



Selling Excess Energy in ERCOT

A Presentation for Waste Heat to Power Workshop
September 25, 2007

Agenda

- **About Fulcrum**
- **ERCOT Market Overview**
- **Marketing Excess Power**
- **Working with a QSE**

About Fulcrum

Energy Management Services



Power Generators



Retail Electricity Providers



Large Consumers



Financial Entities

About Fulcrum

- **3,057 MW of power generation under management**
 - Fossil Fueled – 2,702 MW
 - Renewable – 355 MW
- **Managed more than 1,650 MW of natural gas fired cogeneration facilities at 4 locations in ERCOT**
- **FERC licensed power marketer, ERCOT Level 4 QSE, California Scheduling Coordinator, member of PJM, ISO-NE and NYISO**
- **Experienced team offering relationship free of conflicts of interest**

Large Consumer Management Services



- **24 hour scheduling and dispatch of gas and power**
- **Marketing and origination of excess generation capacity**
- **Development and assistance in executing a procurement, hedging and risk management plan**
- **Evaluation of alternative plant operating parameters to minimize overall cost of power**

Large Consumer Management Services



- **Valuation analyses for development of onsite cogeneration projects**
- **Assistance in establishing a “Self Serve” REP**
- **Assistance in valuation, qualification, and marketing of electrical load shedding capacity (“LAAR”)**
- **Assistance in mitigating ERCOT TDSP charges**

ERCOT Market Overview

2007 Report on the Capacity, Demand, and Reserves in the ERCOT Region

Summer Summary

| Load Forecast: | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| Total Summer Peak Demand, MW | 63,794 | 65,135 | 66,508 | 67,955 | 69,456 | 70,733 |
| less LAARs Serving as Responsive Reserve, MW | 1,125 | 1,125 | 1,125 | 1,125 | 1,125 | 1,125 |
| less LAARs Serving as Non-Spinning Reserve, MW | 0 | 0 | 0 | 0 | 0 | 0 |
| less BULs, MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Firm Load Forecast, MW | 62,669 | 64,010 | 65,383 | 66,830 | 68,331 | 69,608 |

| Resources: | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| Installed Capacity, MW | 61,424 | 61,424 | 61,424 | 61,424 | 61,424 | 61,424 |
| Capacity from Private Networks, MW | 6,513 | 6,217 | 6,217 | 6,217 | 6,217 | 6,217 |
| Effective Load-Carrying Capability (ELCC) of Wind Generation, MW | 298 | 298 | 298 | 298 | 298 | 298 |
| RMR Units under Contract, MW | 169 | 169 | 169 | 169 | 0 | 0 |
| Operational Generation, MW | 68,404 | 68,108 | 68,108 | 68,108 | 67,939 | 67,939 |
| 50% of Non-Synchronous Ties, MW | 553 | 553 | 553 | 553 | 553 | 553 |
| Switchable Units, MW | 2,848 | 2,848 | 2,848 | 2,848 | 2,848 | 2,848 |
| Available Mothballed Generation, MW | 165 | 510 | 419 | 594 | 558 | 522 |
| Planned Units (not wind) with Signed IA and Air Permit, MW | 0 | 550 | 550 | 550 | 1,300 | 2,100 |
| ELCC of Planned Wind Units with Signed IA, MW | 0 | 171 | 174 | 174 | 174 | 174 |
| Total Resources, MW | 71,970 | 72,740 | 72,652 | 72,827 | 73,372 | 74,136 |

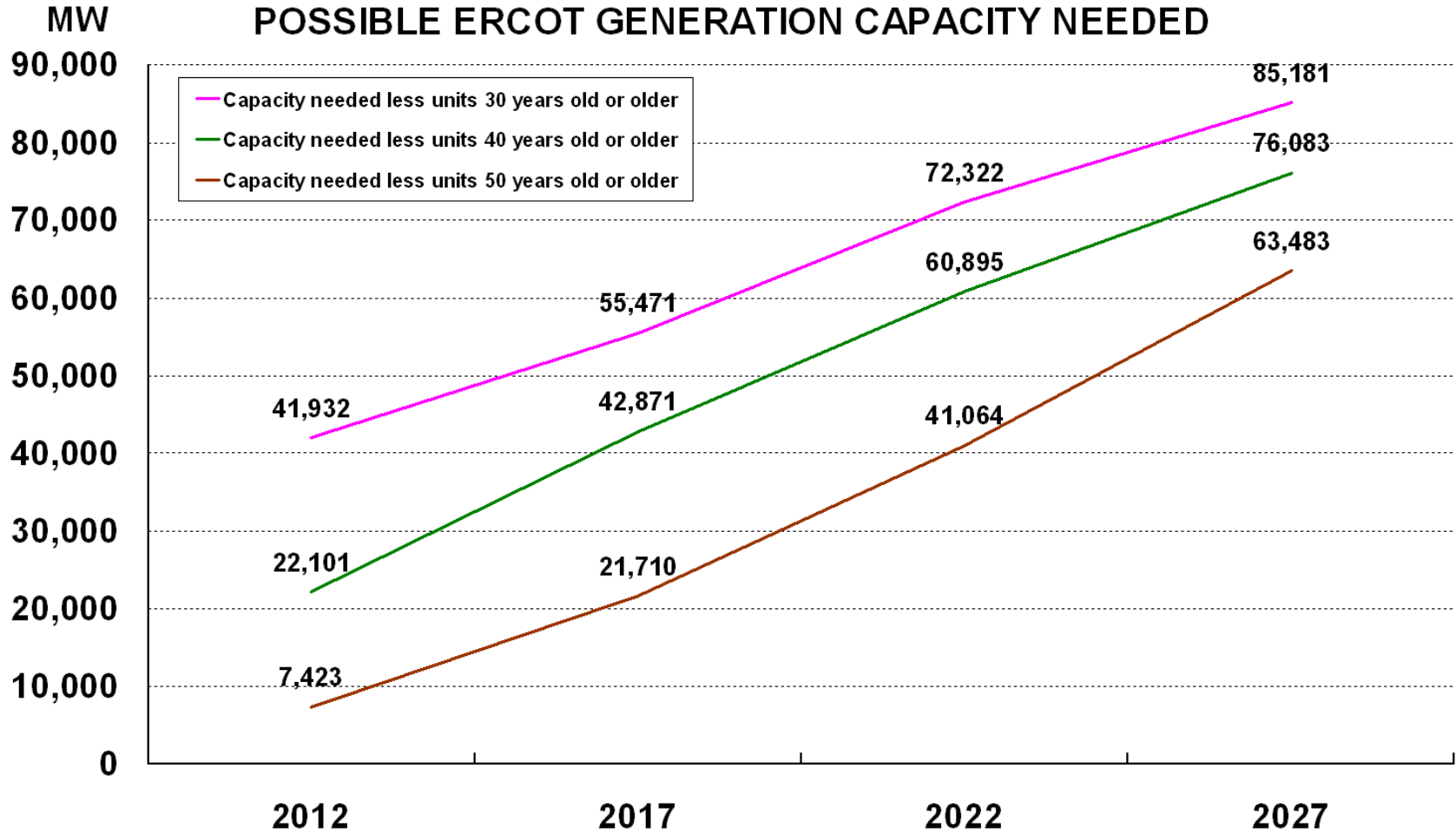
| | | | | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| less Switchable Units Unavailable to ERCOT, MW | 158 | 317 | 317 | 0 | 0 | 0 |
| less Retiring Units, MW | 0 | 375 | 375 | 433 | 433 | 433 |
| Resources, MW | 71,812 | 72,048 | 71,960 | 72,394 | 72,939 | 73,703 |

Reserve Margin

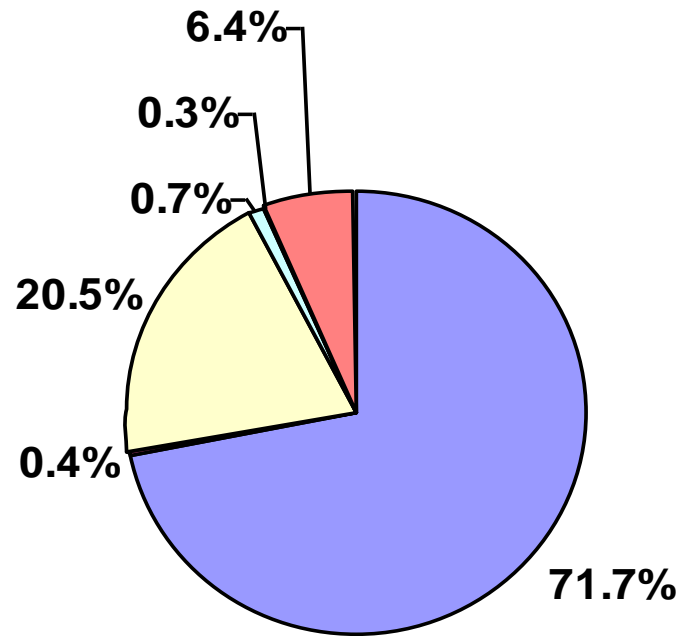
(Resources - Firm Load Forecast)/Firm Load Forecast

14.6% 12.6% 10.1% 8.3% 6.7% 5.9%

POSSIBLE ERCOT GENERATION CAPACITY NEEDED

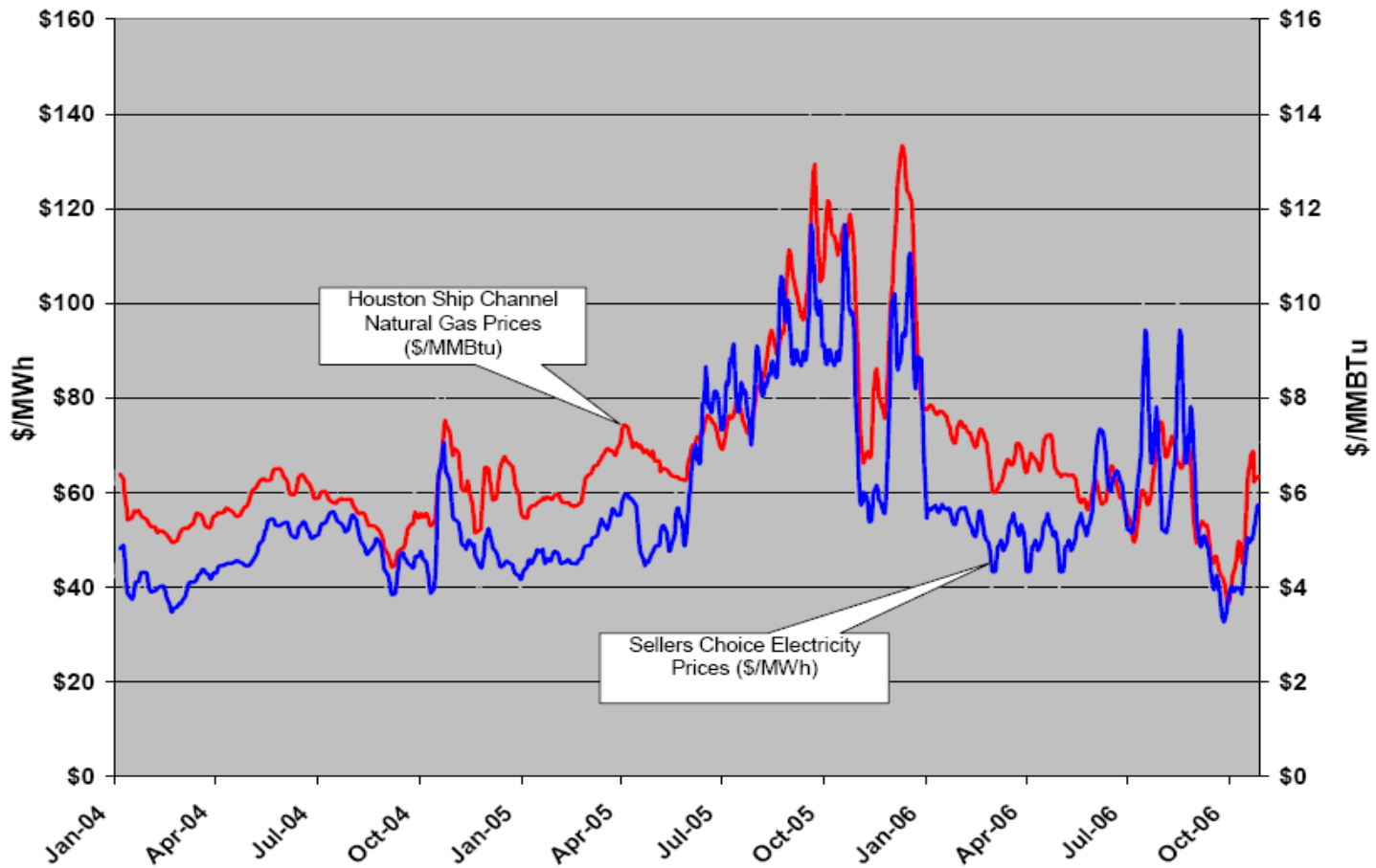


Summer 2007 Fuel Types - ERCOT



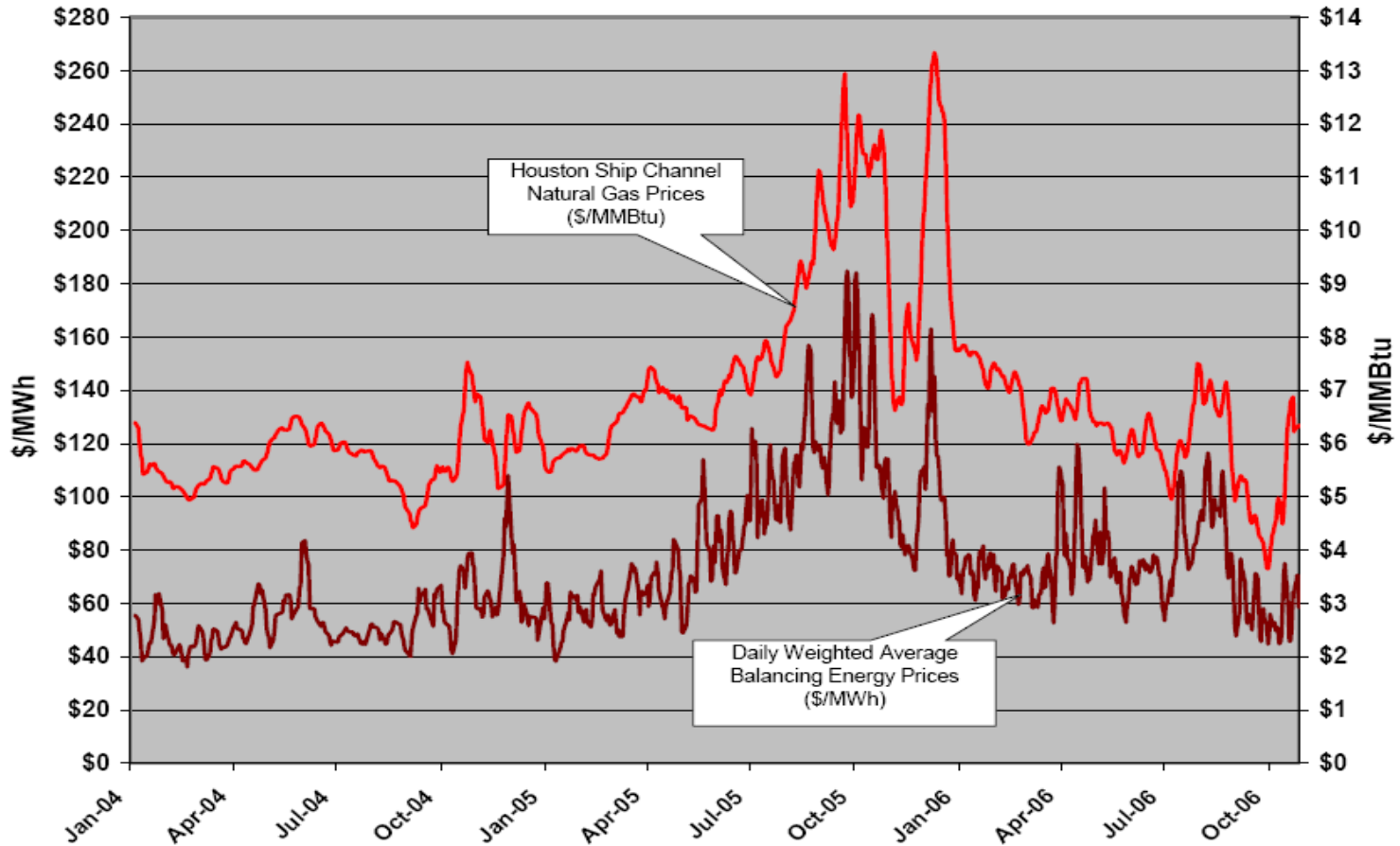
■ Natural Gas ■ Wind ■ Coal ■ Water ■ Other ■ Nuclear

**Figure 1: Market Price for Wholesale Electricity vs. Natural Gas Price
5-Day Moving Average**



Source: SNL Energy and Intercontinental Exchange (ICE)

**Figure 2: ERCOT Balancing Energy Price vs. Natural Gas Price
5-Day Moving Average**



Source: PUC and ICE

ERCOT Operations

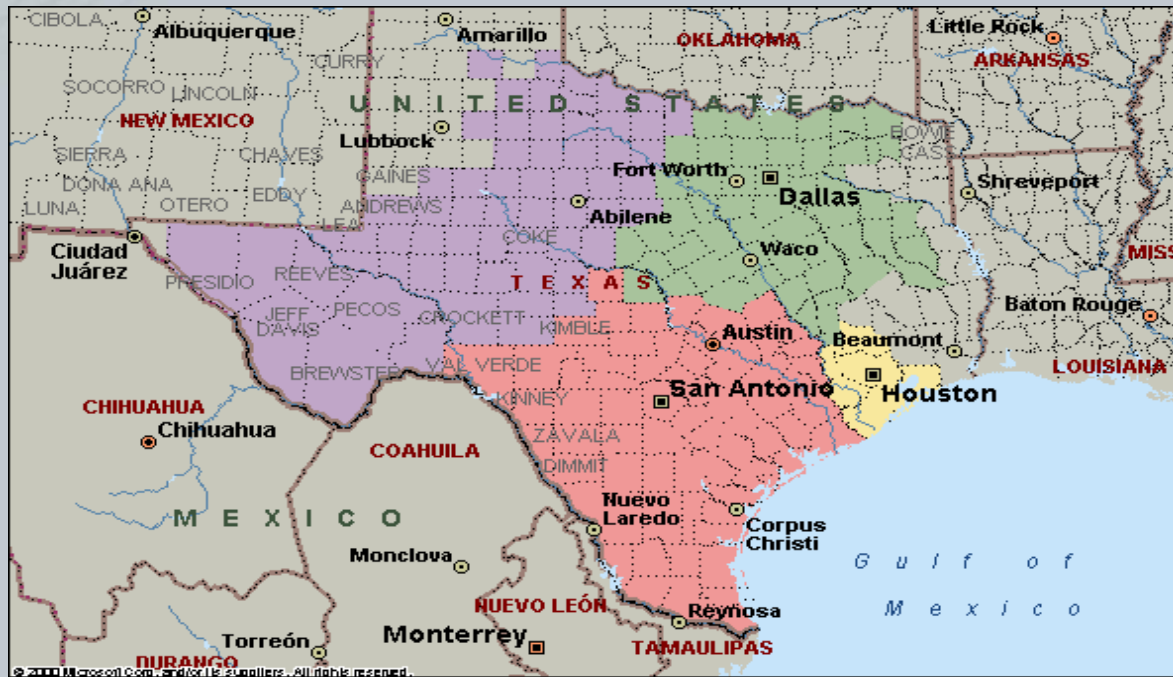
- **ERCOT ISO acts as single control area operator to ensure reliability**
- **All schedules flow and ERCOT manages congestion through the balancing energy market**
- **Zonal market today**
 - Inter-zonal congestion is directly assigned
 - Intra-zonal congestion is uplifted to Load Serving Entities on the basis of Load Ratio Share
- **Transmission Congestion Rights can be purchased to manage congestion risk**

ERCOT Operations

- **ERCOT also manages load and generator imbalances with the balancing energy market and ancillary services**
- **The Balancing Energy market accounts for less than 5% of the overall market**
- **ERCOT runs a daily auction for Ancillary Services (Regulation Up/Down, Responsive Reserves, Non Spinning Reserves, Replacement Reserves)**

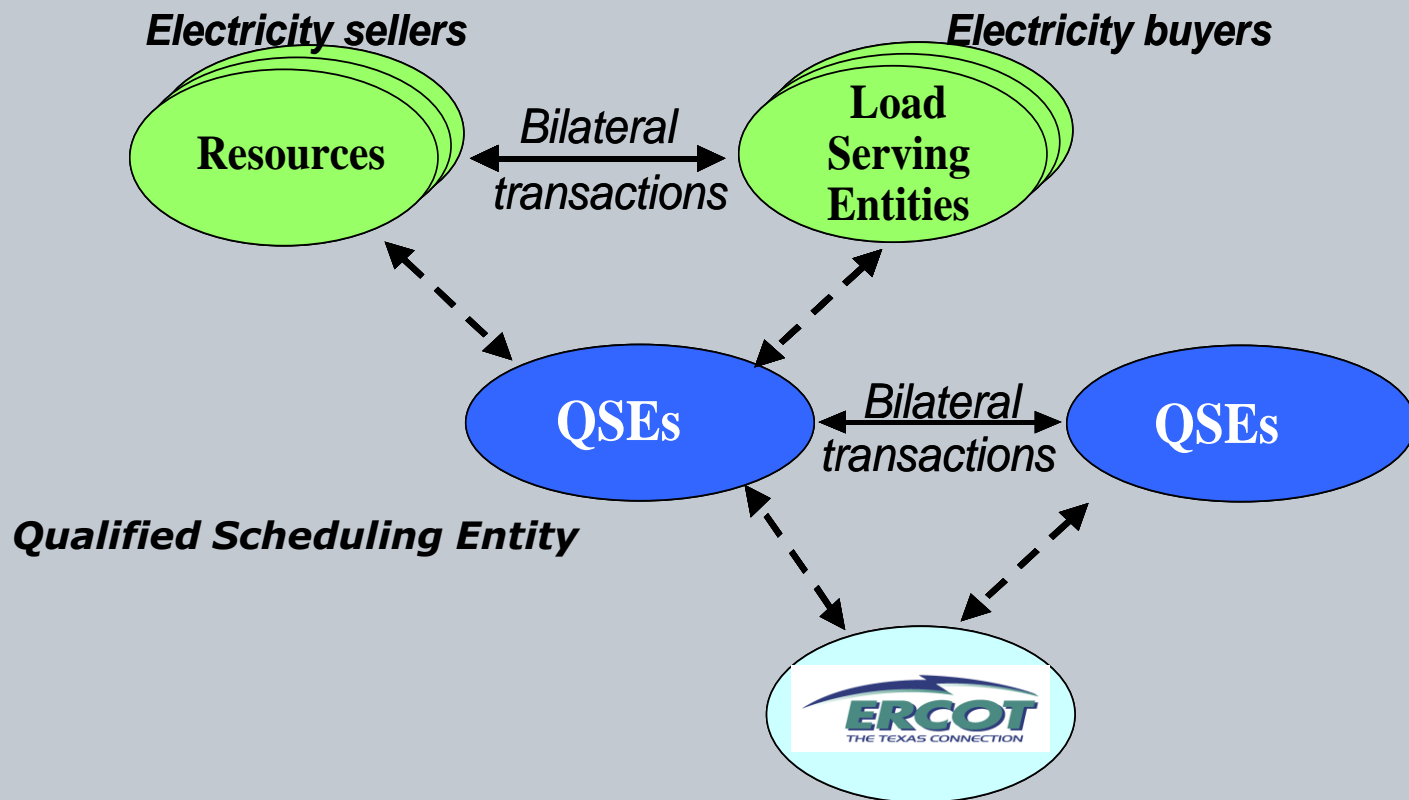
Marketing Excess Power

Bilateral Trading



- **EEI Master Purchase and Sales Agreements**
- **Market trades by Zone or ERCOT Seller's Choice**
- **On peak 5 x 16 HE 0700 thru HE 22**
- **Off peak 7 x 8 HE 23 and HE 24 plus HE 0100 thru 0600**

How the Bilateral Market Works



Marketing Excess Power in ERCOT

- **Post deregulation in ERCOT, QF has a viable market in which to market its power and there are no special PURPA put rights**
- **Excess power can be marketed in:**
 - Bilateral market to any Power Marketer or Load Serving Entity (majority of trading occurs in bilateral market)
 - ERCOT real time Balancing Energy market
 - Ancillary services market
- **In the bilateral market, power is typically sold on a firm basis with liquidated damages for non-performance (“Firm LD”)**
- **Long term structured contracts typically include a capacity and energy component**

Forward Market Prices

| 9/24/2007 | ERCOT Houston | | | | | | | | | | |
|-----------|---------------|-------|----------------|-------|----------------|-------|---------------|-------|----------------|-------|----------------|
| | Henry Hub | 5x16 | 5x16 Heat Rate | 2x16 | 2x16 Heat Rate | 7x8 | 7x8 Heat Rate | Wrap | Wrap Heat Rate | 7x24 | 7x24 Heat Rate |
| Jan-08 | 8.18 | 62.98 | 7.69 | 58.12 | 7.10 | 50.72 | 6.20 | 53.15 | 6.49 | 58.01 | 7.09 |
| Feb-08 | 8.20 | 62.73 | 7.65 | 57.89 | 7.06 | 50.78 | 6.20 | 53.22 | 6.49 | 57.81 | 7.05 |
| Mar-08 | 8.01 | 67.48 | 8.42 | 62.30 | 7.78 | 48.59 | 6.07 | 53.67 | 6.70 | 59.91 | 7.48 |
| Apr-08 | 7.61 | 66.88 | 8.79 | 61.77 | 8.12 | 48.95 | 6.44 | 53.32 | 7.01 | 59.95 | 7.88 |
| May-08 | 7.63 | 69.98 | 9.18 | 62.56 | 8.20 | 46.82 | 6.14 | 52.69 | 6.91 | 60.87 | 7.98 |
| Jun-08 | 7.70 | 78.55 | 10.21 | 68.69 | 8.93 | 47.24 | 6.14 | 54.95 | 7.14 | 65.96 | 8.57 |
| Jul-08 | 7.78 | 92.04 | 11.84 | 76.97 | 9.90 | 56.56 | 7.28 | 63.03 | 8.11 | 77.38 | 9.95 |
| Aug-08 | 7.84 | 92.78 | 11.83 | 82.94 | 10.58 | 52.68 | 6.72 | 64.29 | 8.20 | 77.16 | 9.84 |
| Sep-08 | 7.86 | 78.53 | 9.99 | 72.57 | 9.23 | 49.24 | 6.26 | 56.92 | 7.24 | 67.49 | 8.58 |
| Oct-08 | 7.95 | 70.34 | 8.85 | 65.03 | 8.19 | 45.93 | 5.78 | 52.01 | 6.55 | 61.08 | 7.69 |
| Nov-08 | 8.37 | 65.61 | 7.84 | 60.60 | 7.24 | 48.05 | 5.74 | 52.97 | 6.33 | 58.59 | 7.00 |
| Dec-08 | 8.79 | 62.57 | 7.12 | 57.97 | 6.59 | 51.21 | 5.83 | 52.91 | 6.02 | 57.69 | 6.56 |
| AVG 2008 | 7.99 | 72.54 | 9.08 | 65.62 | 8.21 | 49.73 | 6.22 | 55.26 | 6.92 | 63.49 | 7.94 |
| AVG 2009 | 8.32 | 72.61 | 8.73 | 65.70 | 7.90 | 47.82 | 5.75 | 54.18 | 6.51 | 62.96 | 7.57 |
| AVG 2010 | 8.13 | 74.62 | 9.25 | 67.52 | 8.36 | 43.69 | 5.38 | 52.20 | 6.44 | 62.89 | 7.78 |
| AVG 2011 | 7.88 | 71.98 | 9.21 | 65.15 | 8.33 | 52.50 | 6.68 | 56.93 | 7.25 | 64.09 | 8.18 |
| AVG 2012 | 7.63 | 70.23 | 9.27 | 63.57 | 8.38 | 50.76 | 6.66 | 55.26 | 7.27 | 62.38 | 8.22 |

ERCOT BALANCING MARKET

- The marginal clearing price of balancing energy (“MCPE) is set every 15 minutes
- Last offer cleared establishes MCPE for an interval
- MCPE is capped at \$1,500 today and transitioning to \$3,000 with nodal

| Year | Zone | 5x16 | 2x16 | 7x8 | 7x24 |
|----------|-----------|----------|----------|----------|----------|
| 2004 | North | \$ 47.63 | \$ 43.95 | \$ 33.59 | \$ 42.25 |
| 2004 | South | \$ 46.62 | \$ 42.84 | \$ 32.86 | \$ 41.32 |
| 2004 | West | \$ 46.87 | \$ 43.88 | \$ 33.33 | \$ 41.79 |
| 2004 | Houston | \$ 47.91 | \$ 43.72 | \$ 33.31 | \$ 42.25 |
| 2004 | Northeast | \$ 46.75 | \$ 43.93 | \$ 33.16 | \$ 41.68 |
| 2005 | North | \$ 74.49 | \$ 63.84 | \$ 48.19 | \$ 63.67 |
| 2005 | South | \$ 69.65 | \$ 60.29 | \$ 48.05 | \$ 60.63 |
| 2005 | West | \$ 74.38 | \$ 63.35 | \$ 48.73 | \$ 63.69 |
| 2005 | Houston | \$ 75.99 | \$ 64.04 | \$ 48.45 | \$ 64.49 |
| 2005 | Northeast | \$ 73.41 | \$ 63.14 | \$ 48.19 | \$ 63.02 |
| 2006 | North | \$ 57.46 | \$ 54.10 | \$ 41.33 | \$ 51.44 |
| 2006 | South | \$ 55.75 | \$ 52.88 | \$ 40.51 | \$ 50.12 |
| 2006 | West | \$ 57.40 | \$ 53.94 | \$ 41.27 | \$ 51.36 |
| 2006 | Houston | \$ 58.20 | \$ 54.87 | \$ 41.63 | \$ 52.04 |
| 2006 | Northeast | \$ 56.79 | \$ 52.94 | \$ 41.00 | \$ 50.79 |
| 2007 YTD | Houston | \$ 62.71 | \$ 56.55 | \$ 42.74 | \$ 54.82 |
| 2007 YTD | North | \$ 61.01 | \$ 55.55 | \$ 42.33 | \$ 53.69 |
| 2007 YTD | South | \$ 61.57 | \$ 55.45 | \$ 42.57 | \$ 54.01 |
| 2007 YTD | West | \$ 60.67 | \$ 55.71 | \$ 43.34 | \$ 53.90 |

Factors to Consider in Short Term Sales

- **Ability to commit to a Day Ahead schedule**
- **Impact of steam requirements on ability to control to a specific output level**
- **Natural gas cost, including imbalance costs/constraints**
- **True costs of any waste fuels that are burned in lieu of gas**
- **Marginal cost to produce power, including O&M, taking into account any steam revenues or cost of alternate steam supply from a boiler**

Factors to Consider in Short Term Sales

- **Opportunity to reduce production of product(s) to sell more power or interrupt load to provide Responsive Reserves**
- **Day Ahead prices vs. Balancing Energy prices**
- **Ability to offer intra-day flexibility through Ancillary Services or short schedules**
- **Emissions limits**

Factors to Consider in Long Term Sales

- **Term**
- **Price Structure**
- **Forward Price Curve for Natural Gas and Power**
- **Hedging Strategies**
- **Delivery Point**
- **Firm LD vs. Unit Contingent**
- **Steam Requirements**
- **Dispatch ability / flexibility to ramp up/down**
- **Ancillary Services Capacity**

Factors to Consider in Long Term Sales

- **Fuel Supply Costs**
- **Operating Costs**
- **Forced Outage Rates**
- **Planned Maintenance**
- **Credit Requirements**
- **Counterparty Default Risk**
- **Financing Requirements**
- **Emissions limits**

Working with a QSE

Beginning Steps in ERCOT

- **For projects >10 MW**
 - Request interconnection study from ERCOT
 - ERCOT Study Fees \$15 to \$30K, depending upon size of the capacity
 - Interconnection agreement with TDSP
 - Process typically takes 90 to 270 days
- **Registration as Power Generating Company with ERCOT**
- **Registration with PUC on or before the date power is first generated**
 - See Section 25.109 of PUC Regulations
- **Negotiation of QSE agreement, submit QSE paperwork to ERCOT**
- **Installation of telemetry, AGC and ERCOT meter**

QSE Operations

- **24 hour operations, 365 days, similar to control area system operations**
- **All load and resources must be represented by a QSE**
- **Only entity allowed to financially transact with ERCOT**
- **Submits energy schedules by zone, balanced between obligations (retail load or bilateral trades) and supply resources**
- **SCADA & telemetry required to continuously monitor generation and to respond to dispatch instructions**

QSE Operations

- **Submits offers to sell balancing energy and ancillary services to ERCOT**
- **Submits mandatory Balancing Down bids to ERCOT**
- **Schedules awarded Ancillary Services, including LAAR**
- **Submits power generation Resource Plans to ERCOT**
- **Responds to dispatch instructions from ERCOT**
- **QSE performance is monitored through measurement of Schedule Control Error calculation**

Additional Services to Consider

- Assistance in optimizing cogen plant operations and market opportunities
- Valuation analysis for cogen development
- Assistance in hedging gas and power
- Assistance in structuring flexible fuel and long term power sales contracts
- Assistance in negotiation of REP contract
- Assistance in establishing Self Serve REP
- Assistance in qualifying and monetizing LAAR capacity

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