us/ors/455.html
	Oregon Department of Energy, Energy Code Publications and Software.	http://egov.oregon.gov/ENERGY/CONS/Codes/cdpub.shtml
Texas	**Texas Residential Building Guide to Energy Code Compliance.**	http://165.91.209.42/sb5/documents/ResGuideRev104.pdf
	Texas State Legislature, SB 5–Legislative Session 77(R), Chapter 388.	http://www.capitol.state.tx.us/statutes/docs/HS/content/htm/hs.005.00.000388.00.htm
Washington	**Washington State Legislature, WSR 05-01-013.** Enter “05-01-013 ” in *Search Bills, RCW, WAC, and State Register box* and check “State Register 2005.”	http://search.leg.wa.gov/pub/textsearch/default.asp
	Washington State Building Code Council, State Building Codes.	http://www.sbcc.wa.gov

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4.4 State Appliance Efficiency Standards

Policy Description and Objective

Appliance standards save energy and generate net benefits for homes, businesses, and industry by reducing the energy cost needed to operate equipment and appliances.

Summary

State appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products. These standards typically prohibit the sale of less efficient models within a state. Many states are implementing appliance and equipment efficiency standards, where cost-effective, for products that are not already covered by the federal government.[13] States are finding that appliance standards offer a cost-effective strategy for improving energy efficiency and lowering energy costs for businesses and consumers.

As of November 2005, 10 states (Arizona, California, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Washington) have adopted standards for 36 types of appliances. Four states (Maine, New Hampshire, Pennsylvania, and Vermont) are considering adopting standards.

Appliance efficiency standards have been an effective tool for improving energy efficiency. At the federal level, the U.S. Department of Energy (DOE) has been responsible for setting minimum appliance standards and test procedures for an array of residential and commercial appliances and equipment since 1987. As of 2000, federal appliance efficiency standards had reduced U.S. electricity use by 2.5% and carbon emissions by nearly 2%. By 2020, the benefits from existing standards are expected to more than triple as the stock of appliances and equipment is replaced by more efficient models (Geller et al. 2001). The appliance standards for 16 products established by the Energy Policy Act of 2005 (EPAct 2005) are expected to yield an additional 2% savings in total electricity use (ACEEE 2005a).

Efficiency standards can play a significant role in helping states meet energy savings goals. In New England, for example, a package of state standards is expected to reduce load growth by 14% from 2008 to 2013 and cut summer peak demand growth by 33% (Optimal Energy 2004).

States are also finding that appliance standards have low implementation costs because the existing standards of states like California can be leveraged.

Objective

The key objectives of appliance efficiency standards are to:

- Raise the efficiency of a range of residential, commercial, and industrial energy-consuming products, where cost-effective.
- Overcome market barriers, such as split incentives between homebuilders and homebuyers and between landlords and tenants, and panic-purchase situations where appliances break and must be replaced on an emergency basis. In a panic purchase, customers usually don't have the time to consider a range of models, features, and efficiency levels.
- Ensure energy use reductions to prevent pollution and greenhouse emissions, improve electric system reliability, and reduce consumer energy bills.

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13 Under certain conditions, states can exceed a federal standard for a federally covered product; overall, however, federal law is preemptive. For example, in the case of building codes, a state can create a building code compliance package in which a furnace is at a higher efficiency than the federal standard. However, the state must also provide a compliance path under which the higher-efficiency furnace is not required. Thus, the option to exceed federal standards is indirect and is typically only possible in the case of building codes. In addition, states cannot ban lower efficiency products.

Benefits

In addition to saving energy, appliance and equipment standards help reduce pollutant emissions, improve electric system reliability, and save consumers and business owners significant amounts of money over the life of the equipment. As of 2000, federal standards had reduced U.S. electricity use by 2.5% and U.S. carbon emissions from fossil fuel use by nearly 2%. Total electricity savings from already adopted federal standards are projected to reach 341 billion kilowatt-hours (kWh) per year or 7.8% of the projected total U.S. electricity use in 2020 (Geller et al. 2001). The appliance standards in the EPAct of 2005 are expected to result in additional savings of 90 billion kWh or 2% of projected total U.S. electricity use in 2020 (ACEEE 2005a). The potential savings from five products that are not currently covered by federal law or designated under the EPAct for standard setting by DOE are estimated to be 24.4 terawatt-hours (TWh)[14] of electricity and about 4 quads[15] of primary energy[16] in 2030 if implemented nationally, generating $14.6 billion in net savings for consumers and business owners for equipment purchased through 2030. These standards are also very cost-effective, with a high benefit-cost ratio, as illustrated in Table 4.4.1 (Nadel et al. 2005).

The direct economic and environmental benefits of state standards are also substantial. One study of 19 California product standards projects savings to California consumers and businesses of more than $3 billion by 2020 and estimates that these standards will reduce the need for three new power plants (ASAP 2004).

Table 4.4.1: Estimated Energy Savings and Economics of Appliance Standards Not Covered by Federal Law

Products	Effective Date (year)	National Energy Savings in 2020		National Energy Savings in 2030		Cumulative Savings for Products Purchased thru 2030 (quads)	Net Present Value[a] for Purchase thru 2030 ($ billion)	Benefit Cost Ratio
		(TWh)	(tril. Btu)	(TWh)	(tril. Btu)			
Digital cable and satellite boxes	2007	1.4	14	1.4	14	0.4	1.2	4.1
Digital television adapters	2007	0.3	3	0.0	0	0.2	1.1	7.4
Medium-voltage dry-type transformers	2007	2.7	28	4.7	47	0.6	2.4	5.5
Metal halide lamp fixtures	2008	9.0	93	14.4	144	1.9	7.3	10.8
Reflector lamps	2007	3.9	40	3.9	39	0.9	2.6	4.1
Total		17.3	178.0	24.4	244.0	4.0	14.6	

a Net Present Value is the value of energy savings due to standards minus the additional cost of more efficient products, expressed in current dollars. A 5% real discount rate was used for these calculations.

Source: Nadel et al. 2005.

14 One TWh is a billion kWh.

15 A quad is a quadrillion Btus. By way of comparison, the entire United States currently uses a total of about 100 quads annually in all sectors of the economy.

16 Primary energy includes the energy content of the fuel burned at the power plant and not just the energy content of electricity as it enters a home or factory. Typically, about three units of energy are consumed at the power plant in order to deliver one unit of energy to a home. The remaining energy is lost as waste heat from the power plant and along the transmission and distribution system.

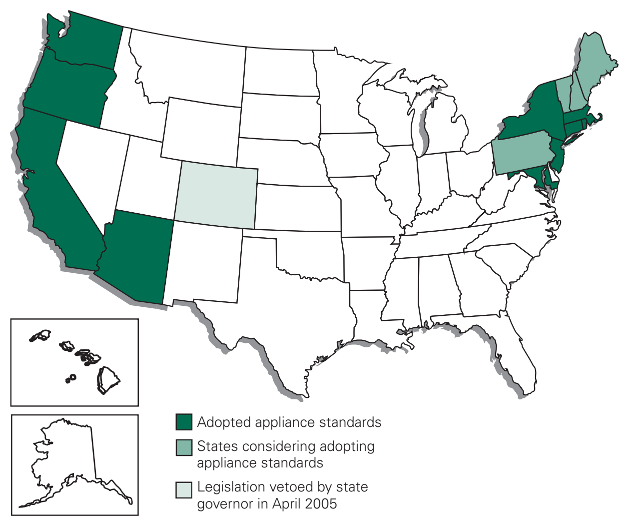
States with Appliance Efficiency Standards

A number of states have either implemented appliance standards or are considering implementing them, as shown in Figure 4.4.1. California's appliance standards program dates to the 1970s, when the state began to pursue standards before the enactment of federal legislation. When the federal government opted not to issue standards under its legislative mandate in 1982, other states joined California and developed state standards. These state initiatives helped create the consensus for new federal legislation in 1987 (the National Appliance Energy Conservation Act or NAECA) and the Energy Policy Acts of 1992 and 2005. While the NAECA preempted state action on federally covered consumer products (with limited exceptions as discussed later), California has continued to develop efficiency standards for other products and technologies.

California's appliance efficiency standards are estimated to have saved about 2,000 megawatts (MW) (about 5%) of peak electricity load in 2001. As shown in Figure 4.4.2, this represents 20% of California's total peak load savings from all energy efficiency programs. The standards cover 30 products (plus three additional products for which standards or revised standards are pending) and have saved consumers and businesses millions of dollars (Delaski 2005).

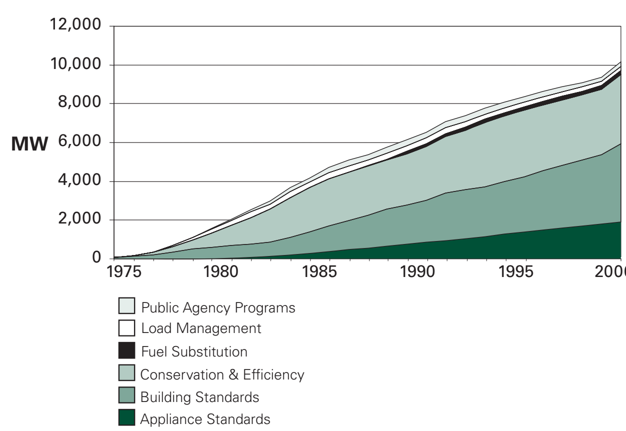
Additional states have recently enacted efficiency standards. These include Arizona, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Washington. Table 4.4.2 lists adopted and pending efficiency standards by state. In setting equivalent or stronger standards at the national level for the shaded products in Table 4.4.2, the EPAct of 2005 preempts additional states from setting standards for these particular products. States that enacted standards prior to EPAct 2005 will enforce their state standard up until the equivalent or stronger federal requirements go into effect.

Figure 4.4.1: States with or Considering Appliance Standards



Source: Compiled by Stratus Consulting Inc.

Figure 4.4.2: Load Savings from Appliance Efficiency Standards As Compared to Other Energy Efficiency Programs in California



Source: Motamedi 2005 (based on CEC data).

Table 4.4.2: States with Adopted or Pending Appliance Efficiency Standards

Products	AZ	CA	CT	MA	MD	NJ	NY	OR	RI	WA
Boilers and central furnaces not covered by federal standards		x		x						
Ceiling fans and ceiling fan lights[a]					x		x			
Commercial clothes washers	x	x	x		x	x		x	x	x
Commercial hot food holding cabinets		x								
Commercial ice-makers[b]	x	x					x	x	x	x
Commercial reach-in refrigerators and freezers[b]	x	x	x		x	x	x	x	x	x
Commercial unit heaters	x	x	x		x	x	x	x	x	x
Computer room air conditioners		x								
Consumer audio and video equipment		x					x			
Digital television adaptors		x					x			x
Duct furnaces		x								
Evaporative coolers		x								
Exit signs	x	x	x		x	x	x	x	x	x
External power supplies[b]	x	x		x			x	x	x	x
Freezers (residential, 30 to 39 cubic feet)		x								
General service incandescent lamps not federally regulated		xo								
High-intensity discharge lamp ballasts									x	
Hot tubs (portable electric spas)		x								
Incandescent reflector lamps not federally regulated		o		x			x	x		x
Large commercial packaged air-conditioners	x	x	x		x	x	x		x	
Low-voltage dry-type distribution transformers	x	x	x		x	x		x	x	x
Medium-voltage dry-type distribution transformers				x						
Metal halide lamp fixtures	x	xo		x			x	x	x	x
Pool heaters not covered by federal standards		x								
Pool pumps		x								
Pre-rinse spray valves	x	x					x	x	x	x
Refrigerated beverage vending machines[b]		x								
Small water heaters not covered by federal standards		x								
Torchieres	x	x	x		x	x	x	x	x	x
Traffic signal modules-pedestrian	x	x				x	x	x		
Traffic signal modules-vehicular	x	x	x		x	x	x	x	x	x
Under-cabinet light fixture ballasts		x								
Walk-in refrigerators and freezers		x								
Water dispensers		x								
Water and ground water-source heat pumps		x								
Wine chillers		x								

Key: X=Adopted, XO=Standard adopted and a revised standard is pending, O=Pending.

Note: Products where rows are shaded are state standards preempted by the standards established by EPAct 2005. EPAct 2005 also establishes federal efficiency standards for compact fluorescent lamps, residential dehumidifiers, traffic lights, and fluorescent lamp ballasts.

[a] EPAct 2005 sets standards for residential ceiling fan light kits.

[b] The specific standards for these products were not established by the legislation; the legislation requires DOE to investigate whether standards are technically feasible and economically justified and to set standards where these criteria are met.

Sources: Compiled from Delaski 2005, Nadel et al. 2005, State of Washington 2005, and other sources listed under Examples of Legislation on page 4-66.

Washington's appliance efficiency standards are expected to result in significant electricity, natural gas, and water savings. An analysis by the state's Department of Community, Trade and Economic Development's Energy Policy Division estimates that the standards on these 13 products will save 136 million kWh of electricity, 2 million therms of natural gas, and 406 million gallons of water in the first year the standards are enacted. Savings grow significantly over time as old products are retired and new products subject to these standards are installed. This report also estimates that by 2020, assuming the standards are in place through that period, natural gas savings would amount to 3% of the commercial sector's consumption and total electricity savings could power 90,000 homes. By 2014, annual water savings from these standards could total up to 2 billion gallons. Standards on pre-rinse spray valves could save 51,205 megawatt-hours (MWh) of electricity, 6,745 therms of natural gas, and 1,785 million gallons of water per year by 2020 (State of Washington 2005).

Designing an Effective Appliance Standards Policy

States have substantial experience with appliance efficiency standards. Key issues they have addressed include: identifying participants, design issues, and linkages with federal and state policies.

Participants

- *State Legislatures.* Establishing efficiency standards in a state typically requires enabling legislation. However, once legislation is enacted, it may allow an executive agency to set further standards administratively. Because legislation has been developed for many standards, state legislatures typically do not need to conduct original research on definitions. Similarly, because several states have established standards for administration procedures, these implementation processes can also be largely replicated from other states' experiences.
- *State Energy Offices.* State energy offices, which typically administer the federal state energy program funds, have generally acted as the administrative lead for standards implementation.
- *Product Manufacturers.* Companies that make affected products clearly have a stake in standards development. Proactive consultations with manufacturers can increase the speed and effectiveness of the development and implementation process. Their expertise can help refine efficiency levels and labeling and certification procedures.
- *Product Distributors, Installers, and Retailers.* Wholesale distributors, installation contractors, and retail vendors are key players in that they must know the technical requirements and labeling and certification rules to be able to participate effectively in standards implementation and enforcement.
- *Customers.* It is important to consider the people who use the affected products during the standard development and implementation processes. Consideration includes assessing benefits and costs to consumers and impacts on product features or market choices.
- *Utilities.* Utilities may provide technical assistance for developing standards and support for implementation. Their relationships with customers and trade allies can also be helpful in educating markets about the effects of new standards. Utilities that operate voluntary efficiency programs may want to coordinate their incentive and education programs, gearing voluntary incentive targets to the standards.
- *Public Interest Organizations.* Groups representing consumers, environmental interests, and other public interests can offer technical expertise and important public perspectives in developing and implementing standards as baselines.

Key Design Issues

- *Defining the Covered Products and Their Energy Efficiency, Applicability, and Cost-Effectiveness.* States have adopted appliance standards that cover from five to more than 30 products. Some products may not be appropriate candidates for standards if, for example, they have recently been covered by federal law, or they are not appropriate for the state's climate or markets. States target certain products for standards based on their total energy savings potential, technical feasibility, and economic attractiveness. Because technologies suitable for appliance standards are typically already being used in well-known, consistent applications, estimating their energy savings has been relatively straightforward.

- *Assessing Overall Benefits and Costs.* In addition to the economic assessment of individual technologies, states have conducted overall assessments of benefits and costs. Benefits can include energy savings, energy bill reductions, electric reliability benefits, reduction in future energy market prices, and air pollutant and greenhouse gas emission prevention. Costs can include product buyer costs, product manufacturer costs, and program administration costs.
- *Availability of Test Methods.* Test methods are necessary to set efficiency levels for the state appliance standards. Test methods may have been established by federal agencies such as DOE or the U.S. Environmental Protection Agency (EPA), by other states that have already set standards, or by industry associations representing companies that make the products of interest.
- *Defining Certification and Labeling Requirements.* Like test methods, product certification and labeling procedures may have already been established by federal or state agencies or by industry associations. In some cases, it may be necessary for appliance standards regulations to define a labeling or certification method beyond those already established. On the other hand, and in rare instances, technical or market issues may warrant certification or labeling exemptions for certain products. For example, if a standard calls for a simple, prescriptive design change, that feature may be so visible on the product that certification and labeling may not be needed.
- *Establishing Inspection and Enforcement Procedures.* Inspection and enforcement of appliance standards regulations has typically involved self-policing. Industry competition is usually such that competitive manufacturers report violations. While states may want to reserve the legal right to inspect individual products or installations, it is rare that federal or state agencies have had to institute regular inspection or sustained enforcement actions.

Interaction with Federal Policies

Federal laws, such as NAECA, EPAct 1992, and EPAct 2005, have established appliance efficiency standards for more than 40 products (see Table 4.4.3 on page 4-60). DOE is currently conducting rulemakings for three of the products listed in Table 4.4.3: commercial packaged air conditioners, residential furnaces and boilers, and dry-type distribution transformers. EPAct 2005 directs DOE to set standards for several additional products, including: vending machines, dehumidifiers, external power supplies, commercial refrigeration, and icemakers. States can actively promote efficient models of these products by increasing consumer awareness and developing other programs.

States are preempted from setting their own standards for the products covered by federal standards. State efficiency standards that were established before a product was covered under NAECA are preempted as of the effective date of the federal standard (i.e., the date that manufacturers must comply with that standard). Nevertheless, some states are enacting standards for products that are not yet covered by federal law, for which DOE rulemakings will take place (as directed by EPAct), and/or that are being considered for coverage under NAECA, expecting to gain several years of savings in the interim. States can apply for waivers of preemption for products that are covered by federal law. If, for example, they face special conditions, states can cite such circumstances as the basis for a waiver. In September 2005, California petitioned DOE for a preemption waiver to implement a state water efficiency standard for clothes washers. Legislation pending in Massachusetts would require state officials there to seek a waiver from federal preemption allowing the state to implement tougher home furnace and boiler standards.

Table 4.4.3: Products Subject to Existing Federal Appliance Efficiency Standards

Products Included in NAECA 1987	
· Central air conditioners and heat pumps · Clothes washers · Clothes dryers · Direct-fired space heaters · Dishwashers · Fluorescent lamp ballasts · Freezers	· Furnaces and boilers · Pool heaters · Ranges and ovens · Refrigerator-freezers · Room air conditioners · Televisions[a] · Water heaters
Products Added by EPAct 1992	
· Commercial furnaces and boilers · Commercial packaged air conditioners and heat pumps · Commercial water heaters · Distribution transformers[a] · Electric motors (1 to 200 horsepower) · Faucets and aerators	· Fluorescent lamps · High-intensity discharge lamps[a] · Incandescent reflector lamps · Small electric motors (< 1 horsepower)[a] · Showerheads · Toilets
Products Added by EPAct 2005	
· Automatic commercial ice makers[a] · Ceiling fans and ceiling light kits · Commercial clothes washers · Commercial refrigerators and freezers[a] · Commercial pre-rinse spray valves · Compact fluorescent lamps · Dehumidifiers · External power supplies[a] · Fluorescent lamp ballasts	· High-intensity discharge lamp ballasts · Illuminated exit signs · Large packaged air-conditioners (> 20 tons) · Low-voltage dry-type transformers · Torchieres · Traffic signals (vehicular) · Traffic lights · Unit heaters · Vending machines[a]

[a] The specific standards for these products were not established by the legislation; the legislation requires DOE to investigate whether standards are technically feasible and economically justified and to set standards where these criteria are met.

Sources: Nadel and Pye 1996, ACEEE 2005b.

Interaction with State Policies

It is important for states to recognize that state appliance efficiency standards are different from ENERGY STAR efficiency specifications. Appliance efficiency standards set minimum energy efficiency performance levels that all appliances must meet, while ENERGY STAR specifications set higher energy efficiency levels to help the consumer choose a more energy-efficient product. Typically, the ENERGY STAR label is made available for only a fraction of the products on the market. As the market share of these products grows over time, a new ENERGY STAR specification is developed to again recognize the most energy-efficient products. Because of these differences between appliance efficiency standards and ENERGY STAR, ENERGY STAR specifications may not be an appropriate basis for appliance efficiency standards.

Program Implementation and Evaluation

Many states have learned that they do not need to start from scratch when developing and implementing appliance efficiency standards; in many cases, they can refer to the work already conducted by states with established appliance efficiency standards. For example, states have made minor adaptations to existing legislation based on the product lists and analyses conducted by other states. States have also consulted national and regional organizations with expertise and technical support capability. (For additional information about states' activities, see the *State Examples* section on page 4-62.)

While a state agency can initiate an inquiry into efficiency standards, legislation is typically needed to enable executive agencies to regulate in this area. Once legislatively authorized, states have followed these steps toward successful implementation of appliance efficiency standards:

- *Establish a Stakeholder Process*. Notify affected manufacturers, consumers, utilities, state agencies, and public interest organizations about the initiative. Develop information materials and hold workshops to inform stakeholders and solicit feedback.

- *Define Covered Products.* Develop a specific list of product and equipment types to be covered by the program. States have obtained lists of eligible products from other states that have recently enacted standards and from national organizations.
- *Conduct Benefit-Cost Analysis and Related Studies.* (See design issues described on page 4-58.)
- *Conduct Rulemaking*. The rule typically defines covered products, effective dates, efficiency standards, test methods, certification and labeling procedures, inspection and enforcement procedures, penalties for noncompliance, procedures for appeals, waivers and other exceptions, and contact information for the agencies involved. A rulemaking also provides formal notice, review, and comment procedures. When enabling legislation authorizes the executive branch to add new products or update standards on covered products, the regulatory process may be reopened after a few years.
- *Monitor, Review, and Modify the Program as Needed*. Based on stakeholder response and market trends, some states have made specific program modifications, including revisions to covered products, efficiency levels, and effective dates, as well as process improvements such as more frequent stakeholder input cycles and more transparent public information processes.

Typical implementation issues include:

- *Effective Dates*. A single date is typically established after which noncomplying products cannot be sold or installed in the state. In some cases, where warranted by product-specific considerations, extra time is allowed for manufacturers or retailers to prepare for the new standards.
- *Test Methods.* A specific method must be defined for testing the efficiency of a given product type. DOE, industry associations, and/or technical societies such as the American Society for Testing Materials (ASTM), American Society of Mechanical Engineers (ASME), Illuminating Society of North America (IESNA), or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) are typical sources of test methods.
- *Product Certification.* The federal standards program is essentially self-certifying; that is, manufacturers use approved test procedures to attest that affected products comply with standards. Some states, notably California, maintain databases of covered products to identify which models are in compliance with their state standards.
- *Labeling Requirements*. To date, state standards programs have relied primarily on national labeling and other information programs to address the need to label covered products. For example, federal law requires the Federal Trade Commission to operate an appliance labeling program for defined product types, and the DOE/EPA ENERGY STAR programs include certain labeling guidelines. In some cases, industry associations set labeling guidelines for certain products. Labeling issues vary by product type and are resolved on a case-by-case basis.
- *Enforcement*. The federal standards program and the California program are largely self-policing. Manufacturers are expected to provide complying products and competitive forces are expected to prevent violations. Enforcement actions typically depend on market participants to bring violation claims. In the two long-running programs—the

Best Practices for Standards Design and Implementation

- *Learn from others*. There are many lessons to be learned from states that have adopted appliance standards.
- *Consult with stakeholders*. Identify key groups early, including product manufacturers, affected retailers and customer groups, advocates, and utilities. Keep stakeholders informed and seek their input regularly.
- *Conduct a benefit-cost analysis* of the proposed standards.
- *Address key issues* such as: covered products, efficiency levels, effective dates, test methods, product certification, labeling requirements, and enforcement.
- *Review and adjust covered product lists* to be sure they are technically and legally up to date.

federal and California programs—enforcement actions have been rare.

Evaluation

Appliance efficiency standards programs have achieved defined results with minimal expenditure of public funds. Evaluating the benefits and costs of the standards is important during the standards-setting process. Once enacted, little field evaluation is performed.

Depending on the state enabling law, the implementing agency may be empowered to increase standards for affected products and/or to set standards for other product types. These actions are likely to involve detailed technical and economic evaluation. Improvements in the standards-setting process itself can also be considered at such times.

Once a state has operated a standards program for several years, it is helpful to conduct a program review to improve procedures and implement other enhancements.

A key issue for assessment is degradation of savings. Standards are established for a typical assumed application; over time the use of the product or device may change so that the original intent of the standard is not being served, or technology may change to the point that the device is used differently. Consequently, it can be valuable to review the markets and applications in which standards-covered devices are used, to ensure that the standards are having the intended effect. If the market or application context changes sufficiently for a product, the applicable standard may need to be reevaluated.

Other opportunities for evaluation include assessments of energy, demand, emissions, and other impacts over time, both for evaluating effectiveness and for quantifying emissions impacts for air quality or climate policy purposes. A periodic process evaluation of the standards program can also be helpful to ensure that stakeholder participation is appropriate, technical methods are up-to-date and effective, and rulemaking procedures are as transparent and non-bureaucratic as possible.

Best Practices for Standards Evaluation

- Conduct technical and economic evaluation of opportunities to increase appliance standards and/or set standards for new products.
- Review markets and product applications periodically (e.g., every three to five years) to determine whether new or adjusted regulations are needed to avoid degradation of savings.

State Examples

California

California was the first state to initiate an appliance efficiency standards program (in 1977) and maintains the most active and well-funded standards program of any state. California law now covers 30 products; new or upgraded standards are under consideration for three products. Most state standards programs in recent years have used California's covered products, or a subset of these products, and its technical procedures as the basis for their efforts. The California Energy Commission (CEC) operates the standards programs for the state. It develops technical and economic assessments of products recommended for rulemakings, develops draft regulations, holds public participation processes, issues final rules, monitors compliance, and maintains a database of covered products.

California's standards program has contributed to substantial improvements in energy efficiency. The standards in place in the state are currently reducing peak electric demand by about 2,000 MW or about 5% of peak load. These savings account for about 20% of California's total peak demand reductions from all efficiency programs over the past 20 years. By 2010, the 2002 California appliance standards could reduce natural gas consumption by 20.9 billion cubic feet and electricity use by 2,485 million kWh. This translates into a cumulative net savings of $1.9 billion. The savings could increase significantly by 2020: natural gas consumption would be reduced by 41 billion cubic feet and electricity consumption would be reduced by 7.1 billion kWh, resulting in a cumulative net savings of $4.3 billion (ACEEE 2000).

California must receive a federal waiver to enact its proposed state standards for residential water heaters and clothes washers, since they would exceed the existing federal standards. California has published standards for NAECA-covered and non-NAECA covered products. However, the CEC appears unlikely to request the waiver for water heaters so the proposed standards are not likely to save energy beyond NAECA levels. On clothes washers, California established a water factor in their standard. This requires a waiver, which the CEC filed on September 13, 2005. If the waiver is granted to CEC, the clothes washers standards could save 17 billion cubic feet of natural gas, 1.1 billion kWh of electricity, and more than $1.9 billion in cumulative net savings by 2020. Water heater standards could save 19 billion cubic feet of natural gas, 469 million kWh in electricity, and $761 million in cumulative net savings.

Web sites:
http://www.energy.ca.gov/efficiency/appliances/index.html

http://www.energy.ca.gov/appliances/documents/index.html (contains documents detailing California's technical and economic analysis process)

http://www.energy.ca.gov/appliances/appliance/index.html

http://www.energy.ca.gov/appliances/appliance/excel_based_files/ (contains California appliance data)

Connecticut

Connecticut enacted efficiency standards legislation in 2004 through Senate Bill 145 (S.B.145). This bill covers the following products: torchiere lighting fixtures, building transformers, commercial refrigerators and freezers, traffic signals, exit signs, large packaged air conditioning equipment, unit heaters, and commercial clothes washers. The Connecticut standards are expected to save residents and businesses more than $380 million in energy costs by 2020, conserve over 430 gigawatt-hours (GWh) of electricity, reduce summer peak electricity demand by over 125 MW, and avoid the emissions of about 65,000 metric tons of carbon (NEEP 2004).

Web site:
http://search.cga.state.ct.us/dtsearch_lpa.html

New Jersey

In 2005, New Jersey enacted energy efficiency standards for nine products. Very similar to the Connecticut bill, the new law sets standards for commercial clothes washers, commercial freezers, illuminated exit signs, very large air-cooled commercial air conditioning equipment, low-voltage dry-type distribution transformers, torchiere lighting fixtures, traffic signal modules, and unit heaters.

Analysis of the bill indicates that New Jersey customers will save hundreds of millions of dollars in energy costs over the next 20 years, while significantly reducing emissions of sulfur dioxide (SO_2) and smog-forming nitrogen oxide (NO_x). The new standards are estimated to reduce New Jersey's annual carbon dioxide (CO_2) emissions by almost 175,000 metric tons, equivalent to removing almost 145,000 cars from the road.

Web site:
http://www.bpu.state.nj.us/home/home.shtml

New York

Signed on July 29, 2005, the *Appliance and Equipment Energy Efficiency Standards Act of 2005* establishes state energy efficiency standards for 14 household appliances and electronic equipment not currently covered by federal standards. The products covered under the new law include ceiling fans, ceiling fan light kits, furnace air handlers, commercial pre-rinse spray valves, commercial washing machines, refrigerators and freezers, icemakers, torchiere lighting, unit heaters, reflector lamps, metal halide lamp fixtures, pedestrian and vehicular traffic signal modules, exit signs, and very large commercial air conditioning units. In addition, the law requires the Secretary of State and the New York State Energy Research and Development Authority (NYSERDA) to set efficiency standards for electronic products that use standby power when they are turned off but remain plugged in (e.g., DVD players and recorders, VCRs, and battery chargers) in an effort to reduce "phantom" energy consumption.

The appliance and equipment efficiency standards are expected to save 2,096 GWh of electricity annually, enough to power 350,000 homes. This equates to annual savings of $284 million per year. CO_2 emissions are expected to decrease by 870,000 metric tons annually, NO_x by 1,429 metric tons annually, and SO_2 by 2,858 metric tons annually as a result of the new standards (Pew 2005).

Web site:
http://assembly.state.ny.us/leg/?bn=A08103

What States Can Do

Depending on whether authority for efficiency standards already exists, states interested in exploring appliance efficiency standards can begin a new standards initiative, upgrade standards for products currently covered by state law, or expand coverage to new products.

Action Steps for States

States that have adopted appliance efficiency standards can conduct the following action steps:

- Assess whether authority exists to upgrade current standards or set standards for other products. If authority exists, determine appropriate increases in efficiency levels for current standards or appropriate new products and efficiency levels. If authority does not exist, work with policymakers to assess the benefits of allowing the implementing agency to upgrade standards and set standards for other products.
- Develop a list of potential products for which standards could be established and conduct an initial assessment of efficiency levels. Conduct a rulemaking process to determine the final products to cover and the associated efficiency levels. Encourage active stakeholder participation and use transparent analysis and decision-making procedures.
- Periodically report on program impacts and operations.
- Assess stakeholder communication and participation and revise these processes, if needed.
- Actively promote consumer awareness of appliances for which EPAct 2005 directs DOE to set standards.

States that are considering adopting appliance efficiency standards can:

- Review sample legislation, product lists, and analyses available from other states.
- Consult with stakeholders, national and regional associations, and other key parties to conduct preliminary cost/benefit and feasibility analyses.
- Work cooperatively with policymakers to determine whether appliance efficiency standards are an appropriate option.
- Actively promote consumer awareness about the energy cost savings and environmental benefits of appliance standards.

Information Resources

Information About States

Title/Description	URL Address
The California Appliance Efficiency Program. This Web site provides information and resources on California's appliance efficiency programs, including current regulations, rulemakings, a database of energy efficiency appliances, and background information.	http://www.energy.ca.gov/efficiency/appliances/index.html
California Appliance Efficiency Regulations. This Web site provides information on California's appliance standard regulations.	http://www.energy.ca.gov/appliances/2006regulations/index.html
California's Appliance Standards: A Historical Review, Analysis and Recommendations, Staff Report. CEC, Sacramento, 1983.	URL not available.
Energy Efficiency Standards: A Low-Cost, High Leverage Policy for Northeast States. The analysis conducted for this project showed that efficiency standards have very large and highly cost-effective economic, energy, and environmental benefits for states in the Northeast.	http://www.neep.org/Standards/Efficiency Standards Report.pdf
Energy Efficient Florida: Smart Energy Policy That Benefits Florida's Economy and Environment. This document provides information on Florida's clean energy potential.	http://floridapirg.org/FL.asp?id2=10282&id3=FL&
Report on Appliance Efficiency: Incentives and Standards. January 20, 2005. Presented by the Maine Public Utilities Commission (PUC) to the Utilities and Energy Committee, this report reviews alternative methods of using voluntary incentive programs and/or establishing minimum energy efficiency standards. It recommends that the Maine Legislature implement minimum efficiency standards for nine different products.	http://mainegov-images.informe.org/mpuc/staying_informed/legislative/2005legislation/appliance_standards_rpt.pdf

General Information About Appliance Efficiency Standards

Title/Description	URL Address
The American Council for an Energy-Efficient Economy (ACEEE). The ACEEE Web site contains many publications and resources on all aspects of energy efficiency, economic development, and environmental concerns.	http://www.aceee.org
The Appliance Standards Awareness Project (ASAP). This group provides information and resources on federal and states appliance standards.	http://www.standardsasap.org
Codes and Standards White Paper on Methods for Estimating Savings. Mahone, D., N. Hall, L. Megdal, K. Keating, and R. Ridge. 2005. April 7. Prepared by HMG for Marian Brown, SCE in Support of Statewide NRNC MA&E. This paper addresses California building and appliance energy efficiency standards, and the role of codes and standards programs as part of utility portfolios of energy efficiency programs.	http://www.calmac.org/publications/CSWhite_Paper_Final.pdf
The Collaborative Labeling and Appliance Standards Program (CLASP). This program's Web site provides information and resources on developing countries that are pursuing energy efficiency and labeling programs.	http://www.clasponline.org/disdoc.php3?no=289

Title/Description	URL Address
DOE Appliance and Commercial Equipment Standards. This DOE Web site provides information on state and federal appliance standards.	http://www.eere.energy.gov/buildings/appliance_standards/
Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards. Nadel, S., A. deLaski, J. Kleisch, and T. Kubo. 2005. January. This report describes opportunities for state governments to set minimum-efficiency standards for 18 appliances and other types of equipment currently not covered by federal standards.	http://www.standardsasap.org/a051.pdf
Northeast Energy Efficiency Partnerships (NEEP). NEEP's Web site provides information on promoting energy efficiency in the Northeastern United States.	http://www.neep.org
NEEP. Energy Efficiency Standards: A Low-Cost, High Leverage Policy for Northeast States. This Web site provides access to updated information about energy efficiency standards in the Northeastern states.	http://www.neep.org/Standards/index.html
Realized and Prospective Impacts of U.S. Energy Efficiency Standards for Residential Appliances. Meyers, S., J. McMahon, M. McNeil, and X. Liu. 2002. Lawrence Berkeley National Laboratory (LBNL). June. Final Report. This project involved development of an analytical framework to estimate energy, environmental, and consumer economic impacts of federal residential energy efficiency standards.	http://eappc76.lbl.gov/tmacal/esdocs.cfm?iddoc=1072
Smart Energy Policies: Saving Money and Reducing Pollutant Emissions through Greater Energy Efficiency. The report details nine specific policy recommendations that could have a substantial impact on the demand for energy in the United States while also providing positive economic returns to American consumers and businesses.	http://www.aceee.org/pubs/e012full.pdf
What Are Appliance Efficiency and Standards in the States? This DOE Web site provides information and resources on state appliance standards.	http://www.eere.energy.gov/state_energy_program/topic_definition_detail.cfm/topic=101

Examples of Legislation

State	Title/Description	URL Address
Arizona	**Appliances and Equipment Energy Efficiency Standards.** This bill sets minimum efficiency standards for 15 products.	http://www.swenergy.org/legislative/arizona/HB%202390%20Engrossed%20Bill%20Language.pdf
California	**Appliance Efficiency Regulations, 2006.** This document provides California's appliance efficiency regulations, and related public comments, hearing transcripts, and other information.	http://www.energy.ca.gov/appliances/2006regulations/index.html
Colorado	**A Bill for an Act Concerning Energy Efficiency Standards for Specified Devices (HB 04-1183).** This bill sets minimum energy efficiency standards for 14 products.	http://www.swenergy.org/legislation/colorado/HB-1183.pdf http://www.swenergy.org/legislation/colorado/HB-1183_FactSheet.pdf
Connecticut	**An Act Concerning Energy Efficiency Standards, S.B.145.** This act requires the Secretary of the Office of Policy and Management to establish, by regulation, minimum energy efficiency standards for certain heating, cooling, lighting, and other types of products.	http://www.cga.ct.gov/asp/cgabillstatus/cgabillstatus.asp?selBillType=Bill&bill_num=145&which_year=2004&SUBMIT.x=7&SUBMIT.y=7

State	Title/Description	URL Address
Maryland	**Maryland House Bill 1030.** This bill, which was enacted in January 2004, provides legislative language for Energy Efficiency Standards for 10 products.	http://mlis.state.md.us/2005rs/billfile/HB1030.htm
Massachusetts	**Massachusetts Appliance Efficiency Standards Act. Commonwealth of Massachusetts.** 2005. Chapter 139 of the Acts of 2005. This act requires establishment of minimum efficiency standards for five products.	http://www.mass.gov/legis/laws/seslaw05/sl050139.htm
New Hampshire	**Minimum Efficiency Standards for Certain Products.** Senate Bill 105 (S.B.105). State of New Hampshire. 2003. S.B.105-FN. Minimum Energy Efficiency Standards for Certain Products. New Hampshire appliance standards information. This bill, introduced in 2003, establishes state appliance and equipment energy efficiency standards for 10 products.	http://www.gencourt.state.nh.us/legislation/2004/sb0105.html
New Jersey	**Establishes Minimum Energy Efficiency Standards for Certain Products.** This act establishes minimum energy efficiency standards for eight products.	http://www.njleg.state.nj.us/ (To locate information about the Act, go to Select “Bills 2004–2005” from the left sidebar; select “Search by Bill Number;” and type “A516” into the search box.)
New York	**Appliance and Equipment Energy Efficiency Standards Act of 2005.** State of New York. 2005. Governor Pataki Introduces the Appliance and Equipment Energy Efficiency Standards Act of 2005. New York appliance standards information. This act establishes state energy efficiency standards for 14 household appliances and electronic equipment.	http://www.state.ny.us/governor/press/year05/april20_2_05.htm
Oregon	**House Bill 3363.** This act establishes minimum energy efficiency standards for 12 products.	http://www.leg.state.or.us/05reg/measures/hb3300.dir/hb3363.b.html
Pennsylvania	**House Bill 2035.** General Assembly of Pennsylvania. 2003. House Bill No. 2035. Providing for Minimum Efficiency Standards. Providing for Minimum Energy Efficiency Standards for Certain Appliances and Equipment; and Providing for the Powers and Duties of the Pennsylvania PUC and of the Attorney General. This provides the text for the Pennsylvania bill introduced in 2003.	http://www.legis.state.pa.us/wu01/li/bi/bt/2003/0/hb2035p4640.htm
Rhode Island	**S 0540–Energy and Consumer Savings Act of 2005.** This provides the text of the Rhode Island appliance standards legislations signed July 1, 2005.	http://www.rilin.state.ri.us/Billtext/BillText05/SenateText05/S0540A.pdf
Vermont	**Senate Bill 52. An Act Relating to Renewable Energy Portfolio Standards, Appliance Efficiency Standards, and Distributed Electricity.** State of Vermont. 2005–2006. Renewable Energy Goals. Vermont General Assembly, Montpelier. Vermont appliance standards information. This provides the text for the Vermont bill introduced in 2005.	http://www.leg.state.vt.us/docs/legdoc.cfm?url=/docs/2006/bills/senate/S-052.htm
Washington	**Senate Bill 5098.** An Act Relating to Energy Efficiency. Text of the Washington bill establishing minimum standards and testing procedures for 13 electrical products that are not covered by federal law.	http://www.leg.wa.gov/pub/billinfo/2005-06/Htm/Bill%20Reports/Senate/5098-S.SBR.htm
United States	**Energy Policy Act of 2005.** This is the text of EPAct 2005.	http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:h6enr.txt.pdf

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Title/Description	URL Address
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ACEEE. 2005b. The Federal Energy Policy Act of 2005 and Its Implications for Energy Efficiency Program Efforts. Steven Nadel, September 2005. Report #E053 ACEEE.	http://www.aceee.org/pubs/E053.pdf
ASAP. 2004. ASAP Web site. Boston, MA.	http://www.standardsasap.org
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Geller, H, T. Kubo, and S. Nadel. 2001. Overall Savings from Federal Appliance and Equipment Efficiency Standards. ACEEE. February. Accessed June 21, 2005.	http://www.standardsasap.org/stndsvgs.pdf
Motamedi, L. 2005. Regulatory Analyst, Division of Strategic Planning, California Public Utilities Commission. Presentation to the EPA State Energy Efficiency/Renewable Technical Forum, April 11.	http://www.epa.gov/cleanenergy/pdf/keystone/CA_EE_Overview__Motamedi.pdf
Nadel, S. and M. Pye. 1996. Appliance and Equipment Efficiency Standards: Impacts by State. ACEEE, Washington, D.C.	http://www.aceee.org/store/proddetail.cfm?&ItemID=146&CategoryID=7
Nadel, S., A. deLaski, J. Kleisch, and T. Kubo. 2005. Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards. Report Number ASAP-5/ACEEE-A051. ACEEE, Washington, D.C., and ASAP, Boston, MA. January.	http://www.standardsasap.org/a051.pdf
NEEP. 2004. Connecticut Adopts New Energy Efficiency Product Standards. NEEP Press Release, May 17.	http://www.neep.org/files/enews_elements/CT.pdf
NEEP. 2005. Energy Efficiency Standards: A Boon for Maryland. Fact Sheet. Accessed November 9, 2005.	http://www.neep.org/Standards/FactSheets/MDfactsheet.pdf
Optimal Energy. 2004. Economically Achievable Energy Efficiency Potential in New England. Prepared by Optimal Energy, Inc. for NEEP. November 17.	http://www.neep.org/files/Executive_Summary.pdf
Pew. 2005. Pew Center on Global Climate Change Web Site. State and Local News. New York Adopts New Energy Efficiency Standards. Accessed November 9, 2005.	http://www.pewclimate.org/what_s_being_done/in_the_states/news.cfm
State of Washington. 2005. 2005 Biennial Energy Report. State of Washington Department of Community, Trade and Economic Development's Energy Policy Division, Olympia. Accessed May 31, 2005.	http://www.cted.wa.gov/_CTED/documents/ID_1872_Publications.pdf

Chapter 5.
Energy Supply Actions

States can achieve a number of environmental and economic benefits by encouraging the development of clean energy supply as part of a balanced energy portfolio. This chapter provides an in-depth discussion of five policies that states have successfully used to support and encourage continued growth of clean energy supply in their state. The term clean energy supply is used in this chapter to describe clean, distributed generation (DG), including renewable energy and combined heat and power (CHP). While states identify renewable technologies differently, most tend to include, at a minimum, solar, wind, biomass, and landfill gas/biogas. CHP is an efficient approach to generating electric and thermal energy from a single fuel source.

The policies shown in Table 5.1 were selected from a larger set of clean energy supply strategies because of their proven effectiveness and the significant effect they can have in increasing the amount of clean energy supply in those states that adopt them. The information presented in each policy description is based on the experiences and best practices of states that are implementing the programs, as well as on other sources, including local, regional, and federal agencies and organizations, research foundations and nonprofit organizations, universities, and utilities.

Table 5.1 also lists examples of states that have implemented each type of policy or program. States can refer to this table for an overview of the policies described in this chapter and to identify other states they may want to contact for additional information about their clean energy supply policies or programs. The *For More Information* column lists the *Guide to Action* section where each in-depth policy description is located.

In addition to these five policies, states are adopting a number of related policies to maximize the benefits of clean energy supply. These policies are addressed in other sections of the *Guide to Action* as follows.

Clean Energy Policies

Type of Policy	For More Information
State Planning and Incentive Structures	
Lead by Example	Section 3.1
State and Regional Energy Planning	Section 3.2
Determining the Air Quality Benefits of Clean Energy	Section 3.3
Funding and Incentives	Section 3.4
Energy Efficiency Actions	
Energy Efficiency Portfolio Standards	Section 4.1
Public Benefits Funds for Energy Efficiency	Section 4.2
Building Codes for Energy Efficiency	Section 4.3
State Appliance Efficiency Standards	Section 4.4
Energy Supply Actions	
Renewable Portfolio Standards	**Section 5.1**
PBFs for State Clean Energy Supply Programs	**Section 5.2**
Output-Based Environmental Regulations to Support Clean Energy Supply	**Section 5.3**
Interconnection Standards	**Section 5.4**
Fostering Green Power Markets	**Section 5.5**
Utility Planning and Incentive Structures	
Portfolio Management Strategies	Section 6.1
Utility Incentives for Demand-Side Resources	Section 6.2
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	Section 6.3

- *Lead by Example* programs provide opportunities to install clean energy supply within state buildings or purchase clean energy attributes for state buildings (see Section 3.1).

- *State and Regional Planning* activities help states identify opportunities to incorporate clean energy supply as a way to meet future load growth (see Section 3.2).
- *Determining the Air Quality Benefits of Clean Energy* describes how to incorporate the emission reductions from clean energy supply into air quality planning and related activities (see Section 3.3).
- *Funding and Incentives* describes additional ways states provide funding for clean energy supply through grants, loans, tax incentives, and other funding mechanisms (see Section 3.4).
- *Portfolio Management Strategies* include proven approaches, such as Integrated Resource Planning (IRP), that place a broad array of supply and demand options on a level playing field when comparing and evaluating them in terms of their ability to meet projected energy demand. These strategies highlight and quantify the value of energy efficiency and clean DG as a resource to meet projected load growth (see Section 6.1).
- *Utility Incentives for Demand-Side Resources* presents a number of approaches, including decoupling and performance incentives, that remove disincentives for utilities to consider energy efficiency, renewable energy, and clean DG equally with traditional electricity generation investments when making electricity market resource planning decisions (see Section 6.2).
- *Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation.* This section describes how electric and natural gas rates set by public utility commissions (PUCs), can be designed to support clean DG projects and avoid unintended barriers, while also providing appropriate cost recovery for utility services on which consumers depend (see Section 6.3).

Table 5.1: Energy Supply Policies and Programs

Policy	Description	State Examples	For More Information
Renewable Portfolio Standards (RPS)	RPS establish requirements for electric utilities and other retail electric providers to serve a specified percentage or amount of customer load with eligible resources. Twenty-one states and Washington, D.C. have adopted RPS.	AZ, CA, MA, TX, WI	Section 5.1
Public Benefits Funds (PBFs) for State Clean Energy Supply Programs	PBFs are pools of resources used by states to invest in clean energy supply projects and are typically created by levying a small charge on customers' electricity bills. Sixteen states have established PBFs for clean energy supply.	CA, CT, MA, NJ, NY, OH	Section 5.2
Output-Based Environmental Regulations to Support Clean Energy Supply	Output-based environmental regulations establish emissions limits per unit of productive energy output of a process (i.e., electricity, thermal energy, or shaft power), with the goal of encouraging fuel conversion efficiency and renewable energy as air pollution control measures. Twelve states have established output-based environmental regulations.	CT, IN, MA, TX	Section 5.3
Interconnection Standards	Standard interconnection rules establish processes and technical requirements that apply to utilities within the state and reduce uncertainty and delays that clean DG systems can encounter when obtaining electric grid connection. Fourteen states have standard interconnection rules, and 39 states offer net metering.	MA, NJ, NY, TX	Section 5.4
Fostering Green Power Markets	States play a key role in fostering the development of voluntary green power markets that deliver cost-competitive, environmentally beneficial renewable energy resources by giving customers the opportunity to purchase clean energy. Green power is available in more than 40 states.	CT, MA, NJ, NM, WA	Section 5.5

5.1 Renewable Portfolio Standards

Policy Description and Objective

Summary

A renewable portfolio standard (RPS) requires electric utilities and other retail electric providers to supply a specified minimum percentage (or absolute amount) of customer load with eligible sources of renewable electricity. As of September 2005, RPS requirements have been established in 21 states plus Washington, D.C., and are a key driver for new renewable electric generation facility development in the United States (Figures 5.1.1a and 5.5.1b). Over 2,300 megawatts (MW) of new renewable energy capacity through 2003 is attributable to RPS programs (Petersik 2004). RPS is cited as the driving force behind the installation of approximately 47% of new wind capacity additions in the United States between 2001 and 2004 (Wiser 2005).

Many states have adopted RPS requirements because they are an administratively efficient, cost-effective, and market-based approach to achieving renewable electricity policy objectives. RPS requirements can be used in both regulated and restructured electricity markets.

States have tailored their RPS requirements to satisfy particular state policy objectives, electricity market characteristics, and renewable resource potential. Consequently, there is wide variation in RPS rules from state to state with regard to the minimum requirement of renewable energy, implementation timing, eligible technologies and resources, and other policy design details.

Renewable Portfolio Standards (RPS) provide states with an opportunity to increase the amount of renewable energy in a cost-effective, market-based approach that is administratively efficient.

Figure 5.1.1a: Projected New Renewable Capacity by 2015 Attributable to Existing RPS Requirements
(California compared to all other states)

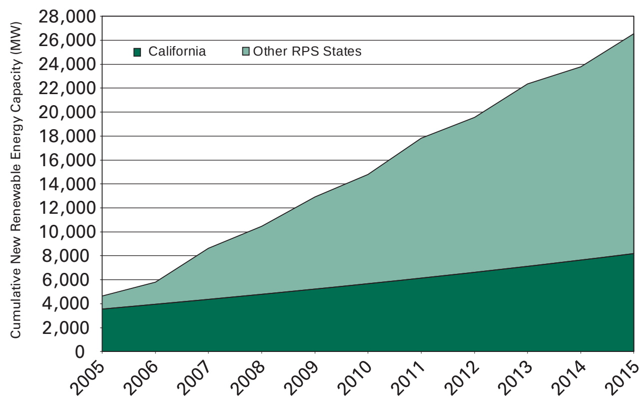
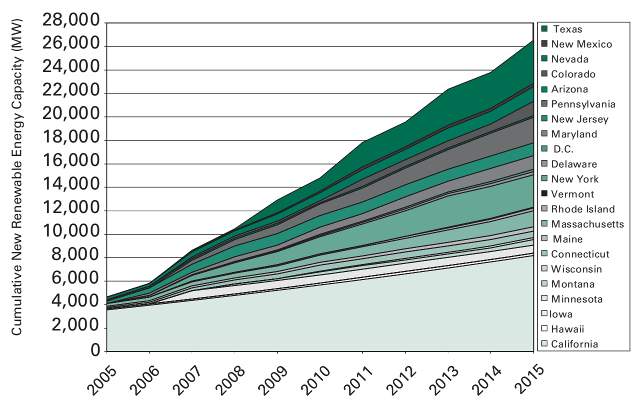


Figure 5.1.1b: Projected New Renewable Capacity by 2015 Attributable to Existing RPS Requirements
(comparison of all other states)



Source: Navigant 2005.

Electricity suppliers must demonstrate compliance with RPS requirements by any of these three mechanisms:

- Purchase electricity from a renewable facility inclusive of all renewable attributes (sometimes called "bundled renewable electricity").
- Purchase renewable energy certificates (RECs). A REC is a tradable right (separate from the electrical energy itself) to claim the environmental and other attributes associated with 1 megawatt-hour (MWh) of renewable electricity from a specific generation facility.
- Own a renewable energy facility and its output generation.

As of September 2005, 16 states allow the use of RECs to satisfy RPS requirements. Unlike bundled renewable energy, which is dependent on physical delivery via the power grid, RECs can be traded between any two parties, regardless of their location.[17] However, state RPS rules typically condition the use of RECs based on either location of the associated generation facility or whether it sells power into the state or to the regional grid. (A more detailed explanation is provided in Figure 5.1.6 on page 5-10.)

Objective

States create RPS programs because of the energy, environmental, and economic benefits of renewable energy. Many states have also adopted RPS programs to stimulate market and technology development and, ultimately, to help make renewable energy competitive with conventional forms of electric power.

Examples of broader goals and objectives that the state may want to prioritize in the RPS design process include:

- Local, regional, or global environmental benefits.
- Local economic development goals.
- Hedging fossil fuel price risks.
- Advancement of specific technologies.

Benefits

The benefits of an RPS are the same as those from renewable energy and combined heat and power (CHP)[18] in general:

- Environmental improvement (e.g., avoided air pollution, climate change mitigation, waste reduction, habitat preservation, conservation of water and other valuable natural resources).
- Increased diversity and security of energy supply, with greater reliance on domestic, regional, and in-state resources.
- Reduced volatility of power prices given the stable (or nonexistent) fuel costs of renewables.
- Possible reduction of wholesale market prices due to low bid prices of intermittent renewables in competitive wholesale markets.
- Mitigation of natural gas prices due to some displacement of gas-fired generation.
- Local economic development resulting from new jobs, taxes, and revenue associated with new renewable capacity.

Because it is a market-based program, an RPS has several operational benefits:

- Achieves renewable policy objectives efficiently and with relatively modest impacts to customer bills. State analyses performed prior to implementation of RPS requirements have shown that annual ratepayer impacts result in increases of less than 1% and savings of up to 0.5%, with the impact on residential bills of a few dollars a year (DSIRE 2005, Navigant 2005; see Figure 5.1.2). States have found the importance of performing analyses in conjunction with the design of an RPS to ensure the level is not set too high, which would result in higher costs.

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17 RECs represent the attributes of electricity generated from renewable energy sources. When they are sold or traded with the physical electricity, they are considered bundled. They can be unbundled and sold or traded separately as two commodities.

18 CHP is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source by recovering the waste heat for use in another beneficial purpose.

Figure 5.1.2: A Sampling of the Impacts of RPS Requirements on Ratepayers

State	Incremental Target	Overall Rate Impacts	Average Impact on Resdential Bill
CA	41,000 GWh (2010)	Savings: 0.5% in 2010	Savings: $3.5/yr in 2010
CO	4,500 GWh (2020)	Savings: 0.5% expected value	Savings: $2.4/yr expected values
IA	4,400 GWh (2015)	Savings: 0.3% on average	Savings: $3.4/yr on average
MN	6,300 GWh (2010)	Savings: 0.7% on average	Savings: $4.6/yr on average
NY	12,000 GWh (2013)	Cost: 0.32% in 2009	Cost: $3/yr in 2009
PA	17,000 GWh (2015)	Cost: 0.46% on average	Cost: $3.5/yr on average
WA	14,300 GWh (2023)	No impact	No impact
WI	7,500 GWh (2013)	Cost: 0.6% on average after 2010	Cost: $3.3/yr on average after 2010

Source: Wiser 2005.

- Spreads costs associated with RPS requirements among all customers.
- Minimizes the need for ongoing government intervention.
- Functions in both regulated and unregulated state electricity markets.

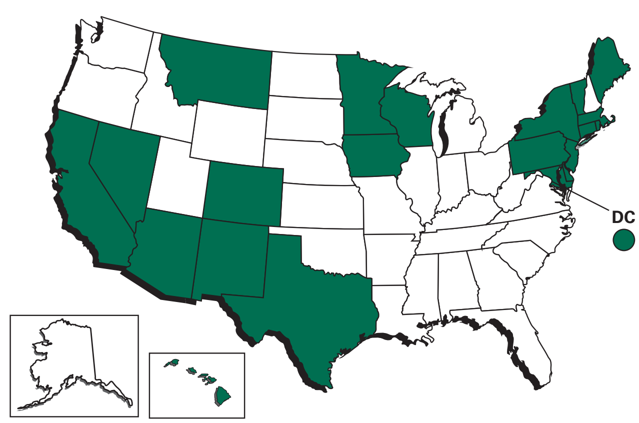
States are often finding that RPS requirements provide a cost-effective approach to achieving energy and environmental goals. RPS requirements typically lead to market development of the most cost-competitive forms of renewable energy (currently wind power in most cases), unless designed to encourage higher-cost renewable technologies.

States with RPS Requirements

As of September 2005, 21 states and Washington, D.C. have established RPS requirements (see Figure 5.1.3). Eight states enacted RPS rules in 2004 alone. In addition, Illinois has adopted legislation with a renewable energy goal of at least 5% by 2010, and at least 15% by 2020 (DSIRE 2005, Navigant 2005). The legislation does not include a verification process or any noncompliance penalties. Tremendous diversity exists among these states with respect to the minimum requirements of renewable energy, implementation timing, and eligible technologies and resources (see Figures 5.1.4 on page 5-6 and 5.1.5 on page 5-7). After initial enactment, several states have fine-tuned the RPS rules to reflect new technology, resource, or policy considerations that may have changed over time.

Initially, RPS requirements emerged as a part of deregulation of the electricity sector. Recently, however, states that are not deregulated have begun to adopt RPS requirements with an eye towards other policy concerns, such as rising natural gas and coal

Figure 5.1.3: States with RPS Requirements



Note: In Minnesota, an RPS is applicable only to the state's largest utility, Xcel Energy, which is required by special legislation to build or contract for 125 MW of biomass electricity and 1,125 MW of wind by 2011. The other Minnesota utilities must make a good faith effort to meet a Renewable Energy Objective, which is not mandatory.

Sources: DSIRE 2005, Navigant 2005.

Figure 5.1.4: State RPS Requirements

	Target	Solar
AZ	1.1% by 2007	0.66% by 2007
CA	20% by 2017	
CO	10% by 2015	0.4% by 2015
CT	10% by 2010	
DC	11% by 2022	0.386% by 2022
DE	10% by 2019	
HI	105 MW (2% by 1999)	
IA	105 MW (2% by 1999)	
MA	4% by 2009 (+1%/year after)	
MD	7.5% by 2019	
ME	30% by 2000 incl. some non-RE	
MN[a]	10% by 2015 (1% biomass)	
MT	5% in 2008, 10% in 2010, 15% in 2015	
NJ	6.5% by 2008	0.16% (95 MW) by 2008
NM	5% by 2006, 10% by 2011	
NV	6% by 2005, 20% by 2015	5% of portfolio
NY	25% by 2013	0.154% customer-sited by 2013
PA	18% by 2020 (8% is RE)	0.5% by 2015
RI	16% by 2019	
TX	2.7% or 2000 MW new by 2009, 880 MW existing preserved	
VT	Total incremental energy growth between 2005 and 2012 to be met with new renewables (cap 10% of 2005 sales)	
WI	2.2% by 2011	

[a] See note concerning Minnesota's RPS in Figure 5.1.3.

Sources: DSIRE 2005, Navigant 2005.

prices or climate change. To date, eight states have enacted RPS requirements as part of restructuring legislation, and 14 states have enacted RPS requirements outside of restructuring.

Designing an Effective RPS

This section describes key elements to consider in designing effective RPS requirements. These elements include participants, goals and objectives, applicability of the program, eligible technologies, program structure, and administration. The discussion that follows reflects lessons learned from states' experiences in developing and implementing RPS requirements. In addition, this section provides insights on interactions of the RPS requirements with other state and federal policies.

Participants

A number of organizations are involved in the design of RPS requirements:

- *State Legislatures.* Typically, the state legislature enacts legislation to mandate RPS requirements. However, legislation is not always necessary to introduce RPS requirements. For example, in Colorado, RPS requirements were mandated by a state ballot initiative. In New York, the state Public Utility Commission (PUC) established RPS requirements under its existing regulatory authority at the request of the governor. Governors have become increasingly involved in shaping RPS-related policies.
- *State PUCs.* State PUCs and other state agencies are generally tasked with establishing the detailed rules governing RPS requirements. In crafting detailed RPS rules, state agencies follow the intent and requirements of the enabling legislation but sometimes must resolve technical and policy issues that can influence the effectiveness of the program. In Arizona and New Mexico, RPS requirements were adopted via a regulatory process before being codified by the legislature. As of September 2005, a similar process is ongoing in Illinois.
- *Renewable Electricity Generators.* The efforts and ability of renewable electricity generators to build new facilities are critical to the success of RPS requirements. Therefore, the legitimate commercial needs of these generators are an important component of the design phase and can be addressed by facilitating long-term contracts.
- *Utilities.* Whether deregulated or vertically integrated, utilities are crucial entities in the successful implementation of RPS requirements. Ensuring that utility needs are addressed (e.g., recovery of compliance costs associated with RPS requirements) is vital to make RPS requirements effective.
- *Competitive Electric Service Providers (ESPs).* In states that have restructured, competitive ESPs that provide generation service to customers may be subject to RPS requirements. Administrative feasibility, flexibility, and compliance provisions are key concerns of many ESPs.

- *Other Stakeholders.* Developing RPS rules has involved numerous other stakeholders, including state and local government officials, environmental organizations, ratepayer advocates, labor unions, trade associations, project developers, and others.

Goals and Objectives

States have found that RPS have multiple goals, and some states aim for a broader set of objectives (Rader and Hempling 2001). As described in the *Objective* section (page 5-4), examples of the broader goals and objectives include:

- Local, regional, or global environmental benefits
- Local economic development goals
- Hedging fossil fuel price risks
- Advancement of specific technologies

These broader goals and objectives can serve as a guide to design choices for RPS requirements. It is important, therefore, to clearly articulate these goals and objectives in order to avoid protracted rule implementation debates and, ultimately, to produce the best RPS design for the state.

Applicability and Eligibility

A common element of RPS requirements is the *applicability* to investor-owned utilities and electric service providers. It is highly unusual for RPS requirements to extend to municipal utilities and cooperatives as these entities are predominately self-regulated.

Successful states have ensured that *eligibility* of a resource or technology reflects whether or not it supports the goals and objectives established for the RPS requirements. States are finding that defining which renewable energy resources and technologies qualify as eligible under RPS requirements can be a complicated process with multiple issues to consider. Issues that states have considered include:

- *Technologies and Fuel.* Which fuel sources and energy production technologies will be eligible?

Figure 5.1.5: Eligible Technologies Under State RPS Requirements

	AZ	CA	CO	CT	DC	DE	HI	IA	MA	MD	ME	MN	MT	NJ	NM	NV	NY	PA	RI	TX	VT	WI
Biomass	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Cogeneration				●			●				●					●		●				
Energy Efficiency							●									●		●				
Fuel Cells[a]				●							●	●		●	●			●				
Geothermal	●	●	●		●	●	●			●	●		●	●	●	●		●	●	●		●
Hydro		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Landfill Gas	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●	●	●	●
Municipal Waste		●		●	●		●	●		●	●	●	●	●		●		●			●	
Ocean Thermal		●		●	●	●	●		●	●							●		●	●		
Photovoltaics	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Solar Thermal Electric	●	●		●	●	●	●		●	●	●	●	●		●	●		●		●	●	●
Tidal		●		●	●	●			●	●	●			●			●		●	●		●
Transportation Fuels							●															
Waste Tire		●									●											
Wave		●		●	●	●	●		●	●				●			●		●	●		●
Wind	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

[a] All states shown in this figure allow fuel cells using fuel from eligible renewable sources to count towards the state's RPS. States shown in the fuel cell row also allow fuel cells to meet the RPS regardless of whether the input fuel is derived from a renewable resource.

Sources: DSIRE 2005, Navigant 2005.

Some fuel sources are universally accepted (such as wind and photovoltaics [PV]) with almost no technology or project limitations. Other fuels have been excluded (e.g., municipal solid waste [MSW] or nuclear power) or conditioned on qualifying project technologies (e.g., run-of-river hydro), project scale (e.g., "small" hydro), or project performance characteristics (e.g., "low emission" biomass combustion). For example, nine states do not consider MSW as eligible in their RPS (see Figure 5.1.5 on page 5-7).

- *Existing Versus New.* How are existing renewable resources to be treated? Do they count toward RPS compliance or not? States have typically set a date to establish what is considered an existing renewable resource versus what is new. Some state rules are designed to prevent existing renewables from capturing additional revenues relating to the RPS, which could increase ratepayer costs but not the amount of renewable generation.
- *Geographic Zone.* In what geographic area must the resources be located to be eligible in the RPS requirements (e.g., energy generation just within the state boundary or energy generation within a regional power market)? RPS requirements and other policies in neighboring states may affect this decision. To address this, states have performed cost-benefit analyses of the geographic zone and available resources. Strict in-state eligibility requirements may raise legal concerns under the Interstate Commerce Clause.
- *Central Versus Customer-Sited.* How are grid-tied and off-grid customer-sited systems considered? Are there reasons why they are treated differently?

RPS requirements have varied tremendously with respect to eligibility. Some states, such as Maine, employ fairly expansive definitions of eligible renewable electricity including both existing and new facilities, large hydro (up to 100 MW), MSW, and efficient CHP facilities (regardless of fuel source). Other states, such as Massachusetts, use a much narrower definition that excludes renewable generators in operation before the RPS requirements (unless refurbished or repowered), excludes hydro and MSW, and limits biomass facilities based on their emission performance. Still other states, such as Pennsylvania, allow energy efficiency, waste heat recovery, and certain fossil fuel generation to qualify under a more expansive "alternative energy" portfolio standard. States with more permissive eligibility provisions in RPS rules typically require a higher percentage of renewable energy than states with more restrictive definitions of eligible resources.

Structure

While RPS requirements are varied and are a relatively new policy tool, experience with some program elements to date have identified best practices for structuring RPS requirements. These elements of structure include:

- *Energy Versus Capacity.* Most states have chosen to base RPS requirements targets on energy production (MWh) rather than installed capacity (MW). An energy production metric provides more incentive to use the renewable resources and, therefore, to achieve the benefits that an RPS is designed to create.
- *Time Horizon.* Adequate time is required to establish, implement, and create new renewable electricity facilities and markets. Therefore, RPS requirements with sufficiently long timelines will enable markets to develop and provide project developers and investors time to recover capital investments. Many RPS rules have been established for an extended period of time, often with an end date no earlier than 10 years after RPS requirements are fully operational. RPS requirements that are built to last will go a long way toward inspiring confidence among developers and financiers.
- *Mandatory or Voluntary.* Longevity of RPS requirements is crucial in getting projects financed. Instilling investor confidence in the REC market and other trading mechanisms related to RPS requirements is vital to developing new renewable energy projects.

  Most states use a mandatory structure with financial consequences for noncompliance. An RPS that is not enforced may do little to provide investors with sufficient assurance that financial returns will be adequate to invest in new renewable facilities, especially when renewable energy options are more expensive than conventional power supplies. In addition, compliance obligations that apply to the broadest possible group of retail sellers, including default service providers, will increase demand for renewable resources. State laws that enable inclusion of municipal utilities in RPS requirements also reduce the potential for bias in retail energy markets and broaden the base of intended benefits from RPS requirements. For example, the Colorado RPS includes municipal utilities and cooperative utilities, but they can opt-out or self-certify. If they self-certify, compliance reports are for informational purposes only.

Enforcement options are numerous, but a number of states use an Alternative Compliance Payment (ACP). Under such a policy, in the event that a retail supplier cannot meet its RPS, it may instead pay a per-kilowatt-hour (kWh) charge for the amount by which it is out of compliance. The ACP rates vary, generally ranging from 1 to 5 cents per kWh, with even higher amounts for solar-specific RPS requirements. Some states "recycle" payments to support renewable energy development. (See the *State Examples* section on page 5-14 for examples of ACPs.)

- *Renewable Energy Mix.* States may have policy interests in promoting particular renewable energy technologies and deployment locations to advance market competitiveness or other social, economic, or environmental objectives. "Technology tiers" and "credit multipliers" are the primary approaches used to meet these objectives. A technology tier carves out a portion of the overall RPS obligation for a subset of eligible technologies. These technologies may be viewed as crucial for renewable policy objectives but less competitive due to higher cost, greater technical difficulty, or other market barriers. For example, New Jersey has a PV tier that requires, by 2008, that 0.17% of retail sales be supported by in-state solar RECs issued for PV projects.

  The most common resource tier approaches taken to date include a: (1) single tier for new resources, (2) single tier for existing and new resources, and (3) multiple-tier RPS differentiated by the vintage, fuel, or technology of the renewable resource.

  Credit multipliers, such as those used in Arizona for solar PV, provide more than 1 MWh of credit for each MWh of generation. New Mexico and Nevada use a similar approach. Credit multipliers increase the economic incentive for developers to install the specific technology that is granted the additional credit.

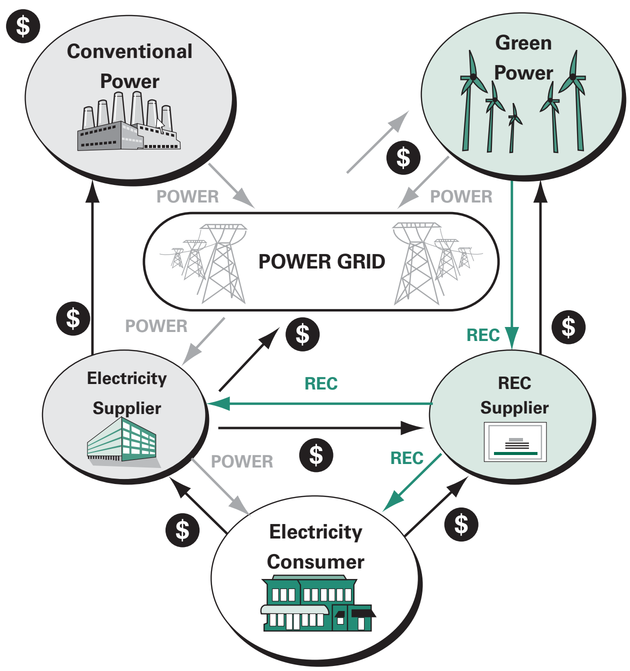
- *Start Dates and Amount of Renewable Energy.* A target percentage of renewable energy is a key element of an RPS. As shown in Figure 5.1.4 on page 5-6, these targets vary from 1% to 30% and are influenced by many factors, including a state's goals, renewable energy potential, and definition of eligible technologies and resources. States establishing provisions for ramping up to the specified target of renewable energy is important. Every state will have unique economic, environmental, and policy factors that lead to creation of a best fit approach. States have found that since there are no absolutes, careful analysis and modeling of the expected impacts before establishing the targets are the keys to success.

Administration

When considering how the RPS requirements will be administered, some key issues include:

- *Accounting.* It is important to regularly account for the renewable energy generated and to determine compliance with RPS requirements. Many states use RECs to determine compliance. These states include New Mexico, Massachusetts, Connecticut, Maine, New Jersey, Texas, and Wisconsin, among others. REC trading is permissible in all but four states where RPS requirements apply. These four states require bundled renewable energy (i.e., energy with attributes intact) to demonstrate compliance. (See Figure 5.1.6 for more detail on RECs and their interaction in power markets.)
- *Flexibility Mechanisms.* Because retailers may face difficulties in complying with a renewable energy purchase obligation, states are developing mechanisms that allow retailers flexibility. These

Figure 5.1.6: Illustration of Renewable Energy Credits (RECs) and Power Markets



Description of Diagram

- Green power generator produces electric power, which is delivered to the power grid and sold in the wholesale spot market.
- Green power generator is awarded RECs and sells them to an REC supplier. RECs convey the right to claim the environmental and other attributes of the green power for regulatory or marketing purposes.
- REC supplier retails some RECs directly to the consumer as a REC-based green product; no energy is sold.
- REC supplier wholesales some RECs to a retail electricity supplier, who needs them to meet RPS requirements; no energy is sold.
- Electricity supplier sells retail electricity to consumer. RPS-eligible RECs obtained by the supplier define the percentage of the electricity that is deemed renewable for RPS purposes.

Note: Conventional power is sold predominately using bilateral contracts and passes through the power grid transmission; it is easier to sell green power into the wholesale spot market. (Both are represented in this diagram within "Power Grid.")

Source: Adapted from EPA 2004.

mechanisms can allow a retail supplier to receive credit for renewable energy generated before the compliance date (e.g., credit for early compliance, forward compliance banking, REC banking) and some flexibility when compliance is not met by the specified date (e.g., deficit banking, true-up period).

- *Cost Recovery.* Renewables can command a premium cost in the marketplace. However, recent increases in natural gas and coal prices and improvements in renewable technology have negated some of the premium to the point that renewable energy is now cost-effective in some regions. Retail suppliers will buy RECs, develop renewable generation, or enter into power purchase agreements (potentially at above-market rates) to be compliant with RPS requirements. Therefore, RPS requirements generally have a mechanism to enable the utility to pass eligible costs on to retail customers via existing rate structures or by a new surcharge to utility bills. In some states, system benefits charge (SBC) funds may also be used to support utility cost recovery. Competitive retail supplier rates are not regulated by PUCs, and therefore, suppliers will need to recover their costs through the rates that they charge to their customers who are subject to competitive market conditions.

  Some, but not all, RPS rules prohibit the sale of voluntary, premium-priced green power by the retail supplier as a means of compliance with RPS requirements. This policy reflects the perspective that voluntary green power sales are intended to have an impact by being incremental to RPS requirements, and not simply offset sales that otherwise would have occurred and been paid for by all customers under the RPS. For example, the New Jersey statewide green power program contains language that specifically prohibits the sale of RECs used for RPS compliance in green power programs, and vice versa. For more information on the interaction between RPS and green power markets, see Section 5.5, *Fostering Green Power Markets*.

- *Cost Caps.* Because of the uncertainty about how the renewable energy market will function in the future, cost caps may be used to impose an upper bound on ratepayer impacts. They also limit potential market abuses and create a fair and efficient alternative compliance mechanism for suppliers if the renewable energy market is underdeveloped. Depending on how it is designed, a cost cap may put a ceiling on the price of renewable energy or RECs. Generally, effective caps are low enough to limit ratepayer impacts, but high enough to encourage renewable energy development.

As an example, Massachusetts established an ACP so that any retailer under RPS compliance could choose, if necessary, to make some of its renewable energy obligation through a payment to the state rather than by obtaining renewable energy. The ACP thus functions as a cap on retailers' exposure to potentially high renewable energy prices. The ACP is set for each calendar year by the Massachusetts Division of Energy Resources (DOER). In 2005, the ACP was set at $53.19 per MWh. The ACP is paid to the Massachusetts Technology Collaborative (MTC), which can use the payments to encourage renewable energy project development in the state.

When used, ACPs typically reflect an inadequate supply of eligible renewables vis-à-vis RPS requirements and are generally recoverable by regulated utilities from the customers. On the other hand, noncompliance penalties, which may reflect willful disregard for the RPS requirements (e.g., failure to file compliance documentation), are typically not recoverable for utility providers.

Interaction with State and Federal Programs

States coordinate and leverage their RPS requirements with an array of federal and state programs and policies. States have found that analysis of regional renewable resources and RPS requirements are helpful in designing their RPS. Exploring in advance how RPS requirements interact with both state and federal policy will avoid implementation pitfalls.

Interaction with Federal Policies/Programs

- *Production Tax Credit (PTC).* Originally enacted in the 1992 Energy Policy Act (EPAct 1992), the PTC provides a tax credit for qualifying forms of renewable energy production, such as wind, biomass, geothermal, solar, and other technologies. The PTC is currently authorized through the end of 2007 and provides 1.9 cents per kWh for wind for the first 10 years of the wind farm's commercial operation. The PTC has lapsed three times[19] since first enacted, and these lapses resulted in significant decreases in project completions during those periods. State RPS requirements can be designed to provide the flexibility to accelerate or delay renewable procurement to take advantage of short-term PTC expiration or extension.
- *Transmission Facility Extension Costs.* Many large wind farms developed in recent years have required significant and costly transmissions system extensions or upgrades to facilitate grid connection. The Federal Energy Regulatory Commission (FERC) has ratemaking jurisdiction over interstate transmission facilities. Transmission line extensions can be rather costly for remotely sighted wind turbines. Whether transmission interconnection facilities are "rolled in" and paid by all system users or are assigned specifically to the new generators could significantly influence RPS compliance.
- *Proposed Federal RPS.* In the 2005 congressional session, there were bills and amendments to create a national RPS. In June 2005, the U.S. Senate, in a 52-48 vote, adopted a proposal aimed at increasing the amount of electricity that utilities generate using renewable sources. The proposal would require 10% of the power that utilities sell to the retail market to come from renewable sources.

Interaction with State Policies/Programs

- *Existing State Incentives.* A review of existing state incentives for renewable energy can identify opportunities where existing policies and programs could further support RPS requirements. For example, SBC funds targeted for renewable energy in New York, New Jersey, and Massachusetts are used to subsidize design studies or actual installation costs of projects which help meet RPS targets. In contrast, funds in Minnesota and Wisconsin are allocated to renewable energy projects that are incremental to RPS requirements. For more information on SBCs, see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs.*

19 (1) Expired on 6/30/99, extended in 12/99, (2) expired on 12/31/01, extended in 2/02, and (3) expired on 12/31/03, extended in 10/04.

- *Utility Regulation.* In states with a restructured electricity sector, the rules surrounding how default service is provided can affect the market for RECs. In many cases, default service providers cannot enter into long-term contracts for power supplies or purchases of RECs. This limits the ability of renewable energy developers to secure project financing, which typically requires a sufficient long-term revenue stream to ensure adequate debt coverage ratios used by project financiers.
- *Interconnection Requirements.* Renewable electricity generators usually are interconnected with the utility grid to access wholesale markets and find customers of the highest value. Some states have taken great strides in recent years to prepare for implementing RPS requirements by ensuring that interconnection rules are designed to ensure safety while avoiding excessive costs or technical requirements that can be an obstacle to RPS compliance. For more information, see Section 5.4, *Interconnection Standards*.
- *State Emissions Regulations.* State environmental regulators can review the interaction between emission rules and RPS requirements. At least six states grant nitrogen oxide (NO_x) emission allowances or other emission credits, which may have notable market value, to renewable energy projects. Some states have expressly prohibited eligible RPS resources from selling emission allowances or credits they obtain through state environmental incentive programs. Other state RPS rules are silent on this issue. If emission credits can be sold separately (and not invalidate the use of the resource for purposes of meeting RPS requirements), the cost of compliance with the RPS requirements may be reduced due to the additional revenue stream available to renewable energy project owners. Alternately, RPS requirements are intended to produce environmental benefits, and emission allowances and credits therefore remain "bundled" with renewable electricity eligible under RPS requirements and may not be sold separately.

RPS Design Choices and Approaches

Many innovations and best practices can be found in state RPS. A sampling of noteworthy elements in these rules is shown below. Additional state cases are shown in the *State Examples* section on page 5-14.

- *REC Trading.* Texas was the first state to adopt the use of RECs for compliance verification and development of an efficient renewables market. Texas regulators also saw RECs as complementary to their efforts at restructuring the broader electricity market. The use of RECs for RPS requirements and other voluntary markets is now becoming typical in state RPS rules.
- *Centralized Procurement.* New York is the first and only state thus far where a state agency, rather than the utility or retail supplier, is responsible for procuring the renewable energy attributes. In New York, the distribution utility collects a surcharge on electricity delivered to each customer. The funds are turned over to the state. The New York State Energy Research and Development Authority (NYSERDA) then uses the funds to purchase the renewable attributes by soliciting bids from developers.
- *Stakeholder Review.* After Massachusetts adopted legislation mandating RPS requirements, the

Best Practices: Designing an RPS

The best practices identified below will help states design an RPS. These best practices are based on the experiences of states that have RPS requirements.

- Develop broad support for an RPS, including top-level support of the governor and/or legislature.
- Clearly articulate all RPS goals and objectives, since these will drive RPS rules and structure.
- Specify which renewable energy technologies and resources will be eligible, driven by the stated goals and objectives. Also consider state and regional resource availability if a goal/objective is to encourage resource diversity through a technology tier. Then, determine the mix and amount of renewable energy desired.
- Finally, consider using energy generation (not installed capacity) as a target, establish a long timeline to encourage private investment, make compliance mandatory for all retail sellers, make enforcement credible, allow utility cost recovery, establish cost caps, and consider flexible compliance mechanisms.

Massachusetts DOER (the implementing agency) conducted an extensive stakeholder consultation process and commissioned a wide-ranging analytical review of design issues related to RPS requirements. This review process led to the creation of 12 white papers on key RPS requirement topics with key insights and analytical support for eventual design choices (MA DOER 2002).

- *Technology Tiers.* The Arizona RPS requirements (called an Environmental Portfolio Standard), created in 2001, was one of the first RPS to establish a technology tier approach. Arizona mandated that at least 50% of renewable energy requirements come from solar electric sources as of 2001 and 60% by the 2004–2012 time frame. A number of states have followed suit and have used technology tiers in subsequent development of RPS requirements.

Program Implementation and Evaluation

This section provides an overview of implementation and evaluation of RPS requirements.

Roles and Responsibilities of Implementing Organization

The state entity enacting RPS requirements (e.g., the state legislature) will want to name one agency as the primary implementation authority. A number of agencies and organizations will likely be involved in the implementation regardless of which agency is named as lead. These include:

- *State PUCs* will be involved in enforcing RPS requirements and overseeing cost and ratepayer issues.
- *State Energy Offices* or similar State Public Benefit Corporations (e.g., NYSERDA) and quasi-public agencies (e.g., MTC or Connecticut Innovations Incorporated [CII]) may be involved in siting and permitting of new facilities or identifying existing facilities that could help meet RPS requirements. These agencies may also be involved in "making the market" by providing support to emerging REC markets and administering system benefits funds that are targeted toward enhancing compliance with RPS requirements.
- *Independent System Operators (e.g., Texas/Energy Reliability Council of Texas [TX/ERCOT]) or Regional Transmission Operators* may be involved in administering RECs or contracts related to compliance.

Best Practices: Implementing an RPS

The best practices identified below will help states implement an RPS. These best practices are based on the experiences of states that have implemented an RPS.

- Identify the most appropriate "lead" agency or organization for implementation authority of the RPS.
- Establish a transparent and easy-to-use accounting system for compliance.
- Provide retail suppliers with some flexibility in their compliance.
- Make sure a credible noncompliance mechanism is in place in the form of penalties.
- Conduct a mid-course performance review and enact modifications if warranted and if consistent with the original intent of the RPS.

Evaluation

Ongoing evaluation of RPS requirements is key to their success. The enabling legislation for RPS requirements sometimes includes provisions for annual or periodic evaluation and reporting of progress. Massachusetts, for example, requires an annual report. In some states, evaluations have identified serious implementation problems that have necessitated mid-course corrections. Examples of modifications that states have made to existing RPS rules are presented as follows.

- *Arizona* developed an Environmental Portfolio Standard (EPS) in 2001 that required 1.1% renewable energy by 2007, 60% of which was to come from solar. Based on the findings of the Cost Analysis Working Group and a series of workshops, the Arizona Corporation Commission staff determined that the Arizona EPS requirements were inadequate and could be increased significantly.

Challenges: Potential Market Constraints on Meeting RPS Supply

Private sector development of renewable energy projects, which may be necessary to meet a state's RPS requirements, could be constrained without access to private finance and long-term REC contracts. There are two factors that may hinder finance for renewable energy projects in deregulated markets.

1. Short-term power supply contracts

Problem: Default service providers are often limited by restructuring rules to short-term contractual arrangements for purposes of securing default service power supply and RECs. However, a developer might be required to have a long-term power contract in order to obtain private finance.

Potential Solution: In order to facilitate private investment in renewable energy projects, state regulators may want to change the way default service providers contract for power, allowing default service providers to enter into long-term service contracts from renewable generators. In order to limit the service provider's price risk, regulators could limit this policy to a relatively small percentage of total default service load. One approach is emerging in New Jersey, where regulators have included a defined percentage of renewable energy for RPS compliance in their three-year Basic Generation Service Auctions.

2. Uncertainty of REC market

Problem: Market players, such as utilities and competitive ESPs, are reluctant to enter into long-term contracts for RPS compliance RECs. This may be explained by limitations imposed on utilities in their purchase of long-term energy supplies or RECs, or uncertainties about the permanence of existing RPS provisions.

Solution: Since instilling investor confidence in the REC market is critical for developing new renewable energy projects, states could find ways to offer renewable energy project developers long-term REC contracts. One approach implemented by the Massachusetts Renewable Energy Trust (MRET) in 2003 is to use SBC funds for establishing REC contracts of up to 10 years for RPS-eligible projects. In this manner, the state is offering project developers bankable, long-term revenue from an investment grade entity (a state agency with money in escrow). (See RET 2006.)

Source: Navigant 2005.

In 2004, the staff proposed amendments that would raise the EPS requirements to 5% by 2015 and 15% by 2025, 20% of which would come from solar and 25% of which would come from distributed generation (DG).

- *Connecticut* initially exempted utility default service from the RPS requirements. Because most customers remained on default service, revisions to the RPS requirements, which were enacted in June 2003, changed the rules to require all retail suppliers to comply with the RPS requirements.

While scheduled policy evaluations are important, experience has shown that altering RPS policy midstream without sufficient justification or consistency with the original legislative intent of the RPS can hinder the program. The danger is that, if long-term certainty and stability in the policy is lacking, then facility developers and regulated retail providers may delay plans and projects and fail to deliver the results intended by the RPS.

State Examples

The following state examples illustrate the diverse types of RPS requirement design approaches, policy objectives, and implementation strategies that states have deployed. Each example highlights a particular design issue or policy objective. For projected new renewable capacity attributable to existing RPS requirements, see Figures 5.1.1a and 5.1.1b on page 5-3.

Arizona

The Arizona Corporation Commission (ACC) developed an EPS, which took effect in March 2001. The EPS requires regulated utilities to generate a certain percentage of their electricity using renewable energy.

The eligible technologies include solar PV, solar water heating, solar air conditioning, landfill gas, and biomass. Unlike many other RPS requirements around the country, the nonsolar portion of Arizona's EPS is limited strictly to in-state resources. The Arizona EPS illustrates RPS requirements built on very aggressive technology tiers (e.g., the solar set-aside component) that recognize the important system-wide benefits that solar technologies can provide. Initially, it was proposed that solar would make up 60% of the total renewables requirement from 2004 to 2012. Due to heavy reliance on solar PV, which can be a more costly renewable resource than others in the EPS, the overall renewables requirement is lower as a percentage of total generation when compared to RPS requirements of other states. Initially, the EPS target between 2007 and 2012 for renewable electricity generation was 1.1%. However, ACC staff proposed amendments in 2005 to increase the EPS to 5% by 2015 and 15% by 2025, with 20% of that requirement to be met using solar. The continuing emphasis on solar technologies for a substantial part of the overall RPS target is raising some concerns about the ability of utilities to meet the RPS requirements within prescribed ratepayer funding mechanisms.

Web site:
http://www.cc.state.az.us/utility/electric/environmental.htm

California

The legislation for California's RPS requirements was enacted in September 2002. California's RPS requirements are among the most aggressive in the country, since they require retail sellers of electricity to purchase 20% renewable electricity by 2017. At a minimum, retailers must increase their use of renewable electricity by 1% each year. California is considering increasing its RPS requirements to 33% in 2020.

Although there are some restrictions, the following technologies are eligible under the RPS: biomass, solar thermal, solar PV, wind, geothermal, fuel cells using renewable fuels, small hydropower (< 30 MW), digester gas, landfill gas, ocean wave, ocean thermal, and tidal current. In some cases, municipal solid waste is also eligible.

The legislation for the RPS requirements directs the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) to work together to implement the RPS requirements and assigns specific roles to each agency. Currently, investor-owned utilities are required to participate (as are ESPs, once the rules are established); municipal utilities are mandated to implement and manage their own initiatives related to increasing renewable energy in their energy portfolios.

Given the financial position of the distribution utilities in the state following the energy crisis in 2000, subsequent legislation offered production incentives (referred to as supplemental energy payments) for the above-market costs of eligible procurement by investor-owned utilities to fulfill their obligation related to RPS requirements.

Web site:
http://www.energy.ca.gov/portfolio/index.html

Massachusetts

The drafting of Massachusetts' RPS requirements began as a result of electric utility restructuring in 1997. In April 2002, the Massachusetts DOER finalized the regulation. In 2003, the DOER required retail electric suppliers to use 1% renewable energy in their overall supply. By 2009, retail electric suppliers must reach 4%, after which the RPS requirements will increase 1% each year until the DOER determines that additional requirements are no longer necessary. The percentage requirements do not translate into hard MW as they are based on the suppliers' overall supply.

Eligible technologies include: solar, wind, ocean thermal, wave, tidal, fuel cells using renewable sources, landfill gas, and low emissions and advanced technology biomass. Existing renewable facilities are allowed, as long as they were installed after 1997. However, if they comply with all technical criteria, facilities installed before 1997 can obtain a waiver that qualifies the quantity of their electricity output each year that exceeds their historical generation rate.

To reduce the risk to retail suppliers associated with acquiring affordable renewable energy, the DOER allows retailers to submit an ACP as an alternative to purchasing or generating renewable energy. The price of the ACP is set annually (e.g., $53.19 per MWh in 2005).

Web site:
http://www.mass.gov/doer/rps/index.htm

Texas

Texas was among the first states to establish RPS requirements and is considered by many policymakers and advocates to be among the most successful. Since Texas passed an RPS in 1999, 1,187 MW of renewable energy capacity has been installed in Texas as of February 2005.

The Texas Renewable Generation Requirement (RGR), issued by the Texas Public Utility Commission in 1999, requires that 2,000 MW of new capacity be installed by 2009. Texas initially used a total capacity requirement (MW), which the Texas PUC later converted into a generation requirement (MWh). Texas allocates a share of the mandated new renewable generation to all retail suppliers based on a prorated share of statewide retail energy sales.

The Texas RPS requirements have been successful in part because of good renewable energy resources in the state. However, success also resulted from key provisions in the legislation, including: (1) high renewable energy requirements that triggered market growth in the state, (2) use of RECs for meeting targets, (3) credible penalties for noncompliance, and (4) inclusion of all electricity providers.

The qualifying resources include: solar, wind, geothermal, hydroelectric, wave or tidal, biomass, and biomass-based waste products (e.g., landfill gas).

The PUC in Texas established a REC trading program. A penalty system also exists. Fines are set at the lesser of $50/MWh or 200% times the average cost of REC for the year.

The RPS requirements include all retail energy providers if they have opted into retail competition (i.e., investor-owned utilities, competitive energy service providers, municipal utilities, and cooperative utilities). Otherwise, they are exempt. This requirement differs from those of many other states that often make participation by public power entities optional.

Texas has changed transmission rules to accommodate the amount of wind power developed as a result of the RPS requirements. It should be noted that there are ongoing transmission line questions, focusing on the cost to upgrade and add lines, surrounding the RPS (ERCOT 2005).

The RPS requirements have had clear positive economic impacts on the state. The tax base in the rural west has grown as a result of more than $1 billion of new wind development. This new source of local income provides much-needed resources for local services, including schools, hospitals, and emergency services. The RPS requirements have also supported hundreds of manufacturing jobs and other opportunities related to the wind industry statewide.

Web site:
http://www.puc.state.tx.us/rules/subrules/electric/25.173/25.173ei.cfm

Wisconsin

In 1999, the Wisconsin legislature established an RPS requiring investor-owned electric utilities, municipal electric utilities, and rural electric cooperatives (electricity providers) to meet a gradually increasing percentage of their retail sales with qualified renewable resources. Wisconsin's RPS requirements went into effect in October 1999 and require 2.2% renewable supply by the end of 2011. As of early 2005, Wisconsin had already secured enough renewable energy to meet their requirements through 2011.

The enabling legislation expressly allows Wisconsin electricity providers the option of using Renewable Resource Credits (RRCs) in lieu of providing renewable electricity to their customers. An RRC trading system is in operation and there is a penalty system for violations.

Eligible technologies include fuel cells that use renewable fuel, tidal or wave power, solar thermal electric, solar PV, wind power, geothermal electric, biomass, and hydropower (< 60 MW).

Wisconsin is considering increasing its RPS requirements, and studies show that the state has adequate renewable sources to make this a reasonable objective.

Web site:
http://psc.wi.gov/

What States Can Do

Action Steps for States

RPS accelerates the development of renewable and clean energy supplies. Benefits include a clear and long-term target for renewable energy generation that can increase investors' and developers' confidence in the prospects for renewable energy. States have chosen from a wide variety of approaches and goals in developing their RPS requirements. The "best practices" common among these states have been explored above. Action steps are outlined below.

States with existing RPS requirements have made it a priority to identify and mitigate issues that might adversely impact the success of the program. The longevity and credibility of the RPS requirements is crucial for investment in new renewable projects. More specifically, states with existing RPS requirements can:

- Monitor the pace of installing new renewable projects to ensure that the renewable resources needed to meet RPS goals will be in place. If adequate resource development is lagging, identify the reasons for any delay and explore possible mitigation options. For example, adequate transmission planning and policies often present obstacles to successful RPS implementation.
- Monitor utility and retail supplier compliance and the impact on ratepayers. Any significant, unanticipated adverse impacts on ratepayers can be addressed through implementing or adjusting cost caps or other appropriate means.
- Evaluate the scope of eligible technologies and, as needed, consider adding eligible technologies or altering the percentage requirements. At the same time, it is important to recognize that long-term stability and certainty of policy are important and frequent changes may undermine the success of RPS requirements.

Broad political and public support for establishing renewable energy goals have been an important part of establishing RPS requirements. Many states have found that after establishing general support for goals, it is helpful to hold facilitated discussions among key stakeholders regarding appropriate RPS design. More specifically, states that do not have existing RPS requirements can:

- Establish a working group of interested stakeholders to consider design issues and develop recommendations for RPS requirements.
- Analyze costs and benefits as in New York and Texas.
- Publicize RPS goals as they are reached to ensure that state officials, pubic office holders, and the public know that the RPS requirements are working and achieving the desired results.

Related actions that states can take include:

- Consider the need for additional policies or regulations that will help make RPS requirements successful. Transmission-related policies have proven to be critical to the success of large wind farms that are some distance from load centers and require transmission line extensions or upgrades. Ratemaking provisions that allow such upgrades to be treated as general system investments, which are funded by all users of the transmission system, help alleviate significant cost hurdles that can impede otherwise excellent wind projects.
- Consider adopting (or improving) net metering and interconnection standards to facilitate customer-sited clean DG projects that may be eligible technologies under an RPS.

Information Resources

General Information

Title/Description	URL Address
Evaluating Experience with Renewables Portfolio Standards in the United States. Wiser, R., K. Porter, and R. Grace. Prepared for the Conference Proceedings of Global Windpower. Chicago, IL: March 28-31, 2004. Ernest Orlando Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA. LBNL-54439. This document provides a comprehensive analysis of U.S. experience with RPS, including lessons learned.	http://eetd.lbl.gov/EA/EMP/reports/54439.pdf
Interwest Energy Alliance Benefits of Renewable Energy. Interwest Energy Alliance is a trade association that brings the nation's wind energy industry together with the West's advocacy community. This document provides the answers to some questions about renewable energy, including economic and environmental benefits.	http://www.interwestenergy.org/benefits.htm
Projecting the Impact of RPS on Renewable Energy and Solar Installations. Wiser, R. and K. Bollinger. January 20, 2005. This PowerPoint presentation estimates and summarizes the potential impacts of existing state RPS on renewable energy capacity and supply, and of state RPS solar set-asides on solar PV capacity and supply.	http://www.newrules.org/de/solarestimates0105.ppt
Union of Concerned Scientists. Plugging in Renewable Energy: Grading the States. This report assigns grades to each of the 50 states based on their commitment to supporting wind, solar, and other renewable energy sources. It measures commitment by the projected results of renewable energy.	http://www.ucsusa.org/clean_energy/clean_energy_policies/plugging-in-renewable-energy-grading-the-states.html
Union of Concerned Scientists. Real Energy Solutions: The Renewable Electricity Standards, Fact Sheets. A national renewable energy standard (RES) can diversify our energy supply with clean, domestic resources. It will help stabilize electricity prices, reduce natural gas prices, reduce emissions of carbon dioxide and other harmful air pollutants, and create jobs—especially in rural areas—and new income for farmers and ranchers. This fact sheet provides an overview of RES.	http://www.ucsusa.org/clean_energy/clean_energy_policies/real-energy-solutions-the-renewable-energy-standard.html
Union of Concerned Scientists. Renewable Electricity Standards at Work in the States. In a growing number of states, RES—also called RPS—have emerged as an effective and popular tool for promoting a cleaner, renewable power supply. This fact sheet gives an overview of some state RES.	http:www.ucsusa.org/clean_energy/clean_energy_policies/res-at-work-in-the-states.html

Information About Federal Resources

Title/Description	URL Address
EPA CHP Partnership. This is a voluntary program that seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities for policy developments (energy, environmental, economic) to encourage energy efficiency through CHP. The Partnership can provide information and assistance to states considering including CHP or waste heat recovery in their RPS requirements.	http://www.epa.gov/chp/
EPA Green Power Partnership. This program provides assistance to renewable generators in marketing RECs and helps educate potential REC buyers about resources. The Partnership may be of assistance to states that employ RECs as a compliance measure for their RPS requirements but also allow for purchase and retirement of RECs for organizational "green power" designation.	http://www.epa.gov/greenpower

Information on Selected State Programs

State	Title/Description	URL Address
Arizona	Arizona Corporation Commission (ACC) Environmental Portfolio Standard Developments. This site is the ACC archive on RPS rules, suggested amendments, workshops, and public comment.	http://www.cc.state.az.us/utility/electric/environmental.htm
California	California Energy Commission (CEC) Renewables Portfolio Standard. This site provides an overview of the California RPS and a link to Senate Bill 1078.	http://www.energy.ca.gov/portfolio/index.html
Massachusetts	Massachusetts Division of Energy Resources (DOER): Renewable Portfolio Standard Web Site. This Web site provides an archive on the state's RPS requirements, rulings, and subsequent actions.	http://www.mass.gov/doer/rps/index.htm
	Massachusetts DOER: RPS Papers and Reports. This DOER Web site provides links to white papers that served as a basis for discussion of RPS design and implementation issues.	http://www.mass.gov/doer/programs/renew/rps.htm#papers
	Massachusetts DOER: Renewable Portfolio Standard, RPS Annual Reports. The RPS regulations (at 225 CMR 14.10(2)) require DOER to issue an Annual Energy Resource Report summarizing certain information from the Annual Compliance Filings.	http://www.mass.gov/doer/rps/annual.htm
	Massachusetts Technology Collaborative. Renewable Portfolio Standard. This Web site describes the components of the state's RPS and provides a link to information about renewable energy certificates that are a tool for implementing the RPS.	http://www.masstech.org/cleanenergy/policy/rps.htm
New York	New York State Public Service Commission: Retail Renewable Portfolio Standard. This site provides an archive of documents on New York RPS requirements.	http://www.dps.state.ny.us/03e0188.htm
Texas	Public Utility Commission of Texas: Goal for Renewable Energy. This site provides the Texas PUC's archive of documents on RPS requirements.	http://www.puc.state.tx.us/rules/subrules/electric/25.173/25.173ei.cfm
	Transmission Issues Associated with Renewable Energy in Texas. Informal White Paper for the Texas Legislature, 2005. This document provides data for consideration by legislators in evaluating bills to expand the Texas RPS.	http://www.ercot.com/news/presentations/2006/RenewablesTransmissi.pdf
Wisconsin	Evaluating the Impacts of Increasing Wisconsin's Renewable Portfolio Standard. University of Wisconsin-Madison for the Wisconsin Department of Administration, Division of Energy Renewable Energy Assistance Program. This study considered the economic impact to Wisconsin of four scenarios for future RPS standards.	http://www.ucsusa.org/assets/documents/clean_energy/UW_RPS_Final_Report_10-31-03.pdf

References

Title/Description	URL Address
DSIRE. 2005. Database of State Incentives for Renewable Energy (DSIRE) Web site. A comprehensive source of information on state, local, utility, and selected federal incentives that promote renewable energy, including a state-by-state description of RPS requirements. Accessed 2005.	http://www.dsireusa.org/
EPA. 2004. Guide to Purchasing Green Power. Produced in a joint effort between EPA, DOE, the World Resources Institute, and the Center for Resource Solutions. September 2004, p. 10.	http://www.epa.gov/greenpower/pdf/purchasing_guide_for_web.pdf
ERCOT. 2005. Transmission Issues Associated with Renewable Energy in Texas. Informal White Paper for the Texas Legislature, 2005. Produced in a joint effort between the industry and the ERCOT Independent System Operator (ISO).	http://www.ercot.com/AboutERCOT/TexasRenewableWhitePaper2005/RenewablesTransmissionWhitePaperFINAL.pdf
MA DOER. 2002. Massachusetts DOER RPS Policy Analysis has a series of white papers that cover many topics related to RPS requirements in great detail. The papers were developed during the creation of the Massachusetts RPS requirements. December 16.	http://www.mass.gov/doer/programs/renew/rps.htm
Navigant. 2005. Company intelligence. Navigant Consulting Inc. Also see: Katofsky, R. and L. Frantzis. 2005. Financing renewables in competitive electricity markets. Power Engineering. March 1.	http://www.navigantconsulting.com/A559B1/navigantnew.nsf/vGNCNTByDocKey/PPA91045514813/$FILE/Financing%20Renewables%20in%20Competitve%20Electricity%20Markets_Power%20Engineering_March%202005.pdf
Petersik, T. 2004. State Renewable Energy Requirements and Goals, Status through 2003. U.S. EIA. July.	http://www.mass.gov/doer/programs/renew/rps.htm
Rader, N. and S. Hempling. 2001. The Renewables Portfolio Standard: A Practical Guide. Prepared for the National Association of Regulatory Utility Commissioners. February.	http://www.naruc.org/displayindustryarticle.cfm?articlenbr=15688&searchcriteria=Renewable%20Portfolio%20Standard&securetype=All&startrec=1
RET 2006. Renewable Energy Trust Web site. Massachusetts Green Power Partnership.	http://www.masstech.org/RenewableEnergy/mgpp.htm
Wiser, R. 2005. An Overview of Policies Driving Wind Power Development in the West. Ernest Orlando LBNL, Berkeley, CA. February.	http://www.nationalwind.org/events/transmission/western/2005/presentations/Wiser.pdf

5.2 Public Benefits Funds for State Clean Energy Supply Programs

Policy Description and Objective

Public benefit funds (PBFs) can increase clean energy supply and enhance state economic development and environmental improvement. A clean energy fund can be designed to address key market barriers including the upfront cost of equipment and to provide consumer and education outreach.

Summary

Public benefits funds (PBFs), also known as system benefits charges (SBCs) and clean energy funds, are typically created by levying a small fee or surcharge on electricity rates paid by customers (i.e., for renewable energy, this fee is approximately 0.01 to 0.1 mills[20] per kilowatt-hour [kWh]) (DSIRE 2005). To date, PBFs have primarily been used to fund energy efficiency and low-income programs (see Section 4.2, *Public Benefits Funds for Energy Efficiency*). More recently, however, they have also been used to support clean energy supply (i.e., renewable energy and combined heat and power [CHP]).

PBFs were initially established during the 1990s in states undergoing electricity market restructuring. The goal was to assure continued support for renewable energy and energy efficiency programs in competitive markets and ensure that low-income populations had access to quality electrical service.[21] With respect to renewable energy, the concern was that in a competitive market, lower-cost generation would be favored over renewable energy. In response to this concern, PBFs were seen as a mechanism for continuing support for renewable energy and the benefits it provides in a competitive market situation.

CHP projects have been included in PBF-funded programs more recently due to their very high efficiency and environmental benefits. Although typically not considered a renewable energy technology, CHP can be characterized as a clean energy technology, a super-efficient generating technology, or an energy efficiency technology. As such, it has been addressed through both renewable and energy efficiency PBF-funded programs. States that have included CHP as an energy efficiency measure include New York and New Jersey (see *State Examples* section on page 5-26 for results of these CHP programs). This flexibility allows states to include CHP in PBF-funded programs where it makes most sense for that state, as a clean energy technology, an energy efficiency technology, or a super-efficient generating technology.

In 2005, 16 state renewable energy programs were expected to provide more than $300 million in support of clean energy supply. PBFs (i.e., clean energy funds) provided much of this funding (see Figure 5.2.1), and according to one estimate, PBFs will generate more than $4 billion for clean energy by 2017 (UCS 2004). In comparison, PBFs were expected to provide over $1 billion in funding for energy efficiency programs in 2005. (For more information on PBFs for energy efficiency, see Section 4.2, *Public Benefits Funds for Energy Efficiency.*)

Because state clean energy funds for energy supply are a relatively recent policy innovation, it is too early to measure their success. While some states track clean energy fund metrics (e.g., the number of dollars invested, number of kilowatts [kW] installed, and number of installers trained), larger issues such as the impact of clean energy funds on the renewable energy market have not yet been systematically evaluated.

Objective

The key objective of creating state clean energy funds with PBFs is to accelerate the development of renewable energy and CHP within a state. The objectives underlying a push for more renewable energy include state economic development, environmental

20 1 mill = one-tenth of a cent.

21 In California, these were initially called "stranded benefits" charges.

Figure 5.2.1: Estimated 2005 Funding Levels for State Renewable Energy Programs

	Est. 2005 Funding ($ millions)	Additional Information
AZ	$8.5[a]	To be determined in 2005
CA	$140	Through 2011
CT	$20	Through 2012
DE	$1.5[b]	Undefined end date
IL	$5	$50 million over 10 years
MA	$24	Undefined end date
ME	Voluntary	
MN	$16	Undefined end date; tied to Xcel Nuclear Prairie Island plant operation
MT	$2	2005
NJ	$68	2005–2008, 37% of SBC funding
NY	$9	$67 million over 5 years from 2002 to 2006
OH	$1.25	Through 2011
OR	$11	Through 2009
PA	$5.5	Through 2006
RI	$3.0	Through 2012
WI	$1.3	4.5% of SBC funding

Note: Values shown are annual amounts for renewable energy only and do not represent total SBCs.

a In 2005 Arizona was estimated to generate $8.5 million from PBFs and an additional $11–11.5 million from a utility bill surcharge for renewable energy. Funds are given to utilities to comply with the Environmental Portfolio Standard (EPS) through green power purchases, development of renewable generation assets, and customer photovoltaic (PV) rebates. Arizona is currently modifying EPS rules, which could result in the elimination of PBFs for renewable energy, and instead create a utility bill surcharge to generate ~$50 million per year.

b Amount represents both renewable energy and energy efficiency programs.

Sources: DSIRE 2005, Navigant 2005.

improvement, and response to public demand. These objectives can be advanced, in part, by creating a clean energy fund that incorporates a variety of strategies, including lowering equipment costs, addressing market barriers, and providing consumer education and outreach.

Benefits

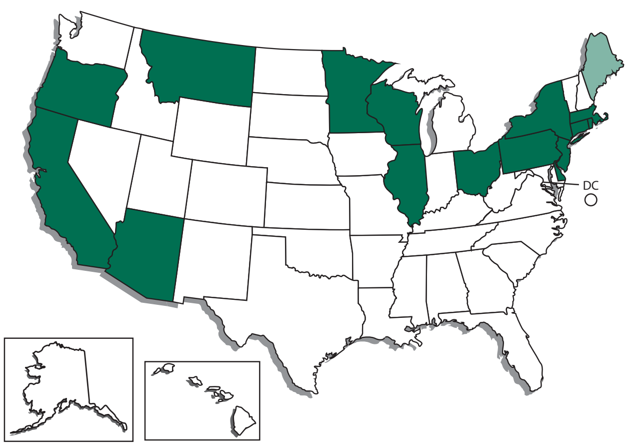
PBF-based clean energy funds offer the following benefits:

- *Provide a Cohesive Strategy "Under One Roof."* Combining a range of clean energy programs and funding within one organization allows for a cohesive strategy for addressing the range of clean energy market issues.
- *Tailored to a State's Needs.* State clean energy funds provide flexibility in the types of incentives and programs that states can offer and can be customized to the state's goals, natural resources, and industry presence (e.g., industries that are well established in a state, such as wind or biomass).
- *Support Long-Term Goals.* While policies such as renewable portfolio standards (RPS) are generally aimed at jump-starting markets for commercially ready technologies, clean energy funds have been designed to fund options with benefits that accrue over the long term. These longer-term programs, such as technology research, development, and demonstration programs, require a longer time frame (10 or more years) than is typically allowed by other approaches. In addition, these funds can be designed to improve the state economy by accelerating the development and deployment of technologies focused by in-state businesses. (See, for example, Section 5.1, *Renewable Portfolio Standards.)*
- *Complement Other Policies.* Because of their flexibility, state clean energy funds complement other state and federal policies, making those policies more effective. For example, PBFs are used by state energy programs to lower clean energy equipment costs by helping to ramp up volume, address key market barriers, and provide consumer education and outreach to increase the effectiveness and use of federal tax incentives, state RPS, and improved interconnection and net metering standards. In addition, PBFs can be used to support the successful implementation of other clean energy policies. For example, in California PBFs are used to pay the incremental cost for utility RPS compliance.

States That Use PBFs for Clean Energy Supply

As of early 2005, 16 states had established clean energy funds to promote renewable energy: Arizona, California, Connecticut, Delaware, Illinois, Massachusetts, Maine (voluntary), Minnesota,

Figure 5.2.2: Map of State Renewable Energy Funds



PBF for renewable energy
Voluntary PBF for newable energy

Sources: DSIRE 2005, Navigant 2005.

Montana, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, and Wisconsin (UCS 2004, DSIRE 2005). (See Figures 5.2.1 and 5.2.2.)

Designing and Implementing an Effective Clean Energy Fund

States consider a variety of key issues when designing PBFs directed at expanding the clean energy supply market. These issues include selecting an organizational structure to administer PBFs, protecting funding from being diverted for other uses, considering the importance of technology stages when designing PBF programs, and assessing the interaction of clean energy funds with state and federal policies.

Participants

Many states encourage the participation of a variety of stakeholders, including trade associations, equipment manufacturers, utilities, project developers, and leading environmental groups. For example, the consensus between stakeholders in Massachusetts over a clean energy fund resulting from electric utility restructuring is described in the Massachusetts Renewable Energy Collaborative (1997).

Administration

PBFs are typically established by state legislatures, and the bill(s) may provide varying levels of specificity for selecting an administrator for the PBF. Selecting the appropriate administrative organization for a clean energy fund is an important step. The role of the fund administrator is essential for the review of fund dispersal to ensure that each investment is valuable and represents the public interest. States have employed several organizational models for administering clean energy funds, including state energy offices, quasi-public agencies, public regulatory agencies, nonprofit organizations, and utilities. Many experts feel that no one model has proven more successful or effective than another.

States have chosen different models based on their goals and situations. Although utilities often manage PBFs used to support energy efficiency programs, utilities typically do not administer PBFs for renewable energy (a notable exception occurs in Arizona, where state renewable energy funds are managed by utilities). States have found that ensuring that a fund administrator has access to adequate staffing with appropriate expertise is more important than the administrative structure.

Examples of different administrative approaches include:

- *Massachusetts* chose the Massachusetts Technology Collaborative (MTC) to administer its clean energy funds. One of the main goals of the fund is to create a clean energy industry, and these goals are consistent with the MTC's charter, which is to foster high-tech industry "clusters" in Massachusetts (Commonwealth of Massachusetts 1997).
- *Connecticut* chose to administer its Clean Energy Fund through Connecticut Innovations Incorporated (CII), a quasi-public state agency charged with expanding Connecticut's entrepreneurial and technology economy. CII's experience in building a vibrant technology community in Connecticut fit well with the challenges of developing a clean energy industry and market.

Approach

States use a variety of approaches, based on their specific objectives, for using clean energy funds to support renewable energy market development. Some of these approaches are described below.

- *Investment Model.* Under this approach, loans and equity investments are used to support clean energy companies and projects. In many cases, renewable energy businesses find it difficult to obtain financing since traditional financial markets may be hesitant to invest in clean energy. The rationale behind having the state provide initial investment is to bring the renewable energy businesses and the traditional financial markets to a point where investment in renewable energy businesses is sustainable under its own power. (An example is the Connecticut Clean Energy Fund [CEF 2005].)
- *Project Development Model.* This approach uses financial incentives, such as production incentives and grants and/or rebates, to directly subsidize clean energy project installation. These funds typically are put in place to help renewable energy be more competitive in the short-term by offsetting or lowering the initial capital cost or by offsetting the higher ongoing cost of generation. The rationale behind these incentives is that increased market adoption of renewable energy technologies will ultimately drive down the cost of these technologies to a point where, without incentives, they can compete with traditional generation. (Examples include California's Renewable Resource Trust Fund [CEC 2005] and New Jersey's Clean Energy Program [NJCEP 2005].)
- *Industry Development Model.* With this approach, states use business development grants, marketing support programs, research and development grants, resource assessments, technical assistance, consumer education, and demonstration projects to support clean energy projects. The rationale behind these programs is that they will facilitate market transformation by building consumer awareness and demand, supporting the development of a qualified service infrastructure, and investing in technological advancement. (Examples include Wisconsin's Public Benefit Fund [State of Wisconsin 2005] and New Jersey's Clean Energy Program [NJCEP 2005].)

Funding

Leading states have designed their clean energy funds to be generated from a set rate in the electricity tariff, thereby providing consistency in funding levels from year to year. The ability to carry forward excess annual contributions to a clean energy fund can be important, especially during the fund's initial years. This approach helps states obtain consistent funding levels and protect against the diversion of funding to other state needs (e.g., to meet general budget shortfalls). If funding is diverted from the PBF to another use, such as to the state general fund, it significantly harms the ability of the PBF program to be successful, particularly during the initial years of the program.

Technology Stages

State clean energy funds include a portfolio of program options to support both emerging and commercially competitive technologies. Determining both the stage of technology development and the kind of incentives needed to support each technology are important steps in designing a clean energy fund program.

- For *emerging technologies*, clean energy funds can be used to address a variety of technical, regulatory, and market challenges. For example, MTC, administrator of the Massachusetts Renewable Energy Trust (MRET), is exploring offshore wind power, which to date has yet to be established in the United States. In anticipation of stakeholder concerns for potential wildlife, safety, and aesthetic impacts, MTC has used clean energy funds to bring stakeholders together in a collaborative process to discuss these issues. This approach ensures that stakeholder concerns and issues are addressed early in the process to help obtain support for later implementation.
- For renewable energy technologies that are *technologically proven but relatively expensive* compared

to fossil fuel energy generation, PBF funds can provide economic incentives to help bridge the gap between what the market is willing to bear and current costs. Examples of widely used incentives are buy-downs (rebates) for photovoltaic (PV), small wind systems, and fuel cells. For example, CII, administrator of the Connecticut Clean Energy Fund (CCEF), uses commercial buy-down programs for fuel cells and solar PV to support residential, commercial, and industrial uses of these technologies.

- Clean energy funds can also be used to develop programs that provide noneconomic incentives, which can be critical to *clean energy market development*. For example, while tax incentives and buy-down money may be available to support PV and fuel cells, additional funding might be needed to stimulate the development of a qualified installer network and other key industry infrastructure crucial to the success of the technology. For example, through its Renewable Energy Economic Development (REED) Program, New Jersey provides incentives to renewable energy companies to expand their businesses (e.g., helping to support infrastructure development) (NJCEP 2004).
- For *mature technologies* that are already cost-competitive (e.g., wind power, CHP, and biomass power), states can use clean energy funds to address other market barriers. For example, in 2003, the MTC formed the Massachusetts Green Power Partnership to use PBF funds to add economic certainty to Renewable Energy Certificate (REC) markets. MTC is currently entering into contracts of up to 10 years for RECs from RPS-eligible projects, providing them with bankable, long-term revenue from an investment-grade entity.
- *Increased use of CHP* can also be fostered with funding from state clean energy funds. In 2004, the New Jersey Board of Public Utilities' Office of Clean Energy created a CHP incentive program and provided $5 million for CHP projects. The California Public Utilities Commission (CPUC) issued a decision in 2001 requiring the investor-owned utilities to provide self-generation incentives, which include CHP.[22] In New York, the New York State Energy Research and Development Authority (NYSERDA) manages the Distributed Generation (DG)/CHP Program, which offers incentives for CHP projects funded by PBFs. From 2000 to 2004, NYSERDA awarded $64 million under the program, with the goal of awarding $15 million/year. (Note that some of this funding is provided from PBFs focused on energy efficiency.)

Interaction with State and Federal Policies

The incentives and programs implemented by clean energy funds interact with state and federal policies in ways that may be important to the designers of a clean energy fund. For example:

- States have found that programs designed to support the overall energy and environmental goals of the state and work in concert with other state renewable energy initiatives, such as RPS and tax credits, are most effective.
- Programs are most successful when leveraging other funding sources without activating "double-dipping" clauses. Incentives for wind projects that also allow developers to continue to take advantage of federal incentives include the production tax credit (PTC) and five-year accelerated depreciation (Wiser et al. 2002a).
- States have found that the success of clean energy fund incentives can also depend on the existence of other state clean energy policies. For example, in some states, net metering eligibility and interconnection standards may need to be established or modified by the state Public Utility Commission (PUC) to encourage small-scale distributed generation. (For more information on net metering and interconnection, see Section 5.4, *Interconnection Standards*.)

22 CPUC incentive funding is $125 million a year, most of which goes to PV installations. For microturbines or internal combustion (IC) engines, the incentive funding does not require CHP.

State Examples

California

The California Energy Commission (CEC), in coordination with the CPUC, manages clean energy funding in California. The California PBF, established in 1998, generates more than $135 million per year for clean energy. The program has four primary components:

- *Existing Renewable Resources*, which supports market competition among in-state existing renewable electricity facilities through varying incentives. Eligible existing renewable energy facilities are primarily supported through a cents/kWh payment.
- *New Renewable Resources*, which encourages new renewable electricity generation projects through fixed production incentives. Incentives are provided on a cents/kWh payment.
- *Emerging Renewable Resources*, which stimulates renewable energy and CHP[23] market growth by providing rebates to purchasers of onsite clean energy generation while encouraging market expansion (primarily incentives for capacity installed, on a dollar-per-watt basis).
- *Consumer Education*, which informs the public about the benefits and availability of renewable energy technologies through dissemination of general information and project descriptions.

Web sites:
http://www.energy.ca.gov/renewables/

http://www.cpuc.ca.gov/static/industry/electric/distributed+generation/

Connecticut

The CCEF is managed by a quasi-government investment organization called CII. CCEF receives about $20 million annually from PBFs. Since its inception in 1998 through September 2004, CCEF has invested a total of $52.8 million in renewable energy development. The program has three components:

- *Installed Capacity Program*, which supports long-term contracts for clean energy projects and incentive programs for host supply or onsite installations of clean DG projects.
- *Technology Demonstration Program*, which supports the demonstration of new clean energy technologies and innovative applications, while also providing infrastructure support to the emerging clean energy industry.
- *Public Awareness and Education Programs*, which support local clean energy campaigns to influence the buying behavior of electricity customers so that they voluntarily support clean energy.

Web site:
http://www.ctcleanenergy.com/

Massachusetts

MRET is managed by MTC, an independent economic development agency focused on expanding the renewable energy sector and Massachusetts' innovation economy. The State Division of Energy Resources provides oversight and planning assistance. A total of $150 million over a five-year period is earmarked for renewable energy. MTC's approach is to first identify barriers to renewable energy growth in Massachusetts, then leverage additional funds from other sources, including private companies and nonprofits. MTC's goals include maximizing public benefit by creating new high-tech jobs and producing clean energy. The MRET includes four program areas:

- Clean Energy Program
- Green Buildings and Infrastructure Program
- Industry Support Program
- Policy Unit

Web site:
http://www.mtpc.org/renewableenergy/index.htm

New Jersey

New Jersey's clean energy initiative, administered by the New Jersey Board of Public Utilities (NJBPU), provides information and financial incentives and creates enabling regulations designed to help New Jersey residents, businesses, and communities reduce their energy use, lower costs, and protect the environment.

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23 Limited to fuel cell CHP systems fueled with biogas.

New Jersey's Clean Energy Program has three components: residential programs, commercial and industrial programs, and renewable energy programs. CHP is funded as an efficiency measure through the commercial and industrial programs.

On July 27, 2004, the NJBPU approved a funding level of $5 million for the Office of Clean Energy's CHP Program. The program's goals are to increase energy efficiency, reduce overall system peak demand, and encourage the use of emerging technologies. The 2004 CHP Program funded a total of 23 projects that will generate in excess of 8 megawatts (MW) of power with system efficiencies of 60% or greater.

Furthermore, on December 22, 2004, the NJBPU established the Clean Energy Program (CEP) funding level at $745 million for the years 2005–2008. Of that total, renewable energy programs will receive a total of $273 million, making New Jersey home of one of the most aggressive renewable energy programs in the country. In 2004, the Customer Onsite Renewable Energy Program provided $12 million in rebates for 280 PV projects, adding more than 2 MW of new capacity.

In addition, New Jersey takes a comprehensive approach to ensure that all the different programs and policies intended to support clean energy are in place and work together (e.g., RPS with solar set-aside, net metering, interconnection standards).

Web sites:
http://www.bpu.state.nj.us

http://www.njcleanenergy.com/html/Combined/combined.html

http://www.njcep.com/srec

New York

NYSERDA, a public benefit corporation created in 1975 by the New York State Legislature, administers the New York Energy $mart program. This program is designed to support certain public benefit programs during the transition to a more competitive electricity market. Some 2,700 projects in 40 programs are funded by a charge on the electricity transmitted and distributed by the state's investor-owned utilities. The New York Energy $mart program provides energy efficiency services, research and development, and environmental protection activities.

Among other things, the Energy $mart program administers the New York Energy $mart Loan Fund program, which provides an interest rate reduction of up to 4% (400 basis points) off a participating lender's normal loan interest rate for a term up to 10 years on loans for certain energy efficiency improvements and/or renewable technologies.

In addition, since 2001, NYSERDA has administered other programs for energy efficiency and renewable energy. These include the DG/CHP Program, which has approved 83 DG/CHP systems for funding, representing 90 MW of peak demand reduction.

Web site:
http://www.nyserda.org

Ohio

Ohio's 1999 electric restructuring law created the Energy Loan Fund (ELF) and Universal Service Board. The ELF will collect $100 million over 10 years to provide low-interest loans or loan guarantees for energy efficiency improvements undertaken at residential, government, educational, small commercial, small industrial, and agricultural facilities. Renewable energy projects and public education efforts are also eligible for loans through ELF. The Ohio Department of Development's Office of Energy Efficiency (OEE) operates this fund. CHP systems up to 25 MW for commercial, institutional, and industrial applications are eligible for grants and loans under this program.

Web site:
http://www.odod.state.oh.us/cdd/oee/energy_loan_fund.htm

What States Can Do

Action Steps for States

States have chosen from a variety of approaches and eligible technologies in developing their clean energy funds. The best practices common among these states have been explored above. This section describes suggested action steps states can take to help ensure these best practices are implemented.

It is important for states that want to include CHP in their clean energy portfolios to comprehensively promote its benefits. For example, identifying CHP as both a clean source of energy and a source of significant energy savings and efficiency provides additional flexibility in including CHP in PBF programs and communicating the program to the public.

States That Have an Existing Clean Energy Fund

A top priority after establishing a clean energy fund is to identify and mitigate issues that might adversely affect the program's success. Demonstrating that the desired benefits are being achieved is essential for continued funding and support for the program. States can:

- Develop and monitor progress against clear targets for renewable energy and CHP development and related goals, such as green power participation rates, infrastructure development (e.g., MW of new capacity), and consumer awareness. Often, these targets are related to state goals.
- If necessary, shift fund priorities and develop new or modified programs in response to changes in markets or technologies (Wiser et al. 2002b).

States That Do Not Have an Existing Clean Energy Fund

Broad political and public support is a prerequisite to establishing a clean energy fund. After establishing general support for goals, a key step is to facilitate discussion and negotiation among key stakeholders toward developing an appropriate clean energy fund design.

- Ascertain the level of general interest and support for renewable energy and CHP in the state. If awareness is low, consider performing an analysis followed by an educational campaign to raise awareness of the environmental and economic benefits of accelerating the development of clean energy supply. For example, SmartPower has been working in numerous states to raise awareness of clean energy through public education campaigns (SmartPower 2005).
- Establish a working group of interested stakeholders to consider design issues and develop recommendations toward a clean energy fund. Work with the state legislature and PUC, as necessary, to develop model language and address ratemaking issues for raising, distributing, and administering the fund. Develop draft legislation for consideration by the state legislature, if legislation is required to implement a clean energy fund. In addition, if necessary, work with the PUC to establish the ratemaking process for creating the SBC.

Related Actions

- Consider additional policies or regulations that will help make a clean energy fund successful. For example, consider net metering and interconnection standards that are favorable to renewable energy and CHP development. For more information on these policies, see Section 5.4, *Interconnection Standards*.
- Publicize success stories and goals that have been reached. Make sure that state officials, office holders, and the public are aware that the clean energy fund is working and achieving the desired results.
- Develop a stakeholder communication process. A majority of clean energy funds were established through legislation after a robust stakeholder process that included input from utilities, PUCs, energy users, equipment manufacturers, project developers, state energy offices, and clean energy advocates. A stakeholder process is crucial to ensuring that market and project realities are considered in the design process.

On The Horizon

The *Guide to Action* focuses on established PBF policies that have proven to be successful in various states. Table 5.2.1 provides a brief description of emerging policies and innovative approaches, along with sources of additional information about these policies. To learn about additional policies on the horizon related to the other energy supply policies, see Appendix C, *Clean Energy Supply: Technologies, Markets, and Programs*.

Table 5.2.1: Emerging Policies and Innovative Approaches

Policy	Description	For More Information
Contractor and Equipment Certification	Some states require equipment and contractor certification for renewable energy installations that receive buy-down or state financial incentives. These standards ensure that high-quality products and services are provided to customers.	The North American Board of Certified Energy Practitioners (NABCEP) works with renewable energy and energy efficiency industries, professionals, and stakeholders to develop and implement quality credentialing and certification programs for practitioners. http://www.nabcep.org In New York, NYSERDA's PV or Solar Electric Incentive Program provides cash incentives for the installation of small PV or solar-electric systems. The cash incentives are only available for PV systems purchased through an eligible installer. http://www.powernaturally.org/Programs/Solar/incentives.asp?i=1
Standard REC Trading/Tracking Systems	A few state renewable energy programs currently have Web-based tracking systems for DG and/or assigning RECs based on this generation. These systems enable DG systems to participate in REC markets.	New Jersey established a separate REC trading system for solar PV. http://www.njcep.com/srec/
Mandated Long-Term Contracts for Renewables	This policy allows utilities in deregulated markets to sign long-term contracts with renewable energy generators. This would provide generators with the long-term certainty they need to get their projects financed.	The Colorado referendum that created the RPS requires a 20-year purchase for projects eligible to satisfy the RPS. http://www.dora.state.co.us/puc/rulemaking/Amendment37.htm A legislative act in Connecticut requires distribution companies to sign long-term Power Purchase Agreements for no less than 10 years for clean energy at a wholesale market price plus up to $0.055 per kWh for the REC. http://www.ctcleanenergy.com/investment/MarketSupplyInitiative.html
Integrating PUC goals into PBF Program Design (i.e., "Cross-Walking")	This policy encourages the use of PBFs not only to support energy efficiency and renewable energy but also to help PUCs and utilities reach their goals, such as increased reliability, congestion relief, and permanent peak reduction.	New England Demand Response Initiative. http://nedri.raabassociates.org/index.asp In Massachusetts, annual peak demand reductions from energy efficiency and PBF-funded load management ranged from 98 to 135 MW in 1998, 1999, and 2000. Cumulative reductions from these programs reached 700 MW (7.2% of peak) as of 2000. http://eetd.lbl.gov/EA/EMP/reports/PUB5482.pdf

Source: Compiled by EPA based on multiple sources.

Information Resources

Federal Resources

Title/Description	URL Address
The U.S. Environmental Protection Agency's (EPA's) CHP Partnership is a voluntary program that seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities to encourage energy efficiency through CHP, and can provide additional assistance, including information on CHP incentives and program design.	http://www.epa.gov/chp/
The EPA Green Power Partnership is a voluntary Partnership between EPA and organizations that are interested in buying green power. Through this program, the EPA supports organizations that are buying or planning to buy green power.	http://www.epa.gov/greenpower/

General Articles and Resources About Clean Energy Funds

Title/Description	URL Address
Case Studies of State Support for Renewable Energy. This site contains a set of articles pertaining to different aspects of clean energy funds authored by staff at Lawrence Berkeley National Laboratories (LBNL).	http://eetd.lbl.gov/ea/EMS/cases/
Clean Energy States Alliance (CESA). Twelve states have established funds to promote renewable energy and clean energy technologies. CESA is a nonprofit organization that provides information and technical services to these funds and works with them to build and expand clean energy markets in the United States. The CESA Web site includes links to all state clean energy funds and related state agencies.	http://www.cleanenergystates.org/
The Database of State Incentives for Renewable Energy (DSIRE). This database is a comprehensive source of information on state, local, utility, and selected federal incentives that promote renewable energy.	http://www.dsireusa.org/
SmartPower Web Site: Marketing Resources. SmartPower has been working in numerous states to raise the awareness of clean energy through public education campaigns.	http://www.smartpower.org/clean_energy_marketing.htm
Union of Concerned Scientists. This Web site contains articles and fact sheets by staff at the Union of Concerned Scientists on clean energy funds and PBFs for renewable energy. New articles and other information are added to the Web site continually.	http://www.ucsusa.org/clean_energy/

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Title/Description	URL Address
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Commonwealth of Massachusetts. 1997. Chapter 164 of the Acts of 1997. An act regarding restructuring the electric utility industry in the Commonwealth, regulating the provision of electricity and other services, and promoting enhanced consumer protections therein. Approved November 25.	http://www.mass.gov/legis/laws/seslaw97/sl970164.htm
DSIRE. 2005. DSIRE Web site. Contains information on state PBFs.	http://www.dsireusa.org/index.cfm?&CurrentPageID=2
Massachusetts Renewable Energy Collaborative. 1997. Consensus Report to the Legislature on the Proposed Renewable Energy Fund. July 1.	http://www.raabassociates.org/Articles/Renewable_Fund_Final.doc
Navigant. 2005. Company intelligence. Navigant Consulting Inc. Also see Katofsky, R. and L. Frantzis. 2005. Financing renewables in competitive electricity markets. Power Engineering. March 1.	http://www.navigantconsulting.com/A559B1/navigantnew.nsf/vGNCNTByDocKey/PPA91045514813/$FILE/Financing%20Renewables%20in%20Competitve%20Electricity%20Markets_Power%20Engineering_March%202005.pdf
NJCEP. 2004. New Jersey Clean Energy Program: Incentives, Regulation, and Services Designed to Transform Energy Markets in New Jersey. October 4. 9th National Green Power Marketing Conference, Scott Hunter, NJBPU, Office of Clean Energy.	http://www.eere.energy.gov/greenpower/conference/9gpmc04/hunter.pdf
NJCEP. 2005. Financial Incentives to “Get with the Program.” NJCEP Web site. Accessed July 2005.	http://www.njcep.com/html/2_incent.html
SmartPower. 2005. SmartPower Web Site: Marketing Resources. SmartPower has been working in numerous states to raise the awareness of clean energy through public education campaigns.	http://www.smartpower.org/clean_energy_marketing.htm
State of Wisconsin. 2005. Focus on Energy. Renewable Energy. Wisconsin's Focus on Energy Web site. Accessed July 2005.	http://www.focusonenergy.com/
UCS. 2004. Table of State Renewable Energy Funds. Union of Concerned Scientists.	http://www.ucsusa.org/clean_energy/clean_energy_policies/clean-energy-policies-and-proposals.html (PDF Link: State Renewable Energy Funds)
Wiser, R, M. Bolinger, and T. Gagliano. 2002a. Analyzing the Interaction between State Tax Incentives and the Federal Production Tax Credit for Wind Power. LBNL-51465. Environmental Energy Technologies Division, LBNL, Department of Energy, Berkeley, CA. September.	http://eetd.lbl.gov/ea/EMS/reports/51465.pdf
Wiser, R., M. Bolinger, L. Milford, K. Porter, and R. Clark. 2002b. Innovation, Renewable Energy, and State Investment: Case Studies of Leading Clean Energy Funds. LBNL-51493. Environmental Energy Technologies Division, LBNL and The Clean Energy Group. September.	http://eetd.lbl.gov/ea/EMS/reports/51493.pdf

5.3 Output-Based Environmental Regulations to Support Clean Energy Supply

Policy Description and Objective

States utilize output-based environmental regulations to encourage efficient energy generation by leveling the playing field for fuel conversion efficiency and renewable energy as air pollution control measures. Historically, environmental regulations have been input-based, which does not account for the pollution prevention benefits of process efficiency, which encourages the use of more efficient generation approaches.

Description

Output-based environmental regulations relate emissions to the productive output of a process. The goal of output-based environmental regulations is to encourage the use of fuel conversion efficiency and renewable energy as air pollution control measures. While output-based emission limits have been used for years in regulating some industrial processes, their use is only recently evolving for electricity and steam generation. Output-based regulations can be an important tool for promoting an array of innovative energy technologies that will help achieve national environmental and energy goals by reducing fuel use.

Most environmental regulations for power generators and boilers have historically established emission limits based on heat input or exhaust concentration: that is, they measure emissions in pounds per million British thermal units (lb/MMBtu) of heat input or in parts per million (ppm) of pollutant in the exhaust stream. These traditional input-based limits do not account for the pollution prevention benefits of process efficiency in ways that encourage the application of more efficient generation approaches. For example, a facility that installs an energy efficient technology emits less, because less fuel is burned. But with an input-based emission limit, the reduced emissions from improved energy efficiency are not counted toward compliance. By not accounting for these emission reductions, input-based emission limits can be a barrier to adopting energy efficiency improvements.

Output-based emission limits are particularly important for promoting the significant energy and environmental benefits of combined heat and power (CHP). CHP units produce both electrical and thermal output. Output-based limits can be designed to explicitly account for both types of output in the compliance computation. Traditional input-based limits, on the other hand, can present a barrier to selecting CHP technologies, because they do not account for the emission reductions achieved through increased generation efficiency.

To encourage more efficient energy generation, states have begun to design and implement output-based environmental regulations. An output-based emission limit is expressed as emissions per unit of useful energy output (i.e., electricity, thermal energy, or shaft power). The units of measure can vary depending on the type of energy output and the combustion source. For electricity generation, the unit of measure is mass of emissions per megawatt-hour (lb/MWh).

Output-based emission limits do not favor any particular technology and do not increase emissions. Output-based regulations simply level the playing field by establishing performance criteria and allowing energy efficiency and renewable energy to compete on an equal footing with any other method of reducing emissions (e.g., combustion controls and add-on controls).

Objective

The key objective is to encourage more efficient energy generation by designing environmental regulations that allow energy efficiency to compete as an air pollution control measure. Emission standards that account for the emission reduction benefits of energy efficiency, and specifically the efficiency benefits of CHP, will make it more attractive for facilities to permit and install clean energy technologies.

Output-based approaches also can be designed into cap and trade programs to encourage non-emitting end-use energy efficiency and renewable energy projects.

An output-based emission regulation can reduce compliance costs because it gives the plant operator greater flexibility in reducing emissions. A facility operator can comply by installing emission control equipment, using a more energy efficient process, or using a combination of the two. Regulating the emissions produced per unit of output has value for equipment designers and operators because it gives them additional opportunities to reduce emissions through more efficient fuel combustion, more efficient cooling towers, more efficient generators, and other process improvements that can increase plant efficiency.

Example of Cost Flexibility Allowed by an Output-Based Emission Standard

Consider a planned new or repowered coal-fired utility plant with an estimated uncontrolled nitrogen oxide (NO_x) emissions rate of 0.35 lb/MMBtu heat input. To comply with an input-based emission standard of 0.13 lb/MMBtu heat input, the plant operator would have to install emission control technology to reduce NO_x emissions by more than 60%. On the other hand, if the plant were subject to an equivalent output-based emission standard of 1.3 lb/MWh, then the plant operator would have the option of considering alternative control strategies by varying both the operating efficiency of the plant and the efficiency of the emission control system (Table 5.3.1). This output-based format allows the plant operator to determine the most cost-effective way to reduce NO_x emissions and provides an incentive to reduce fuel combustion. The total annual emissions are the same in either case.

Table 5.3.1: Design Flexibility Offered by Output-Based Standards

Plant Efficiency (%)	Emission Standard (lb/MWh)	Required Control Device Efficiency (%)
34	1.3	60
40	1.3	55
44	1.3	48

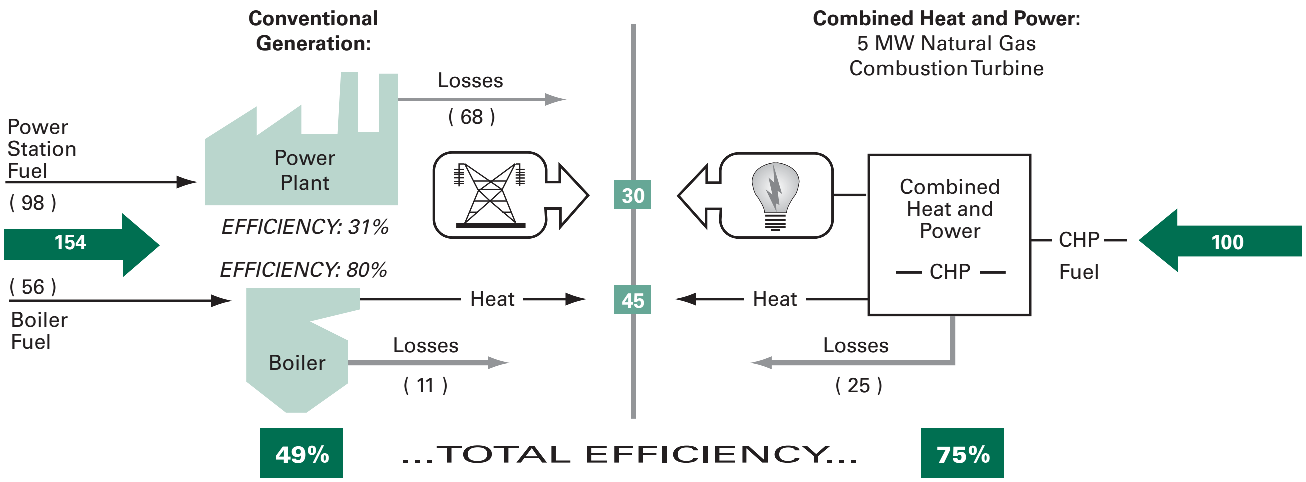
Source: EPA 2004.

Benefits

Output-based environmental regulations level the playing field and encourage pollution prevention and energy efficiency. The primary benefits of using more efficient combustion technologies and renewable energy include:

- *Multi-Pollutant Emission Reductions.* The use of efficiency as a pollution control measure results in multi-pollutant emission reductions. For example, to comply with a rule for NO_x, a source that increases fuel conversion efficiency will reduce emissions of all other pollutants, including sulfur dioxide (SO_2), particulate matter, hazardous air pollutants, as well as unregulated emissions such as carbon dioxide (CO_2).
- *Multimedia Environmental Reductions.* By encouraging reduced fuel use, output-based environmental regulations reduce air, water, and solid waste impacts from the production, processing, transportation, and combustion of fossil fuels.
- *Reduced Fossil Fuel Use.* Encouraging energy efficiency and renewable energy sources will reduce stress on today's energy systems and reduce the demand for imported fossil fuels.
- *Technology Innovation.* Encouraging more efficient energy generation can advance the use of innovative technologies, such as CHP. Figure 5.3.1 illustrates how CHP can save energy compared to the conventional practice of separate generation of heat and power. CHP offers a combined fuel conversion efficiency of 75% compared to 45% for the conventional system while providing the same thermal and electric service. As a result, the CHP system emits only 17 tons of NO_x per year while the conventional system emits 45 tons per year.

Figure 5.3.1: CHP System Efficiency



Source: EPA 2004.

- *Compliance Flexibility.* Allowing the use of energy efficiency as part of an emission control strategy provides regulated sources with an additional compliance option. Under an output-based environmental regulation, sources would have the option of varying both the efficiency of the process and the efficiency of the emission control system. This flexibility allows the plant operator to determine the most cost-effective way to reduce emissions, while providing an incentive to burn less fuel. Input- or concentration-based regulations do not provide this option.

States That Have Developed Output-Based Regulations

Several states have been at the forefront of adopting output-based environmental regulations in general and, in particular, developing rules that account for the efficiency benefits of CHP. Programs adopted by these states include:

- Conventional emission limits using an output format.
- Special regulations for small distributed generators (DG) that are output-based.
- Output-based allowance allocation methods in a cap and trade program.
- Output-based allowance allocation set-asides for energy efficiency and renewable energy.
- Multi-pollutant emission regulations using an output-based format.

A summary of state output-based environmental regulations programs is presented in Table 5.3.2.

Designing an Effective Output-Based Environmental Regulations Program

Key elements that are involved in designing an effective output-based environmental regulations program include participants, applicable programs, interaction with other state and federal policies, and barriers to developing output-based environmental regulations.

The most common use of output-based regulations is for emission limits. To design an output-based limit, states make several decisions about the format of the rule. Making these decisions involves tradeoffs between the degree to which the rule accounts for the benefits of energy efficiency, the complexity of the rule, and the ease of measuring compliance.

Table 5.3.2: State Output-Based Regulations

State	Rule Type
California	Small DG Rule[a]
Connecticut	Allowance Allocation/trading Small DG Rule[a]
Delaware	Allowance Allocation/trading Small DG Rule[a]
Indiana	Allowance Allocation/set-asides
Maine	Small DG Rule
Maryland	Allowance Allocation/set-asides
Massachusetts	Allowance Allocation/trading[a] Small DG Rule Multi-Pollutant Regulation Allowance Allocation/set-asides
New Hampshire	Multi-Pollutant Regulation
New Jersey	Allowance Allocation/trading Allowance Allocation/set-asides
New York	Small DG Rule Allowance Allocation/set-asides
Ohio	Allowance Allocation/set-asides
Texas	Conventional NO_x Limits Small DG Rule[1]

[a] Includes recognition of CHP through inclusion of a thermal credit.

Source: Compiled by EPA based on multiple sources.

The general steps for designing an output-based emission standard are:

- *Develop the Output-Based Emission Limit*. The method used to develop this limit depends on whether emissions and energy output data that were measured simultaneously are available. If not, states can develop output-based emission limits by converting input-based emissions data or existing emission limits to an output-based equivalent using unit conversions and a benchmark energy efficiency.
- *Specify a Gross or Net Energy Output Format*. Net energy output will more comprehensively account for energy efficiency, but can increase the complexity of compliance monitoring requirements.
- *Specify Compliance Measurement Methods*. Output-based rules require methods for monitoring electrical, thermal, and mechanical outputs. These outputs are already monitored at most facilities for commercial purposes, and the methods are readily available.
- *Specify How to Calculate Emission Rates for CHP Units*. To account for the pollution prevention benefits of CHP, output-based regulations must specify a method to account for both the thermal and electric output of the CHP process (in this document, we refer to this as "recognizing" CHP). States have used several approaches to recognize CHP. These approaches are described in more detail in The U.S. Environmental Protection Agency's (EPA's) *Output-Based Regulations: A Handbook for Air Regulators* (EPA 2004). Each approach has policy and implementation tradeoffs, but they all provide a more appropriate framework for regulating CHP emissions than do conventional emission limit formats.

Participants

- *State Environmental Agencies.* The state environmental agency is responsible for formulating and administering state air regulations.
- *State Energy Offices and Public Utility Commissions (PUCs).* These organizations can play an active role in encouraging the use of output-based environmental regulations. Both types of organizations typically have an interest in promoting efficient and clean energy generation and are looking for policies that can promote such technologies. They often have a good understanding of the value of efficiency in the generating sector and can assist the process by analyzing potential energy and economic benefits that the state could achieve by using output-based environmental regulations.
- *State Economic Development Agencies*. These agencies may also have an interest in output-based environmental regulations due to their potential to encourage lower cost and more reliable sources of energy for new industry. Output-based environmental regulations might also simplify environmental permitting for clean, efficient facilities, providing an advantage for economic development in the state.

- *Regulated and Nonregulated Stakeholders.* Stakeholders often play a role in developing and promoting output-based environmental regulations. Energy users, CHP and DG equipment manufacturers, project developers, and trade associations representing these interests may provide relevant information and comments throughout the regulatory development and implementation process.
- *State Legislators.* In some cases, state legislators may play a role in promoting output-based environmental regulations. Legislators can be proponents of efficiency and clean technology and can provide support for development of output-based environmental regulations as a means of meeting state efficiency and clean air goals.

Applicable Programs

Output-based concepts can be applied to a variety of air regulatory programs, including:

- *Conventional Emission Limits, Such as Reasonably Available Control Technology (RACT), National Emission Standards for Hazardous Air Pollutants (NESHAP), and New Source Performance Standards (NSPS).* The Ozone Transport Commission (OTC) has used an output-based format for "beyond-RACT" NO_x limits. EPA has used an output-based approach with recognition of CHP for the NSPS for NO_x from utility boilers, the NSPS for mercury from coal-fired utility boilers, and the NESHAP for combustion turbines.
- *Emission Limits for Small DG and CHP.* Most states that have recently promulgated emission limits for DG are using output-based environmental regulations. These states include California, Texas, Connecticut, Massachusetts, and Maine. Delaware, Rhode Island, and New York are currently developing output-based environmental regulations. All of these states, except Massachusetts and New York, recognize CHP by including a thermal credit in their regulations. Massachusetts and New York currently are considering how to recognize CHP. These are standalone efforts in response to developing markets for DG.
- *Allowance Allocation in Emission Trading Programs.* Allowance allocation is an important component in emission cap and trade programs for electric utilities. Allowance allocations are most commonly based on either heat input or energy output. Allocation based on heat input gives more allowances to less efficient units, and allocation based on energy output gives more allowances to more efficient units. An updating allocation system (where allowances are reallocated in the future) using an output basis provides an ongoing incentive for improving energy efficiency. Connecticut and New Jersey use output-based allocation in their NO_x trading rules. Massachusetts uses an output-based allocation that includes the thermal energy from CHP.
- *Allowance Allocation Set-Asides for Energy Efficiency and Renewable Energy.* In addition to allocating allowances to regulated sources, a cap and trade program can "set aside" a portion of its NO_x allowances for allocation to energy efficiency, renewable energy, and CHP projects that are not regulated under the cap and trade program. These unregulated units can sell the allowances to regulated units to generate additional revenue. States with set-aside programs include Indiana, Maryland, Massachusetts, New York, New Jersey, and Ohio. Connecticut is currently developing a set-aside rule.
- *Multi-Pollutant Programs*. Several states have adopted multi-pollutant emission limits for power generators. Some include emission trading, while others are similar to conventional emission rate limits. Massachusetts and New Hampshire have established such programs using output-based environmental regulations, although neither currently includes CHP.

Interaction with Federal Policies

Several federal programs have adopted output-based regulations with recognition of CHP (see *Examples of Legislation and Program Proposals*, in *Information Resources* on page 5-41). These programs include:

- NSPS for NO_x from electric utility boilers and the proposed combustion turbines both apply output-based limits with recognition of CHP through the treatment of a thermal credit. The boiler NSPS was one of the first such rules and helped set an example for other regulations. The most recently proposed NSPS revisions expand the use of output-based environmental regulations to other pollutants and improve the treatment of thermal output from CHP.

- Emission limits in state implementation plans (SIPs) can be in expressed in any format as long as the plan demonstrates compliance with federal air quality standards.
- The new EPA cap and trade programs (Clean Air Interstate Rule for ozone and fine particulate matter and the Clean Air Mercury Rule) allow states to determine the method for allocating allowances. The EPA model rules include examples of output-based allocation, including methods to include CHP units. These model rules can be adopted by states "as is," which would be a benefit to CHP.

Interaction with State Policies

The use of output-based environmental regulations to encourage CHP can be coordinated with other state programs, including:

- State emission disclosure programs for electricity that typically use an output-based format (lb/MWh). This is an indication of the usefulness of the output-based approach to accurately relate emissions to useful output.
- Other state policies that are important in encouraging efficiency and CHP development include grid interconnection standards, electricity and gas ratemaking, and financial incentives for CHP developments.

Barriers to Developing Output-Based Environmental Regulations

For power and steam applications, an output-based regulation is a change from historical regulatory practice and can create uncertainties for implementation. At this time, however, the use of output-based environmental regulations is growing, and there has been sufficient experience with state and EPA rulemakings to provide successful examples for rule development and implementation.

One issue that has been raised in past rulemakings is the lack of simultaneously measured energy output and emission data upon which to base the emission limit. Where these data were not available, EPA and states developed output-based environmental regulations by converting input-based data or emission limits to an output-based format using units of measure conversions and a benchmark energy efficiency. The selection of a benchmark energy efficiency is an important policy decision, because processes with efficiency below the benchmark would have to control emissions to a greater degree than those that exceed the benchmark. This is especially true for regulation of existing sources, which have far fewer options to take advantage of efficiency. Application of output-based regulation to existing sources

Best Practices: Developing and Adopting an Output-Based Regulation

The best practices identified below will help states design effective output-based environmental regulations programs. These recommendations are based on the experiences of states that have implemented output-based environmental regulations to encourage CHP.

- Determine what types of DG and CHP technologies and applications might be affected and whether there are any specific technology issues that the regulation needs to address. Consult with the PUC, the independent system operator (ISO), and owners on operations of DG and CHP units to inform regulatory determinations.
- Gather/review available output-based emission data for regulated sources. Alternatively, convert available data to output-based format. Obtain information from equipment providers on technologies and emissions profiles, and capitalize on experience and work already conducted by other states.
- Evaluate alternative approaches to account for multiple outputs of CHP units. (See EPA's 2004 *Output-Based Regulations: A Handbook for Air Regulators* and other references in the *Information Resources* section on page 5-40).

requires special attention to the feasibility and cost of compliance options.

Other common issues include the feasibility of emission monitoring, compliance methods, and technology to measure process output (electricity and thermal output). However, all of these questions have been successfully addressed by states in their output-based rulemakings (see *State Examples* on page 5-39).

Program Implementation and Evaluation

The best practices states can use when implementing and evaluating output-based regulations are described below.

Administering Body

The state, local, or tribal environmental agency is almost always responsible for developing output-based environmental regulations.

Roles and Responsibilities of Implementing Organization

The state, local, or tribal environmental agency's responsibilities include:

- Identify and evaluate opportunities for the application of output-based environmental regulations.
- Gather information, develop goals for output-based environmental regulations, develop output-based environmental regulations, and establish appropriate output-based emission limits.
- Publicize and implement output-based environmental regulations. Train permit writers on new rules.
- Evaluate the value of output-based environmental regulations in encouraging efficiency, CHP, and emission reductions.

Evaluation

States can evaluate their overall air pollution regulatory program periodically to determine whether their regulations are structured to encourage energy efficiency, pollution prevention, and renewable resources. This evaluation helps identify new opportunities for using output-based environmental regulations to encourage energy efficiency through effective regulatory design.

Regulatory programs are routinely reviewed and revised, and occasionally new programs are mandated by state or federal legislation. For example, states are developing revised SIPs to achieve greater emission reductions to address problems of ozone, fine particulates, and regional haze. States can use this opportunity to evaluate the benefits of energy efficiency in attaining and maintaining air quality goals. States can identify the overall benefits of output-based

Best Practices: Implementing Output-Based Regulations

The best practices identified below will help states effectively implement their output-based environmental regulations programs. These recommendations are based on the experiences of states that have implemented output-based environmental regulations to encourage CHP.

- Start with internal education to ensure that state environmental regulators understand the benefits, principles, and mechanisms of output-based environmental regulations and CHP. Ensure that regulators understand why this change is good for the environment.
- Coordinate with other state agencies that can lend support. State energy offices, energy research and development offices, and economic development offices can provide valuable information on the energy benefits of output-based environmental regulations, efficiency, and CHP. Their perspective on the importance of energy efficiency and pollution prevention can help formulate policy.
- Apply output-based environmental regulations principles to new regulations, as appropriate.
- Publicize the new rules. Consider training permit writers on implementation of the new rules.

environmental regulations by assessing the affect of higher efficiency on energy savings, other emissions reduced, jobs created, and costs savings to utilities and consumers. It may be advantageous to engage state energy officials in this process to get additional perspective and insights into the energy implications of output-based environmental regulations.

State Examples

Connecticut

Connecticut has promulgated output-based environmental regulations for NO_x, particulate matter, carbon monoxide (CO), and CO_2 from small distributed generators (< 15 MW capacity), including CHP. The regulation is expressed in lb/MWh based on the Model Rule for DG developed by the Regulatory Assistance Project (RAP 2002). The regulation values the efficiency of CHP based on the emissions that are avoided by not having separate electric and thermal generation. Connecticut also allocates allowances based on energy output in their NO_x trading program.

Web site:
http://dep.state.ct.us/air2/regs/mainregs/sec42.pdf

Indiana

Indiana has created a set-aside of allowance allocations for energy efficiency and renewable energy in their NO_x trading program. Indiana allocates 1,103 tons of NO_x allowances each year for projects that reduce the consumption of electricity, reduce the consumption of energy other than electricity, or generate electricity using renewable energy. Highly efficient electricity generation projects for the predominant use of a single end user or highly efficient generation projects that replace or displace existing generation equipment are eligible to apply for NO_x allowances. Projects can involve combined cycle systems, CHP, microturbines, or fuel cells.

Web site:
http://www.in.gov/idem/air/standard/Sip/guide.pdf

Massachusetts

Massachusetts has used output-based environmental regulations in several important regulations. The Massachusetts NO_x cap and trade program employs useful output, including the thermal output of CHP, to allocate emission allowances to affected sources (generators > 25 MW). This approach provides a significant economic incentive for CHP within the emissions cap. Massachusetts also has a multi-pollutant emission regulation (NO_x, SO_2, mercury [Hg], CO_2) for existing power plants, which uses an output-based format for conventional emission limits.

Web site:
http://www.mass.gov/dep/bwp/daqc/files/728reg.pdf

Texas

In 2001, Texas promulgated a standard permit with output-based emission limits for small electric generators. The permit sets different NO_x limits (lb/MWh) based on facility size, location, and level of utilization. The compliance calculation accounts for the thermal output of CHP units by converting the measured steam output (British thermal unit, or Btu) to an equivalent electrical output (MWh). To qualify as a CHP unit, the heat recovered must represent a minimum of 20% of total energy output by the unit.

Web site:
http://www.tnrcc.state.tx.us/permitting/airperm/nsrpermits/files/segu_permitonly.pdf

What States Can Do

Output-based regulations with provisions to recognize the pollution prevention benefits of CHP are becoming more common in the development and implementation of environmental regulations. Where appropriate, states can investigate incorporating output-based environmental regulations into new regulations or amendments. The most important step is to integrate an evaluation of output-based environmental regulations into the routine review and implementation of environmental regulations. In this way, a state can promote energy efficiency through the structure of its air pollution regulatory program.

Information Resources

Federal Resources

Title/Description	URL Address
Developing and Updating Output-based NO_x Allowance Allocations. This EPA guidance document was the result of a 1999 stakeholder process to develop approaches to output-based allocation of emission trading allowances, including allocation to CHP facilities.	http://www.epa.gov/airmarkets/fednox/april00/finaloutputguidanc.pdf
The EPA CHP Partnership. This voluntary program seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities for policy developments (i.e., energy, environmental, and economic) to encourage energy efficiency through CHP. In 2006, the Partnership, in conjunction with the Northeast States for Coordinated Air Use Management (NESCAUM), is developing output-based environmental regulations training for state air regulators.	http://www.epa.gov/chp
Output-Based Regulations: A Handbook for Air Regulators. The EPA CHP Partnership has developed a handbook that explains the benefits of output-based emission limits, how to develop output-based environmental regulations, and the experience of several states in implementing output-based environmental regulations. This handbook is intended as a resource for air regulators in evaluating opportunities to adopt output-based environmental regulations and in writing regulations.	http://www.epa.gov/chp/pdf/output_rpt.pdf

Other Resources

Title/Description	URL Address
The Impact of Air Quality Regulations on Distributed Generation. National Renewable Energy Laboratory (NREL), Golden, CO. October. This report finds that current air quality regulatory practices are inhibiting the development of DG, either through a failure to recognize the environmental benefits offered by DG or by imposing requirements designed for larger systems that are not appropriate for DG systems.	http://www.nrel.gov/docs/fy03osti/31772.pdf
NESCAUM. This is an interstate association of air quality control divisions in the Northeast. The eight member states are comprised of the six New England States and New York and New Jersey. NESCAUM's purpose is to exchange technical information and promote cooperation and coordination of technical and policy issues regarding air quality control among the member states.	http://www.nescaum.org/
Regulatory Requirements Database for Small Electric Generators. This online database provides information on state environmental regulations for small generators and other types of regulations for small generators.	http://www.eea-inc.com/rrdb/DGRegProject/index.html

General Articles on Output-Based Regulation

Title/Description	URL Address
Analysis of Output-Based Allocation of Emission Trading Allowances. This report for the U.S. Combined Heat and Power Association (USCHPA) provides background on emission trading programs and the benefits of output-based allocation, with a particular focus on CHP.	http://uschpa.admgt.com/AllocationFinal.pdf

Examples of Legislation and Program Proposals

Following are examples of output-based approaches to different types of environmental regulation:

Example	Title/Description	URL Address
Allowance Allocation	Massachusetts uses useful output, including thermal energy from CHP, to allocate emission allowances in its NO_x trading program.	http://www.mass.gov/dep/bwp/daqc/files/728reg.pdf
	EPA has also included elements of output-based emission allocation approaches in its model trading rules for the Clean Air Interstate Rule (CAIR) and Clean Air Mercury Rule.	http://www.epa.gov/cair/pdfs/cair_final_reg.pdf http://www.epa.gov/mercuryrule/pdfs/camrfinal_regtext.pdf
	EPA has suggested model language for energy efficiency/renewable energy set-asides in NO_x emission trading programs.	http://www.epa.gov/ttn/oarpg/t1/memoranda/ereseerem_gd.pdf
Conventional Rate Limits	The OTC has developed output-based "beyond RACT" regulatory language for a variety of sources.	http://www.otcair.org/interest.asp?Fview=stationary#
	The federal NSPS for NO_x from electric utility boilers and the proposed NSPS for combustion turbines are structured as output-based environmental regulations. Each rule also contains compliance provisions for CHP. These regulations provide excellent examples of rule language and technical background documentation.	http://www.epa.gov/ttn/oarpg/t3pfpr.html
DG Regulations	Texas has an output-based standard permit for small electric generators with recognition of CHP.	http://www.tnrcc.state.tx.us/permitting/airperm/nsr_permits/files/segu_permitonly.pdf
	The RAP, with support from the U.S. Department of Energy (DOE), developed model rule language for regulation of small electric generators, including CHP.	http://www.raponline.org/ProjDocs/DREmsRul/Collfile/ModelEmissionsRule.pdf
	Connecticut has promulgated a rule using the RAP model rule approach.	http://dep.state.ct.us/air2/regs/mainregs/sec42.pdf

References

Title/Description	URL Address
EPA. 2004. Output-Based Regulations: A Handbook for Air Regulators. Produced in a joint effort between Energy Supply and Industry Branch, Green Power Partnership and CHP Partnership. August 2004.	http://www.epa.gov/chp/pdf/output_rpt.pdf
RAP. 2002. Model Regulations for the Output of Specified Air Emissions from Smaller-scale Electric Generation Resources Model Rule and Supporting Documentation. RAP. October 15.	http://www.raponline.org/ProjDocs/DREmsRul/Collfile/ModelEmissionsRule.pdf

5.4 Interconnection Standards

The state public utility commission (PUC), in determining utility interconnection rules, can establish uniform application processes and technical requirements that reduce uncertainty and prevent excessive time delays and costs that distributed generation (DG) can encounter when obtaining approval for electric grid connection.

Policy Description and Objective

Summary

Standard interconnection rules for distributed generation (DG) systems (renewable energy and combined heat and power [CHP]) are a relatively recent policy innovation used by states to accelerate the development of clean energy supply. CHP is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source by recovering the waste heat for use in another beneficial purpose. Customer-owned DG systems are typically connected in parallel to the electric utility grid and are designed to provide some or all of the onsite electricity needs. In some cases, excess power is sold to the utility company.

Standard interconnection rules establish uniform processes and technical requirements that apply to utilities within the state. In some states, municipally owned systems or electric cooperatives may be exempt from rules approved by the state regulators. Standard interconnection rules typically address the application process and the technical interconnect requirements for small DG projects of a specified type and size.

Customers seeking to interconnect DG systems to the utility grid must meet the procedural and technical requirements of the local utility company. These requirements address such important issues as grid stability and worker and public safety. With the approval of regulators, utilities establish the conditions that customers seeking to connect DG systems to the grid must meet. These conditions include safeguards, grid upgrades, operating restrictions, and application procedures that may create barriers for some DG projects, particularly smaller systems. Smaller-scale DG systems are often subject to the same, frequently lengthy, interconnection procedures as larger systems even though their system impact is likely to be significantly less. If interconnection procedures are overly expensive in proportion to the size of the project, they can overwhelm project costs to the point of making clean DG uneconomical.

It is for these and other reasons that states are increasingly developing and promoting standardized interconnection requirements and rules for DG. In addition, some states use net metering rules to govern interconnection of smaller DG systems. Net metering is a method of crediting customers for electricity that they generate on site in excess of their own electricity consumption. It allows smaller DG owners to offset power that they obtain from the grid with excess power that they can supply through their grid connection.

Standard interconnection is a critical component of promoting clean DG and has been most successful when coupled with other policies and programs. Consequently, states are promoting clean DG through a suite of related policies, including standard interconnection; addressing utility rates for standby, backup, and exit fees; creating renewable portfolio standards (RPS); and other initiatives. The Energy Policy Act of 2005 (EPAct 2005) directs states to consider their interconnection standards for DG within one year of enactment (by September 2006) and their net metering standards within two years of enactment (September 2007).

Objective

The key objective of standard interconnection rules is to encourage the connection of clean DG systems (renewable and CHP) to the electric grid in order to obtain the benefits that they can provide without compromising safety or system reliability.

Benefits

Standardized interconnection standards can support the development of clean DG by providing clear and reasonable rules for connecting clean energy systems to the electric utility grid. By developing standard interconnection requirements, states make progress toward leveling the playing field for clean DG relative to traditional central power generation. Standard interconnection rules can help reduce uncertainty and prevent excessive time delays and costs that small DG systems sometimes encounter when obtaining approval for grid connection.

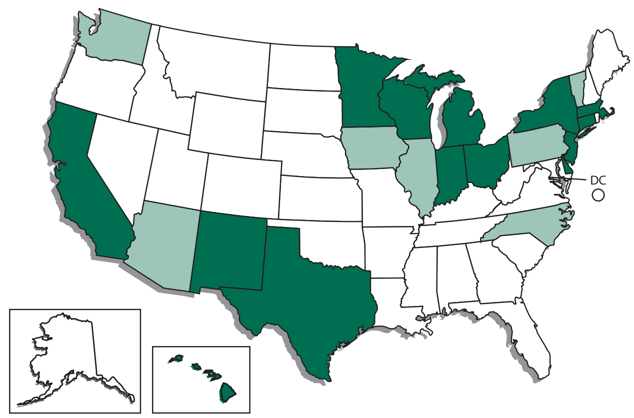
The benefits of increasing the number of clean DG projects include: enhancing economic development in the state,[24] reducing peak electrical demand, reducing electric grid constraints, reducing the environmental impact of power generation, and helping states achieve success with other clean energy initiatives. The application of DG in targeted load pockets can reduce grid congestion, potentially deferring or displacing more expensive transmission and distribution infrastructure investments. A 2005 study for the California Energy Commission (CEC) found that strategically sited DG yields improvements to grid system efficiency and provides additional reserve power, deferred costs, and other grid benefits (Evans 2005). Widespread deployment of DG can slow the growth-driven demand for more power lines and power stations.

States with Interconnection Standards

DG interconnections that do not involve power sales to third parties typically are regulated by states. The Federal Energy Regulatory Commission (FERC) regulates DG interconnections used to export power or for interstate commerce.[25] Since most DG is used to serve electric load at the customer's site, states approve the interconnection standards used for the majority of interconnections for smaller, clean DG systems.

As of November 2005, 14 states had adopted standard interconnection requirements for distributed generators (i.e., California, Connecticut, Delaware, Hawaii, Indiana, Massachusetts, Michigan, Minnesota, New Mexico, New Jersey, New York, Ohio, Texas, and Wisconsin), and seven additional states were in the process of developing similar standards (i.e., Arizona, Illinois, Iowa, North Carolina, Pennsylvania, Vermont, and Washington) (see Figure 5.4.1). While these standards often cover a range of generating technologies,

Figure 5.4.1: States with DG Interconnection Standards



Notes:

- New Jersey also has interconnection standards for net metered renewable DG ≤ 2 MW.
- New Hampshire has interconnection standards for net metered renewable DG ≤ 25 kW.

Maximum System Size for a State Interconnection Standard			
CA	None	NH	25 kW
CT	25 MW	NJ	2 MW
DE	1 MW	NM	10 kW
HI	None	OH	None
MA	None	NY	2 MW
MI	None	TX	10 MW
MN	10 MW	WI	15 MW
NC[a]	100 kW		

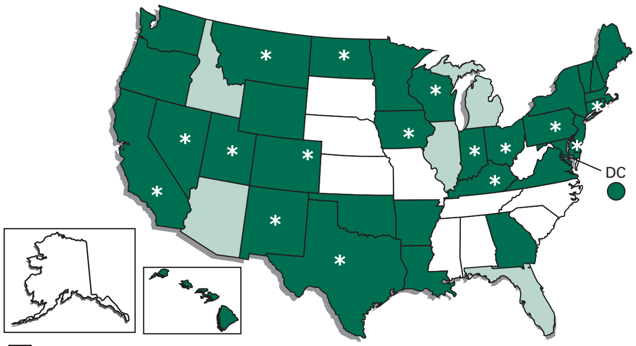
[a] System size is limited to 20 kW for residential customers.

Source: Navigant 2005.

24 Economic development occurs through the increased number of DG facilities needed to meet electricity demand in the state and inducing companies to invest more in their facilities.

25 Particularly those installations that are not interconnected to transmission systems or involved in third-party wholesale transactions.

Figure 5.4.2: States with Net Metering Rules



- State-wide net metering for all utility types
- * State-wide net metering for certain utility types (e.g., IOUs only)
- Net metering offered by one or more individual utilities

Net Metering System Size Limit (kW) (in some cases limits are different for residential and commercial as shown)			
AR	25/100	MN	40
AZ	10	MT	50
CA	1,000	ND	100
CO	Under development	NH	25
CT	100	NJ	2,000
DC	100/25	NM	10
DE	Varies	NV	30
FL	Varies	NY	10/400
GA	10/100	OH	No limit
HI	50	OK	100
IA	Varies	OR	25
ID	25/100	PA	Varies
IL	40	RI	25
IN	10	TX	50
KY	15	UT	25
LA	25/100	VA	10/500
MA	60	VT	15/150
MD	80	WA	25
ME	100	WI	20
MI	Varies	WY	25

Source: IREC 2005.

most include interconnection of renewable and CHP systems.

In addition to interconnection requirements, many states have adopted net metering provisions. Most states find that smaller DG systems are more likely to produce power primarily for their own use, with exports to the grid tending to be incidental. These DG customers are at an economic disadvantage if the interconnect requirements are excessive. Also, small systems are more likely to have de minimus effects on the physical electric grid and on equity issues among customers, so the requirements needed for large generators are unnecessary in these instances. For these reasons, a simplified process has been adopted.

Net metering provisions can be considered a subset of interconnect standards for small scale projects. As of July 2005, 39 states and Washington, D.C. had rules or provisions for net metering (see Figure 5.4.2). When DG output exceeds the site's electrical needs, the utility may pay the customer for excess power supplied to the grid or have the net surplus carry over to the next month's bill. Some states allow the surplus account to be reset periodically, meaning that customers might provide some generation to the utility for free. Net metering provisions streamline interconnection standards but often are limited to specified sizes and types of technologies.

Some state net metering provisions are limited in scope. For example, net metering rules often apply only to relatively small systems,[26] specified technologies, or fuel types of special interest to policymakers. Some rules lack detailed specifications and procedures for utilities and customers to follow and vary across utilities within the state.[27] Several states, however, have net metering provisions and interconnection rules that provide a complete range of interconnection processes and requirements.[28]

26 Thirty-four of 39 states that have net metering rules limit system sizes to 100 kW or less.

27 States that have variable net metering policies among utilities include Arizona, Florida, Idaho, and Illinois.

28 Some states (e.g., New Hampshire and New Jersey) have developed standard interconnection processes and requirements as part of their net metering provision.

Designing Effective Interconnection Standards

States consider a number of key factors when designing effective interconnection standards that balance the needs of DG owners, the utility company, and the public. These factors include promoting broad participation during standards development, addressing a range of technology types and sizes, and taking into consideration current barriers to interconnection. In addition, it is important to consider state and federal policies that might influence the development and operation of interconnection standards.

Participants

Key stakeholders who can contribute to the process of developing effective interconnection standards include:

- *Electric Utilities.* Utilities are responsible for maintaining the reliability and integrity of the grid and ensuring the safety of the public and their employees.
- *State PUCs.* PUCs have jurisdiction over investor-owned utilities (IOUs) and, in some cases, public-power utilities. They are often instrumental in setting policy to encourage onsite generation.
- *Developers of CHP and Renewable Energy Systems and Their Respective Trade Organizations.* Developers and their customers that will rely on these systems can provide valuable technical information and real-world scenarios.
- *Third-Party Technical Organizations.* Organizations such as the Institute of Electric and Electronic Engineers (IEEE) and certifying organizations like the Underwriters Laboratories (UL) have been active in establishing interconnection protocols and equipment certification standards nationwide.

Complicated Landscape of Interconnection for Distributed Generation

Renewable energy and CHP systems used by commercial or industrial facilities are typically smaller than 10 MW in capacity. When designing and implementing standards for systems of this size, it is important to realize that the size dictates how and by whom interconnection is regulated.

- *10 MW and larger systems: generally regulated by FERC.* Standards are being developed, or have already been developed, for larger systems that are often connected directly to the transmission grid and can be outside of a state's jurisdiction. Historically, most grid-connected generation systems were owned by electric utilities. As a result of restructuring and other legislation (e.g., the Public Utilities Regulatory Policy Act, PURPA), utilities were required to interconnect non-utility generators to the electric grid. States and regulatory agencies such as FERC have begun to develop or have already implemented standard interconnection rules for non-utility generators. However, most of these rules apply to larger generating facilities (> 10 MW).
- *100 kW systems and under: often covered to some degree by state net metering provisions.* Some states have developed provisions for net metering of relatively small systems (i.e., < 100 kW). While these provisions typically are not as comprehensive as interconnection standards, they can provide a solid starting point for industry, customers, and utilities with respect to connection of relatively small DG systems to the electric grid.
- *0.1–10 MW systems: require attention.* This "intermediate" group represents systems that are interconnected to the distribution system but are larger than the systems typically covered by net metering rules and smaller than the large generating assets that interconnect directly to the transmission system and are regulated by FERC. In response to the mounting demands by customers and DG/CHP developers to interconnect generation systems to the grid, utilities increasingly have established some form of interconnection process and requirements. In addition, to increase utility confidence around DG systems, industry organizations such as the IEEE and UL have begun to develop standards that enable the safe and reliable interconnection of generators to the grid. However, there is a need for states to establish standard interconnection rules for generation systems of all sizes.

- *Regional Transmission Organizations (RTOs).* These organizations may have already implemented interconnection standards using FERC requirements for large non-utility generators generally above 10 MW.
- *Other Government Agencies.* Federal agencies (e.g., FERC) and state environmental and public policy agencies can play an important role in establishing and developing interconnection standards.

Some states are bringing key stakeholders together to develop state-based standards via a collaborative process. For example, in Massachusetts, the Distributed Generation Collaborative (DG Collaborative) successfully brought together many diverse stakeholders to develop the interconnection rules now used by DG developers and customers in Massachusetts.

Typical Specifications

Interconnection standards typically specify:

- The type of technology that may be interconnected (e.g., inverter-based systems, induction generators, synchronous generators).
- The required attributes of the electric grid where the system will be interconnected (i.e., radial or network distribution, distribution or transmission level, maximum aggregate DG capacity on a circuit).
- The maximum system size that will be considered in the standard interconnection process.

Standard interconnection rules typically address the application process and the technical interconnection requirements for DG projects:

- The application process includes some or all parts of the interconnection process from the time a potential customer considers submitting an application to the time the interconnection agreement is finalized. For example, rules may specify application forms, timelines, fees, dispute resolution processes, insurance requirements, and interconnection agreements.
- Technical protocols and standards specify how a generator must interconnect with the electric grid. For example, requirements may specify that DG must conform to industry or national standards and include protection systems designed to minimize degradation of grid reliability and performance and maintain worker and public safety.

In addition, some states are developing different application processes and technical requirements for differently sized or certified systems. Since the size of a DG system can range from a renewable system of only a few kW to a CHP system of tens of MW, standards can be designed to accommodate this full range. Several states have developed a multi-tiered process for systems that range in size from less than 10 kW to more than 2 MW. Three states (Connecticut, Michigan, and Minnesota) have classified DG systems into five categories based on generator size. Other states use fewer categories, but also define fees, insurance requirements, and processing times based on the category into which the DG falls. The level of technical review and interconnection requirements usually increases with generation capacity.

In states with a multi-tiered or screen interconnection process, smaller systems that meet IEEE and UL standards or certification generally pass through the interconnection process faster, pay less in fees, and require less protection equipment because there are fewer technical concerns. States that require faster processing of applications for smaller systems ($\leq$ 10 to $\leq$ 30 kW) include California, Connecticut, Massachusetts, Michigan, Minnesota, New York, and Wisconsin. For relatively large DG systems, processes and requirements may be similar or identical to those used for large central power generators. For mid-size systems, states have found they may need to develop several levels of procedural and technical protocols to meet the range of needs for onsite generators, utilities, and regulators.

Constraints

Designing new DG interconnection rules provides an opportunity to resolve recurring barriers encountered by applicants for interconnection of DG systems. These barriers have been well-documented (NREL 2000, Schwartz 2005); three areas in which a DG developer typically confronts problems include:

- *Technical Barriers* resulting from utility requirements (including requirements for safety measures) regarding the compatibility of DG systems with the grid and its operation. For example, customers may be faced with costly electric grid upgrades as a condition of interconnection. Another frequently cited technical requirement that is particularly costly for smaller DG is the visible shut-off switch located outside the premises that can be accessed by the utility to ensure that no power is flowing from the DG unit. These shut-off switches range from $1,000 to $6,000 for small systems (e.g., 30 kW to 200 kW), depending on their location and whether they are installed as part of the original facility design or after the system began operations.
- *Utility Business Practices*, including issues that result from contractual and procedural interconnection requirements between the utility and the project developer/owner. For example, customers may face a long application review period or lengthy technical study requirements, with high associated costs.
- *Regulatory Constraints* arising primarily from tariff and rate conditions, including the prohibition of interconnection of generators that operate in parallel with the electric grid.[29] In some instances, environmental permitting or emission limits also can create barriers. For more information on the barriers posed to DG systems by tariff and rate issues, see Section 6.3, *Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation*.

Some states are beginning to address these areas of concern through a combination of policy actions and regulatory changes to remove or alter requirements that they believe are not appropriate for the scale of small DG units.

Interaction with Federal Policies

States have found that several federal initiatives can be utilized when designing their own interconnection standards:

- In May 2005, FERC adopted interconnection standards for small DG systems of up to 20 MW. The rulemaking addresses both the application processes and technical requirements. Concurrently, through a separate rulemaking, FERC has addressed an application process and technical requirements for systems under 2 MW. States can use the new FERC standard interconnection rules as a starting point or template for preparing their own standards.[30]
- Under the Public Utilities Regulatory Policy Act (PURPA), utilities are required to allow interconnection by Qualifying Facilities (QFs).[31] Utilities may have standard procedures for such interconnection and some states may regulate such interconnection. New interconnect rules for DG may be more or less favorable than the existing regulations for QFs and also may not be consistent with existing rules for QFs. For example, in Massachusetts the application timelines and fees in the QF regulations are different than the DG interconnection tariff, which could create confusion and delay in establishing an interconnection.
- EPAct 2005 requires electric utilities to interconnect customers with DG upon request. The Act

29 When a CHP system is interconnected to the grid and operates in parallel with the grid the utility only has to provide power above and beyond what the onsite CHP system can supply.

30 FERC's interconnection rules, however, apply only to the third party and wholesale power transactions they regulate. Most DG systems fall under state, rather than FERC, jurisdiction, since most are connected at the distribution-system level and do not involve third-party exports via the utility grid.

31 A QF is a generation facility that produces electricity and thermal energy and meets certain ownership, operating, and efficiency criteria established by FERC under PURPA.

specifies that the interconnection must conform to IEEE Standard 1547, as it may be amended from time to time. In addition, the state regulatory authority must begin to consider these standards within one year of enactment (September 2006) and must complete its consideration within two years (September 2007). However, states that have previously enacted interconnection standards, have conducted a proceeding to consider the standards, or in which the state legislature has voted on the implementation of such standards do not have to meet these time frames.

- EPAct 2005 requires electric utilities to make available upon request net metering services to any electric customer. The state regulatory authority is required to consider net metering within two years of enactment (September 2007) and after three years of enactment must adopt net metering provisions (September 2008). However, states that have previously enacted net metering provisions, have conducted a proceeding to consider the standards, or in which the state legislature has voted on the implementation of such standards do not have to meet these time frames.

Interaction with State Policies

Interconnection standards are a critical complementary policy to other clean energy policies and programs such as state RPS (see Section 5.1, *Renewable Portfolio Standards*), clean energy fund investments (see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*), and utility planning practices (see Section 6.1, *Portfolio Management Strategies*).

Best Practices: Designing an Interconnection Standard

Best practices for creating an interconnection standard are identified below. These best practices are based on the experiences of states that have designed interconnection standards.

- Work collaboratively with interested parties to develop interconnection rules that are clear, concise, and applicable to all potential DG technologies. This will streamline the process and avoid untimely and costly re-working.
- Develop standards that cover the scope of the desired DG technologies, generator types, sizes, and distribution system types.
- Address all components of the interconnection process, including issues related to both the application process and technical requirements.
- Develop an application process that is streamlined with reasonable requirements and fees. Consider making the process and related fees commensurate with generator size. For example, develop a straightforward process for smaller or inverter-based systems and more detailed procedures for larger systems or those utilizing rotating devices (such as synchronous or induction motors) to fully assess their potential impact on the electrical system.
- Create a streamlined process for generators that are certified compliant to certain IEEE and UL standards. UL Standard 1741, "Inverters, Converters and Charge Controllers for Use in Independent Power Systems," provides design standards for inverter-based systems under 10 kW. IEEE Standard 1547, "IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems," establishes design specifications and provides technical and test specifications for systems rated up to 10 MW. These standards can be used to certify electrical protection capability.
- Consider adopting portions of national models (such as those developed by the National Association of Regulatory Utility Commissioners [NARUC], the Interstate Renewable Energy Council [IREC], and FERC) and successful programs in other states, or consider using these models as a template in developing a state-based standard. Also, consistency within a region increases the effectiveness of these standards.
- Try to maximize consistency between the RTO and the state standards for large generators.
- Developing consistency among states is important in reducing compliance costs for the industry based on common practices.

Implementation and Evaluation

This section describes the implementation and evaluation of new interconnection standards, including best practices that states have found successful.

Administering Body

While individual states may develop interconnection standards that are then approved by the PUC, utilities are ultimately responsible for their implementation.

Roles and Responsibilities of Implementing Organization

By establishing clearly defined categories of technologies and generation systems, utilities are able to streamline the process for customers and lessen the administrative time related to reviewing interconnection applications. For example, some states create multiple categories and tiers for reviewing applications with established maximum time frames. Across these technology categories, the maximum processing time allowed can vary by more than a factor of five depending on the technical complexity and size of the interconnection. Several states (including California, Connecticut, Massachusetts, Michigan, Minnesota, New York, and Wisconsin) have created tiered application processes based on system size and other factors. They have found that this tiered approach allows smaller systems a streamlined process while maintaining a standard process for larger systems.

- A *streamlined process* that applies to smaller[32] or simpler systems (e.g., inverter-based) could have lower fees, shorter timelines, and fewer requirements for system impact studies. In some cases, states have pre-certified certain devices (i.e., California and New York) or require compliance with UL 1741 or IEEE 1547 and other applicable standards (i.e., Connecticut, Massachusetts, Minnesota, New Jersey, and Texas) to expedite approval.
- Systems in a *standard process* are subject to a comprehensive evaluation. Applicants for these systems are typically required to pay additional fees for impact studies to determine how the DG may affect the performance and reliability of the electrical grid. Because of the higher degree of technical complexity, fees are higher and processing times are longer.

State Examples

There is no single way that states are approaching the interconnection of DG. In fact, there is tremendous diversity among the key elements of interconnection standards recently established at the state level. In the examples presented below, each state has different interconnection *application processes*, including fees, timelines, and eligibility criteria. Greater similarities are emerging among states' *technical requirements*, and this consistency is making it increasingly easier to increase the amount of clean DG in the states.

Massachusetts

In June 2002, the Massachusetts Department of Telecommunications and Energy (DTE) initiated a rulemaking to develop interconnection standards for DG. The policymakers within the DTE established a DG Collaborative to engage stakeholders (including utilities, DG developers, customers, and public interest organizations) to jointly develop a model interconnection tariff.

By adopting this model interconnection tariff, Massachusetts established a clear, transparent, and standard process for DG interconnection applications. The process uses pre-specified criteria to screen applications and establish application fees and timelines for DG systems of all types and sizes. The model interconnection tariff clearly specifies each step within the interconnection process and the maximum permissible time frames for each step. In addition, the model interconnection tariff provides for a

32 States that require faster processing of applications for smaller systems (≤ 10 kW to ≤ 30 kW) include California, Connecticut, Massachusetts, Michigan, Minnesota, New York, and Wisconsin.

Best Practices: Implementing an Interconnection Standard

The best practices identified below will help guide states in implementing an interconnection standard. These best practices are based on the experiences of states that have implemented interconnection standards.

- Consider working as a collaborative to establish monitoring activities to evaluate the effectiveness of interconnection standards and application processes.
- Periodically review and update standards based on monitoring activities, including feedback from utilities and applicants.
- Keep abreast of changes in DG/CHP and electric utility technology and design enhancements, since these may affect existing standards, including streamlining the application process and interconnection requirements.
- Consider working with groups such as IEEE to monitor industry activities and to stay up-to-date on standards developed and enacted by these organizations.

"simplified process" that allows most inverter-based systems that are 10 kW or less and are UL 1741 certified to be processed in less than 15 days without an application fee. Under the "standard process," used for larger DG systems that may have significant utility system impact, the process can take as long as 150 days and involve a $2,500 application fee in addition to other technical study and interconnection costs. The DG Collaborative also agreed to a five-step dispute resolution process in the event the interconnecting applicant is unable to reach agreement with the utility regarding the utility's decisions on the interconnection application.

After the adoption of the model interconnection tariff, the DG Collaborative reconvened to evaluate the reasonableness of the interconnection process by reviewing how the standard was functioning. The DG Collaborative examines application fees and time frames through a database structured to track interconnection applications. Although many applicants have successfully used the existing standard, the DG Collaborative has determined that it should review the application process and screening criteria in the model interconnection tariffs to further improve the process. This level of review is unique among states that have developed interconnection standards.

Web sites:
http://www.mass.gov/dte/restruct/competition/distributed_generation.htm (DTE DG interconnection proceedings)

http://www.masstech.org/policy/dgcollab/

New Jersey

The New Jersey Board of Public Utilities (NJBPU) has developed net metering and interconnection standards for Class I renewable energy systems. These rules became effective on October 4, 2004, and are separated into three levels. Each level has specific interconnection review procedures and timelines for each step in the review process.

- *Level 1* applies to inverter-based customer-generator facilities, which have a power rating of 10 kW or less and are certified as complying with IEEE 1547 and UL 1741.
- *Level 2* applies to customer-generator facilities with a power rating of 2 MW or less and certified as complying with IEEE 1547 and UL 1741.
- *Level 3* applies to customer-generator facilities with a power rating of 2 MW or less that do not qualify for Level 1 or Level 2 review.

Web site:
http://www.bpu.state.nj.us/cleanEnergy/cleanEnergyProg.shtml

New York

New York was one of the first states to issue standard interconnection requirements for DG systems. Enacted in December 1999, the initial requirements were limited to DG systems rated up to 300 kW connected to radial distribution systems.[33] New York recently modified these interconnection requirements to include

33 A radial distribution system is the most common electric power system. In this electric power system, power flows in one direction from the utility source to the customer load.

interconnection to radial and secondary network distribution systems for DG with capacities up to 2 MW.

New York's Standard Interconnection Requirements (SIR) include a detailed 11-step process from the "Initial Communication from the Potential Applicant" to the "Final Acceptance and Utility Cost Reconciliation." Similar to other states with interconnection standards, the New York SIR includes separate requirements for synchronous generators, induction generators, and inverters. Notably, there is no application fee for DG systems rated up to 15 kW. For DG systems larger than 15 kW, the application fee is $350.

Web site:
http://www.dps.state.ny.us/distgen.htm

Texas

In November 1999, the Texas PUC adopted substantive rules that apply to interconnecting generation facilities of 10 MW or less to distribution-level voltages at the point of common coupling. This ruling applies to both radial and secondary network systems.

The rules require that Texas utilities evaluate applications based on pre-specified screening criteria, including equipment size and the relative size of the DG system to feeder load. These rules are intended to streamline the interconnection process for applicants, particularly those with smaller devices and for those that are likely to have minimal impact on the electric utility grid. For example, under certain conditions, if the DG interconnection application passes pre-specified screens, the utility does not charge the applicant a fee for a technical study. If the DG system is pre-certified,[34] the utility has up to four weeks to return an approved interconnection agreement to the applicant. Otherwise, the utility has up to six weeks.

Web site:
http://www.puc.state.tx.us/electric/business/dg/dgmanual.pdf

What States Can Do

States have adopted successful interconnect standards that expedite the implementation of clean energy technologies while accounting for the reliability and safety needs of the utility companies. Action steps for both initiating a program to establish interconnect rules and for ensuring the ongoing success of the rules after adoption are described below.

Action Steps for States

States That Have Existing Interconnection Standards

A priority after establishing standard interconnection rules is to identify and mitigate issues that might adversely impact the success of the rules. Being able to demonstrate the desired benefits is critical to their acceptance and use by key stakeholders. Strategies to demonstrate these benefits include:

- Monitor interconnection applications to determine if the standards ease the process for applicants and cover all types of interconnected systems. States can also monitor utility compliance with the new standards or create a complaint/dispute resolution point of contact.
- If resources permit, identify an appropriate organization to maintain a database on interconnection applications and new DG systems, evaluate the data, and convene key interconnection stakeholders when necessary.
- Modify and change interconnection rules as necessary to respond to the results of monitoring and evaluation activities.

34 A pre-certified system is a known collection of components that has been tested and certified by a qualified third party (e.g., nationally recognized testing laboratory) to meet certain industry or state standards.

States That Do Not Have Existing Interconnection Standards

Political and public support is a prerequisite to establishing standard interconnection rules.

- Ascertain the level of demand and support for standard interconnection rules in the state by both public office holders and key industry members (e.g., utilities, equipment manufacturers, project developers, and potential system owners). If awareness is low, consider implementing an educational effort targeted at key stakeholders to raise awareness of the environmental and, especially, economic benefits resulting from uniform interconnection rules. For example, demonstrate that DG can result in enhanced reliability and reduced grid congestion. A 2005 study for the CEC found that strategically sited DG yields improvements to grid system efficiency, provides additional reserve power, deferred costs, and other grid benefits (Evans 2005). If resources are available, perform an analysis of these benefits and implement a pilot project (e.g., similar to Bonneville Power Authority's [BPA's] "non-wires" pilot program [BPA 2005] or the Massachusetts Technology Collaborative's [MTC's] Utility Congestion Relief Pilot Projects [RET 2005]) that promotes DG along with energy efficiency and voluntary transmission reduction. While this type of analysis is not essential, states have found it to be helpful.
- Establish a collaborative working group of key stakeholders to develop recommendations for a standard interconnection process and technical requirements. Open a docket at the PUC with the goal of receiving stakeholder comments and developing a draft regulation for consideration by the state PUC.
- If necessary, work with members of the legislature and the PUC to develop support for passage of the interconnection rules.
- Remember that implementing interconnection standards may take some years. States have found that success is driven by the inherent value of DG, which eventually becomes evident to stakeholders.
- Consider existing federal and state standards in the development process of new interconnection procedures and rely on accepted IEEE and UL standards to develop technical requirements for interconnection.

Related Actions

- For interconnection standards to be effective, tariffs and regulations that encourage DG need to be in place. If current tariffs and regulations discourage DG, then interconnection standards may not result in DG growth. Tariffs that encourage DG growth may allow customers to sell excess electricity back to the utility at or near retail rates. Key regulations that might discourage successful implementation of DG include high standby charges or back-up rates. Utility financial incentives that promote sales growth can discourage customers from making their own electricity and also discourage DG deployment. For more information on utility financial incentives, see Section 6.2, *Utility Incentives for Demand-Side Resources*.
- Communicate the positive results to state officials, public office holders, and the public.
- Include key stakeholders (e.g., utilities, equipment manufacturers, project developers, potential customers, advocacy groups, and regulators) in the development of the standard interconnection rules. Stakeholders can also contribute to rule modification based on the results of ongoing monitoring and evaluation.

Information Resources

State-by-State Assessment

Title/Description	URL Address
Database of State Incentives for Renewable Energy (DSIRE) is a resource for information on state interconnection policies. The Web site also provides comparative information on policies for each state.	http://www.dsireusa.org
Distribution and Interconnection Research and Development Program. This U.S. Department of Energy (DOE) program provides information and links to interconnection information in each state.	http://www.eere.energy.gov/distributedpower/interconnection_state.html

Federal Resources

Title/Description	URL Address
DOE's National Renewable Energy Laboratory (NREL) actively participates in many of the programs that create national standards for interconnection.	http://www.nrel.gov/programs/deer.html http://www.nrel.gov/eis/ http://www.nrel.gov/eis/standards_codes.html
The U.S. Environmental Protection Agency's (EPA's) CHP Partnership is a voluntary program that seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities for policy development (energy, environmental, economic) to encourage energy efficiency through CHP and can provide additional assistance to help states implement standard interconnection.	http://www.epa.gov/chp/

National Standards Organizations

Title/Description	URL Address
IEEE has developed standards relevant to many of the technical aspects of the interconnection. In particular, Standard 1547, *Interconnecting Distributed Resources with Electric Power Systems*, provides requirements relevant to the performance, operation, testing, safety considerations, and maintenance of the interconnection.	http://grouper.ieee.org/groups/scc21/1547/1547_index.html
UL also develops standards for interconnecting DG. In particular, UL 1741 will combine product safety requirements with the utility interconnection requirements developed in the IEEE 1547 standard to provide a testing standard to evaluate and certify DG products.	http://www.ul.com/dge/ http://www.eere.energy.gov/distributedpower/research/ul_1741.html

Examples of Standard Interconnection Rules

Title/Description	URL Address
IREC has prepared a model interconnection rule and a guide to connecting DG to the grid:	
Model Distributed Generation Interconnection Procedures and Net Metering Provisions	http://www.irecusa.org/connect/model_interconnection_rule.pdf
Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues	http://www.irecusa.org/pdf/guide.pdf
Model Interconnection Tariff. Massachusetts adopted this model interconnection tariff to establish a clear, transparent, and standard process for DG interconnection applications.	http://www.mass.gov/dte/electric/02-38/515tariffr.pdf
Mid-Atlantic Distributed Resources Initiative (MADRI). In a collaborative process, MADRI has developed a sample interconnection standard.	http://www.energetics.com/MADRI/
NARUC has developed Model Interconnection Procedures and Agreement for Small Distributed Generation Resources.	http://www.naruc.org/associations/1773/files/dgiaip_oct03.pdf

Other Resources

Title/Description	URL Address
Distributed Generation in Oregon: Overview, Regulatory Barriers and Recommendations. L. Schwartz, PUC Staff, February 2005. This report by the Oregon PUC addresses barriers for DG.	http://www.puc.state.or.us/elecnat/dg_report.pdf
Making Connections: Case Studies of Interconnection Barriers and their Impact on Distributed Power Projects. This NREL report studies the barriers projects have faced interconnecting to the grid.	http://www.nrel.gov/docs/fy00osti/28053.pdf
Optimal Portfolio Methodology for Assessing Distributed Energy Resources Benefits for the Energynet. CEC, PIER Energy-Related Environmental Research. CEC-500-2005-061-D. This project addresses whether distributed generation (DG), demand response (DR), and localized reactive power (VAR) sources, or distributed energy resources (DER), can be shown to enhance the performance of an electric power transmission and distribution system.	http://www.energy.ca.gov/2005publications/CEC-500-2005-061/CEC-500-2005-061-D.PDF
The Regulatory Assistance Project (RAP) prepared a **Distributed Resource Policy Series** to support state policy efforts, and facilitated the creation of a **Model Distributed Generation Emissions Rule** for use in air permitting of DG.	http://www.raponline.org/Feature.asp?select=13&Submit1=Submit http://www.raponline.org/Feature.asp?select=8&Submit1=Submit
The U.S. Combined Heat and Power Association (USCHPA) brings together diverse market interests to promote the growth of clean, efficient CHP in the United States. As a result, they have been stakeholders in states that have developed standard interconnection rules.	http://uschpa.admgt.com/statechp.html

State Resources

State	Title/Description	URL Address
California	California Public Utilities Commission (CPUC), Distributed Energy Resource Guide: Interconnection.	http://www.energy.ca.gov/distgen/interconnection/california_requirements.html
	CPUC Decision 00-12-037—Decision Adopting Interconnection Standards (Issued December 21, 2000).	http://www.cpuc.ca.gov/word_pdf/FINAL_DECISION//4117.pdf
Connecticut	Connecticut Department of Public Utility Control (DPUC) (DOCKET NO. 03-01-15).	http://www.dpuc.state.ct.us/DOCKHIST.htm
	Connecticut DPUC Decision—Investigation into the Need for Interconnection Standards for Distributed Generation (Issued April 21, 2004).	http://www.dpuc.state.ct.us/FINALDEC.NSF/2b40c6ef76b67c438525644800692943/d7a46f117bea965485256e7d0064e9a1/$FILE/030115-042104.doc
Delaware	Customer-Owned Generation Web site supported by the Delaware Division of the Public Advocate.	http://www2.state.de.us/publicadvocate/dpa/html/self_gen.asp
Hawaii	Customer Generation Interconnection Standards (Rule 14) maintained by the Department of Business, Economic Development, and Tourism.	http://www.hawaii.gov/dbedt/ert/interconnection/interconnection.html
	Docket No. 02-0051—Decision No. #19773 issued November 15, 2002, and Decision No. 20056 issued March 3, 2003.	http://www.hawaii.gov/dcca/areas/dca/dno/
Massachusetts	Massachusetts DTE Distributed Generation Web page.	http://www.mass.gov/dte/restruct/competition/distributed_generation.htm
	Massachusetts DTE 02-38-B—Investigation by the DTE on its own motion into Distributed Generation (Issued February 24, 2004).	http://www.mass.gov/dte/electric/02-38/224order.pdf
Michigan	Michigan Public Service Commission (PSC) Case No. U-13745.	http://www.cis.state.mi.us/mpsc/orders/electric/
	Michigan PSC Decision in Case No. U-13745, In the matter, on the Commission's own motion, to promulgate rules governing the interconnection of independent power projects with electric utilities. Issued July 8, 2003.	http://www.cis.state.mi.us/mpsc/orders/electric/2003/u-13745.pdf
Minnesota	Case File Control Sheet for Minnesota PUC Docket No. E-999/CI-01-1023.	http://www.puc.state.mn.us/docs/log_files/01-1023.htm
	Minnesota PUC, In the Matter of Establishing Generic Standards for Utility Tariffs for Interconnection and Operation of Distributed Generation Facilities under Minnesota Laws 2001, Chapter 212. Issued September 28, 2004.	http://www.puc.state.mn.us/docs/orders/04-0131.pdf
New Hampshire	New Hampshire Code of Administrative Rules, Chapter PUC 900, Net Metering for Customer-Owned Renewable Energy Generation Resources of 25 Kilowatt or Less. Effective January 12, 2001.	http://www.puc.state.nh.us/Regulatory/Rules/PUC900.pdf

State	Title/Description	URL Address
New Jersey	N.J.A.C 14:4-9, Net Metering and Interconnection Standards for Class I Renewable Energy Systems. Effective October 4, 2004.	http://www.state.nj.us/bpu/wwwroot/secretary/NetMeteringInterconnectionRules.pdf
New York	New York PSC DG Information.	http://www.dps.state.ny.us/distgen.htm
	New York PSC Case 02-E1282, Order Modifying Standardized Interconnection Requirements. Effective November 17, 2004.	http://www3.dps.state.ny.us/pscweb/webfileroom.nsf/0/C70957A0FD0B89FD85256F4E007449ED/$File/02e1282.ord.pdf?OpenElement
Ohio	The Public Utilities Commission of Ohio's Web page, Electric Distributed Generation Equipment: How to Connect to the Utility Company's System.	http://www.puco.ohio.gov/PUCO/Consumer/information.cfm?doc_id=115
	Ohio Administrative Code 4901:1-22 Interconnection Services.	http://onlinedocs.andersonpublishing.com/oh/lpExt.dll?f=templates&fn=main-h.htm&cp=OAC
Texas	Public Utility Commission of Texas Interconnection of Distributed Generation Project #21220.	http://www.puc.state.tx.us/rules/rulemake/21220/21220.cfm
	Public Utility Commission of Texas, Distributed Generation Interconnection Manual.	http://www.puc.state.tx.us/electric/business/dg/dgmanual.pdf
	Substantive Rules § 25.211 and § 25.212. Effective December 21, 1999.	http://www.puc.state.tx.us/rules/subrules/electric/index.cfm
Wisconsin	Wisconsin Administrative Code Chapter PSC 119, Rules for Interconnecting Distributed Generation Facilities. Effective February 1, 2004.	http://www.legis.state.wi.us/rsb/code/psc/psc119.pdf

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5.5 Fostering Green Power Markets

Policy Description and Objective

Summary

Green power is a relatively small but growing market that provides electricity customers the opportunity to make environmental choices about their electricity consumption. Programs in more than 40 states currently serve approximately 540,000 customers, representing nearly 4 billion kilowatt-hours (kWh) annually. Green power is offered in both vertically integrated and competitive retail markets. Green power programs have existed for approximately 10 years and have contributed to the development of over 2,200 megawatts (MW) of new renewable capacity over that time. A recent study estimates that this could reach 8,000 MW by 2015 (Wiser et al. 2001).

Because participation in green power programs is voluntary, the role for states may be more limited than with other clean energy policy options, but it is still important. States can play a key role in helping to accelerate green power market development and increase overall participation levels. States can also ensure that green power markets complement other policies already in place, such as system benefits charge (SBC) funds and renewable portfolio standards (RPS). Overall, state support of green power markets can require less effort on the part of states than for other policies (e.g., RPS) and they can provide significant benefits when properly designed.

The approach taken depends on whether or not a state has vertically integrated or competitive retail electricity markets. For example, in vertically integrated markets, several states now require utilities to offer a green pricing tariff. Although signing up for green power service remains voluntary, this policy ensures that all customers have the option available to them.

In restructured markets, green power products are available from a range of competitive suppliers.

Voluntary green power markets promote the development of renewable energy resources and the renewable energy industry by giving customers the opportunity to purchase clean energy. States can play a key role in fostering the development of green power markets that deliver low-cost, environmentally beneficial renewable energy resources.

Customers may also increasingly be able to choose renewable energy as their default service by so-called "green check-off" programs.

In both vertically integrated and competitive markets, creating an environment favorable to green power can require the development of several policies and programs. For states interested in taking a more active role, this section outlines the suite of policies and programs to be considered.

Objective

The main objective of supporting development of green power markets is to increase the generation and use of renewable energy by giving customers the choice to support cleaner electricity generation options. Green power programs allow customers to support renewable energy development above and beyond the levels determined through the utility resource planning process or through state policies, such as RPS. Most green power products are designed to promote the development of new renewable energy capacity rather than providing support for existing capacity. Some of the underlying objectives of developing a green power market are to:

- Decrease the environmental impact of electricity generation.
- Help reduce the cost of renewable energy generation over time.
- Provide customers with choice, even in vertically integrated markets.
- Increase competition in restructured markets by increasing the number and type of green power options available to electric customers.

- Support development of local resources and associated economic development opportunities.
- Decrease energy price volatility, increase fuel diversity, and provide a hedge against future electricity price volatility.
- Reduce demand for fossil fuels, easing supply concerns.

State support for green power markets is also a complement to other renewable energy policies and programs such as RPS (see Section 5.1, *Renewable Portfolio Standards*). In this way, green power markets provide additional resources beyond the base provided by RPS and other policies.

Benefits

Green power markets support the development of renewable energy without imposing any additional costs on ratepayers (as a class). Generally, only those customers who choose to participate in the programs pay the premiums needed to cover the above-market costs of renewable energy. However, the economic and environmental benefits of green power accrue to all ratepayers.

Properly designed green power programs can be structured to facilitate the execution of long-term contracts for renewable energy, which is critical for project developers seeking to obtain financing for their projects.

To date, green power markets in the United States:

- Have resulted in the construction of more than 2,200 MW of new renewable capacity (see Figure 5.5.1).
- Are supporting the development of an additional 455 MW of renewable capacity in the near term.
- Have permitted more than 540,000 customers to choose green power.

Figure 5.5.1: Renewable Energy Capacity Added to Meet Voluntary Green Power Demand Through 2004

New[a] Renewable Capacity Supplying Green Power Markets				
Renewable Energy Resource	In Place		Planned[b]	
	MW	%	MW	%
Wind	2,045.6	91.6	364.5	80.1
Biomass	135.6	6.1	58.8	12.9
Solar	8.1	0.4	0.4	0.1
Geothermal	35.5	1.6	0.0	0.0
Small Hydro	8.5	0.4	31.3	6.9
Total	2,233.3	100.0	455.0	100.0

[a] New capacity refers to projects built specifically to serve green power customers or recently constructed to meet Green-e standards and used to supply green power customers. Includes utility green pricing and competitive green power products. Capacity installed to meet state RPS requirements is not included.

[b] Planned refers to projects that are under construction or formally announced.

Source: Bird and Swezey 2005.

- Have avoided the release of approximately 2.7 million tons of carbon dioxide (CO_2) in 2003 alone.[35]

Status of Green Power

There are two basic types of green power products: *bundled renewable energy* and *renewable energy certificates* (REC) (see box on page 5-61). Depending on whether a state has vertically integrated or restructured markets, bundled renewable energy is either available from utility green pricing programs or from competitive green power marketers, respectively. REC products are available to anyone in the United States.

As of 2003, utility green pricing programs were available in 34 states at over 500 utilities[36] and competitive green power products were available in restructured markets in nine states and Washington, D.C. through more than 30 green power marketers

[35] Based on an average CO_2 emission rate of 1,368 pounds per kilowatt-hour (lb/kWh) and 3.9 billion kWh of green power sales (emission rate was estimated from the Electric Power Annual 2003; DOE EIA 2004).

[36] Many are municipal utilities or cooperatives.

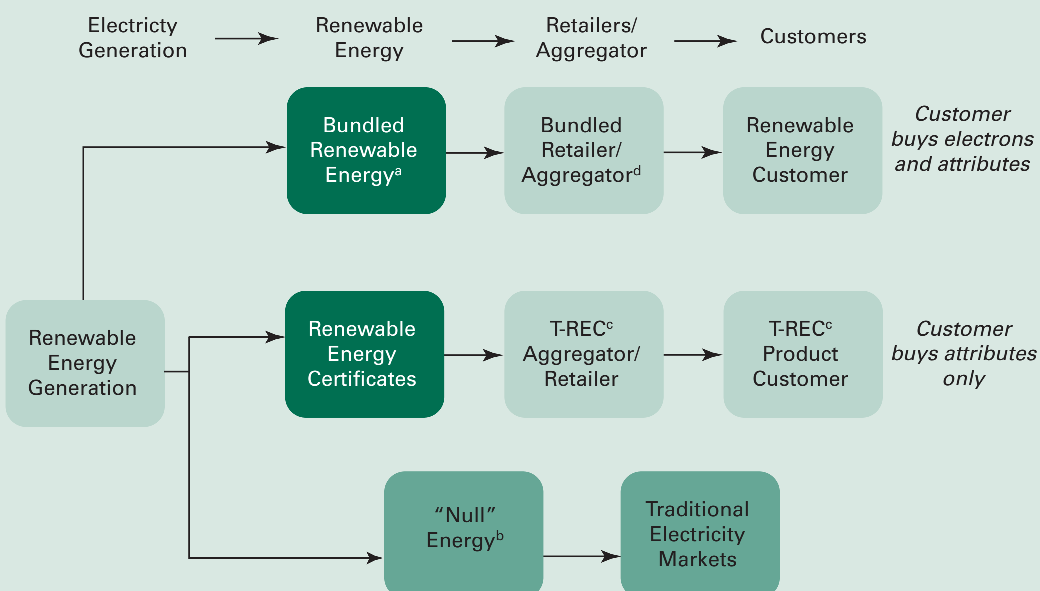
Types of Green Power Products

To fully understand the different types of green power products available to consumers, one must first understand the concept of *renewable energy certificates (RECs)*, also referred to as *green tags*, *green certificates*, *renewable energy credits*, and *tradable renewable certificates (T-RECS)*. RECs are used to value the attributes of renewable energy (i.e., the desirable properties of the renewable energy, such as low or zero emissions, and the fact that they are generated locally). The emergence of RECs as the "currency" for these attributes allows them to be separated from the power produced. Thus, a renewable energy generator now has two products to sell—electricity and RECs. From an economic perspective, the value of a REC can be used to cover the above-market cost of generating power from renewable energy. The value of a REC can also be used to differentiate different types of renewable energy (e.g., some customers may be willing to pay more for RECs generated from solar energy than from landfill gas). RECs are used for demonstrating compliance with renewable energy mandates (like RPS) or can be sold into voluntary markets, like green power.

There are two types of green power products (see figure below): bundled renewable energy and RECs. When a consumer purchases *bundled renewable energy*, he or she is purchasing both energy and attributes together. Thus, the value of the REC is included in the price of the green power. Alternatively, a consumer can purchase the attributes only (i.e., RECs only), while making no changes to his or her electricity purchases. The electricity associated with those RECs, now stripped of its attributes, is sold by the project owner into the market as ordinary electricity ("null energy").

Bundled renewable energy is sold in one of two ways. The term *utility green pricing* generally refers to an optional service or tariff offered by utilities to their own customers in vertically integrated electricity markets. *Green power marketing* refers to the selling of green power by competitive suppliers in competitive retail (restructured) markets.

Some REC-based electricity products are available to consumers located anywhere in the country. These RECs or T-RECs can be bought and sold at the wholesale level like other commodities, and also sold at the retail level to individual consumers. In addition to T-REC marketers and retailers, there are a number of brokers that serve this emerging REC market. The fact that there are T-REC marketers, retailers, and brokers demonstrates the importance of the concept of renewable energy attributes in helping realize the value of renewables in the marketplace.



[a] Energy + attributes.
[b] Energy without attributes.
[c] Tradeable Renewable Energy Certificate, also called a tradable renewable certificate.
[d] Includes regulated utilities.

Source: Katofsky 2005.

(Bird and Swezey 2004)[37] (see Figures 5.5.2 and 5.5.3). Combined, in 2003 these programs had annual sales of approximately 3.2 billion kWh.

In addition, 22 companies offered REC products in 2003. Sales in these programs represented an additional 700 million kWh in 2003.

While utility consumer participation rates are below 10%, green power markets continue to show significant annual growth.

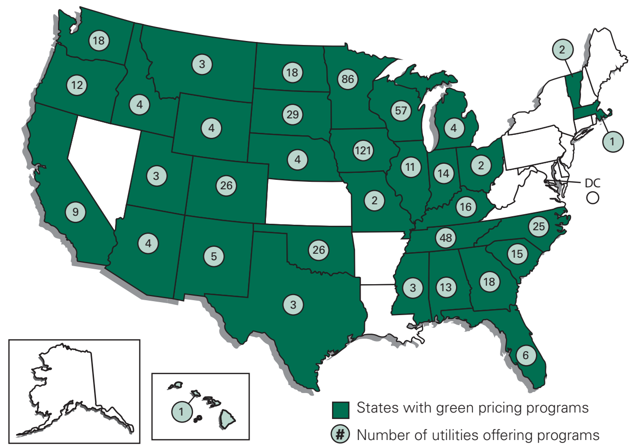
Creating a Favorable State Framework for Green Power Markets

States have found that green power markets are more effective when a number of complementary programs and policies are put in place. States have also learned that it is not sufficient to simply require that utilities provide a green pricing tariff or to open retail markets to competition in the hopes that this will attract green power marketers. This section outlines the suite of programs and options that states can use to create a favorable environment in which green power markets can grow.

Establishing the Program

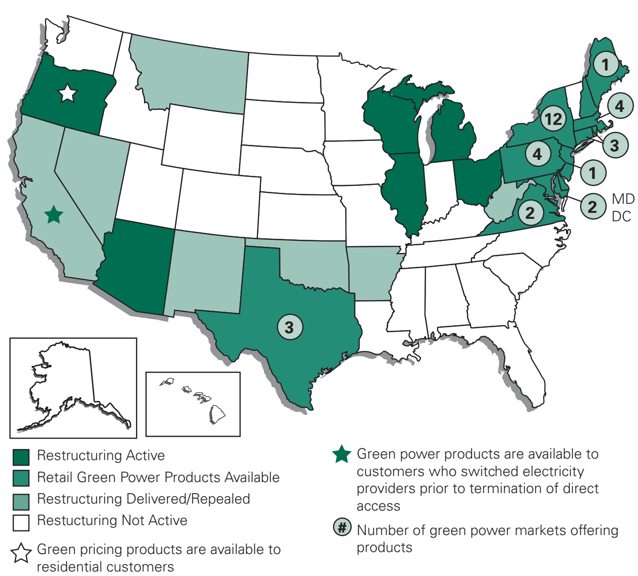
While purchasing green power is voluntary, some state legislatures (or if they have authority, state utility commissions) have taken an active role in making green power products available to consumers. The approach depends primarily on whether retail competition exists. In *vertically integrated markets*, some states have taken a first step by requiring that each utility develop and offer one or more green pricing tariffs. Participation in these programs remains voluntary. Some states have also required utilities to conduct education and outreach to help with market uptake as part of the utility's green power program.

Figure 5.5.2: States with Utility Green Pricing Activities



Source: DOE 2005b.

Figure 5.5.3: States with Green Power Marketing Activity in Competitive Electricity Markets[a]



[a] Represents bundled renewable electricity products available to residential and small commercial customers.

Source: DOE 2005a.

[37] For an up-to-date list and statistics on green power markets, see the DOE Green Power Network Web site (DOE 2005).

In *restructured markets*, a green power mandate can require that all distribution companies act as a platform for green power marketers to more easily access customers receiving default service. These "green check-off" programs provide green power marketers access to electricity customers via utility bills, which eliminates the need for customers to switch electricity providers to purchase green power. For example, customers with low monthly electricity consumption lack options for obtaining green power in some locations. In addition, when competing with the default service, green power marketing companies can face high customer acquisition costs that can make the transaction uneconomical.

In some states, such as Pennsylvania and Texas, the retail market has been reasonably competitive and thus green power suppliers have entered the market to compete for customers with suppliers of traditional electricity. It is primarily in locations where retail competition has not developed that some states are requiring the default utilities to offer green power or provide a check-off program.

The green power product in check-off programs is typically provided by a third-party green power marketer. However, by involving the default service provider in green power marketing, it is possible for customers and renewable energy providers to have easier access to each other. Customers choosing to remain with their default service provider can now choose to purchase green power without having to take the additional step of choosing a new electricity supplier. Examples of states with green check-off programs include statewide coverage in New Jersey (beginning in October 2005) and select utilities in Massachusetts (see *State Examples* on page 5-67).

States can also consider setting quantitative goals and objectives for green power markets. For example, New Jersey set a target of doubling the number of green power customers by 2008, and Connecticut established a 0.5% voluntary green power target by 2008. States have also specified other aspects of the program, such as eligible technologies and resources, whether or not RECs can be used, and if and how cost recovery will be permitted on the part of utilities or retail electricity providers. As part of the process, a state can also outline roles and responsibilities of other parties, such as the state energy office and utility commission, set qualification and certification requirements for providers, and set standards for the green power products.

Roles for Stakeholders

Depending on the approach, a number of stakeholders have roles in fostering green power markets:

- *State Legislatures.* State legislatures have taken a role in enacting enabling legislation that would mandate and/or permit the development of green power offerings through utilities or distribution companies.
- *Public Utility Commissions (PUCs).* If they possess the authority, PUCs can mandate that utilities offer green power options. They are also responsible for approving utility green power tariff requests, and in competitive markets, ensuring that green power options are consistent with state rules regarding competition and supplier certification.
- *State Agencies and Independent Administrators of State SBC Funds.* These agencies and administrators may have a role in administering certain aspects of statewide green power initiatives and related programs (see *Key Supporting Policies and Programs* on page 5-64), ensuring consumer protection, and substantiating green power marketing claims.
- *Nonprofit Organizations.* Certain nonprofit organizations may also play important roles in information dissemination, consumer protection, and certification of green power products. For example, one source for independent certification of green power products is the Green-e program developed by the Center for Resource Solutions (Center for Resource Solutions 2005). In the Northeast,

SmartPower, working in collaboration with the Clean Energy States Alliance (CESA), has launched a major "Got Milk" style media campaign called "Clean Energy–Let's Make More!"

Key Supporting Policies and Programs

While requirements for utilities can be an important policy for advancing green power markets, a state can put in place additional, complementary policies. Some of the most important ones include:

- *Branding, Education, and Outreach*. These activities increase the level of awareness of green power and lead to higher participation rates. States have found that action-oriented messages that are linked directly to the available green power choices are the most effective.
- *Labeling and Disclosure.* These rules require that electricity providers include information about the fuel sources and emissions associated with the electricity they sell. This gives consumers information they can use to compare the impact of different electricity choices.
- *Green Power Customer Aggregation*. Aggregation is the formation of large customer buying groups that can collectively shop for green power supply. It provides a scale that can lead to lower prices and can also create the demand needed to support the entry of green power marketers. Examples include municipalities joining forces to meet their own power needs or municipalities acting as aggregators for their residents and businesses. Some religious organizations are also acting as aggregators (Bird and Holt 2002).
- *Consumer Protection***.** It is important that green power product claims be verified (e.g., with respect to the resource mix). This can include the use of third-party certification or other accepted standards. For example, in Massachusetts, the Clean Energy Choice program uses the same eligibility requirements and attribute tracking system as the state RPS.

Other Supporting Policies and Programs

In addition to the major policies listed above, other policies can also aid in creating robust green power markets, including:

- *State Green Power Purchases*. States can lead by example by committing to a certain amount of green power to meet their own needs. This demand can also help establish the market. The federal government is currently working to meet green power purchase targets that were set by executive order, and a growing number of state and municipal governments have set similar requirements. (For more information, see Section 3.1, *Lead by Example*.)
- *Small Customer Incentives*. States can provide incentives to green power marketers to offset customer acquisition costs or to provide rebates to customers to encourage them to sign up for green power. Several states have tied incentives to market transforming activities as opposed to straight subsidies. For example, the Massachusetts Renewable Energy Trust (MRET), working with the nonprofit group, the Massachusetts Energy Consumers Alliance (Mass Energy), has created a REC-based green power product for which the premiums are tax deductible on federal income tax returns (RET 2005). The Connecticut Clean Energy Fund (CCEF) and SmartPower, through its Clean Energy Communities Program, is offering municipalities free solar photovoltaic (PV) systems if (1) they commit to 20% of their electricity coming from clean energy resources by 2010, and (2) enough local businesses and residents sign up for the CTCleanEnergyOptions program (CCEF 2005).
- *Large Customer Benefits*. Additional benefits and incentives could also be offered to larger customers to encourage them to make substantial, long-term commitments to green power purchases. A proven option is to design a green power offering that can include long-term "hedge" value for green power customers, such as an exemption from utility fuel adjustment charges and potential future environmental control costs. Incentives can

also include providing commercial customers with recognition that provides them with visibility and brand value tied to their green power purchases.[38] Having large customers agree to long-term green power purchases also has the advantage of allowing green power providers to enter into long-term contracts with renewable energy project developers, which in turn helps them secure financing for their projects. One of the most successful programs in the United States—the GreenChoice program offered by Austin Energy—provides customers with the fixed-price attribute of the utility's renewable power purchase contracts.

- *Net Metering*.[39] This policy supports the development of customer-sited green power. These high-visibility projects can raise overall awareness of renewable energy and can also generate RECs or green power for sale through green power programs. For example, utilities and other green power providers can buy up (i.e., aggregate) the RECs from such projects and resell them under their green power offerings. For more information on net metering, see Section 5.4, *Interconnection Standards*.

Interaction with Federal Policies and Programs

While few significant interactions occur between green power programs and federal policies, some issues are described as follows.

Federal renewable energy incentives, such as the production tax credit (PTC), help reduce the cost of renewable generation and thus the price premium that green power customers must pay. Typically, these incentives are complementary to green power markets; the sale of renewable energy through a green power program does not make the project ineligible for federal incentives, such as the PTC and accelerated depreciation (Title 26 of the U.S. Code, Sections 45 and 168).

The U.S. Environmental Protection Agency's (EPA's) Green Power Partnership is a voluntary partnership between EPA and organizations that are interested in buying green power (http://www.epa.gov/greenpower). Through this program, EPA supports organizations that are buying or planning to buy green power. As a Green Power Partner, an organization pledges to replace a portion of its electricity consumption with green power within one year of joining the partnership.

EPA offers credible benchmarks for green power purchases, market information, and opportunities for recognition and promotion of leading purchasers. The goal of the Green Power Partnership is to facilitate the growth of the green power market by lowering the cost and increasing the value of green power.

A *f*ederal renewable energy goal was established by Executive Order 13123 (GSA 1999), which requires federal agencies to increase their use of renewable energy, either through purchases or onsite renewable energy generation. Thus, federal agencies can serve as key green power customers in states across the country.

The EPA Green Power Partnership started in 2001 with the commitment of 21 founding partners. Today there are more than 560 partners with annual green power commitments exceeding 2.5 billion kWh. Green Power Partners encompass a wide range of public and private sector entities, including the U.S. Air Force, Whole Foods Market, Johnson & Johnson, the city of San Diego, the World Bank, Staples, BMW, and the states of Illinois, Maryland, and Pennsylvania. For a complete list of partners, go to: http://www.epa.gov/greenpower/partners/gpp_partners.htm.

38 Austin Energy's GreenChoice program is an example of a program that offers both benefits to business customers: replacement of the fuel adjustment charge with a fixed green power charge, and recognition through online acknowledgement at http://www.austinenergy.com/, print advertisements, EnergyPlus (printed customer newsletter), and billboard advertising.

39 Net metering enables customers to use their own generation to offset their electricity consumption over a billing period by allowing their electric meters to turn backwards when they generate electricity in excess of their demand. This offset means that customers receive retail prices for the excess electricity they generate.

Interaction with State Policies and Programs

There are important interactions between green power markets and existing or planned state policies and programs, as described below.

RPS have emerged as a widely used state-level policy in support of renewable energy (see Section 5.1, *Renewable Portfolio Standards*). Two key issues arise when considering support for green power markets in states with RPS. The first issue is whether renewable energy used to meet voluntary green power demand can also be used to meet RPS requirements. Specifically, if a utility sells renewable energy under a green power program to consumers, should it also be able to count that energy toward its RPS obligations? In most cases, the rules are written so that this is not permitted. Many voluntary green power purchasers have expressed concern that their personal investment in renewable energy is not used to help satisfy a mandate, but instead is contributing over and above any state requirements for renewable energy. For example, the New Jersey statewide green power program described in the *State Examples* section on page 5-67 contains language that specifically prohibits the sale of RECs used for RPS compliance in green power programs and vice versa.

Second, an RPS may create competition for limited renewable energy resources, making it harder for companies offering green power to find or develop renewable energy projects or to be able to source renewable energy at a reasonable price. The emergence of RECs as the currency for these RPS-related premiums, while beneficial overall to the renewable energy industry, is also leading to more liquidity, allowing renewable energy generators to sell their RECs to the highest bidder.

SBC funds (also called public benefits funds) are another widely used state level renewable energy policy. States can use some of these funds to support the development of robust green power markets through such activities as education and outreach, supporting the development of power projects that supply green power, and novel programs that encourage the use of green power (in *State Examples* section on page 5-67, see cases on Massachusetts, New Jersey, and Connecticut). For more information see Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*.

The Role of Third Parties

Third parties can play a key role in the success of green power markets, including developing standards for green power products, providing independent certification of the products, and verifying marketer claims. There may also be a similar role for consumer advocacy groups. Having an independent organization provide program evaluation and monitoring can also be useful (see Connecticut in the *State Examples* section on page 5-68).

Program Implementation and Evaluation

States that have taken an active role in promoting green power have generally followed a number of steps in developing and evaluating green power programs:

- *Establish the Baseline*. Are consumers currently purchasing green power products? For example, even if there are no utility programs or competitive green power marketers, customers may be buying RECs from one of several national REC retailers.
- *Convene Potentially Interested Stakeholders in a Collaborative Process* to establish goals and other attributes of the program. This process can also be used to clearly outline the roles and responsibilities of all stakeholders. For example, Connecticut and New Jersey recently completed such processes (see *State Examples* section on page 5-67).
- *Regularly Evaluate the Success of Green Power Markets*. Possible metrics include the number of customers by customer class, kWh sold, MW of new generation developed, the cost of the green power premium, customer acquisition costs (a measure of program efficiency), the participation rate by customer class, and the number of marketers and

products available (a measure of market development and robustness).

Design issues to be considered include:

- What will be the cost premium charged for different product types (e.g., for different amounts of renewable energy content or different technology types)?
- Will green power be offered in fixed block sizes or as a percent of consumption?
- Does the program make use of bundled renewable energy or RECs (or both)?
- What length of time will customers be required to commit to when making a purchase?
- What are the appropriate geographic boundaries for eligible RECs and/or green power?
- How will cost recovery be dealt with?
- What type of product certification, if any, will be required?
- What types of projects, technologies, and resources will be eligible?

State Examples

The examples that follow were selected to show the diversity of policies and programs that states are using to create environments favorable to green power. Ultimately, each state will develop a set of policies and programs that best meets their specific needs.

New Jersey

New Jersey is an example of a restructured state using multiple policies to increase the development and use of renewable energy in the East. It already has an RPS and SBC fund in place, and has also set additional renewable energy goals with respect to in-state installation of renewable energy, technology cost reduction, job creation, and new manufacturing capability. In addition, the New Jersey Clean Energy Council set a goal to double the number of electric customers purchasing green electricity and increase the load served by qualified renewable resources by 50% over and above the Class I RPS.

Best Practices: Designing and Implementing Green Power Programs

Although green power programs are often implemented through utilities or green power marketers, states can play a major role in program design and in setting up the green power market structure. Some key considerations when designing and implementing a program include:

- Learn from other states' experiences to identify the most appropriate approach for your state.
- Encourage new resources to ensure that renewable benefits are realized.
- Create real value for green power customers, such as exempting them from utility fuel adjustment charges.
- For commercial customers, consider recognition programs to add value to their purchases.
- Create programs with sufficiently long time horizons to encourage and facilitate long-term contracting for power—a critical requirement for project developers to obtain financing for new power projects.
- Determine the appropriate relationship between green power purchases and compliance with RPS.
- Involve key stakeholders and experts in a collaborative design effort.
- Base program designs on your state's market characteristics and customer needs.
- Keep the program design simple and clear, while ensuring that the program leads to real benefits (e.g., development of new renewable energy capacity, emission reductions).

To support this goal, the state implemented a statewide green check-off program, the Green Power Choice Program (GPCP), which began October 1, 2005. The program requires utilities to offer retail electricity customers the option of selecting an energy product with a higher level of renewable energy than required by the state RPS. Through this program, green power is made available to all customers in the state using a sign-up option on electric bills–an example of a check-off program. This green power product must use renewable energy not otherwise allocated to meeting RPS requirements and must have full disclosure of the power's content.

New Jersey is the first state with restructured electricity markets to institute such a statewide voluntary green power program. As such, it is expected to result in lower marketing costs on a per-customer and per-kWh basis. However, it is also the first program to involve multiple utilities and multiple green power providers, which may result in additional costs associated with coordination and planning. If necessary, utilities can apply to recover the costs related to setting up and managing the GPCP. In addition, New Jersey is playing an important role with regard to setting up the mechanisms to certify and verify the attributes of the green power sold to customers.

Web site:
http://www.bpu.state.nj.us/cleanEnergy/GreenPowerChoice.shtml

Connecticut

Connecticut, like New Jersey, is a restructured state. However, Connecticut has both competitive and standard offer providers selling green power products. Connecticut has a Clean Energy Collaboration made up of key stakeholders including marketers, nonprofit organizations, utility companies, state agencies, and others supporting green power market development. Connecticut is also an example of a state that is using its SBC fund to promote voluntary green power market development.

Connecticut has established two voluntary green power market targets: (1) 0.5% (~150 gigawatt-hours [GWh]) by the end of 2007 through the CCEF, and (2) 3% to 4% (~900 GWh) by the end of 2010 through the *Connecticut Climate Change Action Plan 2005*. To assess green power market development, the CCEF has hired an independent third party to monitor and evaluate public awareness and voluntary green power market development in the state.

To support Connecticut's voluntary green power market, several marketing and incentive programs have been initiated, including:

- *SmartPower's Clean Energy–Let's Make More* television and radio ads and the 20% by 2010 clean Energy Campaign. Connecticut and New Haven are key campaign participants.
- *CCEF's Clean Energy Communities* program provides free solar PV systems to SmartPower-qualifying municipalities who (1) commit to SmartPower's 20% by 2010 Clean Energy Campaign, and (2) sign up a specific number of customers to the CTCleanEnergyOptions program. Several towns have already qualified.
- *Sterling Planet's Investment for the Greater Good* program offers rewards to nonprofit organizations, municipalities, and colleges and universities supporting green power by providing a 10% cash rebate for eligible purchases. In addition, eligible organizations may also receive 10% cash back on any residential enrollment they secure.

Connecticut's collaborative model has shown early signs of positive results, with approximately 3,000 sign-ups in two months with the new CTCleanEnergyOptions program.

Web site:
http://www.ctcleanenergyoptions.com/

Massachusetts

Massachusetts, like New Jersey, is a restructured state. However, unlike New Jersey, the retail providers in Massachusetts are not required to offer customers a green power option. Rather, to increase consumer demand for green power, the Massachusetts Technology Collaborative (MTC) is developing creative ways to use SBC funding to promote green power.

The MTC, a nonprofit group, manages the SBC funds for renewable energy in Massachusetts and has a general mandate to increase renewable energy supply and use in the state. To create consumer demand for green power, the MTC developed the Clean Energy Choice program.

The Clean Energy Choice program bundles together a number of features to increase consumer confidence in both green power and the value of green power to them. First, the Clean Energy Choice program identifies credible sources of green power for customers, thereby reducing their risk and simultaneously increasing their confidence in the authenticity of the green power marketer claims. Specifically, the Clean Energy Choice program requires that green power providers use the same definition of renewable energy used in the state's RPS. Second, participants that purchase green power from one of the providers (e.g., Mass Energy) are able to deduct the incremental cost of their green power purchase (i.e., the premium) from their federal income tax.[40] By providing customers with a tax deduction, the Clean Energy Choice program effectively reduces the customer's cost premium for green power by about one-third. Third, the Clean Energy Choice program matches, dollar for dollar, customers' green power premiums with grant payments to their local municipal governments for use in developing additional renewable energy projects. The payment received by a municipality is equal to the amount paid for green power by its residents, up to a total annual grant program cap of $1.25 million. Finally, the Clean Energy Choice program offers matching grants for clean energy projects serving low-income residents throughout the state, subject to a $1.25 million annual program cap. Thus, up to $2.5 million in SBC funds, roughly 10% of the annual SBC funds collected, is being used to promote voluntary green power in Massachusetts.

In the Clean Energy Choice program, consumers have two basic choices. First, there are already three utilities that provide a green power option directly to their customers, with several different products available to them. These utilities include Mass Electric, Cape Light Compact, and Nantucket Electric. The incremental monthly cost of green power is approximately $6 to $12. Second, customers throughout the state (including customers of the above utilities) can purchase RECs from Mass Energy. Under the Mass Energy program, a 500 kWh block of RECs costs $25.

Web site:
http://cleanenergychoice.org/

Washington

Washington has a vertically integrated market for electricity. It provides an example of state-mandated utility green pricing programs created via legislation. In 2001, the governor signed a bill that required all electric utilities to offer customers renewable energy options. The bill stipulates that utilities must regularly promote the option of either fixed or variable rates for voluntary green power in monthly billing statements.

As a result of this 2001 legislation, today there are 17 utilities in Washington that offer voluntary green power to their customers. As shown in Table 5.5.1, green pricing programs vary according to each utility's unique circumstances.

To provide one example, Puget Sound Energy's (PSE's) Green Power Program currently has over 14,000 commercial and residential customers. In 2004, these customers bought more than 46 million kWh of green power, enough renewable energy to serve approximately 4,000 homes for a year. Given this program's success, it was rated one of the top 10 voluntary green power programs nationwide in 2004 (DOE 2005c). PSE offers green power that is produced in the Pacific Northwest from wind and solar facilities. PSE's program allows customers to select the amount of green power they want. Options are available as low as $4 per month for 200 kWh of green power. Each additional block of 100 kWh is sold at a price of $2. For under $10 a month, a household can "green" approximately 30% to 50% of their electricity (based on 1,000 kWh per month usage).

40 Mass Energy is a nonprofit organization and the MTC is a state agency. By a private letter ruling from the Internal Revenue Service (IRS), the MTC was able to classify the premiums paid for renewable energy purchased as a charitable contribution.

Web sites:
http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=WA

http://www.eere.energy.gov/greenpower/markets/state_policies.shtml

New Mexico

New Mexico, like Washington, has a vertically integrated electricity market. It provides an example of a state-mandated utility green pricing program created via regulatory authority. By unanimous approval in 2002, the New Mexico Public Regulation Commission (PRC) created regulations that require all investor-owned utilities and electric cooperatives in the state to offer their customers a voluntary renewable energy tariff. (Cooperatives only have to provide renewable energy to the extent that renewable energy is available to them from their suppliers.) To raise

Table 5.5.1: Green Pricing Programs Offered in Washington *(as of May 2005)*

Utility Name	Program Name	Type	Start Date	Premium
Avista Utilities	Buck-A-Block	Wind	2002	0.33¢/kWh
Benton County Public Utility District (PUD)	Green Power Program	Landfill gas, wind	1999	Contribution
Chelan County PUD	Sustainable Natural Alternative Power	PV, wind, micro hydro	2001	Contribution
Clallam County PUD	Green Power Rate	Landfill gas	2001	0.7¢/kWh
Clark Public Utilities	Green Lights	PV, wind	2002	1.5¢/kWh
Cowlitz PUD	Renewable Resource Energy	Wind, PV	2002	2.0¢/kWh
Grant County PUD	Alternative Energy Resources Program	Wind	2002	2.0¢/kWh
Grays Harbor PUD	Green Power	Wind	2002	3.0¢/kWh
Lewis County PUD	Green Power Energy Rate	Wind	2003	2.0¢/kWh
Mason County PUD No. 3	Mason Evergreen Power	Wind	2003	2.0¢/kWh
Orcas Power & Light	Go Green	Wind, small hydro, PV	1997	3.5¢/kWh
Pacific County PUD	Green Power	Wind, hydro	2002	1.05¢/kWh
Pacificorp: Pacific Power	Blue Sky	Wind	2000	1.95¢/kWh
Peninsula Light	Green by Choice	Wind, hydro	2002	2.8¢/kWh
Puget Sound Energy	Green Power Plan	Wind, solar	2002	2.0¢/kWh
Seattle City Light	Seattle Green Power	Solar, wind, biogas	2002	Contribution
Snohomish County PUD	Planet Power	Wind	2002	2.0¢/kWh
Tacoma Power	EverGreen Options	Small hydro, wind	2000	Contribution

Source: DOE 2005.

awareness and demand for voluntary green power, utilities are also required to develop educational programs for customers on the benefits and availability of their voluntary renewable energy programs.

The renewable energy tariffs allow consumers the option of purchasing more renewable energy than what is required by the RPS. Tariffs offered by utilities and cooperatives in New Mexico range from 1.8 to 3.2 cents/kWh and combine varying mixes of wind, solar, and biomass, depending on the utility. In addition, some utilities offer green power produced only within the state, while others offer green power produced in New Mexico and in surrounding states. In 2004, the state legislature passed SB43, which provides additional guidance to the PRC and explicitly states that voluntary green power sales would need to be in addition to the state's RPS requirements.

Web sites:
http://www.nmprc.state.nm.us/utility/pdf/3619finalrule.pdf

http://legis.state.nm.us/Sessions/04%20Regular/bills/senate/SB0043.html

What States Can Do

The suite of policies and programs that can be used to create robust green power markets and help clean energy contribute to state goals is well understood. States can use the best practices and information resources in this *Guide to Action* to actively promote green power market development and to strengthen existing programs to deliver even more benefits to electricity customers.

Action Steps for States

States with a Competitive Retail Market

- Assess how well competitive markets are working with regard to green power product availability, quality, and uptake.
- If markets are not working to support green power, consider ways to support their development, as outlined in this document.
- Ensure that other state programs and policies are aligned with the needs of the green power marketplace.

States with a Vertically Integrated Retail Market

- Consider a process to evaluate whether to require utilities to offer a green pricing option to all customers, and if so, how to design this option (customer participation would still be voluntary).
- Develop a green pricing program that meets your state's particular situation.
- Ensure that other state programs and policies are aligned with the needs of the green power marketplace.

Information Resources

General Information

Title/Description	URL Address
Green Pricing Resource Guide, Second Edition. This guide focuses on utility green pricing programs, although most of the insights apply or can be adapted to green power marketing in restructured markets, and to a much lesser extent to renewable energy certificates.	http://www.awea.org/greenpower/greenPricingResourceGuide040726.pdf
National Council Series on Information Disclosure. The National Council's research program addresses disclosure of information to consumers who will choose retail electricity providers in restructured states. The Council has published several reports on this topic in draft format. Final published National Council reports will soon be posted on their Web site.	http://www.Ncouncil.org/pubs.html
Power to the People: How Local Governments Can Build Green Electricity Markets. This assesses the benefits and potential obstacles to green aggregation by local governments, while noting the potential of municipal aggregation in general to protect and benefit small power consumers.	http://www.repp.org/repp_pubs/articles/issuebr9/index_ib9.html
Trends in Utility Green Pricing Programs (2003). This report presents year-end data on utility green pricing programs, and examines trends in consumer response and program implementation over time.	http://www.eere.energy.gov/greenpower/pdfs/36833.pdf
Utility Green Pricing Programs: Design, Implementation, and Consumer Response. The purpose of this report is to provide aggregate industry data on consumer response to utility programs, which indicate the collective impact of green pricing on renewable energy development nationally, and market data that can be used by utilities as a benchmark for gauging the relative success of their green pricing programs.	http://www.eere.energy.gov/greenpower/resources/pdfs/nrel_35618.pdf

Federal Resources

Title/Description	URL Address
EPA Green Power Partnership. This is EPA's voluntary program to promote the use of green power by companies, government agencies, and other institutions.	http://www.epa.gov/greenpower
U.S. Department of Energy (DOE) Green Power Network. This is the link to the main Web site of the Green Power Network.	http://www.eere.doe.gov/greenpower

Information About States

Title/Description	URL Address
CESA. Twelve states across the United States have established funds to promote renewable energy and clean energy technologies. CESA is a nonprofit organization that provides information and technical services to these funds and works with them to build and expand clean energy markets in the United States.	http://www.cleanenergystates.org/

Title/Description	URL Address
Database of State Incentives for Renewable Energy (DSIRE). This Web site contains extensive information on federal, state, and local programs, policies, and incentives for renewable energy. The database can be searched by program type, including green power programs.	http://www.dsireusa.org
DOE Green Power Network. This reference links to information about state green power programs (i.e., states that have taken an active role in fostering green power) and power disclosure policies.	http://www.eere.energy.gov/greenpower/markets/states.shtml
Massachusetts Clean Energy Choice Program. This Web site describes the voluntary green power program being promoted by the MTC, the administrator of the state's system benefits fund. It includes descriptions of the green power offerings, and incentive programs offered by the MTC.	http://cleanenergychoice.org
Washington State Utilities and Transportation Commission (UTC) Green Power Programs. This reference links to the main page of the Washington green power programs, providing links to the enabling legislation, annual reports on the green power programs, and utility green pricing tariffs.	http://www.wutc.wa.gov/webimage.nsf/071d50fefd435186882567ad00778646/2a75cd42e959364288256ab000749d8b!OpenDocument

Examples of State Legislation and Regulations

State	Title/Description	URL Address
New Jersey	**State of New Jersey Board of Public Utilities, Order of Approval in the Matter of a Voluntary Green Power Choice Program. Docket No. E005010001**. This document contains the final New Jersey Board of Public Utilities (NJBPU) approval for the statewide green power program and also includes the document containing the final program description, framework, rules, and technical standards.	http://www.bpu.state.nj.us/wwwroot/cleanEnergy/EO05010001_20050413.pdf
New Mexico	**New Mexico legislation (S.B.43) supporting the RPS and voluntary green power programs**. This reference links to state legislation (Senate Bill 43, called the "Renewable Energy Act"). It further clarifies elements of the state RPS and also specifies that sales through the voluntary green pricing programs are in addition to the RPS requirements (see Section 7).	http://legis.state.nm.us/Sessions/04%20Regular/bills/senate/SB0043.html
	New Mexico utility commission final rule requiring the development of voluntary green power offerings (see Section 10.D). This reference links to the New Mexico PRC final rule that established the New Mexico RPS. In Section 10.D, it also requires utilities to offer a voluntary green pricing tariff to its customers.	http://www.nmprc.state.nm.us/utility/pdf/3619finalrule.pdf
Washington	**Revised Code of Washington (RCW) 19.29A.090: Voluntary Option to Purchase Qualified Alternative Energy Resources**. This is the enabling legislation for the Washington State UTC green power program.	http://www.leg.wa.gov/RCW/index.cfm?section=19.29A.090&fuseaction=section

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Title/Description	URL Address
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Bird, L. and B. Swezey. 2004. Green Power Marketing in the United States: A Status Report. Seventh Edition. NREL/TP-620-36823. National Renewable Energy Laboratory (NREL), Golden, CO. September.	http://www.eere.energy.gov/greenpower/pdfs/36823.pdf
Bird, L. and B. Swezey. 2005. Estimates of New Renewable Energy Capacity Serving U.S. Green Power Markets (2004). NREL. September.	http://www.eere.energy.gov/greenpower/resources/tables/new_gp_cap.shtml
CCEF. 2005. Clean Energy Communities Web site. Accessed 2005.	http://ctcleanenergy.com/investment/CleanEnergyCommunities.html
Center for Resource Solutions. 2005. Green-e renewable electricity certification program Web site (includes links to documents covering green power standards, verification, as well as certified products).	http://www.green-e.org/
DOE. 2005. The Green Power Network Web site (includes links to information on existing utility green pricing programs, green power marketer programs, and summaries of state policies on green power and disclosure). Accessed July 2005.	http://www.eere.energy.gov/greenpower/
DOE. 2005a. The Green Power Network Web Site. Information Resources: Green Power Marketing Activity in Competitive Electricity Markets. July 2005.	http://www.eere.energy.gov/greenpower/resources/maps/marketing_map.shtml
DOE. 2005b. The Green Power Network Web Site. Information Resources: Utility Green Pricing Activities. July 2005.	http://www.eere.energy.gov/greenpower/resources/maps/pricing_map.shtml
DOE. 2005c. Green Power Markets Web site. Green Pricing: Top Ten Utility Green Power Programs. December 2005.	http://www.eere.energy.gov/greenpower/markets/pricing.shtml?page=3
DOE EIA. 2004. Electric Power Annual 2003. U.S. DOE Energy Information Administration. December.	http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html
GSA. 1999. Executive Order 13123. U.S. General Services Administration (GSA). Last reviewed June 1, 2005.	http://www.gsa.gov/Portal/gsa/ep/contentView.do?P=PLAE&contentId=16915&contentType=GSA_BASIC
Katofsky, R. 2005. Personal communication with Ryan Katofsky, Navigant Consulting, July 2005.	N.A.
RET. 2005. Renewable Energy Trust Web site. Tax Deductible Option Why Are Some Choices Tax Deductible? Accessed July 2005.	http://www.cleanenergychoice.com/tax_deduct1.htm
Wiser, R., M. Bolinger, E. Holt, and B. Swezey. 2001. Forecasting the Growth of Green Power Markets in the United States. NREL/TP-620-30101, Golden, CO. National Renewable Energy Laboratory, October.	http://www.eere.energy.gov/greenpower/resources/pdfs/30101.pdf

Chapter 6. Utility Planning and Incentive Structures

Public utility commission (PUC) long-term planning policies and utility incentive and rate structures play an important role in determining the attractiveness of investments in energy efficiency and clean distributed generation (DG). In most states, utility profits are reduced if they experience reduced energy sales as a result of aggressive investments in energy efficiency or customer-sited distributed generation. Most utilities can also lose an opportunity for additional revenue when investing in demand-side resources instead of new supply, transmission, and distribution. Rate structures, including exit fees, standby rates, and buyback rates, can create unintended barriers to distributed generation. State PUCs can achieve goals for low-cost, reliable energy markets while also supporting larger state clean energy efforts by removing existing utility disincentives.

This chapter provides an in-depth discussion of three policies that states have successfully used to address disincentives to create effective energy markets. The information presented about each policy is based on the experiences and best practices of states that are implementing the programs, as well as on other sources, including local, regional, and federal agencies and organizations; research foundations and nonprofit organizations; universities; and utilities.

Table 6.1 lists examples of states that have implemented these policies. States can refer to this table for an overview of the policies described in this chapter and to identify other states they may want to contact for additional information about their clean energy policies or programs. The *For More Information* column lists the *Guide to Action* section where each in-depth policy description is located.

Clean Energy Policies

Type of Policy	For More Information
State Planning and Incentive Structures	
Lead by Example	Section 3.1
State and Regional Energy Planning	Section 3.2
Determining the Air Quality Benefits of Clean Energy	Section 3.3
Funding and Incentives	Section 3.4
Energy Efficiency Actions	
Energy Efficiency Portfolio Standards	Section 4.1
Public Benefits Funds for Energy Efficiency	Section 4.2
Building Codes for Energy Efficiency	Section 4.3
State Appliance Efficiency Standards	Section 4.4
Energy Supply Actions	
Renewable Portfolio Standards	Section 5.1
PBFs for State Clean Energy Supply Programs	Section 5.2
Output-Based Environmental Regulations to Support Clean Energy Supply	Section 5.3
Interconnection Standards	Section 5.4
Fostering Green Power Markets	Section 5.5
Utility Planning and Incentive Structures	
Portfolio Management Strategies	**Section 6.1**
Utility Incentives for Demand-Side Resources	**Section 6.2**
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	**Section 6.3**

In addition to these three policies, states are adopting a number of other policies that maximize the benefits of energy efficiency and clean energy

Table 6.1: Utility Planning and Incentive Structures

Policy	Description	State Examples	For More Information
Portfolio Management Strategies	Portfolio management strategies include energy resource planning approaches that place a broad array of supply and demand options on a level playing field when comparing and evaluating them in terms of their ability to meet projected energy demand and manage uncertainty.	CA, CT, IA, MT, NV, OR, PA, VT, Idaho Power, Northwest Power and Conservation Council, PacifiCorp, Puget Sound Energy	Section 6.1
Utility Incentives for Demand-Side Resources	A number of approaches—including decoupling and performance incentives—remove disincentives for utilities to consider energy efficiency and clean distributed generation equally with traditional electricity generation investments when making electricity market resource planning decisions.	AZ, CA, CT, ID, MA, MD, ME, MN, NY, NM, NV, OR, WA,	Section 6.2
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	Electric and natural gas rates, set by Public Utility Commissions, can be designed to support clean DG projects and avoid unintended barriers, while also providing appropriate cost recovery for utility services on which consumers depend.	*Exit Fees*: IL, MA, CA *Standby Rates*: CA, NY *Gas Rates*: NY	Section 6.3

through planning and incentives approaches. These additional policies are addressed in other sections of the *Guide to Action*, as described as follows.

- *State and Regional Planning* activities identify opportunities to incorporate clean energy as a way to meet future load growth (see Section 3.2).
- *Funding and Incentives* describes additional ways states provide funding for clean energy supply through grants, loans, tax incentives, and other funding mechanisms (see Section 3.4).
- *Public Benefits Funds* are pools of resources used by states to invest in energy efficiency and clean energy supply projects and are typically created by levying a fee on customers' electricity bills (see Section 4.2, *PBFs for Energy Efficiency*; and Section 5.2, *PBFs for State Clean Energy Supply Programs*).

6.1 Portfolio Management Strategies

Policy Description and Objective

Summary

Some state public utility commissions (PUCs) require utilities to conduct portfolio management as a way to provide least-cost and stable electric service to customers over the long term. Portfolio management addresses other electric generation and transmission concerns, including reliability, safety, risk management, and environmental issues.

Portfolio management refers to the utility's energy resource planning and procurement strategies. These strategies, required by the state, cover both the generation of electricity and its transmission to customers. A successful portfolio management approach typically includes forecasting customer demand for electricity and resource supply, identifying and assessing a range of resource "portfolio" scenarios, and developing a plan for acquiring the preferred mix of resources.

An ideal portfolio is diversified; it provides many options to allow the utility to adapt to shifting market conditions, including:

- A variety of fuel sources such as coal, natural gas, nuclear power, and clean energy sources. Some states actively promote and sometimes require the use of clean energy sources for some of the electricity supplied to their customers.
- A variety of technologies for the generation and delivery of electricity.
- Programs that encourage customers to adopt energy efficiency measures.
- Financial incentive programs to encourage customers to reduce their consumption during peak demand periods.

Portfolio management refers to energy resource planning that incorporates a variety of energy resources, including supply-side (e.g., traditional and renewable energy sources) and demand-side (e.g., energy efficiency) options. The term "portfolio management" has emerged in recent years to describe resource planning and procurement in states that have restructured their electric industry. However, the approach can also include the more traditional integrated resource planning (IRP) approaches applied to regulated, vertically integrated utilities.

Portfolio management involves deliberately choosing among a variety of electricity products and contracts. The approach emphasizes diversity—diversity of fuels, diversity of technologies, and diversity of power supply contract durations. In its fullest form, energy efficiency and renewable generation are key strategy components.

Objective

States are requiring utilities to use portfolio management strategies to achieve a mix of resources that efficiently and reliably meet consumers' near- and long-term service needs in a manner that is consistent with environmental policy objectives. The most comprehensive portfolio management strategies consider demand- and supply-side resources and include clean energy as an important component of a diversified resource portfolio. Several states also consider rate structure issues and performance-based regulation to place energy efficiency and clean distributed generation (DG) on a level playing field with supply options (see Section 6.2, *Utility Incentives for Demand-Side Resources*).

Portfolio management strategies are used both in states where a regulated utility has an obligation to provide full service to customers and in "retail choice" states where the regulated entity's service might be restricted to distribution and default service.

Benefits

Portfolio management offers benefits through risk management and improved efficiency. Diversification is a key risk management strategy and can take the form of supply contract terms and conditions as well as supply from varied fuels, technologies, and a mix of generation resources. Additionally, diversification can result in a mix of transmission, demand-side resources, energy efficiency, and demand response. With diversification, each resource represents a relatively smaller proportion of the total electricity required to serve customers. This reduces price risks associated with a specific resource type, decreasing the possibility that customers will be exposed to a sudden increase in their electric rates.

Even though many portfolio management strategies are rooted in managing price risks for customers, environmental benefits flow naturally from portfolio management, particularly those strategies that ensure equal consideration of renewable generation and energy efficiency. For example, portfolio management delivers clean air benefits by shifting the focus of procurement from short-term, market-driven, fossil fuel-based prices to long-term, customer costs and customer bills by ensuring the consideration of energy efficiency and renewable generation resources. Portfolio management can also address additional benefits, including increased system reliability and reduced security risks.

Background

In the late 1980s and early 1990s, integrated resource planning (IRP) was common in the electric industry. With vertically integrated electric utilities responsible for generation, transmission, and distribution services for their customers, IRP was a useful tool for developing the most efficient resource portfolio. In 1992, 36 states had IRP requirements in place. After restructuring, the prevalence of ratepayer-funded energy efficiency programs declined significantly as the focus of resource planning shifted to short-term commitments. States either rescinded their IRP regulations or ceased requiring utilities to comply with them, in anticipation that customer choice would result in an optimal resource mix.

When customer choice did not deliver these benefits, some states and utilities began returning to IRP and portfolio management as a tool to ensure a variety of public policy goals, including clean, low-cost, reliable power. Having learned from previous experience, IRP policies today are more effective and vary greatly by state.

Some states are continuing to apply IRP regulations. Other states are requiring that a distribution company or other entity be responsible for acquiring a long-term, diverse resource portfolio to serve customers. In states served by regulated, vertically integrated utilities, portfolio management strategies are implemented through individual utilities' IRPs.

Some retail choice states, served by regulated distribution companies and competitive suppliers, are using portfolio management to stabilize and lower prices for default service consumers. To date, the primary focus of portfolio management in states with retail choice has been the management of costs and risks of supply contracts. Interested states that want to take a more expansive view of portfolio management are beginning to explore ways to incorporate clean energy into portfolio management.

States That Have Adopted Portfolio Management Strategies

Integrated Resource Planning

Several states currently have instituted IRP requirements, including California, Colorado, Hawaii, Idaho, Indiana, Minnesota, Oregon, and Washington. Many electric companies have developed detailed IRPs to guide their resource management and procurement practices in response to various state regulations. They include Avista Corporation, Idaho Power Corporation, PacifiCorp, Portland General Electric (PGE), Georgia Power Company, Duke Power, Xcel Energy, and Puget Sound Energy (PSE).

As vertically integrated facilities, these utilities own their generating assets. They use their IRPs to weigh the benefits of building their own generation plants against procuring energy from other entities. The plans also evaluate how best to balance peak versus off-peak electric load requirements. In addition, they compare various supply- and demand-side options and contract and financial hedging options. Companies achieve these goals simultaneously by analyzing different scenarios. The IRPs detail fuel and electricity price information, customer demand forecasts, existing plant performance, other plant additions in the region, and legislative decisions.

Retail Choice Portfolio Management

As states have restructured the electric industry, they have struggled with the appropriate pace of transition from regulated full-service supply from integrated utilities to full retail choice in a competitive market. Originally, many states hoped that the majority of customers would select a competitive supplier. Many states also included provisions for default service, which would be procured through the regulated distribution company to supply customers who could not, or would not, find a supplier in the competitive market. These services were expected to provide a declining proportion of retail service.

Because the transition to competitive retail markets has been slower than anticipated, default services have taken on greater prominence as the main supply option for most customers with few competitive options. In fact, in restructured states, the majority of residential and small commercial customers continue to take electricity through their default service provider, despite the option to choose their supplier. This trend is expected to continue into the future, making the provision of default service an important element in meeting customers' service needs.

Consequently, to ensure least-cost and reliable supply for customers, several states have mandated portfolio management approaches for the provision of these noncompetitive services, as described in Table 6.1.1.

Some restructured states have adopted a particular aspect of portfolio management: laddering (or "dollar cost averaging") of generation contracts for default service procurement. This approach can offer greater price stability, supplier diversity, and flexibility to adapt to changing loads than a one-time procurement for the entire default service load.

Table 6.1.1: States That Use Diverse Contract Terms

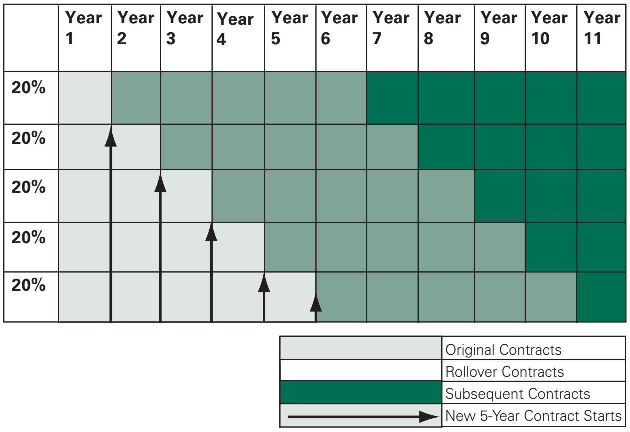
State	Procurement Rules for Default Service
Connecticut	Contracts are procured in overlapping pattern of fixed periods. The contracts must be for terms of not less than 6 months, unless shorter terms are justified.
Delaware	Delaware has proposed an approach similar to that used in New Jersey: a 3-year ladder of contracts.
Illinois	Illinois has proposed a mix of 1-, 3-, and 5-year contracts for its default service electric procurement.
Maryland	Utilities must attempt to obtain 1-, 2-, and 3-year contracts with 50% of load served through 1-year contracts.
New Jersey	There is a single annual auction date. Each year, 1/3 of the load is procured under fix-priced, 3- year contracts.
Washington, D.C.	Recommends that utilities' contract mix include contracts of at least 3 years for no less than 40% of the total load.

Source: Synapse 2005.

The objective of using such a laddered contract approach is that in each year only a fraction of the electric load is exposed to market price uncertainty. Figure 6.1.1 illustrates a basic five-year ladder. Utilities can also manage exposure to market price risk by executing a mix of contracts over short-, mid- and long-term contracts.

Additional tools beyond basic laddering might yield greater price and stability benefits for customers. For example, one enhancement that would promote clean energy would be a dedicated, renewable energy tranche. In other words, a portion of the load can be dedicated specifically to long-term renewable contracts. This would provide not only technology diversification, but also contract length diversification and more stable prices over the long run.

Figure 6.1.1: A Laddered Approach to Default Service Contracts Offers Flexibility and Price Stability



Source: Roschelle and Steinhurst 2004.

Non-State Jurisdictional Entities

While this section focuses on state policies pertaining to portfolio management, portfolio management strategies are a useful planning tool regardless of whether they are required by a state regulatory body or undertaken at the initiative of an individual company, municipal utility, or cooperative. They can be used in both private utilities and public power utilities. The strategies and approaches described in this section are applicable in a wide range of corporate structures and can be adapted to the circumstances of individual companies.

One of the most comprehensive portfolio management efforts takes place in the Pacific Northwest through the Northwest Power and Conservation Council. The Northwest Power and Conservation Council was created by Congress in 1980 as an interstate compact agency for the states of Idaho, Montana, Oregon, and Washington. The region is served by a federal power project (through the Bonneville Power Administration [BPA]), investor owned utilities (IOUs), municipal utilities, and power cooperatives.

The Northwest Power and Conservation Council periodically develops 20-year power plans to ensure an adequate, efficient, economical, and reliable power system and to address the impacts of the region's hydropower system on fish and wildlife. These power plans establish a regional context for the power planning of individual public and investor-owned utilities and provide information on the region's power system. Additionally, the plans offer broadly applicable resource strategies and methods to evaluate uncertainty and risk that can be used in individual companies' planning processes. The Northwest Power and Conservation Council's Fifth Plan is described in *State and Regional Examples*, on page 6-13.

The American Public Power Association (APPA) provides information for public power utilities regarding the inclusion of clean energy in energy portfolios. A 2004 APPA guidebook describes strategies other utilities have used to increase their percentage of renewable energy and provides a step-by-step process for considering renewable resources, especially wind and geothermal, in smaller public power system resource portfolios. Many publicly owned utilities develop IRPs. Examples of these include Seattle City Light, Tacoma Power, the Los Angeles Water and Power District, and the Sacramento Municipal Utility District.

Designing an Effective Portfolio Management Policy

State portfolio management policies, whether for vertically integrated utilities or distribution service providers, create a comprehensive planning and procurement process that levels the playing field for energy efficiency and clean energy supply. The regulated entity must then develop a plan for implementing the policy. This section describes the portfolio management process, including the planning process, participants, funding, timing and duration, and interaction with state practices.

Planning Process

Portfolio management typically involves a multi-step process of forecasting, resource identification, scenario analysis, and resource procurement, as described below.

Forecasting

A utility's first step in portfolio management is to forecast customer demand and resource supply over the planning horizon. Utilities include expected energy efficiency improvements outside of the utility's energy efficiency resources in their load forecasts. By forecasting demand and supply, a utility identifies the timing and magnitude of future resource needs.

Identifying Potential Resources

Next, the utility assesses the wide variety of supply and demand resources available to meet their identified needs. Supply-side resources include traditional sources such as power plants, purchasing from the wholesale spot market, purchasing short-term and long-term forward contracts, and purchasing derivatives to hedge against risk. Supply resources also include clean energy, such as renewable power. Demand-side resources can include energy efficiency programs and demand response. Utilities also assess expanding transmission and distribution facilities, and sometimes consider DG options.

Many states that require IRP establish criteria for evaluating resource options and a process for selecting resources. The criteria can include environmental, economic, reliability, security, and social factors and direct project costs. These factors create an evaluation framework that values the attributes of clean energy as part of the least-cost resource solution.

Recognizing Environmental Costs

Some states, such as California, require consideration of environmental factors as part of their planning process. California requires utilities to consider the cost of future carbon reduction regulations in their long-term planning by requiring a "cost adder" for supplies from fossil fuel plants. This means that for resource comparison purposes, utilities increase the cost of fossil fuel-based supplies to reflect the financial risk associated with the potential for future environmental regulation. This makes fossil fuel plants less attractive as compared to clean energy. Vermont law requires that utilities prepare a plan for providing energy services at the lowest present value life cycle costs, including environmental and economic costs.

Similarly, several utilities, including PacifiCorp, Idaho Power, PGE, Avista, and Xcel, incorporate an estimate of potential carbon emissions fees into their planning processes. For example, Montana requires utilities to consider environmental factors in portfolio management, but it does not require consideration of "environmental externalities." These "externalities," added to the cost of resources, can be used to incorporate estimates of sensitivity to risk associated with the environmental effects of plant emissions (e.g., acid rain, climate change, and other issues).

Creating the Preferred Resource Mix

After establishing evaluation criteria, states and utilities determine the mix of resources that will best meet the regulators' and companies' objectives. In this step, the state PUC directs regulated utilities to identify a mix of possible resources that meets forecasted requirements and addresses as many planning criteria as possible. For example, regulators and utilities might seek the lowest cost, most reliable options that minimize risk and reflect social, cultural, and environmental goals. During this step, utilities analyze the various scenarios and risks associated with different resource "portfolios."

California requires utilities to prioritize their resource acquisitions by incorporating a prioritized resources list established in the state's Energy Action Plan (EAP). Under this plan, also called the "Loading Order," top priority is given to energy efficiency and demand response, followed by renewable energy, then clean fossil-fueled DG, and finally, clean fossil-fueled central generation. Other states include explicit requirements for clean energy in their portfolio management policies. For example, Iowa and Minnesota require utilities to develop conservation or energy efficiency plans for their customers.

Montana mandates that utilities providing default service must consider demand- and supply-side resources when developing their portfolios.

Many states require utilities to conduct a competitive solicitation or other process to ensure that they evaluate options for meeting resource needs using predefined criteria in a fair manner. Oregon, California, and Montana are examples of states that have these types of competitive solicitation requirements.

Participants

States include a broad range of stakeholders as they develop policies and consider alternative scenarios. These stakeholders include state agencies, utilities, supply-side and demand-side resource providers, and customer representatives. For example, California, Connecticut, Oregon, Pennsylvania, Vermont, and Washington work with all interested parties to develop regulations on IRP or portfolio management for default service providers. Montana requires utilities that use portfolio management for default service to conduct a broad-based advisory committee review; make recommendations on technical, economic, and policy issues; and provide opportunities for public input.

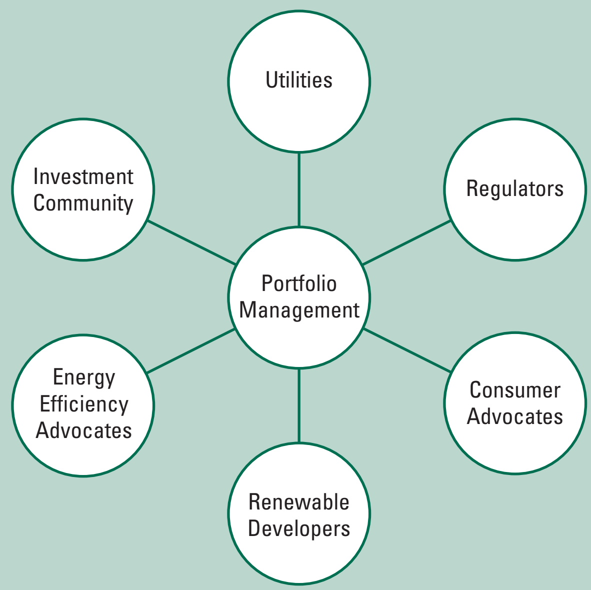
After a plan has been implemented, parties reconvene regularly (sometimes annually or more frequently) to see if their strategy should be adjusted for greater effectiveness in achieving policy and stakeholder objectives. For example, PacifiCorp, a utility that operates in five Western states, invites stakeholders to regularly take part in evaluating and implementing its IRP. The cornerstone of the public input is full-day public meetings, held approximately every six weeks throughout the year-long plan development period. Because of PacifiCorp's large service territory, these meetings are held in two locations and employ telephone and video conferencing technology. PacifiCorp has found that this approach encourages wide participation while minimizing participants' travel burdens and scheduling conflicts. Other companies, such as Idaho Power and PSE, similarly involve stakeholders and the public in the development of resource plans.

Funding

Vertically integrated utilities or distribution service providers bear the costs of resource planning and procurement, then pass the costs on to retail customers.

Best Practices: Participants

A wide variety of stakeholders can be included in the development of a portfolio management strategy, as shown in this example:



As discussed in Section 6.2, *Utility Incentives for Demand-Side Resources*, different regulatory policies create positive or negative incentives for regulated entities to pursue clean energy. Regulators can establish policies that provide utilities with the appropriate financial incentives to prepare and implement proper resource portfolios. These include incentives to:

- Design and implement cost-effective efficiency programs.

- Develop cost-effective DG options.
- Identify and implement the optimal mix of power plants and purchase contracts.
- Implement risk management techniques.
- Implement, update, and modify the resource plan over time to respond to changing market and industry conditions.

In some instances, cost recovery is not guaranteed, thereby creating an incentive for efficient and effective portfolio design and implementation. For example, in Iowa, the Iowa Utilities Board (IUB) can deny cost recovery when it is not satisfied with a utility's programs and budget.

Timing and Duration

Portfolio management approaches, both IRP and portfolio management for default service, usually incorporate regular planning and solicitation cycles—often ranging from one to five years. Many portfolio approaches include a long-range component (10–20 years) and a more short-term action plan (one to five years). Utilities can improve their portfolio management strategies by scheduling regular reviews and updates (perhaps annually) to accommodate new opportunities and energy use scenarios.

Interaction with State Policies

A variety of state programs and policies can be further leveraged by portfolio management strategies and can provide support to a state's portfolio management planning.

Renewable Portfolio Standard Policies

In the course of electric industry restructuring, many states adopted RPS, which require a given percentage of power from renewable power plants (see Section 5.1, *Renewable Portfolio Standards*). Some states, such as Connecticut and Massachusetts, have determined that default service supply must comply with RPS requirements just as competitive suppliers must comply. Recent legislation in Nevada allows a company to meet a portion of its RPS with energy efficiency programs.

RPS compliance can be a parallel process, not a constraint, to portfolio management, especially if RPS allows for renewable energy credits (RECs) to be used for procurement of electricity.

Energy Efficiency Programs

State agencies and legislatures can consider how energy efficiency programs will enhance the diversity and resilience of an energy resource portfolio. For vertically integrated utilities, energy efficiency has been a cornerstone of IRP for some time. However, default service suppliers are just now beginning to incorporate energy efficiency into their offerings. With restructuring, energy efficiency programs offer opportunities for lowering system-wide electricity costs and reducing customers' electricity bills. Energy efficiency also offers utilities the opportunity to reduce risk, improve reliability, mitigate peak demands, minimize environmental impacts, and promote economic development.

Even though utilities scaled back their energy efficiency programs during the 1990s, the primary rationale for implementing these programs—to reduce electricity costs and lower customer bills—is just as relevant in today's electricity industry. Consequently, energy efficiency can be a useful component in portfolio management, because it can (1) lower electricity costs and customers' bills, and (2) reduce the amount of generation needed from the market.

Some states have established a public benefits fund (PBF) to ensure that utilities acquire energy efficiency (see Section 4.2, *Public Benefits Funds for Energy Efficiency)*. In this case, all distribution companies collect a fixed charge from their customers to provide funding for energy efficiency activities. While PBFs help address some of the concerns that restructuring would reduce energy efficiency funding, they do not capture the full potential of cost-effective energy efficiency.

Consequently, some states ask utilities to use portfolio management to identify and implement additional energy efficiency. PSE in Washington includes energy efficiency based on a comprehensive assessment of technical potential. In its 2003 Integrated Resource Plan, the company identified resource needs that could be met with energy efficiency and followed up with an energy efficiency solicitation. During 2004, the company's electricity efficiency programs avoided about 20 megawatts (MW) of capacity need. For its 2005 Integrated Resource Plan, the company has taken a more targeted approach to energy efficiency, where competitive solicitation will focus on obtaining services for specific customer segments, end uses, or technologies rather than an open-ended solicitation.

In Minnesota, legislative mandates in 1982 and 1991 require utilities to develop conservation improvement programs (CIPs). Utilities include the CIP's energy saving goals in the IRPs, which are filed every two years with the PUC. Often, the utilities are required to complete an energy efficiency market potential study. In reviewing a company's IRP, the PUC sets 15-year demand-side management (DSM) goals for energy and capacity.

Energy Planning

Many states have undertaken comprehensive energy planning processes for the entire state (see Section 3.2, *State and Regional Energy Planning*). Portfolio management strategies are included in some states' energy planning processes and sometimes serve as a mechanism for implementing policy goals identified in the states' energy planning processes. For example, the forecasts developed by utilities in the course of the IRP process have been used to develop an electricity supply-and-demand forecast for the state as a whole. Once a state has established energy policy goals, such as the development of clean energy options, that policy goal can shape the implementation of portfolio management strategies. For example, states such as California that place a priority on certain clean resources require utilities to submit IRPs that are consistent with the overall state policy objectives.

Program Implementation and Evaluation

Portfolio management strategies have been effective when utilities, regulators, and other stakeholders are involved in the implementation process.

Regulators sometimes require utilities to submit portfolio management plans and progress reports at regular intervals. These plans and reports describe in detail

Best Practices: Developing and Adopting a Portfolio Management Policy

The best practices identified below will help states develop effective portfolio management policies. These best practices are based on the experiences of states that use portfolio management:

- Identify state policy goals for portfolio management, including reasonable power cost, stable supply, minimal environmental impacts, resource diversity, customer supply in immature markets, and risk minimization for customers and the utility.
- Identify the entity that will procure electricity resources—options include vertically integrated utilities, distribution utilities, and default service providers.
- Include a diverse representation of stakeholders in the development of the policy and process.
- Establish requirements for forecasting and determining resource needs.
- Determine the appropriate process for acquiring resources and comparing alternative resource options. Ensure that the goals of the process are clear, the process is transparent, the selection criteria are enunciated (including non-price factors), the supply and demand resources are considered, and there are mechanisms for fair procurement.
- Establish clear roles for utility and regulatory authorities (i.e., PUCs) in selecting evaluation criteria, reviewing proposals, and choosing final resources. Some states require an independent monitor to ensure a fair and trusted process.
- Consider finding a balance between the need for transparency and participation and the need for a manageable process.
- Require that all demand and supply resources be considered in meeting identified needs.

the assumptions used, the opportunities assessed, and the decisions made when developing resource portfolios. Regulators then carefully review these plans and either approve them or reject them and recommend changes needed for approval. California requires utilities to submit biennial IRPs and quarterly reports on their plans. Similarly, the IUB requires companies to submit annual reports on their energy efficiency and load management programs.

The Northwest Power and Conservation Council 2005 plan calls for monitoring key indicators that could affect the plan, such as loads and resources, conservation development, cost and availability of wind generation, and climate change science. The results of this monitoring would inform IRPs developed by the utilities in the Northwest Power and Conservation Council region.

Roles and Responsibilities of Implementing Organizations

The regulated entity (e.g., the utility or the default service provider) is responsible for implementing the portfolio management policy. This facility conducts the planning process and the resource solicitation process. It is also responsible for presenting the results of the portfolio management process in a policy forum as required by the state, usually a public proceeding before the state regulatory agency. The regulated entity is also responsible for contractual arrangements associated with any resources procured from a third party. While the regulated entity implements the policy, the state regulatory agency usually plays an oversight role, reviewing planning results and any procurement process.

Administering Body

State utility commissioners oversee utilities' and default service providers' procurement practices in their states. Typically, the commissions solicit comments and input as they develop portfolio management practices from a wide variety of stakeholders, including generation owners, default service providers, competitive suppliers, consumer advocates, renewable developers, environmental advocates, and energy efficiency advocates. The utility regulator may also play a role in reviewing and approving utilities' planning procedures, selection criteria, and/or their competition solicitation processes. PUCs in different states take different roles in the IRP process. For example, the California Public Utilities Commission (CPUC) has initiated a series of proceedings to design the IRP policy and to review and approve specific utility plans.

Best Practices: Implementing Policy/Programs

The best practices identified below will help utilities implement portfolio management requirements. These best practices are based on the experiences of states that use portfolio management.

- Establish a process that allows all interested parties to provide input and information.
- Prepare a clear, well-documented report that identifies available electricity or gas resources and resources that will be needed in the future.
- Identify all the resources available, both demand and supply, to help the utility meet its resource needs.
- Incorporate risk analyses into the plan to evaluate how different resource options address risks such as future environmental costs and other issues.
- Consider a wide variety of costs in long-term planning, including the societal costs of the environmental effects of power plants and the costs of complying with anticipated regulatory changes.
- Perform computer simulations of what happens when utilities integrate new resource alternatives with existing generation and transmission assets. Include existing demand-side resources.
- Determine an action plan for near-term needs. Identify when the utility may need to procure resources to meet its needs.
- For any competitive solicitation, establish clear requirements and a format for submitting proposals. These may differ for supply and demand resources. Evaluate potential resources according to predetermined criteria.
- Be prepared to consider technology-specific needs in the evaluation criteria; one size fits all may not necessarily be the appropriate approach.
- Identify difficulties with the process that require adjustments in the next forecast and solicitation process.

Evaluation

Portfolio management strategies can be evaluated at a number of levels. Policymakers, utilities, and stakeholders can evaluate the state policy on portfolio management or the utility-specific implementation of, and results from, the portfolio management strategy.

The state's policy on portfolio management can be reviewed in a regulatory proceeding to determine whether the overall policy is achieving stated public policy goals. This is usually spurred by the legislature or PUC.

Once a company has developed a resource plan, some states require a formal evaluation and approval. In other states, an integrated resource plan is filed and accepted without evidentiary review, and is only reviewed for form and completeness. In either case, the expectation is that subsequent utility resource acquisition and investment will conform with the plan unless there is sufficient justification for modification.

Some companies review the success of the plan and make adjustments according to evolving circumstances. For example, PacifiCorp uses an iterative process for updating its plan and ensuring that the plan is consistent with the company's business goals. In this case, the company's energy portfolios are analyzed based on how well they address PacifiCorp's energy supply and demand needs. In addition, the company looks at whether and how much the resources incur risk to utilities, default service providers, generators, and customers.

Utilities use a variety of techniques to quantify the uncertainties associated with a given portfolio and to evaluate the resilience and performance of a particular portfolio under different scenarios and future circumstances.

Evaluating Energy Efficiency Programs

While companies and regulators use a variety of tests to evaluate the cost-effectiveness of energy efficiency programs, many use the Total Resource Cost (TRC) Test as their main method for assessing their energy efficiency program offerings. The TRC Test incorporates the following benefits and costs:

- *Benefits* include avoided supply costs; a reduction in transmission, distribution, generation, and capacity costs; and a reduction in utility bills.
- *Costs* include program administration costs, the incremental costs to acquire and install an efficiency measure regardless of who pays for it, and the increase in supply costs for the periods in which load is increased.

The results of the TRC Test and other cost-effectiveness tests are typically expressed as a ratio of benefits to cost with more favorable programs achieving a benefit-cost ratio greater than or equal to one.[41] Individual measures can then be further screened based on the extent to which benefits exceed costs and other portfolio considerations such as those mentioned above.

Program administrators and their PUCs may require one or more tests to be used for screening the cost-effectiveness of individual measures and programs and whole portfolios. For example, California recently proposed adding the Program Administrator Test as a secondary screening measure to ensure that utilities do not provide excessive financial incentives to program participants (i.e., incentives in excess of incremental measure costs). Some of the most common tests include:

- The *Participant Test*, which takes into account benefits and costs from a participant's perspective.
- The *Rate Impact Measure (RIM) Test*, which takes into account what happens to a customer's bills or

41 While utilities and PUCs most often express program performance in terms of benefit-cost ratios, it is also helpful to express program costs and benefits in terms of $/kilowatt-hour (kWh). Consumers and legislators can easily relate this metric to the cost of energy in their own area, while utilities and regulators can compare this value to the cost of other resources such as new generation. When expressed this way, the annual levelized TRC ($/kWh) captures the net program and customer costs divided by the projected lifetime savings of the measure or program. Demand-side resource costs can also be calculated in $/kilowatt (kW) to illustrate the value during periods of peak demand.

rates because of changes in revenues and operating costs caused by a program.

- The *Program Administrator Test*, which takes into account the benefits and costs from the program administrator's perspective.
- The *TRC Test*, which takes into account the combined benefits and costs from both the utility's and program participants' perspectives.
- The *Societal Test*, which is similar to the TRC Test, but includes the effects of other societal benefits and costs such as environmental impacts, water savings, and national security.

More information on the typical costs and benefits included in these tests can be found in the *Information Resources* section on page 6-20. States that choose to apply only one test are moving away from the RIM Test because it does not account for the interactive effect of reduced energy demand from efficiency investments on longer-term rates and customer bills. Iowa calls for using several tests in evaluating the cost-effectiveness of utilities' energy efficiency plans. In addition, the IUB conducts periodic regulatory proceedings to review utilities' proposed energy efficiency plans and how they are implemented.

In addition, one important consideration when evaluating energy efficiency and other demand-side resources in comparison with supply-side resources is recognizing the effect of a particular program or investment on the utility's demand curve. An energy efficiency program or other demand-side measure that reduces demand during peak pricing times will provide greater financial benefits than one that reduces demand in low-cost periods. Thus, a simple average of costs and savings across many hours may underestimate the value of a demand-side investment.

Best Practices: Evaluating Policy/Programs

The best practices identified below will help utilities evaluate portfolio management strategies. These best practices are based on the experiences of states that use portfolio management.

- Provide a state procedure for feedback about the policy and how it was implemented. This could include a periodic policy review, a review of written comments, or a review of comments provided within the context of the periodic portfolio management submissions.
- Establish a utility-based procedure for evaluating and obtaining feedback on how the policy was implemented. This could be a regular stakeholder process or other mechanism.
- Evaluate the outcome of each procurement cycle. Consider the appropriateness of the evaluation criteria, how easy it was to participate in the procurement process, perceptions of fairness, and whether the utility was successful in meeting its goals.
- Evaluate the cost-effectiveness of the energy efficiency resources procured as part of the portfolio management strategy. Use a variety of tests, including Societal Cost Tests and TRC Tests.

State and Regional Examples

Oregon

Investor-owned gas and electric utilities file individual least-cost plans or IRPs with the PUC every two years. The plans, required since 1989, cover a 20-year period. The primary goal is to acquire resources at the least cost to the utility and ratepayers in a manner consistent with the public interest. These plans are expected to provide a reasonable balance between least cost and risk. By filing these plans, the utilities hope that in future proceedings the PUC will not reject, and prevent utilities from recouping, some of the costs associated with resource acquisition.

One of the factors that Oregon utilities must consider is the uncertainty associated with certain choices. They consider risk factors such as price volatility, weather, and the costs of current and potential federal regulations, including regulations that address carbon dioxide (CO_2) emission standards. Recently, the utilities have considered nonquantifiable issues that affect planning. These issues include potential changes in market structure, the establishment of RPS, changes in transmission operation and control, and the effect of PacifiCorp's multi-state process on regulation and cost-recovery. Environmental externalities (i.e., the environmental costs associated with different choices) are considered if they are quantifiable as actual or potential costs.

The state imposes different energy efficiency requirements for different utilities. Idaho Power is required to include energy efficiency. PacifiCorp and PGE are no longer required to evaluate energy efficiency as a resource in Oregon, but must include its impact on load forecasts.

In its 2004 integrated resource plan, PGE states that its recommended resource strategies include strong commitments to upgrading existing PGE power plants, encouraging energy efficiency measures, and acquiring newly developed renewable energy. As a result, approximately 50% of PGE's forecasted load growth between 2004 and 2007 is expected to come from sustainable measures instead of new resources that depend on additional fossil fuels (PGE 2004).

Web site:
http://www.portlandgeneral.com/about_pge/news/irp_opucAcknowledgement.asp?bhcp=1

California

In the beginning of 2003, CPUC ordered the three California utilities—San Diego Gas & Electric (SDG&E), Pacific Gas & Electric (PG&E), and Southern California Edison (SCE)—to resume the role of planning for and buying electricity to meet customer needs. This order followed a two-year period of testing customer choice in retail markets. In Decision 04-01-050, CPUC adopted the long-term regulatory framework under which utilities would plan for and procure energy resources and demand-side investments.

CPUC directed the utilities to prioritize their resource procurements and to follow the priorities, or "loading order," established in the state's EAP. The EAP identifies certain demand-side resources as preferred because California believes that they work toward optimizing energy conservation and resource efficiency while reducing per capita demand. The EAP also identifies certain preferred supply-side resources. The EAP established the following priority list:

1. Energy efficiency and demand response.
2. Renewable energy (including renewable DG).
3. Clean fossil-fueled DG and clean fossil-fueled central-station generation.

CPUC requires each utility to submit a 10-year procurement plan biennially, detailing its demand forecasts and showing how it plans to meet that demand. The plans must demonstrate that the utility has adequate, reliable supplies and complies with CPUC goals for efficiency and renewable energy. Utilities must file plans that include three scenarios—low load, medium load, and high load. To date, CPUC has approved long-term procurement plans for PG&E, SCE, and SDG&E.

The long-term procurement plan guides each utility's procurement activities. When the utility anticipates needing fossil fuel sources, it must initiate a competitive process designed to ensure that it compares renewable and fossil fuel energy sources. CPUC has directed the utilities to include the costs of CO_2 emissions in their long-term procurement plans and resource evaluation. Utilities must file monthly risk assessments and quarterly reports on the implementation of their plans.

Based on its first comprehensive review of the implementation of the loading order, California Energy Commission (CEC) staff found different success rates for different resources. For example, the state and its utilities are currently ahead of their goals for energy efficiency, but are having a harder time meeting their goals for demand response and renewables. The state continues to work on reducing barriers to DG and to take steps to meet the goals of the loading order policy (CEC 2005).

SCE's request to meet an anticipated energy shortfall during Summer 2005 with an additional $38 million in efficiency programs demonstrates that the utility is following the EAP's priorities.

Web site:
http://www.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/43224.doc

Iowa

Since 1990, the IUB has required Iowa's four investor-owned gas and electric utilities to develop and implement energy efficiency plans that provide opportunities for all customers to reduce electricity and natural gas demand, thereby reducing their bills. Although not part of a traditional IRP process, Iowa's program illustrates how well-designed portfolio management strategies support energy efficiency.

The IUB developed administrative rules for investor-owned utilities based on legislation enacted in 1990 and 1996. The state legislature played a key role in enacting this legislation. It initially requested direction from the IUB to help shape legislation and then through the legislation directed the IUB to establish energy efficiency and load management requirements.

The IUB and the Iowa Department of Natural Resources (DNR) develop capacity and energy savings performance standards for each utility, and each utility must propose a plan and budget for achieving those standards. In developing their plans, the utilities must perform studies that look at the potential of energy efficiency. The legislature directed the board to use several cost-effectiveness tests (i.e., a Societal Test, utility cost test, ratepayer impact test, and Participant Test) in evaluating the overall cost-effectiveness of plans. Each test evaluates the costs and benefits of the program from the perspective of a particular entity. The Societal Test takes into account the environmental effects of resource choices, requiring utilities to compare options by adding 10% to the cost of fossil fuel generation to account for its environmental effects.

In 2001, the IUB requested that each utility provide new energy efficiency plans. As a result, utility energy efficiency spending has increased to above the peak spending levels reached in the early 1990s, an amount that is equivalent to 2% of electric utility revenues and 1.5% of gas utility revenues. Iowa's electric and gas utilities are investing $80 million annually in energy efficiency and load management programs. These programs are saving 1,000 MW of electrical capacity per year (15% of summer peak demand) and more than 1 million megawatt-hours (MWh) per year. The plans, approved in 2003, are estimated to result in a net savings of $650 billion over five years (Iowa Department of Natural Resources 2004).

The IUB's energy efficiency planning rules include the following requirements:

- Utilities assess the potential for energy efficiency in each sector and submit an energy efficiency plan that identifies economically achievable programs and describes how the savings will be achieved.
- The IUB conducts case proceedings to review the plans. The proceedings involve a range of stakeholders, including the Office of Consumer Advocate, large industrial customers and environmental groups, and the Iowa DNR, which serves as the state energy office.
- The IUB establishes annual performance goals and budgets for each utility's DSM programs and reviews each utility's energy efficiency plan and budget.

In conjunction with utilities and stakeholders, the IUB developed an automatic cost recovery adjustment mechanism that allows utilities to recover the costs of DSM and load management programs. The IUB conducts a regulatory proceeding to evaluate the reasonableness of plan implementation and the budget. The IUB can deny cost recovery if not satisfied with the utility's implementation and expenditures.

The energy efficiency plans are incorporated into utility load forecasts, and utilities are required to estimate how energy efficiency helps them avoid acquiring new capacity or new resources.

Web site:
http://www.state.ia.us/dnr/energy/MAIN/PUBS/CEP/index.html

Vermont

Vermont's State Energy Policy places a strong emphasis on efficient resource use and environmentally sound practices in the provision of adequate, reliable, secure, and sustainable energy service. Legislation requires that each regulated electric and gas company prepare and implement a least-cost integrated resource plan for providing service to its Vermont customers. Under the law pertaining to IRP (30 V.S.A. § 218c. Least Cost Integrated Planning), utilities are required to prepare a plan for providing energy service at the lowest present value life cycle cost, including environmental and economic costs.

The state also prepares a statewide energy plan. The 2005 Vermont Electric Plan, the first update since 1994, contains detailed requirements for electric utilities' integrated resource plans. It also provides a decision framework for addressing uncertainties and multiple contingencies in energy resource selection. These requirements are intended to guide the utilities' planning processes to provide electric service at the lowest present value life cycle cost, including environmental and economic costs. The integrated resource plans should include a combination of supply and demand resources as well as transmission and distribution investments. The process outlined in the Electric Plan is also intended to facilitate information exchange among utilities, regulatory agencies, and the public.

Web site:
http://publicservice.vermont.gov/divisions/planning.html

Northwest Power and Conservation Council

The Northwest Power and Conservation Council was created by Congress in 1980 through the Pacific Northwest Electric Power Planning and Conservation Act. The Act requires The Northwest Power and Conservation Council to develop a 20-year power plan to assure the region of an adequate, efficient, economical, and reliable power system. The plan is updated every five years.

The Fifth Northwest Electric Power and Conservation Plan, issued in May 2005, is the most recent plan. The purpose of the plan is to develop plans and policies that enable the region to manage uncertainties that affect the power system and to mitigate risks associated with those uncertainties. The Fifth Plan contains recommended action items for the next five years as well as recommendations beyond five years to prepare the region for possible future scenarios.

The plan includes clean energy options as the primary options to reduce costs and mitigate risks. Clean energy options include energy conservation and efficiency (targeted at 700 MW between 2005 and 2009), demand response (targeted at 500 MW between 2005 and 2009), and wind (targeted at 1,100 MW between 2005 and 2014) from system benefits charges (SBCs) and utility integrated resource plans. To prepare for potential new resources in the future, the plan includes steps to secure sites and permits for expansion of wind resources and develop possible coal gasification facilities, conventional coal resources, and natural gas facilities. The plan also calls for monitoring key indicators that could affect the plan (such as loads and resources, conservation development, cost and availability of wind generation, and climate change science).

Web site:
http://www.nwcouncil.org/energy/powerplan/plan/Default.htm

PacifiCorp

PacifiCorp prepares an integrated resource plan for providing electricity to 1.6 million Pacific Power and Utah Power customers throughout Oregon, Washington, Idaho, Wyoming, California, and Utah. The company states that the integrated resource plan is not only a regulatory requirement but is also the primary driver in the company's business planning and resource procurement process.

The 2004 integrated resource plan determined that the most robust resource strategy relies on a diverse portfolio of resources that includes renewable energy, DSM, and natural gas and coal-fired generating resources. The plan identified a need for 2,700 MW of capacity by 2014, and emphasized the company's continuing intention of procuring 1,400 MW of wind capacity and demand-side resources (including energy efficiency). PacifiCorp is currently planning for the 2006 IRP cycle.

The integrated resource plan was developed with public involvement from customer interest groups, regulatory staff, regulators, and other stakeholders. It simulates the integration of new resource alternatives with the company's existing assets and compares their economic and operational performance. The method also accounts for future uncertainties by testing resource alternatives against measurable future risks. The integrated resource plan also looks at possible paradigm shifts in the industry; for example, it accounts for the uncertainty associated with future carbon regulations by increasing the cost of fossil fuel suppliers (for the purpose of comparing resources) by $8 per ton of CO_2 emitted by fossil fuel plants. The result is a flexible resource strategy centered on the least-cost, risk-weighted mix of resource options.

Web site:
http://www.pacificorp.com/Navigation/Navigation23807.html

Idaho Power

The Idaho PUC requires electric utilities to file an integrated resource plan every two years. The plan details the utility's 10-year plan for providing electricity to retail customers in Idaho and Oregon. In preparing its integrated resource plan for 2004, Idaho Power worked with an Integrated Resource Plan Advisory Council comprising PUC representatives, the Governor's office, state legislators, members of the environmental community, major industrial customers, irrigation representatives, and others. The 2004 integrated resource plan has two primary goals: (1) to identify resources to provide a reliable power supply for the 10-year planning period, and (2) to ensure that the resource portfolio balances cost, risk, and environmental impact. Two secondary goals of the integrated resource plan are to consider supply and demand resources in a balanced fashion and to provide meaningful public input in development of the integrated resource plan.

In developing its plan, Idaho Power analyzed 12 potential resource portfolios, five of which were selected for additional risk analysis. Based on the risk analysis, the preferred portfolio was a diversified one that included nearly equal amounts of renewable generation and conventional thermal generation. The preferred portfolio presented resource acquisition targets for resources including demand response, energy efficiency, wind, geothermal, combined heat and power (CHP), natural gas, and conventional coal, increasing the capacity of the system almost 940 MW over the planning period.

As a result of the 2004 integrated resource plan, Idaho Power intends to issue several requests for proposals (RFPs) before the next integrated resource plan for resources including wind, geothermal, and peaking combustion turbines. The company will also undertake activities relative to demand-side measures and energy efficiency.

Idaho Power has also designed a risk management policy that addresses the short-term resource decisions required in response to changes in load, resources, weather, and market conditions. The risk management policy typically covers an 18-month period and is intended to supplement the long-term IRP process.

Web site:
http://www.idahopower.com/pdfs/energycenter/irp/2004_IRP_final.pdf

Puget Sound Energy

PSE prepares a Least Cost Plan every two years in response to state regulatory requirements. The plan details how the company plans to provide electricity to retail customers in 11 counties in Washington. The company held numerous formal and informal meetings, providing opportunity for public input to the plan.

PSE's 2005 Least Cost Plan identifies plans for acquiring energy efficiency and renewable resources in the near- and long-term, as well as some conventional fossil generation in the long-term. In developing the plan, PSE used scenarios to evaluate risks and portfolio performance associated with certain potential futures.

Web site:
https://www.pse.com/about/supply/resourceplanning.html

Clean Energy Requirements in Retail Choice States

Connecticut

Connecticut is an example of a retail choice state with a clear, multifaceted clean energy approach. The state requires all generators that provide transitional offer service (Connecticut's standard offer service) to customers to comply with the state's RPS. In addition to the RPS, Connecticut requires its transitional offer service providers to sign contracts for renewable energy totaling 100 MW. Separate from the RPS requirements, Connecticut offers its transitional service customers the option of choosing from one of two clean energy programs. Under either program, customers can pay a premium and purchase either 50% or 100% of their resources through clean energy. Finally, competitive generators that serve Connecticut customers outside of the transitional offer service must also comply with the state's RPS.

Web site:
http://www.ctcleanenergy.com

Pennsylvania

Pennsylvania has taken a different approach to increasing use of clean energy. The state created four funds as a result of restructuring plans. These funds are designed to promote the development of sustainable and renewable energy programs and clean-air technologies on both a regional and statewide basis. The funds have provided more than $20 million in loans and $1.8 million in grants to more than 100 projects. In addition, 20% of standard offer customers are assigned to suppliers that are required to use at least 5% renewable generation.

Web site:
http://www.puc.state.pa.us/utilitychoice/electricity/green_clean.aspx

Montana

Montana established electric least-cost planning rules and policy guidelines that apply to default supply utilities for long-term electric supply resource planning and procurement. Under the "traditional" planning process, the affected utility is required to submit an integrated resource plan every two years. The state also has a "restructured" planning process for one distribution company, where the utility must file a portfolio action plan every year. In both the traditional and restructured processes, the utility must file a long-range plan that includes demand-side resources and supply-side resources. However, the traditional plan must reflect the "least societal cost" and include estimates of the environmental costs of certain options. The restructured plan does not include these factors.

The guidelines for default service state that the objective of the planning process is to assemble and maintain a balanced, environmentally responsible portfolio of power supply and demand-management resources. Both planning processes require utilities to consider the costs of complying with existing and potential environmental regulations.

Nevada

Nevada's 1997 restructuring legislation established an RPS requiring utilities to obtain a minimum percentage of the total electricity they sell from renewable energy resources. The RPS percentages were increased in 2001 and again in 2005. The 2005 revision contained in Assembly Bill 03 (A.B.3) not only increased the required percentage, but also allowed utilities to meet the standard through energy savings from efficiency measures and renewable energy generation (or credits). Energy efficiency can be used to meet up to one-quarter of the standard in a given year. The 2005 legislation sets new requirements for the total amount of electricity that utilities sell from renewable energy resources at 6% in 2005, rising to 20% in 2015. The PUC must write regulations to implement the legislation.

Web site:
http://leg.state.nv.us/22ndSpecial/bills/AB/AB3_EN.pdf

On the Horizon

Clean energy requirements for default service providers are a relatively new concept that states are exploring. For example, in Illinois, the governor organized a sustainable energy plan initiative with the goal of developing RPS, demand response, and energy efficiency programs. The initiative includes input from utilities, consumer groups, large industrial customers, government agencies, and other industry participants. The Illinois Commerce Commission gathered this input to develop an overall clean energy implementation plan for the state, including voluntary renewable and energy efficiency portfolio standards for public utilities and alternative electricity providers. States are likely to continue to expand these approaches as they seek to ensure that customers are served with portfolios that minimize risks, provide stable prices, and reduce long-term costs. States that are interested in expanding the use of portfolio management in resource procurement may wish to pursue policy approaches that incorporate renewables and energy efficiency into energy service supply in restructured states.

What States Can Do

Many states have found that portfolio management strategies offer a useful and effective tool for implementing their clean energy policy goals. These strategies emphasize the development of a portfolio of resources that are resilient under a wide variety of possible future scenarios and that achieve a wide variety of benefits. States can tailor their portfolio management strategies to meet their specific clean energy objectives.

Action Steps for States

States that already have a portfolio management policy or program can:

- Link their portfolio management policy to other state policies, such as RPS, energy efficiency, and energy planning policies.
- Review the portfolio management policy regularly and adjust the portfolio as appropriate.
- Assess transmission policies and how they influence generation. Decisions regarding the maintenance or enhancement of transmission and distribution (T&D) facilities will have important consequences for the development of generation and efficiency resources and vice versa. Portfolio managers can consider not only the generation resources that are available with the existing transmission system, but also those that could be tapped via new or upgraded transmission. Conversely, portfolio managers can also consider whether costly T&D upgrades and enhancements can be deferred or avoided. This involves considering the strategic placement of power plants, energy efficiency investments, or DG technologies.

States that do not have a portfolio management policy or program can:

- Educate stakeholders about the benefits of portfolio management, including more stable prices, risk mitigation, lower long-term costs, and a cleaner environment.
- Review other state practices and current utility portfolio management practices.
- Develop a comprehensive policy with clear provisions for program review and modification.

When modifying or adopting portfolio management requirements, states are moving towards policies and programs that strive to minimize total revenue requirements (i.e., total bills paid by customers) rather than electricity rates.

Information Resources

Information About States

State	Title/Description	URL Address
California	Decision 0412048—opinion adopting PG&E, SCE, and SDG&E's long-term procurement plans.	http://www.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/43224.doc Other decisions at: http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/43479.htm
	CPUC interim decision on administrative structure for energy efficiency program delivery, designating IOUs for the lead role in program choice and portfolio management.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/43628.htm
Connecticut	An example of a state's comprehensive approach to clean energy.	http://www.ctcleanenergy.com
Illinois	Sustainable energy plan initiative to develop an RPS, demand response, and energy efficiency.	http://www.icc.illinois.gov/en/ecenergy.aspx
Iowa	2004 Energy Plan Update.	http://www.state.ia.us/dnr/energy/MAIN/PUBS/CEP/index.html
	2005 Iowa Code: energy efficiency program requirements at Chapter 476.6 (14), and Chapter 467.6(16)–(18).	http://www.legis.state.ia.us/IowaLaw.html
Maine	Another example of how a restructured state thinks about clean energy.	http://www.maine.gov/mpuc/consumer/industry/electricity/index.html
Nevada	A.B.3, June 2005, increasing the RPS and allowing up to one-quarter of the required percentage to be met through energy efficiency measures.	http://leg.state.nv.us/22ndSpecial/bills/AB/AB3_EN.pdf
New Jersey	A detailed description of New Jersey's auction approach to default service.	http://www.bgs-auction.com
Oregon	A brief description of Portland General Electric's 2002 Integrated Resource Plan.	http://www.portlandgeneral.com/about_pge/news/irp_opucAcknowledgement.asp?bhcp=1
Pennsylvania	Information about how the PUC is helping to promote and encourage renewable energy development in Pennsylvania, and a link to the Office of Consumer Advocate's Web site where consumers can find out more information about choosing a "green supplier." Consumers also can find information about air pollution from power plants, fuel sources, and RPS.	http://www.puc.state.pa.us/utilitychoice/electricity/green_clean.aspx
Vermont	Vermont Department of Public Service, 2005 Vermont Electric Plan.	http://publicservice.vermont.gov/divisions/planning.html

State	Title/Description	URL Address
Washington	2005 Biennial Energy Report discusses IRP in the Pacific Northwest.	http://www.cted.wa.gov/_CTED/documents/ID_1872_Publications.pdf
Northwest	Northwest Power and Conservation Council issued its Fifth Northwest Electric Power and Conservation Plan in May 2005. The purpose of the plan is to develop plans and policies that enable the region to manage uncertainties that affect the power system and to mitigate risks associated with those uncertainties.	http://www.nwcouncil.org/energy/powerplan/plan/Default.htm
All States	The Regulatory Assistance Project (RAP) has a survey of some states' IRP practices and discussions of portfolio management that can be found in their subject menu.	http://www.raponline.org

Information About Companies

Title/Description	URL Address
Idaho Power Corporation's IRP	http://www.idahopower.com/energycenter/2004irp.htm
PacifiCorp's IRP	http://www.pacificorp.com/Navigation/Navigation23807.html
PSE's IRP	http://www.pse.com/about/supply/resourceplanning.html

Articles and Reports About Portfolio Management Policy and Specific Programs

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American Public Power Association (APPA) 2004. Guidebook to Expanding the Role of Renewables in a Power Supply Portfolio. Prepared by Altera Energy, Inc. September.	http://www.appanet.org/store/ProductDetail.cfm?ItemNumber=11356
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CPUC. Administrative Law Judge's Ruling Soliciting Pre-Workshop Comments on Draft Policy Rules for Post 2005 Energy Efficiency Programs. Rulemaking 01-08-028.	http://72.14.207.104/search?q=cache:W0vPdKbutFgJ:www.cpuc.ca.gov/word_pdf/RULINGS/42616.doc++Administrative+Law+Judge%E2%80%99s+Ruling+Soliciting+Pre-Workshop+Comments+on+Draft+Policy+Rules+for+Post+2005+Energy+Efficiency+Programs&hl=en
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Illinois Commerce Commission Resolution on Governor's Sustainable Energy Plan (05-0437). 2005. July 19.	http://eweb.icc.state.il.us/e-docket/reports/view_file.asp?intIdFile=148072&strC=bd
Illinois Sustainable Energy Initiative ICC Staff Report. 2005. July 7.	http://www.icc.illinois.gov/docs/en/050713ecEnergyRpt.pdf
Joint Statement of Natural Resources Defense Council (NRDC) and Edison Electric Institute on portfolio management.	http://naruc.org/associations/1773/files/eei_nrdc.pdf
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PSE. 2005. Least Cost Plan. April.	http://www.pse.com/about/supply/resourceplanning.html
RAP. 2005. Clean Energy Policies for Electric and Gas Utility Regulators. January.	http://www.raponline.org/Pubs/IssueLtr/RAPjan2005.pdf
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6.2 Utility Incentives for Demand-Side Resources

Policy Description and Objective

Summary

Regulators in leading states are reworking traditional ratemaking structures to better align utilities' investment incentives and related decisions with state interest in providing affordable and reliable energy supplies with low environmental impacts. Financial incentive structures for utilities can help align company profit goals with the delivery of cost-effective demand-side resources such as energy efficiency and clean DG. Traditional regulatory approaches link a utility's financial health to the volume of electricity or gas sold via the ratemaking structure, thus providing a disincentive to investment in cost-effective demand-side resources that reduce sales. The effect of this linkage is exacerbated in the case of distribution-only utilities, since the revenue impact of electricity sales reduction is disproportionately larger for utilities without generation resources. Aligning utility aims by decoupling profits from sales volumes, ensuring program cost recovery, and providing shareholder performance incentives can "level the playing field" to allow for a fair, economically based comparison between supply- and demand-side resource alternatives and can yield a lower cost, cleaner, and more reliable energy system.

While some utilities manage aggressive energy efficiency and clean distributed generation (DG) programs as a strategy to diversify their portfolio, lower costs, and meet customer demand, many still face important financial disincentives to implementing these programs. Regulators can establish or reinforce several policies to help address these disincentives, including decoupling of profits from sales volumes, ensuring program cost recovery, and defining shareholder performance incentives.

Objective

Financial incentive structures for utilities can be designed to encourage utilities to actively promote implementation of energy efficiency and clean DG when it is cost-effective to do so. This includes first minimizing utilities' financial disincentives to deliver energy efficiency and DG resources and then instituting complementary incentive structures to promote and establish high-performing energy efficiency and DG resources. These utility disincentives can be reduced through the elimination or minimization of "throughput disincentives" embedded in traditional ratemaking mechanisms. Complementary incentive structure objectives include ensuring recovery of costs for effective, economic energy efficiency and DG programs and rewarding utility management and shareholders for well-run and well-performing energy efficiency and DG installation and promotion.

Benefits

States have found that a well-designed framework for utility incentives helps utilities increase the use of energy efficiency and clean DG, which reduces the demand for central station electric generation, lowers consumption and demand for natural gas, reduces air pollution, and decreases the load on transmission and distribution systems.

Such a utility incentive structure can also lead to an increase in the reliability of electric power and gas delivery systems resulting from the increased use of energy efficiency and DG resources. Delivering cost-effective energy efficiency or DG resources reduces a utility's need to build expensive new central station power plants or transmission lines—or expand existing ones—and thus maximizes the value of a utility's existing gas or electric capacity. Energy efficiency and clean DG programs can also lower overall production costs and average prices.

Background on Utility Incentive Structures

A large majority of electric utility costs, including costs for non-jurisdictional energy service companies such as municipalities and cooperatives, are fixed to pay for capital-intensive equipment such as wires, poles, transformers, and generators. Utilities recover most of these fixed costs through volumetric-based rates, which change with each major "rate case," the traditional and dominant form of state-level utility ratemaking. Between rate cases, however, utilities have an implicit financial incentive to see increased regulated retail sales of electricity (relative to forecast levels, which set "base" rates) and to maximize the "throughput" of electricity across their wires. This ensures recovery of fixed costs and maximizes allowable earnings; however, it also creates a disincentive to investing in energy efficiency during the time between rate cases. Recovery of variable costs in some states is assured through regular (usually quarterly) adjustments (e.g., for fuel) and thus does not impose analogous disincentives. Utilities with regular adjustments for variable fuel expenses have an even greater disincentive for energy efficiency than utilities that do not.

With traditional ratemaking, there are few or no mechanisms to prevent "over-recovery" of these fixed costs, which occurs if sales are higher than projected, and no way to prevent "under-recovery," which can happen if forecast sales are too optimistic (such as when weather or regional economic conditions deviate from forecasted or "normal" conditions). This dynamic creates an automatic disincentive for utilities to promote energy efficiency or DG, because those actions—even if clearly established and agreed-upon as a less expensive means to meet customer needs—will reduce the amount of money the utility can recover toward payment for fixed costs.

If ratemaking explicitly accounted for this effect, for example, by allowing more frequent true-ups to rates to reflect actual sales and actual fixed cost revenue requirements, then this disincentive would be removed or minimized and energy efficiency options would then be able to compete on a level playing field with alternative supply options. A simplified illustration of this decoupling rate effect is shown in Table 6.2.1. Separate, supplemental shareholder

Table 6.2.1: Simplified Illustration of Decoupling Rate Effect

Rates and fixed cost recovery during initial period:			
	Sales At Forecast	Sales Below Forecast	Sales Above Forecast
Sales Forecast	100 kWh		
Fixed Cost[a]	$6.00		
Variable Cost[b]	$0.04 per kWh		
Total Variable Cost	$4.00	$3.80	$4.20
Total Costs [Fixed + Variable]	$10.00	$9.80	$10.20
Authorized Rate [Costs Sales Forecast]	$0.100 per kWh		
Actual Sales	100 kWh	95 kWh	105 kWh
Actual Revenues	$10.00	$9.50	$10.50
Fixed Cost Recovery [Revenue - Cost]	Even $0.00	Under ($0.30)	Over $0.30
Rates in next period after decoupling true up:			
	Sales At Forecast	Sales Below Forecast	Sales Above Forecast
Sales Forecast[c]	100 kWh		
Total Costs[c]	$10.00		
Revenue Requirement [Total Costs - Fixed Cost Recovery]	$10.00	$10.30	$9.70
New Authorized Rate [Revenue Requirement Sales Forecast]	$0.100 per kWh	$0.103 per kWh	$0.097 per kWh

a Fixed costs include return on rate base.
b Variable costs include operating costs of power plants.
c Assumes values from initial period for illustrative purposes.

Sources: PG&E 2003, Bachrach et al. 2004.

incentive mechanisms, such as performance-based return on equity (ROE) guarantees, could then operate more effectively in the absence of the disincentive that the standard ratemaking otherwise imposes on utilities. Frequent true-ups and shareholder incentives are more desirable relative to high fixed rates since fixed rates greatly diminish customers' incentives for energy efficiency.

States with Utility Incentive Programs for Demand-Side Resources

States have found three steps for leveling the playing field for demand-side resources through improved utility rate design:

- *Remove Disincentives*. Some states have removed structures that discourage implementation of energy efficiency and clean DG through "decoupling" efforts that divorce profits from sales volumes.
- *Recover Costs.* Some states have given utilities a reasonable opportunity to recover the costs of energy efficiency and clean DG programs (i.e., cost recovery of implementation costs). Cost recovery alone does not remove the financial disincentive needed to further expand a utility's commitment to maximizing energy efficiency and clean DG.
- *Reward Performance.* Some states have created shareholder incentives for implementing high-performance energy efficiency and clean DG programs. These incentives are usually in the form of a higher return on investment for energy efficiency if the programs demonstrate measured or verified success, i.e., an actual reduction of energy use from program implementation. States can also reward performance by using shared-savings mechanisms.

The first mechanism is critically important to allowing the second and third mechanisms to be meaningful. Removing disincentives first gives utility management a consistent framework for providing reliable, economic electric or gas service because it allows utilities to profitably invest in energy efficiency and DG resources without being penalized for lower sales volumes. Utilities can then aim to achieve implementation of high-performing energy efficiency and DG resources through superior management practices that result in assured cost recovery and lead to financial rewards for shareholders.

These three approaches, especially when used together, have helped provide a level playing field for demand-side resource consideration. A number of states, including Arizona, California, Connecticut, Colorado, Idaho, Maine, Massachusetts, Minnesota, New Hampshire, New Mexico, New York, Nevada, Oregon, Rhode Island, and Washington, have had or are reviewing one or more of these forms of decoupling and incentive regulation.

Remove Disincentives Through Decoupling or Lost Revenue Adjustment Mechanisms

Traditional electric and gas utility ratemaking mechanisms unintentionally include financial disincentives for utilities to support energy efficiency and DG. This misalignment can be remedied through "lost revenue" adjustment mechanisms or mechanisms that "decouple" utility revenues from sales.

Lost Revenue Adjustment Mechanisms (LRAMs) allow a utility to directly recoup the "lost" revenue associated with not selling additional units of energy because of the success of energy efficiency or DG programs in reducing electricity consumption. The amount of lost revenue is typically estimated by multiplying the fixed portion of the utility's prices by the energy savings from energy efficiency programs or the energy generated from DG. This amount of lost revenues is then directly returned to the utility. Some states have adopted these mechanisms, but experience has shown that LRAM can result in utilities being allowed more lost revenues than the energy efficiency program actually saved because the lost revenues are based on projected savings. Furthermore, because utilities still earn increased profits on additional sales, this approach leaves a disincentive for utilities to implement additional energy efficiency or support independent energy efficiency activities. The LRAM approach provides limited incentives and does not influence efficient utility operations company-wide like other decoupling approaches.

Decoupling is an alternative means of eliminating lost revenues that might otherwise occur with energy efficiency and DG resource implementation. Decoupling is a variation of more traditional performance-based ratemaking (PBR). Under traditional ratemaking, a utility's rates are set at a fixed amount until the next rate case occurs at an undetermined point in time. Under traditional PBR, a utility's rates are typically set for a predetermined number of years (e.g., five years). This type of PBR is referred to as a "price cap" and is intended to provide utilities with a direct incentive to lower cost (and thereby increase profits) during the term of the price cap.

Decoupling is a variation of traditional PBR, and it sometimes is referred to as a particular form of "revenue cap." Under this approach, a utility's *revenues* are fixed for a specific term, in order to match the amount of anticipated costs incurred plus an appropriate profit. Alternately, a utility's revenues per customer could be fixed, thus providing an automatic adjustment to revenues to account for new or departing customers. If the utility can reduce its costs during the term through energy efficiency or DG, it will be able to increase its profits. Furthermore, if a utility's sales are reduced by any means, including efficiency, DG, weather, or economic swings, its revenues and therefore its profits will not be affected. This approach completely eliminates the throughput disincentive and does not require an accurate forecast of the amount of lost revenues associated with energy efficiency or DG. It does, however, result in the potential for variation in rates or prices, reflecting an adjustment to the relationship between total revenue requirements and total electricity or gas consumed by customers over the defined term. Such rate adjustments, or "true-ups," are a fundamental aspect of the rate design resulting from decoupling profits from sales volumes.

Table 6.2.2 compares decoupling with a lost revenues approach and illustrates why decoupling is simpler and more effective than LRAM. As the table illustrates, decoupling appears to be a more comprehensive approach to aligning utility incentives. While it requires more effort to establish a complete decoupling mechanism, it avoids the downsides of lost revenue approaches.

As an example, California's original decoupling policy, an Electric Rate Adjustment Mechanism (ERAM), was in place between 1982 and 1996 and was successful in reducing rate risk to customers and revenue risk to the major utility companies (Eto et al. 1993). California dropped its decoupling policy in 1996 when restructuring was initiated. When competition did not deliver on its promise, California recently brought back a decoupling approach as part of a larger effort to reinvigorate utility-sponsored energy efficiency programs. Conversely, Minnesota tried a lost revenues approach and met strong customer opposition because there was no cap on the total amount of revenues that could be recovered.

Table 6.2.2: Approaches for Removing Disincentives to Energy Efficiency Investment: Decoupling vs. Lost Revenue Adjustments

Decoupling	Lost Revenue Adjustments
Removes sales incentive and all demand-side management (DSM) disincentives.	Removes some DSM disincentives.
Does not require sophisticated measurement and/or estimation.	Requires sophisticated measurement and/or estimation.
Utility does not profit from DSM, which does not actually produce savings.	Utility may profit from DSM, which does not actually produce savings.
Removes utility disincentive to support public policies that increase efficiency (e.g., rate design, appliance standards, customer initiated conservation).	Continues utility disincentive to pursue activities or support public policies that increase efficiency.
May reduce controversy in subsequent utility rate cases.	No direct effect on subsequent rate cases.
Reduces volatility of utility revenue resulting from many causes.	Reduces volatility of utility earnings only from specified DSM projects.

Source: Mosovitz et al. 1992.

While decoupling is a critical step in optimizing the benefits of energy efficiency, states are finding that decoupling alone is not sufficient. Two other related approaches states are taking include assurance for energy efficiency program cost recovery, and shareholder/company performance incentives to reward utilities for maximizing energy efficiency investment where cost effective.

Program Cost Recovery

One important element of utility energy efficiency and clean DG programs is the appropriate recovery of costs. The extent to which this is a real risk for utilities depends upon the ratemaking practices in each state. Nonetheless, the perception of the risk can be a significant barrier to utilities, regardless of how real the risk. Under traditional ratemaking, utilities might be unable to collect any additional energy efficiency or DG expenses that are not already included in the rate base. Similarly, under a price cap form of PBR, utilities might be precluded from recovering "new" costs incurred between the periods when price caps are set. However, traditional ratemaking can nonetheless allow program cost recovery for well-performing energy efficiency or DG programs, if desired. If revenue caps are in place, well-performing program costs can be included as part of the overall revenue requirement, in the same way that supply-side fixed costs are usually included in revenue requirements. If energy efficiency/DG programs are not shown to meet minimum performance criteria, then these costs could be excluded from revenue requirements, i.e., these costs would not be passed on to ratepayers.

To overcome program cost recovery concerns, regulatory mechanisms can be used to assure that utility investments in cost-effective energy efficiency and DG resources will be recovered in rates, independent of the form of ratemaking in place. Under traditional ratemaking, an energy efficiency or DG surcharge could be included in rates and could be adjusted periodically to reflect actual costs incurred. Under a price cap form of PBR, the costs of energy efficiency and DG could be excluded from the price cap and could be adjusted periodically to reflect actual costs incurred. Many states with restructured electric industries have introduced a public benefits fund (PBF) that provides utilities with a fixed amount of funding for energy efficiency and DG, thus eliminating this barrier to utilities. For example, the New York Public Service Commission (PSC) approved a proposal in a ConEd rate case that included, among other demand-side measures, DSM program cost recovery through a PBF. In Colorado, a new bill has been introduced to require a Public Utilities Commission (PUC) Rulemaking to address gas energy efficiency program cost recovery and regulatory disincentives to cost-effective energy efficiency programs (Colorado Legislature 2006).

Shareholder/Company Performance Incentives

Under traditional regulation, utilities may perceive that energy efficiency or clean DG investment conflicts with their profit motives. However, states are finding that once the throughput disincentive is addressed, utilities will look at cost-effective energy efficiency and clean DG as a potential profit center and an important resource alternative to meet future customer needs. Utilities earn a profit on approved capital investment for generators, wires, poles, transformers, etc. Incentive ratemaking can allow for greater levels of profit on energy efficiency or DG resources, recognizing that many benefits to these resources, such as improved reliability or reduced emissions, are not otherwise explicitly accounted for. Adjustment of approved rate-of-return for capital investment—supply- or demand-side resources—is an important policy tool for state regulators.

States, including Massachusetts and New Hampshire, are using profit or shareholder incentives to make energy efficiency and clean DG investments seem comparable to, or preferable to, conventional supply-side investments. With throughput disincentives removed, utilities can be rewarded with incentives stemming from superior program performance. Such incentives include a higher rate of return on capital invested in energy efficiency and clean DG, or equivalent earnings bonus allowances. Rewards require performance: independent auditing of energy efficiency/DG program effectiveness can drive the level of incentive. Conversely, poorly performing programs or components can be denied full cost recovery, providing a logical "stick" to the "carrot" of increased earnings potential, and ensuring that energy efficiency and clean DG program choices exclude those that only look good on paper. The savings that result from choosing the most cost-effective resources over less economical resources can be "shared" between ratepayers and shareholders, giving ratepayers the benefits of wise resource use while rewarding management for the practices that allow these benefits to be secured.[42]

Implementation of a package of incentive regulation initiatives might include: (1) stakeholder discussion of the issues, (2) state commission rulemaking or related initiative proposing a change from traditional ratemaking, and (3) clear and comprehensive direction from the state commission establishing the explicit rate structure or pilot program structure to be put in place.

Designing Effective Utility Incentives for Demand-Side Resources

Participants

A number of stakeholders are typically included in the design of decoupling and incentive regulations:

- *State Legislatures*. Utility regulation broadly affects all state residents and businesses. State energy policy is affected by and affects utility regulation. Legislation may be required to direct the regulatory commission to initiate an incentive regulation investigation or to remove barriers to elements like periodic resetting of rates without a comprehensive rate case. Legislative mandates can also provide funding and/or political support for incentive regulation initiatives.
- *State PUCs*. State PUCs have the greatest responsibility to investigate and consider incentive regulation mechanisms. Staff and commissioners oversee the stakeholder processes through which incentive regulation issues are discussed. PUCs are the ultimate issuers of directives implementing incentive regulation packages for regulated gas and electric utilities.
- *State Energy Offices/Executive Agencies.* State policies on energy and environmental issues are often driven by executive agencies at the behest of governor's offices. If executive agency staff are aware of the linkages between utility regulatory and ratemaking policies, it may be more likely that executive agency energy goals can be fostered by successful utility energy efficiency and clean DG programs. Attaining state energy and environmental policy goals hinges in part on the extent to which incentive regulation efforts succeed.
- *Energy Efficiency Providers*. Energy efficiency providers have a stake in incentive regulation initiatives. In some states, they contract with utilities to provide energy efficiency program implementation. In other states, energy efficiency providers such as Vermont's "Efficiency Vermont" serve as the managing entity for delivering energy efficiency programs.
- *DG Developers*. DG developers, like energy efficiency providers, are affected by any incentive regulation that reduces throughput incentives, since they are likely to be able to work more closely with utilities to target the locations that maximize the benefits that DG can bring by reducing distribution costs.
- *Utilities*. Vertically integrated utilities and distribution or distribution-transmission-only utilities are affected to the greatest degree by incentive regulation, as their approved revenue collection mechanisms are at the heart of incentive regulation issues. Incentive regulation approaches differ in their impacts on utilities depending in part on the degree of restructuring present in a state.
- *Environmental Advocates*. Energy efficiency and clean DG resources can provide low-cost environmental benefits, especially when targeted to locations requiring significant transmission and distribution investment. Environmental organizations can offer perspectives on using energy efficiency and clean DG as alternatives to supply-side options.
- *Other Organizations***.** Other organizations, including consumer advocates and third-party energy

[42] The utility industry uses the term "shared savings" in several ways. Alternative meanings include, for example, the sharing of savings between an end user and a contractor who installs energy efficiency measures. Throughout this *Guide to Action,* "shared savings" refers to shareholder/ratepayer sharing of benefits arising from implementation of cost-effective energy efficiency/DG programs that result in a utility obtaining economical energy efficiency/DG resources.

efficiency and clean DG providers, can provide cost-effectiveness information as well as perspectives on other complementary policies.

Interaction with Federal and State/Regional Policies

Incentive regulation is closely intertwined with almost all state-level energy policy involving electric and gas utility service delivery, since it addresses the fundamental issue of establishing a means for a regulated utility provider to recover its costs. The following state policies will be affected by changing to a form of incentive regulation:

- *Integrated Resource Planning (IRP) and Portfolio Management Policies.* These are an important complement to utility incentives because they provide vertically integrated utilities (through use of IRP) and distribution-only utilities (through use of portfolio management) with the long-term planning framework for identifying how much and what type of energy efficiency and clean DG resources to pursue. Without removing throughput disincentives, utilities undertaking IRP and portfolio management that include cost-effective energy efficiency and clean DG resources can lose revenue.
- *PBFs.* Also known as system benefits charges (SBCs), PBFs may eliminate the need for (or provide another way of addressing) cost recovery.
- *PBR Mechanisms.* PBR includes a host of mechanisms that can help achieve regulatory objectives. Many are tied to specific elements of ratemaking, such as price caps (i.e., a ceiling on the per unit rate charged for energy), revenue caps (i.e., a ceiling on total revenue), or revenue per customer caps. Typically, all PBR mechanisms are established with the goal of rewarding utility performance that results in superior customer service, reliability, or other measured outcome of utility company effort. Reducing the throughput disincentive is one important form of PBR, and if it is not addressed, the effectiveness of other aspects of PBR can be undermined.
- *Low-Income Weatherization.* Low-income weatherization and other energy efficiency improvement programs target the consumer sector with the least incentive to invest in energy efficiency. A fundamental market failure exists, for example, in the landlord-tenant relationship where landlords are responsible for building investment (e.g., new boilers) but tenants are responsible for paying utility bills. The result is that least-first-cost, rather than least-life-cycle-cost appliances are often installed. As with any other energy efficiency program, a utility company's incentive to see such programs succeed is reduced if overall profits remain linked to sales volume; thus, successful decoupling approaches can help to ensure low-income weatherization program success.

Best Practices: Designing Effective Incentive Regulations for Gas and Electric Utilities

The best practices identified below will help states develop effective incentive regulations to support implementation of cost-effective energy efficiency and DG programs.

- Survey the current regulatory landscape in your state and neighboring states.
- Determine if and how energy efficiency and clean DG are addressed in rate structures. In particular, determine if traditional ratemaking formulas exist. Do they create obstacles to promoting energy efficiency and clean DG?
- Gather information about potential incentive rate designs for your state.
- Assemble key stakeholders and provide a forum for their input on utility incentive options.
- Devise an implementation plan with specific timelines and objectives.

Evaluation

States are evaluating their decoupling activities to ensure program success. For example, independent evaluation of the Oregon initiative for Northwest Natural Gas included a summary of the program's intentions, recognition that deviations from forecast usage affects the amount of fixed costs recovered, and acknowledgement that partial, rather than full, decoupling was attained. States are evaluating decoupling activities to ensure program success. The report stated that the program had reduced the "variability of distribution revenues" and "alter[ed] NW Natural's incentives to promote energy efficiency" (Hansen and Braithwait 2005).

California's earlier decoupling policies (from 1982 to 1996), combined with intensive utility-sponsored DSM activity, resulted in comprehensive program evaluation. Existing reports illustrate the impact of California's decoupling during that period (Eto et al. 1993).

The following information is usually collected as part of the evaluation process to document additional energy efficiency or clean DG savings, customer rate impacts, and changes to program spending that arise due to changes to regulatory structures:

- Utility energy efficiency and clean DG program expenditure and savings information.
- Additional data on weather and economic conditions, to control for factors influencing retail sales other than program actions.
- Rate changes occurring during the program, if any, such as those arising from use of a balancing mechanism.

State Examples

Numerous states previously addressed or are currently exploring electric and gas incentive mechanisms. Experiments in incentive regulation occurred through the mid-1990s but generally were overtaken by events leading to various forms of restructuring. There is renewed interest in incentive regulation due to recognition that barriers to energy efficiency still exist, and utility efforts to secure energy efficiency and clean DG benefits remain promising. States are looking to incentive mechanisms to remove barriers in order to meet the cost-effective potential of clean energy resources.

California, Washington, Oregon, Maine, Maryland, Minnesota, New York, Idaho, Nevada, Massachusetts, Connecticut, New Hampshire, Rhode Island, New Mexico, and Arizona have had or are reviewing various forms of decoupling or incentive regulation, including performance incentive structures. The following state examples are listed in the approximate order of the extent to which decoupling mechanisms have been considered in the state.

California

California has recently re-adopted a revenue balancing mechanism that applies between rate cases and removes the throughput disincentive by allowing for rate adjustment based on actual electricity sales, rather than test-year forecast sales. The California Public Utility Commission (CPUC) established this mechanism to conform to a 2001 law that dictated policy in this area, stating that forecasting errors should not lead to significant over- or under-collection of revenue. As a result, California public utilities are returning to larger-scale promotion of energy efficiency through their DSM programs. Simultaneously, the CPUC is revising its policies to establish a common performance basis for energy efficiency programs that defer more costly supply-side investments.

California's rate policies are not new. Between 1983 and the mid-1990s, California's rate design included an ERAM, a decoupling policy that was the forerunner of today's policy and the model for other balancing mechanisms implemented by other states during the early 1990s. The impact of the original ERAM on California ratepayers was positive, with a negligible effect on rates, and led to reduced rate volatility. Overall utility energy efficiency program efforts in California, along with state building and appliance energy efficiency programs, have reduced peak capacity needs by more than 12,000 megawatts (MW) and continue to save about 40,000 gigawatt-hours (GWh) per year of electricity (CEC and CPUC 2005).

California also implemented a shared-savings incentive mechanism in the 1990s. The CPUC authorized a 70%/30% ratepayer/shareholder split of the net benefits arising from implementation of energy efficiency measures in the 1994–1997 time frame. This mechanism first awarded shareholder earnings bonuses based on measured program performance. Between 1998 and 2002, the performance incentive was changed to reward "market transformation" efforts by the utilities. The incentives were phased out after 2002, because of the state's overhaul of its energy efficiency policies, but recent ongoing activity pursuant to an energy efficiency rulemaking process promises to revisit shareholder incentive structures.

The CPUC continues to promote utility-sponsored energy efficiency efforts. A recent decision approves expenditures of $2 billion over the 2006–2008 time period for the four major California investor-owned utilities. These expenditures will contribute toward overall spending goals of $2.7 billion, with savings targeted at almost 5,000 peak MW, 23 terawatt-hours, and 444 million therms per year (cumulative through 2013). Under an ongoing rulemaking on energy efficiency policies, the CPUC is currently analyzing the risk/reward incentive structure that will apply over this time for the utilities.

Web sites:
http://www.cpuc.ca.gov/Published/Final_decision/40212.htm (energy efficiency goals)

http://www.cpuc.ca.gov/word_pdf/FINAL_DECISION/30826.pdf (shared savings)

http://www.cpuc.ca.gov/word_pdf/FINAL_DECISION/49859.pdf (current energy efficiency program spending plans with reference to new incentive plans)

Washington

In the early 1990s, Washington's Utility and Transportation Commission (WUTC) implemented incentive regulations for Puget Sound Power and Light by establishing a revenue-per-customer cap, a deferral account for revenues, and a reconciliation process. The mechanism lasted for a few years, but was phased out—without prejudice—a few years later when a package of alternative rate proposals was accepted.

Puget's "Periodic Rate Adjustment Mechanism" (PRAM) was successful in achieving "dramatic improvements in energy efficiency performance," and according to the WUTC, it "achieved its primary goal—the removal of disincentives to conservation investment" (WUTC 1993).

Washington held a workshop in May 2005 as part of a rulemaking to investigate decoupling natural gas revenues from sales volumes to eliminate disincentives to gas conservation and energy efficiency. Based on stakeholder feedback, the Utilities and Transportation Commission withdrew the rulemaking in favor of addressing decoupling through specific proposals (WUTC 2005).

Web site:
http://www.wutc.wa.gov/webimage.nsf/6c548b093c5f816c88256efc00506bb6/0e699dd89acd5b1888256fdd00681656!

Oregon

In September 2002, Oregon adopted a partial decoupling mechanism for one of its gas utilities, Northwest Natural Gas. The mechanism was established through a settlement process that established a price elasticity adjustment and a revenue deferral account, even though it did not fully decouple sales from profits. An evaluation found that the mechanism reduced, but did not completely remove, the link between sales and profits and that it "is an effective means of reducing NW Natural's disincentive to promote energy efficiency" (Hansen and Braithwait 2005).

In the past, Oregon adopted and then abandoned lost revenue and shared savings mechanisms for two larger utility companies, PacifiCorp and Portland General Electric (PGE). Lack of support from customer groups, new corporate owners after acquisition, and shifting of DSM implementation to the non-utility sector ended these efforts.

The history and outcome of the NW Natural case in Oregon demonstrates that incentive regulation must be designed to address a number of stakeholders and many related issues that have financial impacts on ratepayers. In its approval of the regulation, the Oregon Commission acknowledged that it was only a "partial decoupling mechanism," but did recognize that decoupling allows for energy efficiency without harming shareholders (Oregon PUC 2002).

Web site:
http://apps.puc.state.or.us/orders/2002ords/02%2D388.pdf (Northwest Natural Gas Order)

Maine

In 1991, the Maine PUC adopted a revenue decoupling mechanism for Central Maine Power (CMP) on a three-year trial basis. "Allowed" revenue was determined in a rate case proceeding and adjusted annually based on changes in the number of utility customers. CMP's ERAM was not, however, a multi-year plan, so CMP was free to file a rate case at any time to adjust its "allowed" revenues. The mechanism quickly lost the support of major stakeholders in Maine due to a serious economic recession that resulted in lower sales levels. The lower sales levels caused substantial revenue deferrals that CMP was ultimately entitled to recover. CMP filed a rate case in October 1991 that would have increased rates at the time, but likely would have caused lower amounts of revenue deferrals. However, the rate case was withdrawn by agreement of the parties to avoid immediate rate increases during unfavorable economic times.

By the end of 1992, CMP's ERAM deferral had reached $52 million. The consensus was that only a very small portion of this amount was due to CMP's conservation efforts and that the vast majority of the deferral resulted from the economic recession. Thus, ERAM was increasingly viewed as a mechanism that was shielding CMP against the economic impact of the recession, rather than providing the intended energy efficiency and conservation incentive impact. The situation was exacerbated by a change in the financial accounting rules that limited the amount of time that utilities could carry deferrals on their books. Maine's experiment with revenue cap regulation came to an end on November 30, 1993, when ERAM was terminated by stipulation of the parties.

This experience illustrates the temporal dimension of decoupling approaches; immediate rate increases can be perceived negatively. However, under traditional forms of regulation, declining consumption trends such as those associated with economic downturns can also result in a need to increase rates to allow for fixed cost recovery.

Web site:
http://www.state.me.us/mpuc/industries/electricity/index.html (electric division of Maine PUC)

Maryland

The gas distribution side of Baltimore Gas and Electric (BG&E) and Washington Gas are each subject to a monthly revenue adjustment by the Maryland Public Service Commission. BG&E's "Rider 8" and Washington Gas' "Monthly Revenue Adjustment" (MRA) decouple weather and energy efficiency impacts from the revenue ultimately recovered by the gas companies. This decoupling mechanism achieves the aim of greater revenue stability for the gas companies, while preventing "over-recovery" from ratepayers during colder-than-normal heating seasons. The base revenue amount is set based on weather-normalized patterns of consumption, but monthly revenue adjustments are accrued based on actual revenues, and rates are adjusted monthly based on the accrued adjustments.

The rate structure has been in place for seven years for BG&E and is new for Washington Gas.

Web sites:
http://www.energetics.com/madri/pdfs/timmerman_101105.pdf (description by Maryland PSC Director of Rates and Economics)

http://www.psc.state.md.us/psc/gas/gasCommodity.htm (Maryland PSC gas commodity fact sheet)

Minnesota

Northern States Power, now Xcel Energy, petitioned the Minnesota PUC in 2004 for a partial decoupling of its natural gas revenue requirement from sales, offering an annual true-up to rates to address reduced sales volume trends. In an approved offer of settlement, this portion of the company's petition was withdrawn, without prejudice, over concerns of the evidence of declining gas usage and whether the Commission had the legal authority to approve such a rate structure change.

Minnesota experimented with a lost revenue recovery approach in the 1990s, but terminated it in 1999 in favor of a "shared savings" approach because of the cumulative impact of the lost revenues. Its shared savings incentive mechanism is similar to the approach used by Massachusetts, Connecticut, New Hampshire, and Rhode Island (see page 6-35), where utility incentives increase if energy efficiency targets are exceeded.

Web site:
http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_1875_1802_3576-15057-5_406_652-0,00.html (gas decoupling information)

New York

In the 1990s, the New York Public Service Commission experimented with several different types of performance-based ratemaking, including revenue-cap decoupling mechanisms for Rochester Gas and Electric, Niagara Mohawk Power, and Consolidated Edison Company (ConEd) (Biewald et al. 1997). More recently, the Commission approved a joint proposal from all the stakeholders in a ConEd rate case that included significant increases in spending on DSM, a lost revenue adjustment mechanism, DSM program cost recovery through a PBF, and shareholder performance incentives. The Commission did not establish a decoupling mechanism, but left open the possibility to do so in another proceeding that is assessing DSM incentives for all New York utilities (NY PSC 2005).

Web site:
http://www.dps.state.ny.us/fileroom.html (CASE 04-E-0572–Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of ConEd of New York, Inc. for Electric Service)

Idaho

In May 2004, the Idaho PUC initiated a series of workshops to investigate the disincentives to energy efficiency that exist with traditional ratemaking. The Commission noted that disincentives are inherent in company-sponsored conservation programs and directed Idaho Power Company to examine balancing mechanisms and consider how much rate adjustment might be needed to remove energy efficiency investment disincentives.

The workshops resulted in a recommendation to establish a pilot project to allow Idaho Power Company to recover fixed-cost losses associated with new construction energy efficiency programs. This "lost revenue" approach is an initial foray by Idaho into incentive mechanisms that could eventually include a broader, fixed-cost true-up mechanism as part of the next general rate case.

Web site:
http://www.puc.idaho.gov/internet/cases/summary/IPCE0415.html (Idaho Power Company application, Commission Order, staff investigation documents)

Nevada

Nevada resurrected DSM efforts in 2001 in the wake of the California energy crisis. The two Nevada electric utilities recently participated in a DSM collaborative to obtain stakeholder input regarding the number and type of DSM programs, and have moved away from the strict Rate Impact Measure (RIM) Test to more lenient cost-effectiveness tests, allowing for greater DSM implementation. The Nevada IRP regulations include a shareholder performance incentive, whereby the electric utilities can place their DSM expenditures in rate base and earn the base rate of return on equity plus 5%. Nevada has not considered decoupling, in part because the state law appears to prevent balancing accounts for fixed cost recovery.

Web sites:
http://energy.state.nv.us/efficiency/default.htm (statewide conservation/efficiency resources)

http://gov.state.nv.us/pr/2005/PR_01-12ENERGY.htm (energy efficiency strategy)

Massachusetts, Connecticut, New Hampshire, and Rhode Island

While Maine is the only New England state with a history of a decoupling mechanism, other New England states have adopted shareholder incentive regulations that reward utility shareholders by allowing earnings on DSM program expenditures, analogous to allowing a rate of return on fixed, or "rate base" assets such as wires, poles, and generators. In these states, different levels of incentives are granted depending on the level of efficiency savings seen with DSM programs, also known as "shared savings." There are typically three levels of program savings defined, which align with three levels of incentives granted. A "threshold level" defines the minimum savings that must be reached for any shareholder incentives to apply. A "target" level incentive is based on the goals of the most recent energy efficiency plan, and an "exemplary" level of incentives is seen if savings beyond the target level (above a certain amount) is achieved.

Web site:
http://www.mass.gov/dte/restruct/competition/index.htm#PERFORMANCE (Massachusetts Department of Telecommunications and Energy (DTE), Performance Based Ratemaking/Service Quality Proceedings)

New Mexico and Arizona

New Mexico and Arizona have recently undertaken legislative or regulatory efforts to address incentive regulation, although neither has an explicit decoupling policy in place. New Mexico's energy efficiency legislation adopted earlier this year promotes and permits convenient cost recovery of both gas and electric utility DSM. In Arizona, the Southwest Gas Company has proposed a set of gas DSM programs in conjunction with decoupling sales from revenue.

Web site:
http://www.cc.state.az.us/ (Arizona Corporation Commission)

What States Can Do

States are leveling the playing field for demand-side resources through improved utility rate design by removing disincentives through decoupling or lost revenue adjustment mechanisms. These actions make it possible for utilities to recover their energy efficiency and clean DG program costs, and/or provide shareholder and company performance incentives. Key state roles include:

- *Legislatures*. Legislative mandate is often not required to allow state commissions to investigate and implement incentive regulation reforms. However, legislatures can help provide the resources required by state commissions to effectively conduct such processes. Legislative mandates can also provide political support or initiate incentive regulation investigations if the commission is not doing so on its own.
- *Executive Agencies.* Executive agencies can support state energy policy goals by recognizing the important role of regulatory reform in providing incentives to electric and gas utilities to increase energy efficiency and clean DG efforts. Their support can be important to encourage utilities or regulators concerned about change.
- *State Commissions*. State regulatory commissions usually have the legal authority to initiate investigations into incentive regulation ratemaking, including decoupling. Commissions have the regulatory framework, institutional history, and technical expertise to examine the potential for decoupling and consider incentive ratemaking elements within the context of state law and policy. State commissions are often able to directly adopt appropriate incentive regulation mechanisms after adequate review and exploration of alternative mechanisms.

Action Steps for States

States can take the following steps to promote incentive regulation for clean energy, as well as overall customer quality and lower costs:

- Survey the current utility incentive structure to determine how costs are currently recovered, whether any energy efficiency programs and shareholder incentives are in place, and how energy efficiency and DG costs are recovered.
- Review available mechanisms.
- Review historical experience in the relevant states.
- Open a docket on these issues.
- Determine which incentive regulation tools might be appropriate.
- Engage commissioners and staff and find consensus solutions.

Information Resources

State and Regional Information on Incentive Regulation Efforts

State	Title/Description	URL Address
California	Background and historical information on CPUC shared savings mechanism in the mid-1990s and general energy efficiency policies.	http://www.cpuc.ca.gov/Published/Final_decision/30826.htm
	California Energy Commission (CEC).	http://www.energy.ca.gov/
	California's "Energy Action Plan II," an implementation roadmap for California energy policies.	http://www.cpuc.ca.gov/PUBLISHED/REPORT/49078.htm
	CPUC.	http://www.cpuc.ca.gov/static/index.htm
	CPUC current rulemaking on energy efficiency policies.	http://www.cpuc.ca.gov/static/energy/electric/energy+efficiency/rulemaking/docs_inr0108028.htm
	CPUC Decision establishing energy savings goals for energy efficiency program years 2006 and beyond. September 23, 2004.	http://www.cpuc.ca.gov/Published/Final_decision/40212.htm
	CPUC Decision on energy efficiency spending—phase I. September 22, 2005.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/49859.htm
Colorado	House Bill 1147 addresses funding and cost recovery mechanism for natural gas energy efficiency.	http://www.leg.state.co.us/clics2006a/csl.nsf/fsbillcont3/CCC36D78DB009296872570CB006CBA70?open&file=1147_01.pdf
Idaho	Idaho PUC, Case No. IPC-E-04-15. Idaho Power—Investigation of Financial Disincentives. This Web site summarizes regulatory proceedings and workshop results regarding the Commission's investigation of financial disincentives to energy efficiency programs for Idaho Power under Case No. IPC-E-04-15.	http://www.puc.idaho.gov/internet/cases/summary/IPCE0415.html
Maryland	Maryland PUC, Gas Commodity Rate Structure reference.	http://www.psc.state.md.us/psc/gas/gasCommodity.htm
Mid-Atlantic Distributed Resources Initiative (MADRI)	MADRI is developing a model rule, called the Electric Utility Revenue Stability Adjustment Factor, to reduce a utility's throughput incentive.	http://www.energetics.com/madri/
Oregon	Oregon PUC, Order on NW Natural Gas Decoupling. This order reauthorized deferred accounting for costs associated with NW Natural Gas Company's conservation and energy efficiency programs.	http://apps.puc.state.or.us/orders/2002ords/02%2D388.pdf
Washington	WUTC, Natural Gas Decoupling Investigation. This Web site describes the Commission's action to investigate decoupling mechanisms to eliminate disincentives to gas conservation and energy efficiency programs.	http://www.wutc.wa.gov/webimage.nsf/6c548b093c5f816c88256efc00506bb6/0e699dd89acd5b1888256fdd00681656
General	The Regulatory Assistance Project (RAP) has published several reports on decoupling and financial incentives.	http://www.raponline.org

General Articles and Web Sites About Utility Incentives for Demand-Side Resources

Title/Description	URL Address
Barriers to Energy Efficiency. This presentation identifies barriers to energy efficiency programs, describes differences between lost base revenue adjustments and revenue decoupling as ways to remove such barriers, and presents other solutions for consumer advocates and regulators to further promote energy efficiency.	http://www.raponline.org/Slides/MACRUCEnergyEfficiencyBarriersWS%2Epdf
Breaking the Consumption Habit: Ratemaking for Efficient Resource Decisions. This Natural Resources Defense Council (NRDC) article from The Electricity Journal (December 2001) describes the concept and history of decoupling mechanisms and calls for re-examination of the mechanisms in order to remove disincentives to deployment of distributed energy resources under the restructured electric industry.	http://www.nrdc.org/air/energy/abreaking.asp
Clean Energy Policies for Electric and Gas Utility Regulators. This article examines policy options for distributed energy resources (e.g., EE/RE and DG) and rate design, and also discusses the importance of regulatory financial incentives to support dissemination of distributed energy resources.	http://www.raponline.org/Pubs/IssueLtr/RAPjan2005.pdf
Decoupling and Public Utility Regulation (publication no. NRRI 94-14). Graniere, R. and A. Cooley. National Regulatory Research Institute. August 1994. This report explores the relationship between decoupling and public utilities regulation. One of the conclusions is that decoupling could preserve the financial integrity of the utility and protects the environment, but at the cost of a high probability of periodic increases of electricity prices.	http://www.nrri.ohio-state.edu/phpss113/search.php?focus=94-14&select=Publications
Decoupling vs. Lost Revenue: Regulatory Considerations. Moskovitz D., C. Harrington, T. Austin. May 1992. This article identifies characteristics and distinctions between decoupling and lost revenue recovery mechanisms and concludes that decoupling is preferable because unlike the lost-base revenue approach, decoupling removes the utilities' incentive to promote new sales and does not provide utilities with an incentive to adopt ineffective DSM programs.	http://www.raponline.org/Pubs/General/decoupling.pdf
Financial Disincentives to Energy Efficiency Investment. Direct Testimony of Ralph Cavanagh, NRDC, Wisconsin, 2005. This testimony identifies financial disincentives to the Wisconsin Power and Light Company's cost-effective energy efficiency programs and identifies solutions.	http://psc.wi.gov/apps/erf_search/default.aspx (PSC Ref.# 31965, filed April 4, 2005)
Joint Statement of NRDC and American Gas Association on Utility Incentives for Energy Efficiency. This statement identifies ways to promote both economic and environmental progress by removing barriers to natural gas distribution companies' investments in urgently needed and cost-effective resources and infrastructure.	http://www.aga.org/Content/ContentGroups/Rates/AGANRDCJointStatement.pdf
Link to All State Utility Commission Web sites. This NARUC Web site provides links to all state utility commission sites.	http://www.naruc.org/displaycommon.cfm?an=15
Southwest Energy Efficiency Project (SWEEP). SWEEP is a nonprofit organization promoting greater energy efficiency in Southwest states.	http://www.swenergy.org/

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CEC and CPUC. 2005. CEC and CPUC. Draft Energy Action Plan II, Implementation Roadmap For Energy Policies. July 27.	http://www.energy.ca.gov/energy_action_plan/2005-07-27_EAP2_DRAFT.pdf
Colorado Legislature. 2006. Colorado House Bill 06-1147.	http://www.leg.state.co.us/clics2006a/csl.nsf/fsbillcont3/CCC36D78DB009296872570CB006CBA70?open&file=1147_01.pdf
Eto, J., S. Stoft, and T. Beldon. 1993. The Theory and Practice of Decoupling. LBL-34555. Lawrence Berkeley National Laboratory (LBNL). January.	http://eetd.lbl.gov/EA/EMP/reports/34555.html
Hansen, D.G. and S.D. Braithwait. 2005. Christensen Associates. A Review of Distribution Margin Normalization as Approved by the Oregon PUC for Northwest Natural. March.	Contact: Christensen Associates Energy Consulting, LLC 4610 University Avenue, Suite 700 Madison, Wisconsin 53705-2164 Phone: 608-231-2266 Fax: 608-231-2108
Mosovitz, D., C. Harrington, and T. Austin. 1992. Decoupling vs. Lost Revenue: Regulatory Considerations. Other decoupling/financial incentives information. RAP, Gardiner, ME. May.	http://www.raponline.org/Pubs/General/decoupling%2Epdf
NY PSC. 2005. Case 04-E-0572. Proceeding on Motion of the Commission as to the Rates, Charges, Rules, and Regulations of ConEd, Order Adopting a Three-Year Rate Plan. March 24. New York PSC.	http://media.corporate-ir.net/media_files/nys/ed/Three-YearRateplan-3-24-05.pdf
Oregon PUC. 2002. Order No. 02-634, Application for Public Purposes Funding and Distribution Margin Normalization. Oregon PUC. September 12.	http://apps.puc.state.or.us/ Click on Orders, View Orders 2000 to Current, List Orders for 2002, Order No. 02-634.
PG&E et al. 2003. Motion of Pacific Gas and Electric Company, Office of Ratepayer Advocates, The Utility Reform Network, Aglet Consumer Alliance, Modesto Irrigation District, Natural Resources Defense Council and the Agricultural Energy Consumers Association for Approval of Settlement Agreement. A.02-11-017 et al. San Francisco, California. PG&E. September 15. Attachment A, p. 17.	http://www.cpuc.ca.gov/proceedings/A0211017.htm
WUTC. 1993. WUTC, Docket Nos. UE-901183-T and UE-901184-P. Puget Sound Power & Light Company. Petition for order approving periodic rate adjustment mechanism and related accounting, Eleventh Supplemental Order. September 21. WUTC Web site.	http://www.wutc.wa.gov/rms2.nsf?Open Click "docket number" on the left side and search the docket numbers.
WUTC. 2005. Washington Utilities and Transportation Commission Web Site. UTC closes rulemaking for natural gas decoupling to increase conservation investment. October 17.	http://www.wutc.wa.gov/webimage.nsf/6c548b093c5f816c88256efc00506bb6/0e699dd89acd5b1888256fdd00681656

6.3 Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation

The state public utility commission (PUC), in setting appropriately designed electric and natural gas rates, can support clean distributed generation (DG) projects and avoid unnecessary barriers, while also providing appropriate cost recovery for utility services on which consumers depend.

Policy Description and Objective

Summary

The unique operating profile of clean energy supply projects (i.e., renewable and combined heat and power [CHP])[43] may require different types of rates and different rate structures. However, if not properly designed, these additional rates and charges can create unnecessary barriers to the use of renewables and CHP. Appropriate rate design is critical to allow for utility cost recovery while also providing appropriate price signals for clean energy supply.

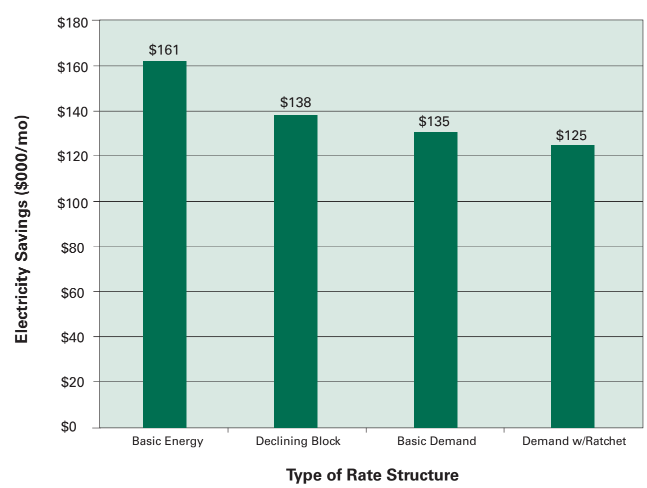
Customer-sited clean energy supply projects are usually interconnected to the power grid and may purchase electricity from or sell to the grid. Electric utilities typically charge these customers special rates for electricity and for services associated with this interconnection. These rates include exit fees, standby rates, and buyback rates. For more information on interconnection, see Section 5.4, *Interconnection Standards*.

As with interconnection, states can play an important role in balancing the utility's need to recover costs for services provided against the clean energy project's benefits in the form of grid congestion relief, reliability enhancement, and emissions reductions. States are finding that strategically sited clean energy supply can be a lower-cost way to meet growing demand, particularly in grid-congested areas.

The charges for services provided to interconnected clean energy projects, the price paid for electricity sold to the grid, and the basic design of electric utility rates can have a significant effect on a project's economic viability. To illustrate, a 1.4 megawatt (MW) CHP project's savings can range from $161,000 to $125,000 per month ($432,000 annual savings differential), depending on the rate structures (see Figure 6.3.1). This can make or break a project's profitability.

Interconnection with the grid can serve a variety of different needs that have potential rate impacts. Depending on the specific renewable energy/CHP system design, operating conditions, and the load requirements of the end user, the onsite clean energy

Figure 6.3.1: Effect of Rate Structure on Electric Savings Revenue for 1.4 MW CHP Project



Source: EEA 2005.

43 Unless otherwise stated, this document refers to smaller-scale, customer-sited DG, not large wind farms or large merchant electricity generators using CHP. These large renewable and CHP systems interact with the electric grid more like central station plants and have different rate and grid interaction issues than the technologies addressed here.

system may provide anywhere from zero to greater than 100% of the end user's electricity needs at any given moment. When the unit produces less than the customer's full electricity requirements, power from the grid is used to supplement (or supply in full) the customer's electricity need. If the system produces more than is required by the customer, it may be able to export power back to the grid and receive payment in return.

In nearly all clean energy supply installations—even those sized to serve the customer's full electric load—grid power may be needed at times due to a forced outage, planned maintenance outage, or a shut-down for economic reasons. Purchasing power from the grid for these purposes is usually more cost-effective than providing redundant onsite generation. Utilities typically charge special rates to provide this service, generically known as "standby rates." Some utilities charge energy users an exit fee when they reduce or end their use of electricity from the grid.

In addition to electric rates, if natural gas is used to fuel the CHP unit, gas rates will also affect the CHP system economics. All of these rates can have a critical effect on the viability of clean energy projects and can be addressed by states.

Rates Background

Under conventional electric utility ratemaking, electricity suppliers are paid largely according to the amount of electricity they sell. If customers purchase less electricity due to onsite generation projects (or energy efficiency projects), the utility has less income to cover its fixed costs. Utilities have applied a variety of rates to recover reduced income due to end-use efficiency, onsite generation, or other changes in customer operation or mix. States have begun exploring whether these alternative rates and charges are creating unanticipated barriers to the use of clean energy supply.

These concerns and other results of electric restructuring have triggered new proposals for rate designs that "decouple" utility profits from sales volume. One category of such approaches is "performance-based" rates, which base the utility's income on its efficiency, rather than simply sales volume. This is one of several strategies that states are applying to avoid undue barriers and to provide appropriate price signals for renewable and CHP projects that balance the rate impacts on utilities with the societal benefits (including electric grid benefits) of renewable and CHP generation. For more information on decoupling utility profits from electric sales, see Section 6.2, *Utility Incentives for Demand-Side Resources.*

Some of the specific rate issues that states are addressing include:

- *Exit Fees.* When facilities reduce or end their use of electricity from the grid, they reduce the utility's revenues that cover fixed costs on the system. The remaining customers may eventually bear these costs. This can be a problem if a large customer leaves a small electric system. Exit (or stranded asset recovery) fees are typically used only in states that have restructured their electric utility. To avoid potential rate increases due to the load loss, utilities sometimes assess exit fees on departing load to keep the utility whole without shifting the revenue responsibility for those costs to the remaining customers.

  States may wish to explore whether other methods exist to make utilities whole. Because many factors affect utility rates and revenues (e.g., customer growth, climate, fuel prices, and overall economic conditions), it does not naturally follow that any reduction in load will necessarily result in cost increases.

  Some states that have restructured their electric industry have imposed exit fees as a means to assure recovery of a special category of historic costs called "stranded costs or stranded asset recovery." In some states, such as Texas, these "competitive transition charges" have expired as the restructuring process is completed. States have exempted CHP and renewable projects from these exit fees to recognize the economic value of these projects, including their grid congestion relief and reliability enhancement benefits. For example, Massachusetts and Illinois exempted some or all CHP projects from their stranded cost recovery fees.

- *Standby and Related Rates*. Facilities that use renewables or CHP usually need to provide for standby power when the system is unavailable due to equipment failure, during periods of maintenance, or other planned outages.

  Electric utilities often assess standby charges on onsite generation to cover the additional costs they incur as they continue to provide adequate generating, transmission, or distribution capacity (depending on the structure of the utility) to supply onsite generators when requested (sometimes on short notice). The utility's concern is that the facility will require power at a time when electricity is scarce or at a premium cost and that it must be prepared to serve load during such extreme conditions.

  The probability that any one generator will require standby service at the exact peak demand period is low and the probability that all interconnected small-scale DG will all need it at the same time is even lower. Consequently, states are exploring alternatives to standby rates that may more accurately reflect these conditions.

  States are looking for ways to account for the normal diversity within a load class[44] and consider the probabilities that the demand for standby service will coincide with peak (high-cost) hours versus the benefits that CHP and renewables provide to the system.

- *Buyback Rates.* Renewable and CHP projects may have electricity to sell back to the grid, either intermittently or continuously. The payment received for this power can be a critical component of project economics. The price at which the utility is willing to purchase this power can vary widely. It is also affected by federal and state requirements.

  The Public Utilities Regulatory Policy Act (PURPA) sets standards for buyback rates at the utility's avoided cost (i.e., the cost of the next generating resource available to the utilities). When large renewable or CHP generators have open access to wholesale electricity markets, they usually have access to competitive markets for both appropriate sales and purchase of electricity, including standby services. These markets usually include the value of both the energy and transmission, whereas the latter is usually not included in regulated rates. In regulated markets, states are responsible for helping generators and utilities establish appropriate buyback rates.

  Net metering regulations allow small generators (typically renewable energy up to 100 kW)[45] a guaranteed purchase for their excess generation at a distribution utility's retail cost. While this price is higher than the utility's wholesale cost of electricity, it also includes the cost of delivery and is typically seen as a reasonable rate for small generators. Net-metering programs typically also address interconnection in a simple way, which is appropriate for small renewable projects. (For more information on net metering, see Section 5.4, *Interconnection Standards.)*

- *Gas Rates for CHP Facilities.* Some states, including New York and California, have established special favorable natural gas rates for CHP facilities. For example, New York has frozen gas rates for DG facilities until at least 2007 to provide economic certainty to developers.

State Objectives

A key state PUC objective is to ensure that consumers receive reliable power at the lowest cost. In approving rates, the PUC can support renewable and CHP projects and avoid unanticipated barriers, while also providing appropriate cost recovery for the utility services on which consumers depend.

44 For example, some industrial facilities run three shifts per day while others only run one shift per day. This would lead to a three-fold disparity between peak and minimum power demand in two otherwise identical facilities.

45 Note that the definition of a renewable resource varies by state.

Benefits

Appropriately designed rates can promote the development of CHP and renewables, leading to enhanced reliability and economic development while protecting utility ratepayers from excessive costs.

The benefits of increasing the number of clean DG projects include expanding economic development, reducing peak electrical demand, reducing electric grid constraints, reducing the environmental impact of power generation, and helping states achieve success with other clean energy initiatives. The application of DG in targeted load pockets can reduce grid congestion, potentially deferring or displacing more expensive transmission and distribution infrastructure investments. A 2005 study for the California Energy Commission (CEC) found that strategically sited DG yields improvements to grid system efficiency and provides additional reserve power, deferred costs, and other grid benefits (Evans 2005). Increased use of clean DG can slow the growth-driven demand for more power lines and power stations.

States with Existing Rates for Renewables or CHP

As of early 2005, several states have evaluated or have begun to evaluate utility rate structures and have made changes to promote CHP and renewables as part of their larger efforts to support cost-effective clean energy supply as an alternative to expansion of the electric grid. This type of work is typically conducted by the state PUC through a formal process (docket or rulemaking) that allows input from all stakeholders.

California and New York have established revised standby rate structures that are more favorable to CHP and renewables. Another state has found that designing a standby rate structure that bases the charges on the onsite generator's capacity rather than the amount of capacity supplied (thus creating a high charge even if there is no outage) has resulted in a dramatic decline in the number of CHP projects proposed where this rate exists.

Some states have incorporated exit fee exemptions into their electric restructuring programs for existing loads that leave a utility's distribution system. For example, Illinois, Massachusetts, and New York allow certain exit fee exemptions for loads that are replaced by clean onsite generation, specifically CHP and renewables.

More than 30 states have net metering regulations that provide a guaranteed purchase of small generators' excess generation at the distribution utility's retail cost.

Two states have established special gas rates for electric generators, including CHP projects. California has implemented special gas tariffs for all electric generators. In 2003, the New York Public Service Commission (PSC) ordered natural gas companies to create a rate class specifically for DG users and certify that they had removed rate-related barriers to DG.

Designing Fair and Reasonable Utility Rates for Clean Energy Supply

States consider a number of key elements as they develop new strategies that ensure utility rates allow renewables and CHP to complete on a level playing field and that recognize their benefits while providing a reliable electric system for consumers and adequate cost recovery for utilities.

Participants

- *State PUC.* Rates typically are approved by the state PUC during a utility rate filing or other related filing. The PUC staff are the focal point for evaluating costs and benefits to generators, utilities, consumers, and society as a whole. Many PUCs conduct active rate reviews in order to maintain consistency with changing policy priorities.
- *Utilities.* Utilities play a critical role in rate-setting. Their cost recovery and overall economic focus have historically revolved around volumetric rates that reward the sale of increased amounts of electricity. Anything that reduces electricity sales

(including clean DG, energy efficiency, and departing load) also reduces utility income and may make it more difficult to cover fixed costs if the fixed components of existing tariffs are not calculated to match utility fixed costs. This creates a disincentive for utilities to support such projects. New ways of setting rates (e.g., decoupling or performance-based rates) can make utility incentives consistent with those of clean energy developers and policymakers. (For more information on policies that can serve as utility incentives for clean energy, including decoupling utility profits from electric sales, see Section 6.2, *Utility Incentives for Demand-Side Resources.)*

- *Renewable Energy and CHP Project Developers.* Project developers establish the benefits of clean technology and the policy reasons for developing rates that encourage their application. They participate in rulemakings and other proceedings, where appropriate.
- *Regional Transmission Organizations (RTOs) or Independent System Operators (ISOs).* While not directly involved in utility rate-setting, these entities manage electricity infrastructure in some regions of the country. They interact with CHP and renewable generators and may also be involved in ratemaking discussions.
- *State Energy Offices, Energy Research and Development Agencies, and Economic Development Authorities.* These state offices often have an interest in encouraging renewables and CHP as a strategy to deliver a diverse, stable supply of reasonably priced electricity. They may be able to provide objective data on actual costs and help balance many of the issues that must be addressed.
- *Current and Future Energy and CHP Users.* Energy users have a considerable stake in the rates discussion. In some states, users are encouraged by the PUC to participate in utility hearings. They can also provide input on required rates and technical requirements and help recommend policies to accommodate utility needs.

Interaction with Federal Policies

PURPA Sec. 210 regulates interactions between electric utilities and renewable/CHP generators that are Qualifying Facilities (QFs).[46] PURPA played a role in structuring these relationships, most notably in developing the concept of rates based on avoided cost. In noncompetitive markets, QF status may be the only option for non-utility generators to participate in the electricity market.

Interaction with State Policies

Designing utility rates to support clean energy can be coordinated with other state policies.

- Ratemaking issues are often closely tied to a state's electric restructuring status. For example, exit fees typically exist only in restructured states. When generators have open access to electric markets, they can often provide for their own standby services through the market. This is especially true for larger generators that can negotiate market rates.
- States have explored decoupling utility returns from the volume of electricity sold. This issue addresses the basic divergence of interest between utilities and onsite generators and can be very important when examining rates for clean DG. (For more information on decoupling, see Section 6.2, *Utility Incentives for Demand-Side Resources.*)
- If a renewable portfolio standard (RPS) and/or a public benefits fund (PBF)/clean energy fund are in place, unreasonable standby rates and exit fees may unintentionally hamper their success by rendering clean energy projects uneconomical. (See Section 5.1, *Renewable Portfolio Standards*, and Section 5.2, *Public Benefits Funds for State Clean Energy Supply Programs*).

46 A qualifying facility is a generation facility that produces electricity and thermal energy and meets certain ownership, operating, and efficiency criteria established by the Federal Energy Regulatory Commission (FERC) under PURPA.

- States may consider working with utilities to offer credits to customer-sited clean energy supply in areas of high grid congestion. This can be the most cost-effective strategy to reduce chronically high congestion costs.

Program Implementation and Evaluation

Addressing rate issues requires different solutions depending on the status of electricity restructuring in each state and other characteristics of the local generating mix and regulatory situation. This section describes some of the issues that states have considered as they undertake the task of developing rates that support clean energy technologies.

Administering Body

Rate-appropriate decisions are almost always within the purview of a state's PUC. However, many state PUCs do not regulate municipal and cooperative utilities standby rates. (Vermont is an example of a state where PUCs do regulate municipal utilities standby rates.) While PUCs are familiar with many of the traditional rate issues, some states are beginning to explore new approaches to balance rate reasonableness with utility cost recovery, particularly for clean energy supply.

Key Issues in Ensuring Rate Reasonableness

- States are attempting to ensure that rates are based on accurate measurement of costs and benefits of clean DG, and further that such costs and benefits are distinct from those already common to the otherwise applicable rate classification. For example, California has funded a study that investigates whether DG, demand response, and localized reactive power sources enhance the performance of an electric power transmission and distribution system. This report presents a methodology to determine the characteristics of distributed energy resource projects that enhance the performance of a power delivery network and quantify the potential benefits of these projects (Evans 2005).

Best Practices: Implementing Rates to Support CHP and Renewable Energy

The following best practices, based on state experiences, can help states implement rates that support CHP and renewable energy.

- Ensure that state PUC commissioners and staff have current and accurate information regarding the rate issues for CHP and renewables and their potential benefits for the generation system. These new technologies may not have been considered for rates that were developed before the more widespread application of renewable energy and CHP.
- Open a generic PUC docket to explore the actual costs and system benefits of onsite clean energy supply and rate reasonableness, if these issues cannot be addressed under an existing open docket.
- Coordinate with other state agencies that can lend support. State energy offices, energy research and development offices, and economic development offices can be important sources of objective data on actual costs and benefits of onsite generation.

- States may wish to explore ways to ensure that the benefits of clean DG that can accrue to the upstream electricity grid are reflected in rates. These benefits include increased system capacity, potential deferral of transmission and distribution (T&D) investment, reduced system losses, improved stability from reactive power, and voltage support. In restructured states, these benefits may be external to the regulated utility, but it is important that rates capture these elements to ensure optimum capital allocation by both regulated and unregulated parties.
- States conduct annual program evaluation of the value of standby rates in encouraging CHP. Such rigorous program evaluation may impose costs and resource requirements on state PUCs.

State Examples

Exit Fees

California

There are several types of exit and transition fees in the California market, and they are handled differently depending on the specific utility. Fee exemptions exist for various classes of renewable and CHP systems, including:

- Systems smaller than 1 MW that are net metered or are eligible for California Public Utilities Commission (CPUC) or CEC incentives for being clean and super-clean.
- Ultra-clean and low-emission systems that are 1 MW or greater and comply with California Air Resources Board (CARB) 2007 air emission standards.
- Zero emitting, highly efficient (> 42.5%) systems built after May 1, 2001.

Illinois

In Illinois, a utility can assess exit fees for stranded costs until December 31, 2006. The rule is fairly stringent and specific about the instances that trigger this fee. The rule does, however, provide an exemption for DG and CHP. A departing customer's DG source must be sized to meet its thermal and electrical needs with all production used on site.

Web site:
http://www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=022000050HArt%2E+XVI&ActID=1277&ChapAct=220%26nbsp%3BILCS%26nbsp%3B5%2F&ChapterID=23&ChapterName=UTILITIES&SectionID=21314&SeqStart=40500&SeqEnd=45100&ActName=Public+Utilities+Act%2E

Massachusetts

In Massachusetts, exit fees can be assessed for DG applications greater than 60 kilowatts (kW). Renewable energy technologies and fuel cells are exempt, regardless of their power rating. Massachusetts' restructuring law, however, specifically provides that distribution companies cannot charge exit fees to renewable or DG facilities unless certain conditions are met. These specified conditions include a prerequisite that the utility must see a "significant" revenue loss from non-utility generation. "Significant" is not defined and has led to unnecessary tension between utilities and DG users on issues of meter ownership and generator performance reporting.

Web site:
http://www.magnet.state.ma.us/dpu/restruct/96-100/cmr11-2.pdf

Standby Rates

California

California Senate Bill 28 1X (passed in April 2001) requires utilities to provide DG customers with an exemption from standby reservation charges. The exemptions apply for the following time periods:

- Through June 2011 for customers installing CHP-related generation between May 2001 and June 2004.
- Through June 2006 for customers installing non-CHP applications between May 2001 and September 2002.
- Through June 2011 for "ultra-clean" and low-emission DG customers 5 MW and less installed between January 2003 and December 2005.

California utilities submitted DG rate design applications in September 2001. A docket was opened to allow parties to file comments on the utility's proposals in October and November 2001. After a year, the CPUC decided to incorporate rate design proposals into utility rate design proceedings. Each utility's rate case is different, but in general, the rate design includes a contracted demand with high fixed charges.

New York

In July 2003, the New York PSC voted to approve new standby rates for utilities' standby electric delivery service to DG customers and standby service to independent wholesale electric generating plants that import electricity as "station power" to support their operations (NYPSC Case 99-E-1470).[47] A key consideration was for the rates to result in onsite generation running when it is less expensive than purchasing power from the grid.

Under the guidelines previously adopted by the New York PSC, standby rates are expected to reflect a more cost-based rate design that avoids relying on the amount of energy consumed (per-kilowatt-hour, or kWh) to determine the charges for delivery service. Instead, the new rates recognize that the costs of providing delivery service to standby customers should more accurately reflect the size of the facilities needed to meet a customer's maximum demand for delivery service at any given time. This varies not with the volume of electricity delivered, but primarily with the peak load (per-kilowatt) that must be delivered at any particular moment.

For certain categories of standby customers, the New York PSC voted to approve a series of options for the transition to the new rate structure. Specifically, preexisting DG customers are offered two options. They can either shift immediately to the new standby rate or continue under the existing rate for four years and then phase into the standby rate over the next four years. Because the new rates align the customer cost with the potential benefit of onsite power to the grid, there are some cases in which it is more favorable for customers to opt in to the new rates, which also provide greater reliability to the grid.

Recognizing the environmental benefits of certain energy sources, customers that begin DG operations between August 1, 2003, and May 31, 2006, and use certain environmentally beneficial technologies or small CHP applications of less than 1 MW, can choose among three options. They can elect to remain on the current standard rate indefinitely, shift immediately to the new standby rate, or opt for a five-year phase-in period beginning on the effective date of the new standby rates.

Web site:
http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/Web?SearchView&View=Web&Query=%5BCaseNumber%5D=99-E-1470&SearchOrder=4&Count=All

Gas Rates for DG Customers

New York

The New York PSC directed electric utilities to consider DG as an alternative to traditional electric distribution system improvement projects. The Commission also recognized that increased gas use for DG can create positive rate effects for gas consumers by providing increased coverage of fixed costs. They therefore ordered natural gas companies to create a rate class specifically for DG users. The ceilings for these rates are to be frozen until at least the end of 2007 to enable the emerging DG industry to predict gas rates for an initial period of time.

Web site:
http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/Web/047CACD1286149B285256DF10075636D/$File/doc11651.pdf?OpenElement

What States Can Do

Action Steps for States

States have chosen a wide variety of approaches and goals in developing their rates. The "best practices" common among these states have been explored above. Suggested action steps are described as follows.

47 The new rates do not apply to Niagara Mohawk, which had previously submitted—and gained approval for—a standby rate external to this process. The Niagara Mohawk rate is less favorable to DG than the rate described herein, and presents an on-going barrier to DG deployment in their service territory.

States That Have Addressed Rates for Renewables or CHP

A top priority after establishing rates is to identify and mitigate issues that might adversely affect the success of the rates. States can:

- Monitor utility compliance and impact on ratepayers. Significant, unanticipated, or adverse impacts on ratepayers can be addressed through implementing or adjusting cost caps or other appropriate means.
- Monitor the pace of installation of new renewable resources and CHP to make sure that the rates are working.

States That Have Not Addressed Rates for Renewables or CHP

States have found that political support from PUC officials and staff is helpful in establishing appropriate rates. Once general support for goals has been established, a key step is to facilitate discussion and negotiation among key stakeholders toward appropriate rate design. More specifically, states can:

- Ascertain the level of general interest and support for renewable energy and CHP in the state among public office holders and the public. If awareness is low, consider implementing an education program about the environmental and economic benefits of accelerating the development of renewable energy and CHP.
- Identify existing renewable portfolio standards or other policies in place or pending that might be significant drivers to new onsite clean energy supply. The rate issue may arise in that context.
- Establish a working group of interested stakeholders to consider design issues and develop recommendations for favorable rates.
- Open a generic PUC docket to explore actual costs and system benefits of onsite clean energy supply and rate reasonableness.

Information Resources

Federal Resources

Title/Description	URL Address
The U.S. Environmental Protection Agency's (EPA's) CHP Partnership is a voluntary program that seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities for policy development (energy, environmental, economic) to encourage energy efficiency through CHP and can provide additional assistance to states in assessing and implementing reasonable rates.	http://www.epa.gov/chp/

General Articles About Ratemaking

Title/Description	URL Address
Accommodating Distributed Resources in the Wholesale Market. This Regulatory Assistance Project (RAP) publication examines the different functions that distributed resources can perform and the barriers to these functions. Policy and operational approaches to promoting distributed resources in wholesale markets are identified.	http://www.raponline.org/showpdf.asp?PDF_URL=%22Pubs/DRSeries/DRWhllMkt.pdf%22
Electricity Transmission: A Primer. This RAP publication was prepared for the National Council on Electric Policy in connection with the Transmission Siting Project. The primer is intended to help policymakers understand the physics, economics, and policies that influence and govern the electric transmission system.	http://www.raponline.org/showpdf.asp?PDF_URL=Pubs/ELECTRICITYTRANSMISSION%2Epd
Energy Efficiency's Next Generation: Innovation at the State Level. American Council for an Energy-Efficient Economy (ACEEE), report number E031, November 2003.	http://www.aceee.org/pubs/e031.htm

Other Resources

Title/Description	URL Address
Regulatory Requirements Database for Small Generators. Online database of regulatory information for small generators. Includes information on standby rates and exit fees, as well as environmental permitting and other regulatory information.	http://www.eea-inc.com/rrdb/DGRegProject/index.html
The U.S. Combined Heat and Power Association (USCHPA) brings together diverse market interests to promote the growth of clean, efficient CHP in the United States. USCHPA can assist states in rate design.	http://www.uschpa.org

Examples of State Legislation and Program Proposals

State	Title/Description	URL Address
Illinois	220 ILCS 5/ Public Utilities Act. Electric Service Customer Choice And Rate Relief Law of 1997. This legislation provides an example of exit fee provisions that encourage CHP.	http://www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=022000050HArt%2E+XVI&ActID=1277&ChapAct=220%26nbsp%3BILCS%26nbsp%3B5%2F&ChapterID=23&ChapterName=UTILITIES&SectionID=21314&SeqStart=40500&SeqEnd=45100&ActName=Public+Utilities+Act%2E
Massachusetts	220 CMR 11.00: Rules Governing the Restructuring of the Electric Industry. This legislation provides an example of exit fee provisions that encourage CHP.	http://www.magnet.state.ma.us/dpu/restruct/96-100/cmr11-2.pdf

References

Title/Description	URL Address
EEA. 2005. Energy and Environmental Analysis Inc. (EEA)	http://www.eea-inc.com/
Evans, P.B. 2005. Optimal Portfolio Methodology for Assessing Distributed Energy Resources Benefits for the Energynet. CEC, PIER Energy-Related Environmental Research. CEC-500-2005-061-D.	http://www.energy.ca.gov/2005publications/CEC-500-2005-061/CEC-500-2005-061-D.pdf

Appendix A. Federal Clean Energy Programs

As states pursue their clean energy policies and programs, they can obtain assistance from a variety of federal programs, as described below.

Cross-Cutting Programs

Cross-cutting federal programs support planning, program development, and initiatives for both energy efficiency and clean energy supply measures. The U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) offer a variety of cross-cutting programs, described below.

Clean Energy-Environment State Partnership Program

This EPA voluntary partnership program is designed to help states review and adopt policies and programs that effectively integrate clean energy into a low-cost, clean, reliable energy system for the state. Clean energy includes energy efficiency, clean distributed generation, and renewable energy. As part of the partnership, EPA works with national organizations to support the state partners, highlight accomplishments, and disseminate lessons learned and best practices. National partners include the National Association of State Energy Officials (NASEO), the National Association of Regulatory Utility Commissioners (NARUC), the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), and the National Conference of State Legislatures (NCSL).

States participating in the Clean Energy-Environment State Partnership Program can use the *Guide to Action* to develop a *Clean Energy-Environment Action Plan* to help identify and implement existing and new energy policies and programs to increase the use of clean energy.

Web site:
http://www.epa.gov/cleanenergy/stateandlocal/partnership.htm

Energy Efficiency and Renewable Energy Projects

The EPA-State Energy Efficiency and Renewable Energy Projects are a joint initiative among EPA, NARUC, and individual state utility commissions. These projects are designed to explore utility regulatory and market-based approaches that deliver significant energy cost savings and other benefits through greater use of energy efficiency, renewable energy, and clean distributed generation. These approaches may include, for example, rate design, resource planning, transmission and distribution planning, and requirements for clean distributed generation (DG).

Web site:
http://epa.gov/cleanenergy/pdf/eere_factsheet.pdf

Federal Energy Management Program (FEMP)

Administered by DOE's Office of Energy Efficiency and Renewable Energy, FEMP promotes energy efficiency and distributed and renewable energy by reducing the operating costs and environmental impacts associated with federal facilities. FEMP advances energy efficiency and water conservation, promotes the use of distributed and renewable energy, and improves utility management decisions at federal facilities. FEMP also offers online information resources, an annual training conference, and workshops to state and local government energy managers. The FEMP Web site provides a compendium of energy efficiency purchasing recommendations, interactive energy cost calculators, and other resources to help purchase energy-efficient products.

Web site:
http://www.eere.energy.gov/femp/

The Industrial Technologies Program

DOE's Office of Energy Efficiency and Renewable Energy supports energy efficiency and renewable energy through the Industrial Technologies Program, which seeks to reduce the energy intensity of the U.S. industrial sector. Through the Best Practices subprogram, DOE works with industry to identify plant-wide opportunities for energy savings and process efficiency.

Web site:
http://www.eere.energy.gov/industry/

State Activities and Partnerships

DOE's Office of Energy Efficiency and Renewable Energy provides technical assistance to state and local jurisdictions that enables them to adopt renewable energy and energy efficiency technologies. The program also offers training and information on funding opportunities and state activities.

Web site:
http://www.eere.energy.gov/states/

The State Energy Program

DOE's Office of Energy Efficiency and Renewable Energy provides grants to states to design and implement their own renewable energy and energy efficiency programs. Because the state energy offices administer their own projects, the technologies and applications that they develop vary widely depending on the state's energy priorities and available renewable resources. This facilitates rapid and inventive deployment of supporting technologies that are environmentally friendly and innovative. These activities cover a wide range of possible projects across all energy-use sectors (i.e., the building, industrial, utility, and transportation sectors). Under the State Energy Program, states have modernized more than 69,000 buildings and completed more than 8,000 energy projects.

Web site:
http://www.eere.energy.gov/state_energy_program/

The Technical Assistance Program (TAP)

The DOE TAP provides state and local officials with quick, short-term access to experts at DOE's national laboratories for assistance with cross-cutting renewable energy and energy efficiency policies and programs that are not currently covered by an existing DOE program. Individualized assistance is available in five eligible areas: (1) system benefit charges or other ratepayer-funded utility efficiency and renewable programs, (2) renewable or efficiency portfolio standards, (3) use of clean energy technologies to help states and localities address air emissions, (4) use of renewable energy on state and local public lands, and (5) disaster relief, mitigation, and planning. Currently, technical assistance is available from three participating laboratories: the National Renewable Energy Laboratory (NREL), the Oak Ridge National Laboratory (ORNL), and the Lawrence Berkeley National Laboratory (LBNL).

Web site:
http://www.eere.energy.gov/wip/informationresources/Tap.html

Energy Efficiency Programs

EPA, DOE, and the U.S. Department of Housing and Urban Development (HUD) administer a variety of programs that provide resources, technical assistance, and research findings on energy efficiency technology and applications.

ENERGY STAR

ENERGY STAR is a voluntary, public-private partnership designed to reduce energy use and related greenhouse gas emissions, where cost-effective. The program delivers significant energy savings, on the order of 135 billion kWh in 2004 or 4% of the nation's total 2004 electricity needs. ENERGY STAR involves an extensive network of partners, including state energy offices, product manufacturers, retailers, home builders, energy service companies, private businesses, and public sector organizations. ENERGY STAR programs employ strategies designed to overcome market barriers and provide information and tools that alter decisionmaking for the long term. Many of the strategies help reduce transaction costs and lower investment risks, making efficiency projects more attractive. Through ENERGY STAR, EPA and DOE invest in energy efficiency efforts that states and utilities can leverage as part of their energy efficiency programs. Key program areas include:

National ENERGY STAR Education Campaign

Since 1997, EPA has operated broad-based public campaigns to educate consumers about the link between energy use and air emissions and to raise awareness about how products and services carrying the ENERGY STAR label can protect the environment while saving them money. Local energy efficiency programs can take advantage of national efforts by incorporating relevant messages or leveraging the campaign via marketing, customer education, and outreach.

Qualifying Products

A government-backed energy efficiency designation—the ENERGY STAR label—is on products in more than 40 categories for the home and business, including heating and cooling, lighting, office equipment, appliances, windows, home electronics, and commercial food service equipment. Each year, EPA and DOE spearhead product-specific national campaigns, enable information exchange on well-developed utility-retailer program models, hold national partner meetings that facilitate networking and collaboration, and provide an array of online resources. Because of ENERGY STAR's well-developed program models and infrastructure, the promotion of ENERGY STAR qualifying products offers a good starting point for new energy efficiency programs.

Existing Homes

ENERGY STAR provides opportunities for obtaining substantial energy savings from improving the heating and cooling systems and envelopes in existing homes; this represents a savings potential that cannot be obtained solely through use of energy-efficient products. The ENERGY STAR program offers specifications for home improvement services such as Home Performance with ENERGY STAR, which emphasizes home diagnostics and evaluation, improvements made by trained technicians and building professionals, sales training, and strong quality assurance. In addition, ENERGY STAR offers systems solutions for home sealing, heating and cooling system best practices, and duct sealing and provides valuable online consumer tools including the Home Energy Yardstick.

New Homes

ENERGY STAR qualifying homes are substantially more efficient than homes built to a model energy code. EPA provides a number of tools to engage home builders in constructing ENERGY STAR qualifying homes, including builder recruitment and sales materials and consumer education and outreach. Many energy efficiency programs promote ENERGY STAR qualifying homes by providing builder training, consumer education, and direct verification of home performance or incentives to offset the cost of verification. Other incentives might include co-op marketing incentives and rebates for qualifying homes.

Commercial Building Performance

The energy efficiency of commercial buildings can be dramatically affected by design, sizing, installation, controls, and operations and maintenance. To better ensure that measures such as lighting, controls, high-efficiency air conditioning, motors, and variable speed drives will deliver expected energy savings, EPA designed an Energy Performance Rating System to measure the energy performance at the whole-building level. Buildings that score low (on a scale of 1 to 100) are typically good candidates for cost-effective improvements, and buildings that score high are eligible for the ENERGY STAR label. ENERGY STAR-labeled buildings use 40% less energy and cost 40% less to operate than average buildings. EPA also works with building owners to encourage them to adopt organization-wide energy management approaches. EPA is working with utility programs throughout the country to integrate these strategies into commercial programs to enhance program uptake and effectiveness.

Industrial Energy Efficiency

ENERGY STAR promotes and encourages superior corporate energy management through the provision of tools and resources specific to the needs of manufacturers. Unique resources offered by ENERGY STAR for manufacturers include opportunities to participate in sector-focused activities, networking opportunities with other industrial energy managers in the broad partnership, the industrial Web site, energy program communication resources, and assistance in developing or improving a corporate energy performance program. Each year, the industrial partnership identifies certain manufacturing sectors to engage in focus activities. These activities include an in-depth study and assessment of energy efficiency opportunities within the sector; production of an energy performance indicator for plants in the sector; and sector-specific energy working groups, including focus meetings aimed at improving corporate energy performance. The partnership currently includes more than 450 participating industrial companies of varying sizes and coordinates focus initiatives with seven industrial sectors.

Web site:
http://www.energystar.gov

Building America

Building America is a DOE/industry partnership that develops energy solutions for new and existing homes. Building America combines the knowledge and resources of building industry leaders with DOE's technical capabilities. The ultimate goal of the program is to achieve a 70% reduction in total home energy use, enabling the balance of energy requirements to be easily met by a solar electric system. As of October 2003, the Building America approach has been used in the design of more than 20,000 houses in 34 states. This accomplishment is a result of the efforts of more than 250 builders implementing projects in many cities across the United States.

Web site:
http://www.eere.energy.gov/buildings/building_america/

Building Technologies Program

DOE's Building Technologies Program helps improve building energy efficiency through the use of innovative new technologies and better building practices. The program includes research and regulatory activities. Research activities advance the next generation of energy-efficient components, equipment, and materials, including a whole-building approach that optimizes building performance and savings. Regulatory activities include efforts to work with state and local regulatory groups and other interested parties to improve building codes, appliance and equipment standards, and guidelines for efficient energy use, and to assist states in updating, implementing, and enforcing their building energy codes.

Web site:
http://www.eere.energy.gov/buildings/

Weatherization Assistance Program (WAP)

Under WAP, DOE works with states and local governments to help low-income families reduce their energy bills by making their homes more energy efficient. Through WAP, weatherization service providers install energy efficiency measures in the homes of qualifying homeowners free of charge. During the last 27 years, WAP has provided weatherization services to more than 5.3 million low-income families. Weatherized households have average energy savings of $224 per year, which amounted to a cost savings of more than $1 billion for all homes served during winter 2000.

Web site:
http://www.eere.energy.gov/weatherization/

The Partnership for Advancing Technology in Housing (PATH)

PATH is a public-private initiative dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing. PATH is a collaborative partnership managed by HUD that spurs change in housing industry design and construction.

Web site:
http://www.hud.gov/offices/cpd/energyenviron/energy/initiatives/index.cfm#path

Partnerships for Home Energy Efficiency (PHEE)

PHEE is a multi-agency (i.e., DOE, EPA, and HUD) program to help households reduce their home energy bills by increasing awareness of ENERGY STAR products, developing new energy efficiency services for homeowners; delivering energy efficiency savings to subsidized and low-income housing; and investing in innovative research in building science technologies, practices, and policies. PHEE incorporates HUD's PATH Roadmap for Energy Efficiency in Existing Homes, which outlines a series of strategies for boosting the energy-efficient remodeling of existing homes and the HUD Energy Action Plan, which promotes energy efficiency in 5 million housing units that have been assisted, insured, or financed by HUD.

The goal of PHEE is to help households save 10% or more on home energy bills over the next 10 years. The initiative builds on existing policies and programs that involve partnerships with manufacturers, retailers, home contractors and remodelers, utilities, states, financial organizations, educational institutions, and others to leverage the power and creativity of the marketplace. Key efforts include:

- Expanding efforts to promote ENERGY STAR products.
- Promoting energy efficiency in affordable housing.
- Continuing to invest in innovative research in building science technologies, practices, and policies.

Web site:
http://www.energysavers.gov/

Clean Energy Supply Programs

EPA and DOE offer a variety of clean energy supply programs that provide information, technical assistance, and research findings related to renewable energy and clean distributed generation, including combined heat and power.

The Combined Heat and Power (CHP) Partnership

The objective of this program is to reduce the environmental impact of power generation by fostering the use of CHP. Through the CHP Partnership, EPA works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development of new projects and promote their energy, environmental, and economic benefits.

Web site:
http://www.epa.gov/chp

The Green Power Partnership

The Green Power Partnership is a voluntary partnership between EPA and organizations interested in buying green power. EPA provides technical assistance and recognition to organizations that pledge to replace a portion of their electricity consumption with green power within a year of joining the partnership.

Web site:
http://www.epa.gov/greenpower/

Buildings Cooling Heating and Power (BCHP) Initiative

The BCHP Initiative is part of the broader building technology efforts of DOE's Office of Energy Efficiency and Renewable Energy. The initiative addresses onsite fuel technologies that make it possible to combine power generation and heating, ventilation, and air conditioning (HVAC) system optimization and integration with other innovative building technologies related to thermal utilization, cooling, and dehumidification.

Web sites:
http://www.eere.energy.gov/de/pdfs/bchp_roadmap.pdf
(describes the BCHP Initiative)

http://www.chpcentermw.org/
(information on the Midwest CHP Application Center [MAC], one of several centers established by DOE to facilitate deployment of CHP technologies through the provision of application assistance, technology information, and educational support.)

Distributed Energy Program

DOE's Distributed Energy Program supports research and development with the goal of lowering costs for distributed energy technologies, reducing emissions, and improving the reliability and performance of these technologies. Program activities focus on two technology areas: distributed energy technologies (including gas-fired reciprocating engines, industrial gas turbines, and microturbines) and integrated energy systems such as CHP.

Web site:
http://www.eere.doe.gov/de/

Geothermal Technologies Program

DOE administers the Geothermal Technologies Program in partnership with industry to help promote geothermal energy as an economically competitive contributor to the U.S. energy supply. It seeks to develop hydrothermal, direct use, and shallow depth area technologies to achieve long-term viability. This program produces many benefits, such as economic competitiveness, environmental improvement, and sustainability of resources.

Web sites:
http://www.eere.energy.gov/geothermal/

http://www.eere.energy.gov/RE/geothermal.html

Hydrogen, Fuel Cells, and Infrastructure Technologies Program

DOE is working with its partners to accelerate the development and successful market introduction of hydrogen, fuel cell, and infrastructure technologies. DOE's Web site provides information on the agency's research, development, and applications in these areas.

Web sites:
http://www.eere.energy.gov/hydrogenandfuelcells/

http://www.eere.energy.gov/RE/hydrogen.html

Million Solar Roofs

DOE is supporting the Million Solar Roofs initiative through national, state, and local partnerships to install solar energy systems (photovoltaic and solar thermal systems) in one million U.S. buildings by 2010. While this program does not direct state actions or provide funding for solar energy systems, it does facilitate collaboration between the federal government, key national businesses, and organizations. This cooperation allows partners and stakeholders to focus on building a strong market for solar energy applications in buildings.

Web site:
http://www.millionsolarroofs.org/

Solar Energy Technologies Program

Through its Solar Energy Technologies Program, DOE works with other federal, state, and local agencies; national laboratories; universities; industry; and professional organizations to research, develop, and deploy cost-effective technologies to expand the use of solar energy throughout the United States and the world. DOE provides information on solar technologies and applications including concentrating solar power, photovoltaics, solar heating, and solar lighting.

Web sites:
http://www.eere.energy.gov/solar/

http://www.eere.energy.gov/RE/solar.html

Wind and Hydropower Technologies Program

DOE's Office of Energy Efficiency and Renewable Energy is working to improve wind energy technology so it can generate competitive electricity in areas with lower wind resources and to develop new, cost-effective, advanced hydropower technologies that will have enhanced environmental performance and greater energy efficiencies. DOE provides information on its Web site on both wind and hydropower energy resources, applications, and technologies.

Web sites:
http://eere.energy.gov/windandhydro

http://www.eere.energy.gov/RE/wind.html

http://www.eere.energy.gov/RE/hydropower.html

Appendix B. Energy Efficiency Program Resources

This appendix provides information on key steps to bring energy efficiency programs to market and provide oversight for investments once these programs have been established. It describes how states can build a portfolio of energy efficiency investments and then monitor and evaluate those investments. The intended audience for this material includes state public utility commissions (PUCs), other agencies that oversee energy efficiency programs, program administrators such as utility program managers and third parties, and other organizations involved in implementing and evaluating energy efficiency programs.

Mechanisms for securing funding for energy efficiency investments are not included in this section. These issues are covered in detail elsewhere in the *Guide to Action*, including Section 3.1, *Lead by Example*, Section 3.4, *Funding and Incentives*, Section 4.1, *Energy Efficiency Portfolio Standards*, Section 4.2, *Public Benefits Funds for Energy Efficiency*, and Section 6.1, *Portfolio Management Strategies*.

Building a Portfolio of Energy Efficiency Investments

States are developing energy efficiency investment portfolios as part of their larger energy strategy. This allows states to position themselves for both short- and long-term energy needs in a way that is cost-effective, serves diverse constituencies, minimizes energy supply and environmental risks, and can help reduce price volatility. Determining the appropriate mix of energy efficiency measures in an overall energy efficiency program portfolio typically involves a series of interrelated activities:

- Assessing the potential for energy efficiency to meet resource needs and inform funding decisions.
- Involving stakeholders in planning.
- Assessing multiple system and customer needs.
- Considering transmission and distribution (T&D) needs.
- Allocating energy efficiency investments within a portfolio.
- Screening for cost-effectiveness.
- Developing program plans.

State and regional approaches for undertaking these activities are addressed in this section.

Assessing Energy Efficiency Potential

As a fundamental step in determining an appropriate level of funding for energy efficiency measures, states or regions typically conduct studies of the potential for increased investments to reduce energy use within a specified time frame. The primary goal of these analyses is to determine the availability of energy efficiency as a resource option (irrespective of the policy or funding mechanism for achieving that potential). In addition to identifying an appropriate level of efficiency investment for a state, potential studies provide valuable data that can be used in the program planning and design stage. States can use this information to:

- Make the initial case or justification for undertaking the establishment of energy efficiency policies and programs.
- Characterize the current and future potential for energy efficiency to identify the most important market sectors and end uses for tapping the efficiency resource potential.
- Obtain detailed information about specific measures and the broader efficiency market to aid in technology screening and program design.

Potential studies typically calculate the following types of potential:

- *Technical potential* assumes the complete penetration of all energy conservation measures that are considered technically feasible from an engineering perspective.
- *Economic potential* refers to the subset of technical potential that is cost-effective when compared to supply-side alternatives.
- *Maximum achievable potential* is the economic potential that could be achieved over time under the most aggressive program scenario.
- *Program potential* refers to energy saved as a result of a specific program's funding level and incentives. These savings are above and beyond what would occur naturally in the absence of any market interventions.
- *Naturally occurring potential* refers to energy saved as a result of normal market forces, that is, in the absence of any utility or governmental intervention (Rufo and Coito 2002, Optimal Energy 2005).

Three Levels of Efficiency Potential Studies

Energy efficiency potential studies can be completed across multiple sectors (i.e., an aggregate study), can provide greater detail within sectors and sub-markets (i.e., a targeted study), or can develop a robust set of data for a full range of individual efficiency measures (i.e., a detailed study).

The cost of an aggregate study can range from a low of about $20,000 to more than $50,000 depending on the size of the state or region and whether all sectors are studied.

Targeted studies typically cost between $50,000 and $100,000 depending on scope and detail. These studies evaluate intra-sectoral trends and characterize end-uses such as motors, residential HVAC, and commercial lighting.

Detailed studies typically include benefit and cost data for individual measures and can range from $50,000 for a study that examines a limited number of sectors to well over $250,000 for a detailed multi-sector analysis that includes detail program design recommendations (Prindle and Elliot 2006).

Efficiency potential studies are typically conducted at the state or regional level. In most cases, efficiency is assessed across residential, commercial, and industrial customer classes. These analyses usually employ quantitative analysis of potential combined with expert judgment on the feasibility and likely performance of the measures being assessed. Estimates of achievable potential are often based on experiences from similar programs around the country.

The results of energy efficiency potential studies can identify untapped opportunities for savings and encourage policy development and program implementation. Recent studies identify economic potential in the ranges of 13% to 27% for electricity and 21% to 35% for gas. Achievable potential—the realistic estimate of what can actually be achieved from programs—ranges between 10% to 33% for electricity and 8% to 10% for gas (Nadel et al. 2004). For example:

- The Southwest Energy Efficiency Project (SWEEP) found that investing about $9 billion (in 2000 dollars) in efficiency measures from 2003 to 2020 would reap total economic benefits for the Southwest region of approximately $37 billion. The resulting benefit-cost ratio is about 4.2, with energy efficiency measures costing, on average, $0.02 per kilowatt-hour (kWh) saved (SWEEP 2002).
- In Connecticut, a 2004 study uncovered significant energy efficiency potential, with opportunities in all sectors. This study found that capturing the achievable cost-effective potential for energy efficiency would reduce peak demand by 13% (908 megawatt [MW]) and electric energy use by 13% (4,466 gigawatt-hours [GWh]) by 2012. This would result in zero electric load growth from 2003 through 2012 and achieve net benefits of $1.8 billion (Connecticut ECMB 2004).
- New York estimated the potential for a bundled increase in energy efficiency and renewable energy, and found that the combined effects could reduce the state's annual electricity generation requirements by 19,939 GWh in 2012 and by 27,244 GWh in 2022. This represents 12.7% and 16.1% of expected statewide requirements for those years, and is achievable at costs below those of conventional generation (Optimal Energy et al. 2003).

- A study for California found that, despite a long track record of delivering energy efficiency programs, energy efficiency resources can play a significantly expanded role in the state's electricity resource mix over the next decade. With implementation of all cost-effective program potential, the study estimates that growth in peak demand could be cut in half. This "advanced efficiency" scenario would result in peak savings of 5,900 MW, energy savings in excess of $20 billion, and net benefits of $11.9 billion (Rufo and Coito 2002).

After identifying the achievable level of energy efficiency, this resource can be compared with the cost of supply-side options enabling states to select a combination of measures that result in the lowest overall costs and largest benefits to utilities and customers. In practice, states often accomplish this by comparing the "avoided cost" of generation, transmission, and distribution with the cost of implementing energy efficiency. States are finding that accurate data on T&D are particularly important when evaluating efficiency in the context of peak-oriented end uses such as air conditioning. In these cases, the avoided cost of physically moving electricity may equal or exceed the value of the energy savings themselves. Another increasingly important consideration for some states is the avoided environmental costs of energy efficiency, including air emission reductions and water savings (Biewald et al. 2003).

Involving Stakeholders in Planning

There is typically a lag time between the time a policy mandate is established and the program administrator develops and implements energy efficiency programs. Administrators can take advantage of this time period to form an Energy Efficiency Advisory Group (often referred to as a Demand-Side Management [DSM] Advisory Group). Meetings of the advisory group are usually open to all interested stakeholders and commonly engage commission staff, ratepayer advocates, contractors and suppliers, and representatives from all customer classes. The program administrator may use the advisory group to:

- Solicit input on program ideas.
- Solicit input on program design issues.
- Review draft requests for proposals for program implementation assistance.
- Provide input on evaluation plans.
- Review draft market assessments and other evaluation reports.

A key consideration for the stakeholder group is the level of experience of the program administrator and implementer. For example, a state that has been designing and overseeing efficiency programs for two decades may take a very different approach than a state with little experience in the field.

Addressing Customer Needs

All customer classes benefit from well-managed energy efficiency programs,[48] regardless of whether they participate directly. However, those who participate receive both the direct benefit of participation and the indirect benefit derived from system-wide program savings and reliability enhancements. Since all customer classes are typically required to pay into energy efficiency programming, many states have developed programs that provide direct benefits for each of their major customer classes, including:

- Residential homeowners.
- Multifamily tenants.
- Low-income customers.
- Small business owners.
- Commercial and industrial (C&I) customers.[49]

States with multiple utilities may wish to ensure that each service territory receives direct benefits that are roughly proportional to the amount paid into the system by customers within that service territory. However, it is important to address this issue in a way

48 For example, an evaluation of the New York State Energy Research and Development Authority (NYSERDA) program concluded: "Total cost savings for all customers, including non-participating customers [in New York Energy $mart programs] is estimated to be $196 million for Program activities through year-end 2003, increasing to $420 million to $435 million at full implementation" (NYSERDA 2004a).

49 Some states allow large C&I customers to opt out of paying program costs if they secure comparable efficiency through other means. This is sometimes referred to as "industrial self direction."

that does not constrain program design and implementation. For example, in a state with multiple utilities, a best practice for a mass-market lighting and appliance program is to require a consistent statewide program that delivers energy efficient products through existing retailer sales channels. Depending on program design, it may not be practical or cost-effective to prove the specific jurisdiction in which a particular product was installed. Consequently, utilities and their oversight authority sometimes reach advanced agreement that energy savings will accrue to each program administrator in proportion to the results of their program offering (usually a financial incentive to the retailer, manufacturer, or customer).

Another important customer need is to avoid regulatory delay and disruption to energy efficiency services. To minimize risk, states can define in advance the conditions under which program funds can be reallocated, either within a customer class or between customer classes. For example, if a high-performing and well-subscribed residential program runs out of funding and a commercial program is not meeting program targets, states can determine whether funds should: (1) be redistributed between these two customer classes, (2) come from another residential program offering, or (3) be forward-funded from a future program year. Alternately, if the highly successful program is temporarily suspended, states can assess the customer service implications, implications for future program success, and whether the program administrators will be able to re-engage other program participants (e.g., suppliers such as retailers and contractors) in the future.

Considering Transmission and Distribution Needs

State officials and other stakeholders are increasingly considering whether funds should be set aside to use energy efficiency as a "nonwires" solution to eliminate T&D congestion. Such investments have the potential to improve the reliability of the electricity grid as a whole. Two examples of this approach include:

- The Connecticut Energy Efficiency Fund directs a large share of its resources to the transmission-constrained southwest region of the state. One-quarter of all efficiency funding goes to the highly constrained Norwalk-Stamford area, while another quarter is allocated to the remainder of southwest Connecticut. As a result, one-half of the Fund's $60 million is being used to mitigate the state's electricity transmission problem (ECMB 2005).
- In California, the cost-effectiveness evaluation of each energy efficiency program and the overall energy efficiency portfolio uses avoided costs that include the avoided cost of T&D, which reflects locational differences. The California Public Utilities Commission (CPUC) takes these T&D constraints into account during the final integration of all programs into the portfolio plans for each utility (CPUC 2005).

The issue of whether to allow efficiency funds to be used to fund "nonwires" solutions is complicated by rate design mechanisms in areas of the country where there is a regional transmission system and multi-state holding companies. While an in-depth discussion of this issue is beyond the scope of the *Guide to Action*, states are becoming increasingly interested in looking to energy efficiency to alleviate T&D congestion. This issue was explored in a 2003 report sponsored by the New England Demand Response Initiative (NEDRI 2003).

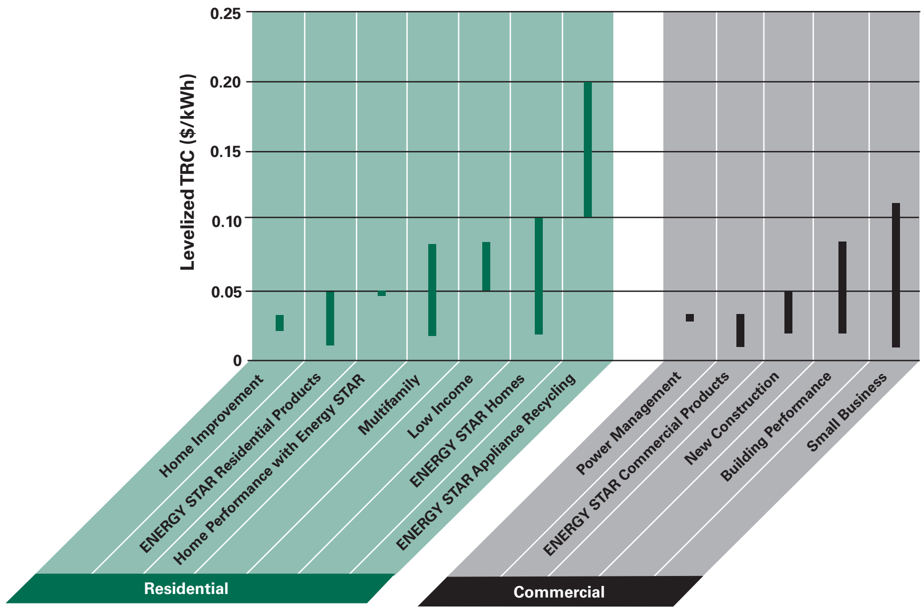
Allocating Efficiency Investments

Once an overall funding level is established, program administrators conduct further screening of individual programs or measures. Program administrators typically balance their efficiency program investment based on the same principles that one would use in evaluating a stock portfolio. For instance, they may ask:

- How reliable is the investment?
- When will it achieve savings?
- How long will those savings last?
- What other investments and/or strategies need to be considered to offset risk?
- Is it wise to include some long-term investments?

At the aggregate portfolio level, many states are able to achieve energy savings at an annual levelized

Figure B.1: Energy Efficiency Program Costs



Sources: EPA estimates based on Efficiency Vermont 2002, SCE 2004, Xcel Energy 2004, Kim 2005, Northwest Power Planning Council 2005.

Total Resource Cost (TRC) of about 0.02 $/kWh to 0.04 $/kWh,[50] although the cost of individual measures or programs can be much higher (see Figure B.1). Nevertheless, including some higher-cost strategies as a part of a broader energy efficiency portfolio may be desirable for a number of reasons; for example, higher costs may be acceptable when savings are more reliable. Certain practices such as verifying proper installation of a home heating and cooling system may add costs to a program, but they increase confidence that the installed measures will actually deliver targeted energy savings and deliver other benefits, such as improving indoor air quality and comfort.

Other factors that can be considered include whether an efficiency measure delivers energy reductions at peak times, reduces water consumption, or offers other nonenergy benefits. States may also invest a portion of their energy efficiency funding in research and development programs that identify and promote emerging technologies, practices, and program models.

Screening for Cost-Effectiveness

Once policies, funding levels and mechanisms, and relative portfolio allocations have been established, organizations charged with overseeing energy efficiency resources usually analyze more in-depth data on cost-effectiveness to further screen programs and measures before approving final program plans.

Many states incorporate cost-effectiveness analysis into the design and evaluation of their programs. This helps ensure the effective use of public funds and can be used to compare program and technology performance with the aim of developing effective future programs. Cost-effectiveness tests commonly used by states are shown in Table B.1.

One frequently used basic economic assessment tool is the TRC Test. This test assesses the net lifetime benefits and costs of a measure or program, accounting for both the utility and program participant perspectives. As with other cost-effectiveness tests, if the benefit-cost ratio is greater than one, it is deemed to be cost-effective. If applied at a portfolio level, individual measures and programs can then

50 The TRC takes into account program administration costs and the full incremental costs of a technology or measure regardless of who pays those costs.

Table B.1: Common Cost-Effectiveness Tests

Type of Test	Description
Total Resource Cost (TRC) Test	Compares the total costs and benefits of a program, including costs and benefits to the utility and the participant and the avoided costs of energy supply.
Societal Test	Similar to the TRC Test, but includes the effects of other societal benefits and costs such as environmental impacts, water savings, and national security.
Program Administrator Test	Assesses benefits and costs from the program administrator's perspective (e.g., benefits of avoided fuel and operating and capacity costs compared to rebates and administrative costs).
Participant Test	Assesses benefits and costs from a participant's perspective (e.g., reductions in customers' bills, incentives paid by the utility, and tax credits received as compared to out-of-pocket expenses such as costs of equipment purchase, operation, and maintenance).
Rate Impact Measure	Assesses the effect of changes in revenues and operating costs caused by a program on customers' bills or rates.

Source: UNEP 1997.

be further screened based on the extent to which benefits exceed costs and on other portfolio considerations mentioned previously in this section.

Sometimes states use a combination of tests to examine the program impacts from different perspectives. In Iowa, for example, the state legislature directed the Iowa Utilities Board to use several cost-effectiveness tests (i.e., the Societal Test, Utility Cost Test, Rate Impact Measure, and Participant Test) in evaluating the overall cost-effectiveness of its energy efficiency plans.

States wishing to consider the non-electric implications for energy use and energy savings may use the Societal Test, which incorporates a broader set of factors than the TRC Test. The Program Administrator and Participant Tests are sometimes used to help design programs and incentive levels, rather than as a primary screen for overall cost-effectiveness. For example, California recently proposed adding the Program Administrator Test as a secondary screening measure to ensure that utilities do not provide excessive financial incentives to program participants.

If using only one test, states are moving away from the Rate Impact Measure (RIM) Test because it does not account for the interactive effect of reduced energy demand from efficiency investments on longer term rates and customer bills. Under the RIM test, any program that increases rates would not pass, even if total bills to customers are reduced. In fact, there are instances where measures that increase energy use pass the RIM Test.

While many utilities and PUCs express program performance in terms of benefit-cost ratios, expressing program costs and benefits in terms of dollars per kilowatt-hour ($/kWh) is also useful because it is easy to relate to the cost of energy. Consumers and legislators can relate this metric to the cost of energy in their own area, while utilities and regulators can compare this value to the avoided costs of energy supply.

The cost-effectiveness tests chosen by a regulatory organization during the initial screening phase are usually used to evaluate and recalculate savings throughout the life cycle of a program or portfolio to ensure that results are consistent with expectations and to assess program impacts. Additional resources on cost-benefit tests are provided in the *Information Resources* section on page B-14.

Developing Program Plans

The program oversight authority typically requires program administrators to submit detailed program plans for approval before beginning program implementation. At a minimum, good program plans include the following information for the overall program and for the individual programs that comprise the overall approach:

- Program descriptions.
- Program goals and objectives.
- Budgets.
- kW and kWh goals including anticipated annual energy savings and lifetime energy savings.

- Benefits and costs.
- Marketing and implementation strategies.
- Major milestones.
- Evaluation plans (including identification of metrics for program success) (EPA 2006).

States can require program administrators to use either a deemed savings or measured savings approach when assessing the potential energy savings of program measures. Deemed savings are the per unit energy savings that are claimed for specific measures; this approach is appropriate for estimating potential savings of common energy efficiency measures. The measured savings approach is more applicable for customized measures and large-scale projects (see box, *Determining Whether to Use "Deemed" or "Measured Savings" Approaches to Quantify Energy Benefits*).

Determining Whether to Use "Deemed" or "Measured Savings" Approaches to Quantify Energy Benefits

Two methods for assessing savings from energy efficiency programs are the *deemed savings* and *measured savings* approaches. Both methods can be used on a prospective basis during the energy efficiency planning phase. This gives states a sense of the savings potential associated with a given portfolio of investments. Some states, particularly those with aggressive timelines for implementing energy efficiency programs, are coming to advanced agreement on which measures in an efficiency portfolio can be estimated using "deemed" savings and which programs or projects will require "measured" savings approaches.

Deemed savings usually apply to the most common energy efficiency measures. Deemed savings values are the per unit energy savings values that can be claimed from installing specific measures. Since they are agreed upon between the program oversight authority and the energy efficiency program administrator, deemed savings can help alleviate some of the guesswork in program planning and design. Deemed savings values are then used as inputs by the program administrator in screening for cost-effectiveness and developing program plans. If a utility receives financial incentives for implementing efficiency programs, deemed savings can also become the basis for incentive claims. Therefore, it is important to consider the suitability of deemed savings approaches for different types of programs and measures and to include requirements for periodic review of deemed savings values in program evaluation, monitoring, and verification activities in advance of policy setting. In general, deemed savings approaches are most reliable for the following types of measures:

- Technologies that typically deliver energy savings independent of human factors such as contractor installation practices or consumer behavior (e.g., plug-in products).
- Technologies that have a clear standard by which to compare efficient and less efficient products (e.g., the Federal National Appliance Energy Conservation Act [NAECA] Standard or ENERGY STAR designation).
- Technologies that have been promoted by other efficiency programs; that have well-established usage patterns, measure life, and performance history; and where usage is not driven by weather.
- Plug-load technologies that are weather sensitive (e.g., room air conditioners and dehumidifiers). Additional analyses can be performed to develop reasonable deemed savings values for technologies installed in each climate zone within a state or service territory.

States that use deemed savings values include New Jersey, Texas, California, and Vermont. Relevant documents and materials from these states can be found in the *Information Resources* section on page B-14.

Measured savings approaches require a high level of rigor and may involve the application of end-use metering, billing regression analysis, or computer simulation. Measured savings approaches are usually used for custom measures and large-scale projects. These approaches add to administrative costs but may provide more accurate savings information. In the planning stage, a utility or other program administrator typically develops savings estimates from the bottom up trying to anticipate the mix of measures that will be involved in a particular project or program. As programs mature over time, utilities usually improve their ability to forecast the measures that will be installed in custom programs. However, because it is difficult to anticipate the interactive effects of specific technologies in complex and variable building systems, it is important to verify measured savings for these types of programs.

Program administrators usually have about three months to develop and submit their program plans. Similarly, oversight authorities typically need about three months to review and approve or suggest modifications to plans. In order to ensure programs are implemented as quickly as possible once approved, program administrators issue requests for proposals during this time period (if they did not do so earlier) and contracts decisions are made contingent upon approval by the oversight authority (Geller 2006).

Evaluating Energy Efficiency Investments

Evaluation is important for sustaining the success of and support for energy efficiency programs and for helping to determine future investment strategies. Unless program overseers can show concrete and robust program results in line with their stated objectives, decisionmakers may not re-authorize the program, the program may become vulnerable to funding shifts or other forms of erosion, and public funds may be poorly spent. State policymakers are promoting evaluation requirements both during program development and after program implementation.

Key elements of state evaluation programs are shown in the box, *Best Practices: Evaluating Energy Efficiency Programs*. Four key aspects of an effective evaluation strategy are addressed below:

- Addressing multiple objectives.
- Managing evaluation activities.
- Measuring energy savings.
- Coordinating with other states and regions.

Addressing Multiple Objectives

Evaluation is used to inform ongoing decisionmaking, improve program delivery, verify energy savings claims, and justify future investment in energy efficiency as a reliable energy resource. Engaging in evaluation during the early stages of program development can save time and money by identifying program inefficiencies and suggesting how program funding can be optimized. It also helps ensure that critical data are not lost.

Best Practices: Evaluating Energy Efficiency Programs

- Evaluate programs regularly, rigorously, and cost-effectively.
- Use methods that have been proven over time in other states, adapting them to state-specific needs.
- Provide both "hard numbers" on quantitative impacts and process feedback on the effectiveness of program operations and methods for improving delivery.
- Use independent third parties, preferably with strong reputations for quality and unbiased analysis.
- Measure program success against stated objectives, providing information that is detailed enough to be useful and simple enough to be understandable to nonexperts.
- Provide for consistent and transparent evaluations across all programs and administrative entities.
- Communicate results to decisionmakers and stakeholders in ways that demonstrate the benefits of the overall program and individual market initiatives.
- Maintain a functional database that records customer participation over time and allows for reporting on geographical and customer class results.

Some states incorporate specific reporting and evaluation requirements into their energy plans and include feedback loops to guide future iterations of the plan. For example, Oregon's Biennial Energy Plan (2003–2005) includes a section that reviews the previous year's achievements. The Iowa Department of Natural Resources prepares a comprehensive energy plan update every two years, reporting on energy consumption and progress in improving energy efficiency and expanding renewable energy use. Many states require evaluation activities to be incorporated into an ongoing program planning, design, implementation, and evaluation cycle to meet multiple objectives. For example, the New York State Energy Research and Development Agency (NYSERDA) conducts evaluations to:

- Identify program goals and key output and outcome measures that provide indicators of program success.
- Review measurement and verification (M&V) protocols used to evaluate programs and verify energy savings estimates to determine if estimates are reasonably accurate.

- Evaluate program processes to determine how and why programs deliver or fail to deliver expected results.
- Characterize target markets, determine changes observed in the market, and identify the extent to which these changes can be attributed to the state's energy efficiency programs.
- Communicate with decisionmakers and stakeholders about the benefits of the overall efficiency program and results of individual programs.
- Refine program delivery models based on evaluation findings (NYSERDA 2004b).

Evaluation addresses different objectives at various stages of program design and implementation. Thus, what is measured depends on the implementation phase and the specific program component being evaluated. Table B.2 presents a hypothetical example of when evaluation activities could be conducted throughout the life of a program, recognizing that program evaluation is a dynamic process.

Managing Evaluation Activities

Since evaluation is complex, and different types of evaluation are needed at various stages of program design and implementation, states may wish to tap into their energy efficiency advisory group, form a

Table B.2: Examples of Evaluation Activities by Energy Efficiency Program Phase

Program Phase	Common Evaluation Activities	
Pre-Program Research and Assessment	• Perform needs assessment. • Establish baseline and research markets.	• Perform scoping study (e.g., define program objectives).
Program Design, Research, and Evaluation	• Develop and document theory of how program will work (i.e., a "program logic model"). • Define program outcomes. • Assess cost-effectiveness. • Establish indicators of, and metrics for, program performance.	• Identify data sources and specify data quality objectives. • Establish evaluation management plan. • Incorporate program refinements into formal program design.
Pilot Program	• Test concepts and program logic. • Measure participant satisfaction. • Assess measurement methods and program scope.	• Incorporate program refinements into formal program design. • Analyze implementation processes.
Full-Scale Implementation	• Track and monitor established indicators. • Report on program performance according to planned schedule. • Introduce program refinements. • Incorporate program refinements into formal program design.	• Adjust data collection and reporting needs as necessary. • Analyze implementation processes.
Mature Program	• Reassess adequacy of program logic; update as needed. • Estimate costs and benefits. • Assess progress against indicators. • Report on progress toward goals. • Introduce program refinements.	• Incorporate program refinements into formal program design. • Assess measurement methods. • Assess program effectiveness in terms of end results. • Assess impacts attributable to the program.

Source: Compiled by EPA based on multiple sources.

separate evaluation advisory group, or hire a professional advisor to guide evaluation investments. These entities can help assess available resources, identify and help prioritize evaluation activities, determine areas of uncertainty in a program or portfolio, and assess the maturity of a program. For example, advisors can be used to help identify and prioritize which assumptions used in the portfolio planning and cost-effectiveness screening process may need to be reassessed based on the parameters that are most uncertain or sensitive (e.g., if estimated incorrectly, could greatly affect overall savings estimates) or the programs or measures that account for the majority of portfolio savings estimates. Parameters may include:

- Hours of use.
- Assumed life of the measure (e.g., number of years that the product, home, or building will perform efficiently).
- Individual customer's interaction with the product, home, or building.
- Accuracy of engineering estimates (e.g., how a product performs in a lab or engineering simulation compared with how it performs after installation).

Identifying and reassessing potential weaknesses early in the process can help improve subsequent year program plans and forecasts and help ensure that no major surprises are uncovered during the impact evaluation process (described below in *Conducting Impact Evaluation*). In addition, an advisory group can help determine which evaluation activities are best managed by the implementing organization and which should be managed by another, third-party organization. The California Measurement Advisory Council (CALMAC) is an example of a highly sophisticated advisory group. CALMAC provides the state with a forum for developing, implementing, and reviewing evaluation studies related to its public benefits fund [PBF]-based energy efficiency programs (CALMAC 2005).

Measuring Energy Savings

States are measuring their energy efficiency savings using strategies and protocols that are increasingly credible, transparent, and consistently applied. The main elements and issues to be considered when conducting an impact evaluation, evaluating a market-based efficiency program, or adopting project-level M&V protocols are described as follows.

Conducting Impact Evaluation

An evaluation of program impacts is designed to identify and measure energy savings and other program impacts. Impact evaluation assesses the net effect of a program by comparing program impacts with an estimate of what would have happened in the absence of a program. In the context of energy efficiency, this typically includes an estimate of the energy reduction and peak reduction impacts. Impact evaluations review each of the assumptions used in energy and peak savings claims, in addition to the current market penetration of the energy-efficient product or service compared to the baseline.

Impact evaluation also typically addresses the impact of "free riders" (i.e., people who participate in the energy efficiency program, but who would have taken the energy efficiency action without the program) and sometimes addresses "free drivers" (i.e., people who are influenced into action by the program, but don't participate in the program). Several states, including New York, California, Connecticut, Oregon, and Wisconsin, have conducted comprehensive impact evaluations of their PBF programs for energy efficiency. For example, NYSERDA measures and tracks its PBF investments and conducts quarterly and annual evaluations of the Energy $mart program. It analyzes the cost-effectiveness of the program, permanent and peak-load energy and cost-savings to customers, economic impacts, and reductions in greenhouse gases and criteria pollutants (NYSERDA 2004b).

Considerations for Market-Based Energy Efficiency Programs

Market-based energy efficiency programs are designed to create a lasting change in the availability and selection of energy-efficient alternatives. In addition, benefits of a market-based program design include greater adoption of efficiency offerings and spillover effects (i.e., the effect of a program to induce other customers to invest in energy efficiency even without a program incentive). These programs often rely on existing market channels (e.g., retailers and contractors) for delivery and operate on the principle that inherent barriers need to be overcome for a customer to choose an energy-efficient product, home, building, or service. Market-based efficiency programs deploy a series of interventions to overcome those barriers and foster lasting change.

Market-based energy efficiency programs can be a highly cost-effective part of an energy efficiency program portfolio, but because they interact with established markets for products and services—and in many cases work closely with national programs such as ENERGY STAR (ENERGY STAR 2005)—it is important that new programs establish and document baselines and articulate program theory or logic from the onset. Establishing a baseline involves determining the current market share for the high-efficiency product or service and then projecting how the market would change over time in the absence of the program. Articulating the program theory or logic involves assessing the barriers to greater adoption, the program activities or interventions that will overcome these barriers, and the indicators that will be used to determine if the program is working as anticipated. Sample barriers, interventions, and indicators are summarized in Table B.3. Documenting the baseline and program theory lays the foundation for assessing and correcting problems with program design and sets the stage for eventual impact evaluation.

Adopting Project-Level Measurement and Verification (M&V) Protocols

Many states with active energy efficiency programs rely on accepted practices and methods approved by their respective regulatory commissions as the basis for measuring and verifying energy efficiency savings. Some states (e.g., Texas and California) have gone further and documented the key assumptions used to calculate energy and demand savings in a technical reference manual, providing a level of transparency. Other states reference specific verification protocols (i.e., specifying a required verification methodology or level of rigor). Without formal evaluation protocols, states will not have access to readily available and transparent energy savings data.

To improve the consistency, accuracy, and comparability of their efficiency initiatives, a number of states have adopted the International Performance Measurement and Verification Protocol (IPMVP). The IPMVP is an accepted industry standard that provides an overview of best practice techniques for verifying energy savings from facility-level and other efficiency initiatives. It is used by California, Florida, Iowa, Texas, New York, and Illinois to support system planning needs, clean energy portfolio standards, and carbon reduction programs (IPMVP 2005). EPA also

Table B.3: Issues to Consider When Documenting Energy Efficiency Program Logic

Barriers	Interventions	Mid Term Indicators	Long Term Indicators
• Lack of awareness. • Lack of supply. • Higher first cost.	• Consumer education. • Supplier education and incentives. • Education on reduced operating costs. • Financial incentives (e.g., rebate, buy-down).	• Increased awareness. • Increased supply of product or service. • Increased knowledge. • Use of financial incentive.	• Behavior change. • Change in manufacturing practice. • Reduction in price premium.

Source: Compiled by EPA based on multiple sources.

recommends the protocol to states participating in the NO_x SIP Call program.[51] The objectives of the IPMVP are to:

- Increase certainty, reliability, and savings level (with a focus on the persistence of savings several years after installation).
- Reduce transaction costs by providing an international, industry consensus approach and methodology.
- Reduce financing costs by providing project M&V standardization, thereby allowing project bundling and pooled project financing.
- Provide a basis for demonstrating emission reduction and delivering enhanced environmental quality.
- Provide a basis for negotiating contractual terms to ensure that an energy efficiency project achieves or exceeds its goals of saving money and improving energy efficiency (Seattle 2006).

The IPMVP provides a flexible set of M&V approaches (see Options A, B, C and D in Table B.4) for evaluating energy savings in buildings. These four options are designed to match project costs and savings requirements with particular efficiency measures and technologies (Fine and Weil 2000). Each option is applicable to different programs and projects based on factors such as the complexity of the efficiency measures under evaluation and the risk expectations. Accordingly, each option varies in accuracy and cost of implementation, as well as strengths and limitations.

Coordinating with Other States and Regions

State adoption of evaluation protocols is critical as policymakers and regulators turn to energy efficiency as a least-cost, short-term strategy to help meet regional transmission needs, offset increasing energy costs, and comply with multi-state commitments to reduce air emissions. States are increasingly complementing their existing energy efficiency policies (e.g., building energy codes, appliance standards, and public benefits charge-funded programs) with strategies that treat efficiency as a resource in the context of regional energy system and environmental frameworks. States can adopt credible and transparent evaluation protocols to advance a range of regional policies and initiatives, including the following:

- *Integrating Energy Efficiency into Resource Procurement Processes*. Developing consistent protocols to measure, verify, and report efficiency savings in a region can help states and regions evaluate the energy efficiency resource on a comparable basis with electricity generation resources in the context of clean energy portfolio standards, portfolio management, and demand response programs. A common evaluation protocol allows efficiency savings to be readily compared, aggregated, and ultimately integrated into broader system plans.
- *Serving As the Basis for Documenting Emission Reductions Associated with Energy Efficiency Programs/Projects*. As states and regions encourage energy efficiency as an emission reduction strategy under regulatory "cap and trade" programs, accurate and transparent evaluation protocols for energy savings are necessary to document reductions and secure credits associated with energy efficiency programs and projects. Texas and Wisconsin are among the states and regions that have analyzed the emission impacts associated with their state's energy efficiency programs. In Wisconsin, the evaluation team developed emission factors for the marginal generating units for different time periods (e.g., peak and off-peak hours during the winter and summer) and used these factors to analyze the effects of different energy efficiency programs (Erickson et al. 2004).
- *Improving Regional Energy Efficiency Modeling and Forecasting*. Various state and regional energy modeling efforts (e.g., efficiency potential studies and regional climate change modeling) require a consistent characterization of energy efficiency projects and programs. This includes estimates of savings and costs, as well as how efficiency savings assumptions are likely to change in the future.

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51 These and other M&V resources are described in the EPA report, Creating an Energy Efficiency and Renewable Energy Set-Aside in the NO_x Budget Trading Program: Measuring and Verifying Energy Savings (EPA forthcoming).

Table B.4: IPMVP Measurement and Verification Options

M&V Option	How Savings Are Calculated	Cost	Typical Applications
Option A. Partially Measured Retrofit Isolation: Savings determined by partial field measurement of the energy use of the system to which a measure was applied, separate from the energy use of the rest of the facility. Focuses on physical assessment of equipment changes to ensure the installation is to specification. Key performance factors (e.g., lighting wattage or chiller efficiency) are determined with spot or short-term measurements. Operational factors (e.g. lighting operating hours or cooling ton-hours) are stipulated based on analysis of historical data or spot/short-term measurements. Performance factors and proper operation are measured or checked annually.	Engineering calculations using spot or short-term measurements, computer simulations, and/or historical data.	Dependent on number of measurement points. Approximately 1% to 5% of project construction cost of items subject to M&V.	Lighting retrofit where power draw is measured periodically. Operating hours of the lights are assumed to be one-half hour per day longer than a store's open hours.
Option B. Retrofit Isolation: Savings determined after project completion by short-term or continuous measurements taken throughout the term of the contract at the device or system level. Performance and operations factors are monitored.	Engineering calculations using metered data.	Dependent on number and type of systems measured and the term of analysis/metering. Typically 3% to 10% of project construction cost of items subject to M&V.	Application of controls to vary the load on a constant speed pump using a variable speed drive. Electricity use is measured by a kWh meter installed on the electrical supply to the pump motor. In the base year, this meter is in place for a week to verify constant loading. The meter is in place through the post-retrofit period to track variations in energy use.
Option C. Whole Facility: After project completion, savings determined at the "whole-building" or facility level using current year and historical utility meter (gas or electricity) or sub-meter data. Short-term or continuous measurements are taken throughout the post-retrofit period.	Analysis of utility meter (or sub-meter) data using techniques from simple comparison to multivariate (hourly or monthly) regression analysis.	Dependent on number and complexity of parameters in analysis. Typically 1% to 10% of project construction cost of items subject to M&V.	Multi-faceted energy management program affecting many systems in a building. Energy use is measured by gas and electric utility meters for a twelve-month base year period and throughout the post-retrofit period.
Option D. Calibrated Simulation: Savings determined through simulation of facility components and/or the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility.	Calibrated energy simulation/modeling; calibrated with hourly or monthly utility billing data and/or end-use metering.	Dependent on number and complexity of systems evaluated. Typically 3% to 10% of project construction cost of items subject to M&V.	Multi-faceted energy management program affecting many systems in a building but where no base year data are available. Post-retrofit period energy use is measured by gas and electric utility meters. Base year energy use is determined by simulation using a model calibrated by the post-retrofit period utility data.

Sources: IPMVP 2002 and Seattle 2006.

- *Incorporating energy efficiency more effectively into regional electric power system planning*. Consistent evaluation and reporting protocols are necessary to determine the total impact that energy efficiency can have within a regional electricity system. Similarly, a common reporting protocol allows two or more adjoining power pools to ensure consistency when analyzing interchange and trade activities.
- *Assessing the impact of energy efficiency on reducing natural gas demand for electric power generation*. Energy efficiency can play a significant role in reducing forecasted natural gas demand. Common protocols for efficiency savings help policymakers, system planners, and other analysts increase the accuracy and reliably of estimates of the impact that efficiency initiatives can have on natural gas demand.
- *Improving the comparability of energy efficiency program cost and value in a region*. Greater consistency in the methods used to determine the cost (e.g., $/kWh) and value (e.g., avoided generation, and T&D costs) of energy efficiency projects and programs allows for better comparison of efficiency relative to other resources. It also allows policymakers, regulators, program administrators, and other parties to more reliably compare program performance across states (NEEP 2006).

Information Resources

Developing Program Cost Estimates

	Title/Description	URL Address
California	**Regulatory–Energy Efficiency Filings**. Monthly Program Reports. This Web site contains monthly program reports on energy efficiency filed by Southern California Edison.	www.sce.com/AboutSCE/Regulatory/eefilings/MonthlyReports.htm
Minnesota	**Electric and Gas Conservation Improvement Program Biennial Plan for 2005 and 2006**. Docket No. E, G002/CIP-04. Submitted to the Minnesota Department of Commerce by Xcel Energy. June 1, 2004.	URL not available.
New York	**New York Energy $mart Program Cost-Effectiveness Assessment**. This report is a benefit-cost analysis to assess the cost-effectiveness of 18 individual New York Energy $mart public benefits programs.	http://www.nyserda.org/Energy_Information/ContractorReports/Cost-Effectiveness_Report_June05.pdf
Northwest	**The Fifth Northwest Electric Power and Conservation Plan**. Document 2005-7. This plan is a blueprint for an adequate, low-cost, and low-risk energy future. Technical appendices include conservation cost-effectiveness methodologies.	http://www.nwcouncil.org/energy/powerplan/plan/Default.htm
Vermont	**Efficiency Vermont. 2002 Annual Report**. The Power of Efficient Ideas. This summary highlights the 2002 accomplishments of Efficiency Vermont.	http://www.efficiencyvermont.org/index.cfm?L1=292&L2=535&L3=537&sub=bus or Contact Efficiency Vermont at 1-888-921-5990.

Cost-Effectiveness Tests

	Title/Description	URL Address
California	**The California Standard Practice Manual: Economic Analysis of Demand Side Programs and Projects**. This manual describes cost-effectiveness procedures for conservation and load management programs from four major perspectives: Participant, Ratepayer Impact Measure (RIM), Program Administrator Cost (PAC), and Total Resource Cost (TRC). A fifth perspective, the Societal test, is treated as a variation on the TRC test.	http://drrc.lbl.gov/pubs/CA-SPManual-7-02.pdf
Oregon	**Cost Effective Policy and General Methodology for the Energy Trust of Oregon**. This report describes the Energy Trust of Oregon's policy for analyzing the cost-effectiveness of its energy efficiency investments. This policy encompasses three generic perspectives—Consumer, Utility System, and Societal.	http://www.energytrust.org/Pages/about/library/policies/4.06_CostEffect.pdf
All States	**Tools and Methods for Integrated Resource Planning: Improving Energy Efficiency and Protecting the Environment**. This report provides information on calculating and analyzing the cost effectiveness of energy conservation measures against supply-side options, as well as methods for integrated resource planning.	http://uneprisoe.org/IRPManual/IRPmanual.pdf

Deemed Savings

	Title/Description	URL Address
California	**2005 Measure Cost Study**. Final Report. CALMAC Study ID: PGE0235.01 This report provides cost information on the non-weather-sensitive and weather-sensitive residential and nonresidential measures and refrigeration measures that are included in the Database for Energy Efficiency Resources (DEER) and used by energy efficiency program planners in California to estimate potential demand and energy savings and costs.	http://calmac.org/publications/MCS_Final_Report.pdf
New Jersey	**New Jersey Clean Energy Program Protocols to Measure Resource Savings**. These protocols were developed to measure energy capacity and other resource savings. Specific protocols are presented for each eligible measure and technology.	http://www.njcleanenergy.com/media/Protocols.pdf
Texas	**Deemed Savings, Installation & Efficiency Standards. Residential and Small Commercial Standard Offer Program, and Hard-to-Reach Standard Offer Program**. This document contains all of the approved energy and peak demand deemed savings values established for energy efficiency programs in Texas.	http://www.puc.state.tx.us/rules/subrules/electric/25.184/25.184fig(d)(1).pdf
Vermont	**Technical Reference User Manual (TRM) No. 4-19. Measure Savings Algorithms and Cost Assumptions Through Portfolio 19**. Efficiency Vermont provides a set of deemed-savings methods in this manual.	http://www.efficiencyvermont.org/ or Contact Efficiency Vermont at 1-888-921-5990.

National Energy Efficiency Potential Analyses

Title/Description	URL Address
Emerging Energy-Saving Technologies and Practices for the Buildings Sector As of 2004. This study identifies new research and demonstration projects that could help advance high-priority emerging technologies, as well as new potential technologies and practices for market transformation activities.	http://aceee.org/pubs/a042toc.pdf
A Responsible Electricity Future: An Efficient, Cleaner and Balanced Scenario for the U.S. Electricity System. This report develops a scenario for the future evolution of the electric power system in the U.S., including increased investment in energy efficiency and in renewable and distributed generating technology, and compares it with the current situation.	http://uspirg.org/reports/AResponsibleElectrictyFuture.pdf
Scenarios for a Clean Energy Future, 2000. This document reflects efforts of the Interlaboratory Working Group, commissioned by the U.S. Department of Energy, to examine the potential for public policies and programs to foster efficient and clean energy technology solutions.	http://www.ornl.gov/sci/eere/cef/
Screening Market Transformation Opportunities: Lessons from the Last Decade, Promising Targets for the Next Decade. This report examines past and recent trends in the market transformation field and presents an updated screening analysis and categorization of the most promising opportunities.	http://www.aceee.org/pubs/u022full.pdf
The Technical, Economic and Achievable Potential for Energy Efficiency in the U.S.—A Meta-Analysis of Recent Studies. This study compares the findings from eleven studies on the technical, economic, and/or achievable potential for energy efficiency in the U.S. to recent-year actual savings from efficiency programs in leading states.	http://www.aceee.org/conf/04ss/rnemeta.pdf

Regional Energy Efficiency Potential Analyses

	Title/Description	URL Address
Midwest	**Examining the Potential for Energy Efficiency to Address the Natural Gas Crisis in the Midwest**. The results of this study suggest that a modestly aggressive, but pragmatically achievable, energy efficiency campaign (achieving about a 5% reduction in both electricity and natural gas customer use over five years) could produce tens of billions of dollars in net cost savings for residential, commercial, and industrial customers in the Midwest.	http://www.aceee.org/pubs/u051.htm
	Repowering the Midwest: The Clean Energy Development Plan for the Heartland. This Web site is supported by the Environmental Law and Policy Center as a source for clean energy information in the Midwest. It provides information on the Clean Energy Development Plan for the Heartland, which proposes policies to implement underutilized energy efficiency technologies and to aggressively develop renewable energy resources.	http://www.repowermidwest.org/

	Title/Description	URL Address
Northeast	**Economically Achievable Energy Efficiency Potential in New England**. This report provides an overview of areas where energy efficiency could potentially be increased in the six New England states.	http://www.neep.org/files/Updated_Achievable_Potential_2005.pdf
	Electric Energy Efficiency and Renewable Energy in New England: An Assessment of Existing Policies and Prospects for the Future. This report applies analytical tools, such as economic and environmental modeling, to demonstrate the value of consumer-funded energy efficiency programs and renewable portfolio standards and addresses market and regulatory barriers.	http://raponline.org/Pubs/RSWS-EEandREinNE.pdf
	NEEP Initiative Review: Commercial/Industrial Sectors Qualitative Assessment and Initiative Ranking. The purpose of this study is to assist Northeast Energy Efficiency Partnerships, Inc. (NEEP) in reviewing the value and future role of existing and potential residential initiatives through a scoring and ranking system that was developed to provide a consistent means of comparing the initiatives.	www.neep.org/html/NEEP_C&IReview.pdf
	NEEP Strategic Initiative Review: Qualitative Assessment and Initiative Ranking for the Residential Sector. Synapse Energy Economics. Submitted to Northeast Energy Efficiency Partnerships, Inc., October 1, 2004.	http://www.neep.org/html/NEEP_ResReview.pdf
Northwest	**The Fifth Northwest Electric Power and Conservation Plan. Document 2005–2007**. This plan is a blueprint for an adequate, low-cost, and low-risk energy future. Technical appendices include conservation cost-effectiveness methodologies.	http://www.nwcouncil.org/energy/powerplan/plan/Default.htm
Southeast	**Powering the South, A Clean & Affordable Energy Plan for the Southern United States.** Powering the South shows that a clean generation mix can meet the region's power demands and reduce pollution without raising the average regional cost of electricity and lists the policy initiatives that can make the changes.	http://poweringthesouth.org/report/
Southwest	**The Potential for More Efficient Electricity Use in the Western U.S.: Energy Efficiency Task Force Draft Report to the Clean and Diversified Energy Advisory Committee of the Western Governor's Association, Draft Report for Peer Review and Public Comment**. This report demonstrates how the adoption of best practice energy efficiency policies and programs in all western states could reduce most of projected load growth during 2005–2020, reduce overall electricity consumption, and yield economic and environmental benefits.	http://www.westgov.org/wga/initiatives/cdeac/Energyefficiencydraft9-15.pdf
	The New Mother Lode: The Potential for More Efficient Electricity Use in the Southwest. This report for the Southwest Energy Efficiency Project examines the potential for and benefits from increasing the efficiency of electricity use in the southwest states of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming.	http://www.swenergy.org/nml/index.html
	Economic Assessment of Implementing the 10/20 Goals and Energy Efficiency Recommendations. This report examines the Grand Canyon Visibility Transport Commission air pollution prevention recommendations. It articulates the potential emission reductions, costs, and secondary economic impacts of meeting the 10/20 goals and implementing the energy efficiency recommendations given the assumptions and scenarios developed by the Air Pollution Prevention (AP2) forum.	http://www.wrapair.org/forums/ap2/docs.html

	Title/Description	URL Address
Southwest	A Balanced Energy Plan for the Interior West. This report shows how energy efficiency, renewable energy, and combined heat and power resources can be integrated into the region's existing power system to meet growing electric demands in a way that is cost-effective, reduces risk, is reliable, and improves environmental quality for the Interior West region of Arizona, Colorado, Montana New Mexico, Nevada, Utah, and Wyoming.	http://westernresources.org/energy/bep.html

State Energy Efficiency Potential Analyses/Energy Strategies

	Title/Description	URL Address
California	California's Secret Energy Surplus: The Potential for Energy Efficiency. This study focuses on assessing electric energy efficiency potential in California through the assessment of technical, economic, and achievable potential savings over the next 10 years.	http://www.ef.org/documents/Secret_Surplus.pdf
Connecticut	Independent Assessment of Conservation and Energy Efficiency Potential for Connecticut and the Southwest Connecticut Region. This study estimates the maximum achievable cost-effective potential for electric energy and peak demand savings from energy efficiency measures in the geographic region of Connecticut served by United Illuminating Company and Connecticut Light and Power Company.	http://www.env-ne.org/Publications/CT_EE_MaxAchievablePotential%20Final%20Report-June%202004.pdf
Georgia	Assessment of Energy Efficiency Potential in Georgia. This report presents a profile of energy use in Georgia, the potential for, and public benefits of, energy efficiency, and a public policy review.	http://www.gefa.org/pdfs/assessment.pdf
Iowa	The Potential for Energy Efficiency in Iowa. This report uses existing programs, surveys, savings calculators, and economic simulation to estimate the potential for energy savings in Iowa.	http://www.ornl.gov/sci/btc/apps/Restructuring/IowaEEPotential.pdf
Massachusetts	The Remaining Electric Energy Efficiency Opportunities in Massachusetts. This report addresses the remaining electric energy efficiency opportunities in the residential, commercial, and industrial sectors in Massachusetts.	http://www.mass.gov/doer/pub_info/e3o.pdf
Nevada	Nevada Energy Efficiency Strategy. Nevada has taken a number of steps to increase energy efficiency. This report provides 14 policy options for further increasing the efficiency of electricity and natural gas and reducing peak power demand.	http://www.swenergy.org/pubs/Nevada_Energy_Efficiency_Strategy.pdf
New Jersey	New Jersey Energy Efficiency and Distributed Generation Market Assessment. This study estimates mid- and long-term potential for energy and peak-demand savings from energy efficiency measures and for distributed generation in New Jersey.	http://www.bpu.state.nj.us/cleanEnergy/KemaReport.pdf

	Title/Description	URL Address
New York	**Energy Efficiency And Renewable Energy Resource Development Potential In New York State. Final Report Volume One: Summary Report**. This study examines the long-range potential for energy efficiency and renewable energy technologies to displace fossil-fueled electricity generation in New York by looking at the potential available from existing and emerging efficiency technologies and practices and by estimating renewable electricity generation potential.	http://www.nyserda.org/publications/EE&ERpotentialVolume1.pdf
Oregon	**Energy Efficiency and Conservation for the Residential, Commercial, Industrial, and Agricultural Sectors**. This report is designed to inform the project development and selection process for a list of potential energy efficiency and renewable energy measures that could provide electricity savings for Oregon consumers.	http://www.energytrust.org/Pages/about/library/reports/Resource_Assesment/ETOResourceAssessFinal.pdf
	Natural Gas Efficiency and Conservation Measure Resource Assessment for the Residential and Commercial Sectors. This is a resource assessment to evaluate potential natural gas conservation measures that can be applied to the residential and commercial building stock serviced by Northwest Natural Gas.	http://www.energytrust.org/Pages/about/library/reports/Resource_Assesment/GasRptFinal_SS103103.pdf
Pennsylvania	**Economic Impact of Renewable Energy in Pennsylvania. Final Report**. This report presents an analysis of the potential economic impacts of renewable energy development in Pennsylvania spurred by a renewable portfolio standard.	http://www.bv.com/energy/eec/studies/PA_RPS_Final_Report.pdf
Wisconsin	**Energy Efficiency and Customer-Sited Renewable Energy: Achievable Potential in Wisconsin**. The Governor's Task Force on Energy Efficiency and Renewables commissioned the Energy Center of Wisconsin to estimate the achievable potential for energy efficiency and customer-sited renewable energy.	http://energytaskforce.wi.gov/section.asp?linkid=34

Evaluation and Measurement and Verification Resources

Title/Description	URL Address
Applications Team: Energy-Efficient Design Applications. This site provides numerous resources, ranging from implementation guidelines to checklists and other resources, to help organizations implement an M&V program.	http://ateam.lbl.gov/mv/
ASHRAE Guideline 14-2002. **Measurement of Energy and Demand Savings. American Society of Heating, Refrigerating and Air Conditioning Engineers.** June 2002. This guidance describes how to reliably measure energy savings of commercial equipment, using measured pre- and post-retrofit data.	http://www.ashrae.org/template/AssetDetail/assetid/15275
California's 2003 Non-Residential Standard Performance Contract Program M&V Procedures Manual. This manual provides general guidelines for preparing an M&V plan, choosing an M&V option and method, defining and adjusting baselines, and collecting and submitting M&V data.	http://www.pge.com/docs/pdfs/biz/rebates/spc_contracts/2000_on_peak_incentive/III-m&v.pdf http://www.pge.com/spc

Title/Description	URL Address
The California Evaluation Framework, prepared for the California Public Utilities Commission and the Project Advisory Group, June 2004. The California Evaluation Framework provides a consistent, systemized, cyclic approach for planning and conducting evaluations of California's energy efficiency and resource acquisition programs. It provides information on when evaluations should be conducted, the types of evaluation that can be conducted, and approaches for conducting these studies.	http://www.fypower.org/feature/workshop_docs/workshop_5/ca_eval_framework_0604.pdf
California Measurement Advisory Council Web Site. California's statewide CALMAC evaluation clearinghouse contains resources for deemed savings and project-specific M&V techniques.	http://www.calmac.org
The CEE Market Assessment and Program Evaluation Clearinghouse (MAPE). This is a fully searchable Web-based database that contains more than 300 evaluation reports, market characterization studies, and market assessments.	http://www.cee1.org/eval/clearinghouse.php3
Creating an Energy Efficiency and Renewable Energy Set-Aside in the NO_x Budget Trading Program: Measuring and Verifying Electricity Savings. This forthcoming EPA report describes key M&V resources.	Contact EPA.
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Appendix C. Clean Energy Supply: Technologies, Markets, and Programs

This appendix provides an overview of the benefits of clean energy supply technologies, including renewable energy (i.e., wind, solar photovoltaics [PV], solar thermal, wind, biomass, geothermal, waste-to-energy, and landfill gas/biomass) and combined heat and power (CHP). It describes the key market issues and challenges related to developing these technologies and concludes with an overview of some of the emerging and innovative approaches that states can pursue to foster clean energy supply in their states.

Benefits of Clean Energy Supply

States are developing initiatives and taking actions aimed at bringing reliable sources of energy to the marketplace. State and local governments are finding that clean energy supply technologies have significant economic and environmental benefits, and therefore enjoy widespread public support. These benefits include:

- *Increased State Economic Development.* Clean energy technologies can promote economic development in a variety of ways. Clean energy projects create short-term construction and installation jobs and provide numerous long-term opportunities associated with new clean energy businesses. Alternative energy sources reduce fuel price volatility and increase fuel diversity, leading to a more stable energy supply portfolio that can be an important component of new economic growth. Renewable energy draws on local resources that can offset imports from out-of-state. Use of these in-state resources improves the state balance of trade and can create long-term economic value.
- *Reduced Energy-Related Environmental Pollution.* CHP reduces the amount of fuel input per unit of energy output and reduces the corresponding emissions of pollutants and greenhouse gases. Electricity from renewable resources generally does not contribute to global climate change or local air pollution. In particular, air emissions associated with generating electricity from solar, geothermal, and wind technologies are negligible, because no fuels are combusted in these processes. Producing electricity from LFG and biogas avoids the need to use nonrenewable resources to produce electricity.
- *Increased Power Reliability.* CHP and renewable energy, as distributed generation (DG), reduce electricity infrastructure vulnerability. DG facilities can help reduce congestion on the electric grid by removing or reducing load in areas of high demand. They can also be operated independently of the grid in the event of a disruption to central systems.
- *Increased Fuel Diversity.* Increased fuel diversity avoids over-reliance on a single fuel, which can cause disruption or price volatility if the supply of that fuel is constrained. Renewable energy technologies broaden the energy mix. CHP can use a variety of fuels, including natural gas, coal, biomass, and biogas.
- *Efficient Use of Natural Resources.* CHP requires less fuel for a given energy output, so it reduces the demand for finite natural resources, such as natural gas and coal. The average efficiency of fossil-fueled power plants in the United States is 33% and has remained virtually unchanged for 40 years. When purchased electricity is combined with onsite thermal generation (assuming 80% boiler efficiency), the typical combined efficiency is 49%. CHP systems typically achieve overall fuel efficiencies of 55% to 80% and reduce fuel use 20% to 50% over separate heat and power.

This improvement in efficiency is an excellent pollution prevention strategy that reduces emissions of air pollutants and carbon dioxide, the leading greenhouse gas associated with climate change. Furthermore, since CHP is located at the energy user's site, it reduces electric transmission and distribution losses (averaging 7% to10%), resulting in further efficiency gains and providing an efficient use of natural resources (e.g., coal and natural gas) through a highly optimized system producing two or more useful outputs from one fuel input. The use of renewable energy sources reduces fossil fuel consumption even further; unlike fossil fuels, renewable energy sources are sustainable and will not run out.

Clean Energy Technologies

A wide range of clean energy technologies can be used to generate electricity. Table C.1 compares key clean energy technologies. The remainder of this section presents a brief description of each technology.

Wind Power

Wind power is currently one of the most economically viable renewable energy resources. Key advantages include its relatively low capital cost (compared to other renewable energy options), low operating costs, and technological maturity. Wind power can also be developed in relatively large-scale projects (resources permitting), further reducing costs through economies of scale.

Table C.1: Comparison of Key Clean Energy Technology Options

	Wind Power	Solar PV[a]	Solar Thermal Electric[b]	Geothermal	Solid Biomass	Waste to Energy	Landfill Gas/Biogas	CHP
Typical Size Project	5–200 MW	0.1–1 MW	25kW–50 MW	5–100 MW	5–50 MW	5–50 MW	1–10 MW	25 kW–500 MW
Approximate U.S. Market Size (installed capacity in MW)	9,149[c]	300[d]	350	2,400[e]	6,500[f]	2,500[f]	1,200[f]	81,000
Typical Total Installed Cost ($/kW)[g]	1,200	6,000–8,000	3,900	2,350	1,500–2,500	4,000–6,000	1,300–1,500	800–2,500[h]
Typical Levelized Cost of Electricity Without Incentives in 2005 (¢/kWh)[i]	6–7	30–50	13	5	8.5–11	Varies[j]	4.5	5–9
Typical Levelized Cost of Electricity with Incentives in 2005 (¢/kWh)[k]	2.5–3.5	12–17	9	4	7.5–10	Varies[j]	3.5	Varies[j]

[a] Assumes PV is for distributed applications (e.g., residential and commercial rooftop applications) that compete with retail electric rates.
[b] Assumes solar thermal is the parabolic trough technology; a centralized solar concentrating system which produces electricity.
[c] Source: AWEA 2006 (data are for the end of 2005).
[d] Source: Navigant 2005.
[e] Source: Lund 2004.
[f] Sources: EIA 2004d, Kiser and Zannes 2004, EPA 2005.
[g] Source: Navigant 2005.
[h] Fuel cell CHP may be as high as 6,000.
[i] Source: Levelized Cost of Energy (LCOE) figures are from a proprietary Navigant Consulting model. Assumes projects are developer- (i.e., private sector) financed. Projects that are developed by municipal utilities or similar public sector entities can have lower LCOEs due to lower financing costs. However, there are also fewer financial incentives for public sector-funded projects.
[j] Cost of energy is highly dependent on tipping fees.
[k] The LCOE, as calculated with incentives, includes the range of current federal and state incentives applicable to the different technology options (e.g. production tax credit [PTC], investment tax credit [ITC], accelerated depreciation, rebates, state property tax exemptions). It does not include revenue impacts from the sale of renewable energy certificates, emission set-side programs, or other similar programs.

Although cost-competitiveness can vary depending on wind speed (also called "wind class"), the United States has many excellent wind sites where new installations can be developed cost-effectively. However, good wind sites are often located in remote areas where the transmission system is weak, requiring system upgrades and line extensions to transport power to load centers. This additional cost can adversely affect project economics and is currently a key focus of policymakers. Other challenges include the intermittent nature of wind and output variability (i.e., electricity is generated only when the wind blows) and the periodic lapsing and reinstatement of a key federal incentive, the production tax credit (PTC). The PTC, currently set at 1.9¢/kilowatt-hour (kWh) for 10 years of output and available through December 31, 2007, has helped close the economic gap of cost-effectiveness for many installations.

At the state level, incentives focus on property tax or sales tax credits and exemptions rather than on support for demonstration programs or for developing new technologies. Wind energy technology has also benefited from state renewable portfolio standards (RPS) that require a certain percentage of new generation to come from renewable resources. Because wind is one of the lowest-cost renewable options available to utilities and electricity suppliers, it has been used to meet a large portion of RPS renewable energy requirements and is expected to play a major role in the future.

Solar Photovoltaics (PV)

PV technology, which directly converts sunlight to electricity in a solid-state device, is also a fairly mature technology with more than 25 years of proven field performance. Compared to wind power, PV output is more predictable and is often coincident with utility load profiles (e.g., PV output is often highest on hot, sunny days, when demand for power is also highest). Thus, PV can provide peak electric load reduction, which may have a higher value than base load demand. Price reductions for PV systems have historically been 4% to 5% per year on average, and this trend is expected to continue (Navigant 2004a). PV is also one of the few renewable energy technologies that can be customer-sited; therefore, the technology can compete with retail electric rates as opposed to the lower wholesale rates with which centralized systems compete.

Nevertheless, electricity from PV is at least two to three times more expensive than U.S. retail electricity rates because the first cost of PV installation is relatively high. To address the first-cost issue, most state support for PV focuses on buy-down programs or rebates that help lower the high, up-front capital cost. In many states, buy-downs will be slowly phased out as PV systems become more economically viable and as the technology becomes self-sustaining in the marketplace. In addition to buy-downs, some states offer property and sales tax credits for PV, as well as grants to support industry infrastructure development (e.g., installer networks).

Solar Thermal

Solar thermal electric plants convert sunlight into electricity by concentrating sunlight onto working fluids, heating them to high temperatures. The fluids are then used to run conventional turbine-generators or heat engines. Plants potentially have high coincidence between peak output and peak demand, and large plants can take advantage of thermal storage to stabilize output and increase operating flexibility.

Larger central station options include parabolic troughs and power towers. Parabolic troughs use a heat transfer fluid that is heated as it circulates through the receivers and returns to a series of heat exchangers at a central location where the fluid is used to generate high-pressure superheated steam. The steam is then fed to a conventional steam turbine/generator to produce electricity. Power towers use fields of "mirrors" (or heliostats) to concentrate sunlight onto a central receiver tower; the energy can be concentrated as much as 1,500 times that of the energy coming in from the sun.

A smaller distributed power option is the dish Stirling engine/turbine, which involves a parabolic-shaped solar concentrator that reflects solar radiation onto a receiver. The collected heat is used directly by a heat engine to generate electricity.

Of these three solar thermal options, states have had the greatest field experience with parabolic troughs (e.g., 350 megawatts [MW] is currently operating in California). The key challenge today is the high capital cost. Solar thermal plant technology is currently not competitive with conventional power options and therefore state support is typically provided in the form of buy-downs or rebates. Some states also have solar set-asides within their RPS programs, which reserve a portion of the RPS target specifically for solar energy.

Solid Biomass

Broadly speaking, solid biomass is any form of organic matter, including wood, wood waste (e.g., sawdust, bark), agricultural residues (e.g., rice husks, wheat straw), construction and demolition debris, and animal waste (e.g., chicken litter). The single largest source of biomass today is the pulp and paper industry, which uses residues from papermaking to meet approximately 50% of its own energy needs.

Solid biomass technologies produce electricity by direct combustion or by combustion of gas derived from these fuels (i.e., co-firing). With direct combustion, biomass is burned in a boiler to produce high-pressure steam, which is then expanded through a steam turbine to generate electricity. Biomass co-firing with coal in existing coal plants is another potentially attractive option. To date, co-firing has been successfully demonstrated in a number of utility boilers, but only a few co-fired systems are in true commercial operation. Nevertheless, the technology is considered mature, and its deployment is likely to increase in those states that include it in their RPS.

The main advantages of solid biomass power are that it is a baseload resource and that it often converts a waste product into useful electricity and thermal energy. The main disadvantages are fuel price and availability, two issues not faced by other renewable energy options. Emissions and permitting are also more challenging for biomass than for other renewables. Some states support biomass applications through tax incentives and rebates. Direct combustion of solid biomass is also eligible in most state RPS programs.

Geothermal Power

Geothermal power converts heat from within the Earth's crust into electricity using well-proven and mature turbine-generator technology. The United States is currently the world leader in terms of total installed capacity. Unlike wind and solar technologies, geothermal is a baseload resource and can achieve very high annual capacity factors that improve overall economics. Geothermal power plants also have a small physical footprint and minimal environmental impacts. The best geothermal resources, however, are limited to a handful of Western states. In addition, finding good resources with good access to the transmission system can be an issue. Because of its more limited overall potential and mature economics, many state programs do not support the technology with direct financial incentives. Nevertheless, geothermal power is an eligible resource in a number of RPS programs, and untapped resources can be potentially developed. In the long term, a new technology called hot-dry rock could broaden the application of geothermal power.

Waste-to-Energy (WTE)

WTE facilities operate based on the same basic principle as solid biomass combustion facilities but use urban refuse (i.e., municipal solid waste) as fuel. WTE facilities, however, require boiler systems designed to handle a more heterogeneous, low-quality fuel, and the emissions control systems are designed to remove contaminants contained in municipal solid waste. WTE plants are also designed to recover noncombustible materials (e.g., glass, metals) either before or after combustion, depending on the plant design.

The key advantages of WTE technology are the steady supply of fuel and the benefits of waste reduction. The key challenges of WTE plants are high capital and operating costs, siting difficulties (mainly due to emissions issues), and the strong dependence on tipping fee revenue for favorable overall economics. States also have differing perspectives on whether WTE facilities qualify as "renewable" and if so, whether they can be used for RPS compliance. For both biomass and wastes, commercialization efforts are underway for next-generation technologies, such as biomass gasification and pyrolysis.[52] Successful commercial-scale demonstration programs are needed to provide market confidence in these technologies.

Landfill Gas (LFG) and Biogas

LFG and biogas are mixtures of approximately 50% to 60% methane and 40% to 50% carbon dioxide. They are the product of anaerobic digestion.[53] LFG is created as waste decomposes in the anaerobic environment of the landfill. For biogas derived from animal waste management and sewage, anaerobic digestion occurs in manmade digesters[54] as part of the overall process of treating these wastes.

The main advantages of biogas and LFG technologies are that they provide a steady supply of renewable fuels, make use of a low- or zero-cost feedstock, and involve moderate capital costs. As such, the economics are often favorable, even without incentives. These technologies also make use of mature power generation technologies (e.g., internal combustion engines, gas turbines, and boilers/steam turbines). LFG and biogas have also been successfully demonstrated with microturbines and fuel cells. Using biogas and LFG to produce electricity provides many environmental and economic benefits. Anaerobic digester systems for animal waste reduce odors and pathogens, improve water quality, reduce methane emissions, and improve farm revenues through energy self-sufficiency and the ability to use or sell the dried solid residues as fertilizer or animal bedding. Combusting LFG will reduce landfill odor (EPA 2005), methane emissions (landfills are the largest anthropogenic source of methane), and toxic organic compounds.

The main disadvantages of LFG and biogas applications are the relatively small scale of the applications and air permitting issues. Compared with other renewable energy options, the total market potential is relatively small. Some states directly support LFG and biogas with grants and incentives, and LFG and biogas are eligible resources within most state RPS programs.

Combined Heat and Power (CHP)

CHP, also known as cogeneration, is an efficient, clean, and reliable approach to generating simultaneous power and thermal energy from a single fuel source. CHP is not a specific technology but an efficient application of technologies to meet an energy user's needs. CHP uses waste heat from electricity generation to produce useful thermal energy for process heat and space heating or cooling for commercial and industrial facilities. A CHP system is substantially more efficient than purchasing electricity from the grid and generating thermal energy with a boiler or process heater.

A CHP system consists of a number of individual components—a prime mover (heat engine), a generator, heat recovery, and electrical interconnection—configured into an integrated system. The type of equipment that drives the overall system (i.e., the prime mover) typically identifies the CHP system. Prime movers for CHP systems include reciprocating engines, combustion or gas turbines, steam turbines, microturbines, and fuel cells. These prime movers are capable of burning a variety of fuels (e.g., natural gas, coal, oil, and alternative fuels) to produce shaft power or mechanical energy. Although mechanical energy from the prime mover is most often used to drive a generator to produce electricity, it can also be used to drive rotating equipment such as compressors, pumps, and fans. Thermal energy from the system can be used in direct process applications or indirectly to produce steam, hot water, process heat for drying, or chilled water for process cooling.

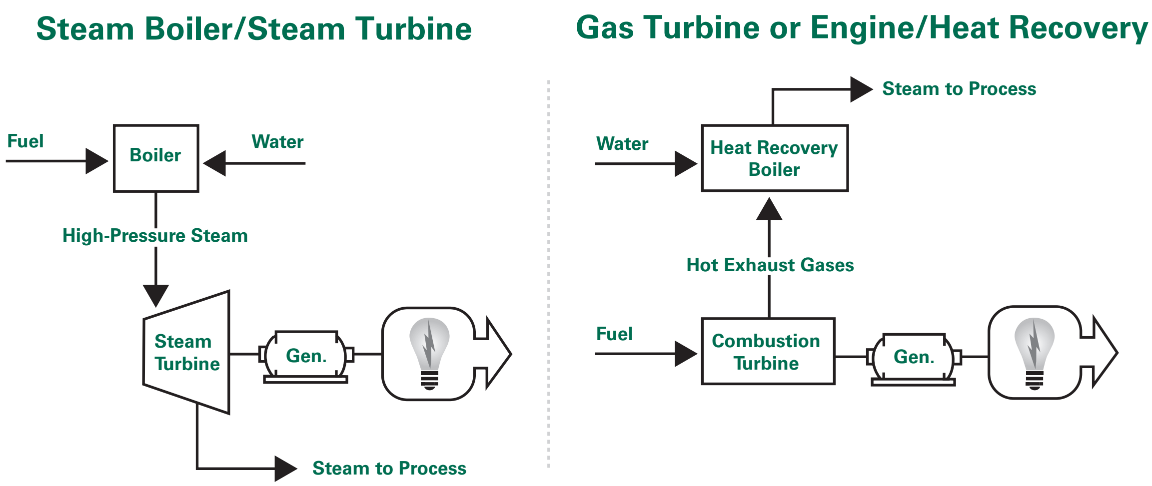
Figure C.1 shows two common configurations for CHP systems: (1) steam boiler/steam turbine, and (2) gas turbine or engine/heat recovery. Historically, the steam boiler/turbine approach has been the most

52 Pyrolysis is the rapid heating and cooling of biomass in the absence of air. It results in a complex liquid hydrocarbon mixture (pyrolysis oils) somewhat similar to crude oil, gaseous compounds such as hydrogen, methane, and carbon (i.e., char).

53 Anaerobic digestion is the conversion of organic material to biogas by microorganisms in the absence of oxygen.

54 With animal waste and wastewater, digesters (typically enclosed concrete structures) are required to contain the organic material and serve as a home for the microorganisms. In comparison, with LFG the biogas is produced naturally in the landfill over a period of years as the organic material slowly decomposes.

Figure C.1: Typical CHP Configurations



Source: EPA 2004.

widely used CHP system. In this approach, a boiler makes high-pressure steam that is fed to a turbine to produce electricity. The turbine is designed so that steam is left over to feed an industrial or other thermal process. Thus, one fuel input to the boiler supplies both electric and thermal energy by recovering waste heat from the steam turbine electric generator. This type of system typically generates about five times as much thermal energy as electric energy. Steam boiler/turbine systems are widely used in the paper, chemical, and refining industries, especially when waste or byproduct fuel exists that can be used to fuel the boiler.

Another common CHP configuration involves a combustion turbine or reciprocating engine to generate electricity. In these applications, thermal energy is recovered from the exhaust stream to make steam or to supply other thermal uses. These CHP systems can use very large (i.e., hundreds of MW) gas turbines, very small (i.e., tens of kilowatts [kW]) microturbines, engines, or fuel cell systems. In these systems, the thermal energy is typically one to two times the electric energy.

Clean Energy Markets

This section describes the current market for renewable energy technologies and CHP, including the growing competitiveness of renewable energy technologies and the proven track record of CHP applications in delivering cost-competitive energy. This clean energy market growth is leading to a range of local economic, environmental, and energy security benefits.

Renewable Energy Technologies

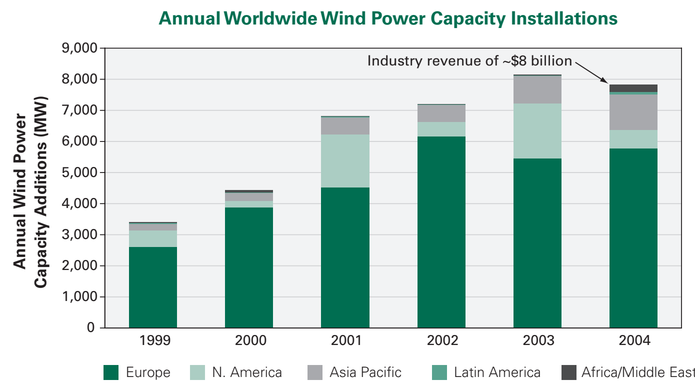
Renewable energy technologies are increasingly cost competitive and are becoming more established in the marketplace. As the opportunities and market have grown, especially over the last five years, large corporations have become major players in the renewable energy industry, bringing additional investment capital, expertise, and capabilities that have spurred further market growth. At the same time, both governments and consumers are placing value on the attributes associated with renewable energy. Many consumers have demonstrated a willingness to pay a premium for renewable energy, and many are able to enroll in voluntary green power programs.

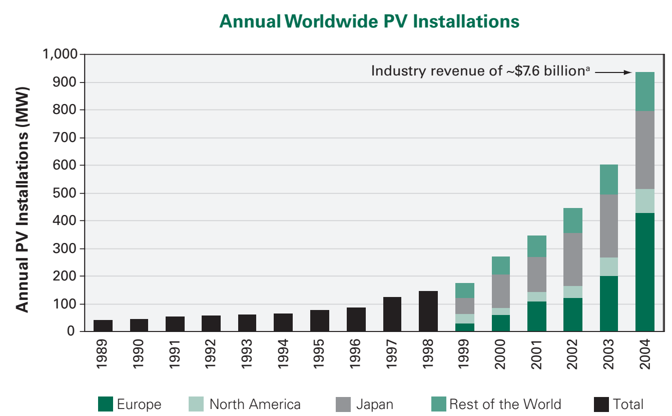
Governments are using incentives and other policy tools, such as RPS, to increase the amount of renewable energy produced. Renewable energy certificates (RECs), also called green tags, green certificates, and tradable renewable certificates, have emerged as the "currency" to both monetize and transact (i.e., trade and sell) the value of the attributes provided by electricity generated with renewable energy. The emergence of both "compliance" (e.g., RPS) and "voluntary" (e.g., green power) markets for renewable energy and renewable energy attributes, facilitated by the emergence of RECs, has changed the renewable energy marketplace and set the stage for future growth.

Both the wind and solar PV markets have experienced double-digit growth over the past decade, primarily as result of the increased demand for renewable energy. Globally, PV has had a 40% compounded annual growth rate (CAGR) since 1999. In 2004, the market was valued at approximately $7.6 billion per year from equipment sales and installation. The wind industry has undergone similar growth. Wind energy installations worldwide have experienced a 24% CAGR since 1999 (see Figure C.2) (Navigant 2005b).

In the United States, annual installations of renewable energy (excluding large-scale hydroelectric plants) have been between 600 MW and 1,700 MW per year between 2001 and 2003 (EIA 2004b). (Fluctuations during this period are primarily the result of changing government incentives.) As shown in Figure C.3, renewable energy (excluding large-scale hydroelectric plants) accounted for 2.2% of electricity consumption in 2003 (EIA 2004a, EIA 2004c). Today, hydropower and biomass, including WTE and LFG, dominate the renewable energy market in the United States. Annual installations of renewable energy (excluding large-scale hydro) in the United States are expected to reach more than 4,500 MW per year by 2015 in a business-as-usual scenario, resulting in an $8 billion market annually from equipment (Navigant 2005b).

Figure C.2: Annual Worldwide Installations for Wind Power and PV

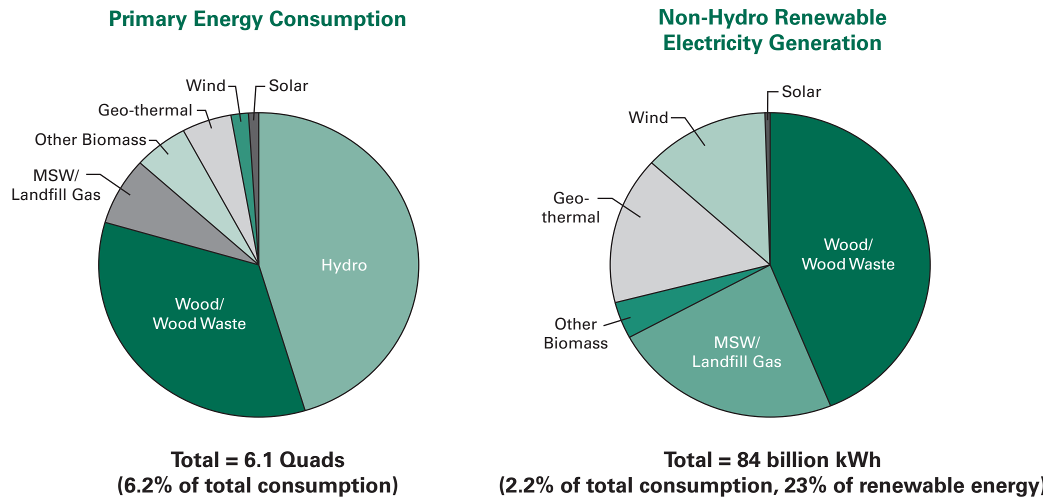




[a] Based on the total installed cost of systems.

Source: Navigant 2005b.

Figure C.3: U.S. Renewable Energy Snapshot *(2003 Data)*



Sources: EIA 2004a, EIA 2004c.

Combined Heat and Power (CHP)

Interest in CHP technologies has been growing among energy customers, regulators, legislators, and developers for a variety of reasons, including electric industry deregulation, environmental concerns, and unease over energy security. The growth of CHP has been fairly constant (with a slightly slower growth rate in the past few years) since the implementation of the Public Utilities Regulatory Policy Act (PURPA) in 1978, which created various incentives for CHP. PURPA has become somewhat less important in states with restructured electric markets but still provides some important support for CHP in regulated states. The U.S. CHP inventory in 2004 was 80.9 gigawatts (GW) at 2,845 sites. As shown in Figure C.4, almost 90% of this capacity is in the industrial sector, with about one-third of the total capacity in the chemical industry alone. The refining and paper industries make up another 25% of the total.

With recent increases in the price of natural gas and uncertainty in future prices, interest in CHP projects fueled by waste and opportunity fuels, such as landfill and digester gas, refinery gas, and wood waste, is growing.

Market Challenges Affecting Clean Energy Technologies

Because of their improving economics and performance, renewable energy technologies are becoming increasingly viable alternatives to conventional power generation technologies. Nevertheless, renewable technologies continue to face persistent market challenges that impede their growth and acceptance. Similarly, while CHP utilizes commercially proven technologies with higher efficiencies that can make it economically attractive, a variety of market, institutional, and regulatory barriers can slow its growth.

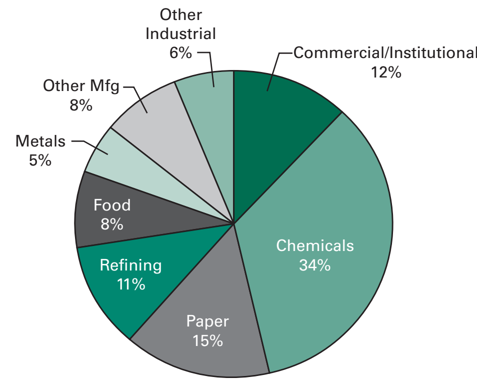
Renewable Energy

Key market challenges faced by renewable energy technologies include:

- High first costs compared with competing technologies.
- Grid integration issues related to the interconnection of distributed technologies and connecting resources in remote locations.
- A lack of maturity of other needed "infrastructure," such as sales, installation, and service.
- A need for more consumer education about the benefits of renewable energy.
- The lack of maturity and liquidity in emerging REC markets.
- Public concerns over aesthetics, noise, and environmental impacts related to certain technologies.

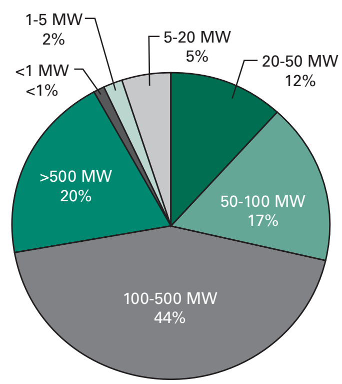
Recognizing the benefits of renewable energy to their constituents, many states are implementing a range of programs, including RPS, net metering, and public benefits funds, to address these challenges. For example, Pennsylvania is advancing renewable energy through its Energy Harvest Grant Program and Alternative Energy Portfolio Standard.

Figure C.4: U.S. CHP Capacity *(2004)*



Source: EEA 2004.

Figure C.5: Size Distribution of U.S. CHP Projects *(2004)*



Source: EEA 2004.

Combined Heat and Power (CHP)

Key market challenges faced by CHP include:

- CHP systems entail larger up-front capital investment, more complicated operation and maintenance (O&M) procedures, and higher O&M costs than conventional generation systems. These issues can be especially difficult for small to medium CHP users (i.e., less than 5 MW), who are less able to bear the additional cost and risk of onsite generation, regardless of the efficiency and environmental benefits.
- Rate-setting and regulation of interconnection are critical factors in the success of CHP. Uneconomical partial-load rates, such as standby or buy-back rates, exit fees, and interconnection requirements, can limit CHP's economic viability.
- Utilities can reduce the economic attractiveness of CHP projects by offering special low electric rates to the potential energy user that reduce the economic benefits of CHP.
- Although CHP typically provides an overall environmental benefit, it can increase the onsite emissions at the CHP facility. While this increase is typically offset by a greater decrease at another location (e.g., the power generator), most environmental regulations are not designed to recognize this benefit.

These potentially higher capital and operating costs and structural barriers are offset by the benefits of lower energy costs and increased power reliability where new CHP projects are being constructed. In addition, state policies (such as output-based regulations, interconnection standards, and public benefits funds) that reduce institutional, regulatory, and structural barriers to CHP and recognize its economic and environmental benefits are important components in addressing these challenges. For example, Connecticut has created an output-based regulation for small distributed generators for several pollutants, and has included CHP as an eligible resource for the state RPS.

Emerging and Innovative Clean Energy Supply Policies

State governments are crafting policies to reduce market and institutional barriers for clean energy technologies and accelerate their adoption in the marketplace. The *Guide to Action* focuses on established policies that have proven to be successful in various states. The following table describes emerging and innovative clean energy supply policies not covered in the *Guide to Action* and provides sources of additional information about these policies.

Table C.2: Emerging and Innovative Clean Energy Supply Policies

Policy	Description	For More Information
Contractor and Equipment Certification	Some states require equipment and contractor certification for renewable energy installations that receive buy-downs or state financial incentives. These standards ensure that high-quality products and services are provided to customers.	The North American Board of Certified Energy Practitioners (NABCEP) works with the renewable energy and energy efficiency industries, professionals, and stakeholders to develop and implement quality credentialing and certification programs for practitioners. http://www.nabcep.org/ In New York, NYSERDA's PV or Solar Electric Incentive Program provides cash incentives for the installation of small PV or solar-electric systems. The cash incentives are only available for PV systems purchased through an eligible installer. http://www.powernaturally.org/Programs/Solar/incentives.asp?i=1
Emissions Disclosure/Generation Disclosure	Similar to the nutritional dietary information found on most food packages, this policy would include a chart in every monthly bill that describes the sources of electricity generation and their emissions.	More than 20 states have some form of electricity label. Information on the Massachusetts program can be found at: http://www.mass.gov/dte/restruct/competition/info_disclosure_2001.htm
Content Requirements for Certain Electricity Contracts (Wholesale)	When a state enters into new contracts for purchasing power or is in the position to approve long-term contracts, the state can require that a certain percentage of the electricity generated is from renewable energy sources or meets thresholds for energy efficiency.	NY Executive Order 111 requires state agencies to purchase 10% of their electricity from renewable sources in 2005 and 20% by 2010. http://www.gorr.state.ny.us/gorr/EO111_fulltext.htm
Loading Order	A Public Utility Commission (PUC) can specify a certain sequence of technologies and resources that would be considered for meeting new electricity demand. Any deviation from this loading order would require utilities to explain the reason for this deviation to the PUC. This policy may need to be combined with others (such as simplified air emissions credits for energy efficiency, renewable energy, and distributed generation) in order to make it profitable or economical to utilities.	California's Energy Action Plan requires utilities to prioritize their resource procurements by following an established "loading order." http://irecusa.org/articles/static/1/1102615783_1018302029.html http://www.energy.ca.gov/energy_action_plan/index.html http://www.cpuc.ca.gov/static/energy/electric/energy+action+plan/
Standard REC Trading/Tracking Systems	A few state renewable energy programs currently have Web-based tracking systems for DG and/or assigning RECs based on this generation. These systems enable DG systems to participate in REC markets.	New Jersey established a separate REC trading system for solar PV. http://www.njcep.com/srec/

(continued on next page)

Table C.2: Emerging and Innovative Clean Energy Supply Policies (*continued*)

Policy	Description	For More Information
Mandated Long-Term Contracts for Renewables	This policy allows utilities in deregulated markets to sign long-term contracts with renewable energy generators. This would provide generators with the long-term certainty they need to obtain project financing.	The Colorado referendum that created the state's RPS requires a 20-year purchase for projects eligible to satisfy the RPS. http://www.dora.state.co.us/puc/rulemaking/Amendment37.htm A legislative act in Connecticut requires distribution companies to sign long-term Power Purchase Agreements for clean energy for no less than 10 years at a wholesale market price plus up to $0.055 per kWh for the REC. http://www.ctcleanenergy.com/investment/MarketSupplyInitiative.html
Builder/Building Incentives	Utilities and states can provide incentives for the construction and operation of energy-efficient and renewable energy homes and buildings (e.g., quicker and less expensive permits for homes with solar power).	Duke Energy lowered electric rates for ENERGY STAR-qualified homes. http://www.dukepower.com/ http://www.dukepower.com/news/releases/2005/feb/2005022201.asp New Jersey offers Solar PV rebates (ranging from $3.06/watt to $5.30/watt) to residential, commercial, and industrial applicants. http://www.njcep.com/html/2_incent.html
Utility Procurement Programs for DG	The PUC can require utilities to purchase or promote the installation of DG to meet increasing electricity demands. Renewable energy DG could be given preferential treatment in this program to promote reductions in carbon emissions. This would be similar to RPS.	The California Public Utilities Commission (CPUC) requires utilities to consider DG (customer- or utility-owned) as an alternative to distribution investments. http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/24136.htm
Integrating PUC goals into PBF Program Design (i.e., "Cross Walking")	This policy encourages the use of public benefits funds (PBFs) not only to support energy efficiency and renewable energy, but to help PUCs and utilities reach their goals (e.g., increased reliability, congestion relief, and permanent peak reduction).	New England Demand Response Initiative http://nedri.raabassociates.org/index.asp In Massachusetts, annual peak demand reductions from energy efficiency and PBF-funded load management ranged from 98 MW to 135 MW in 1998, 1999, and 2000. Cumulative reductions from these programs reached 700 MW (7.2% of peak) as of 2000. http://eetd.lbl.gov/EA/EMP/reports/PUB5482.pdf
Transparent Distribution Planning	Currently, the electricity distribution company primarily conducts distribution planning without outside feedback that could lead to lower-cost alternative solutions or taking into account other decisionmaking criteria. A transparent distribution planning process could allow customers and developers to align their investments with the greatest system need. In addition, the utility would benefit from customer response to the system need.	The California Energy Commission (CEC) is working with CPUC to create a transparent distribution planning process. http://www.energy.ca.gov/energypolicy/index.html

Source: Compiled by EPA based on multiple sources.

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