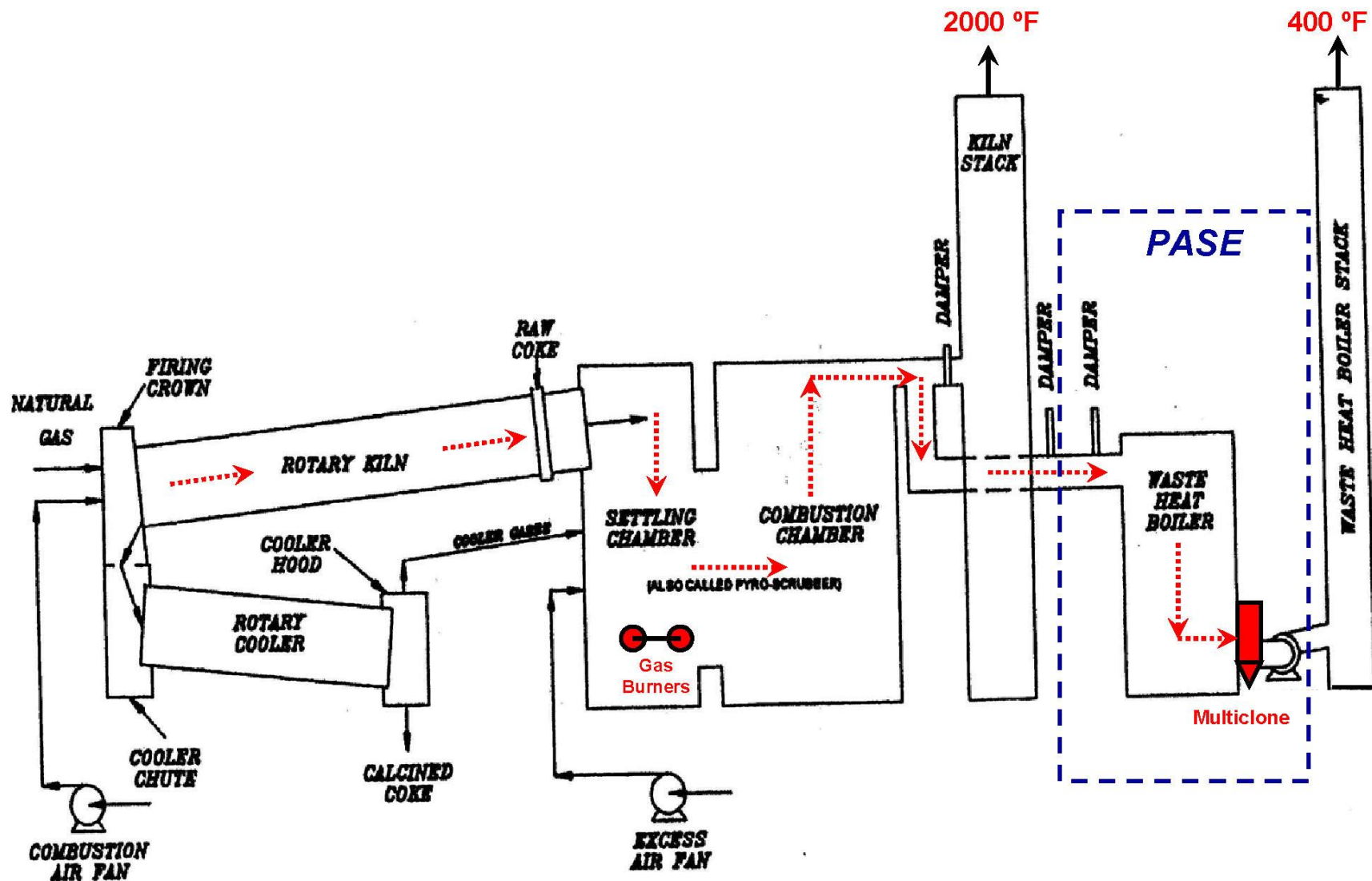
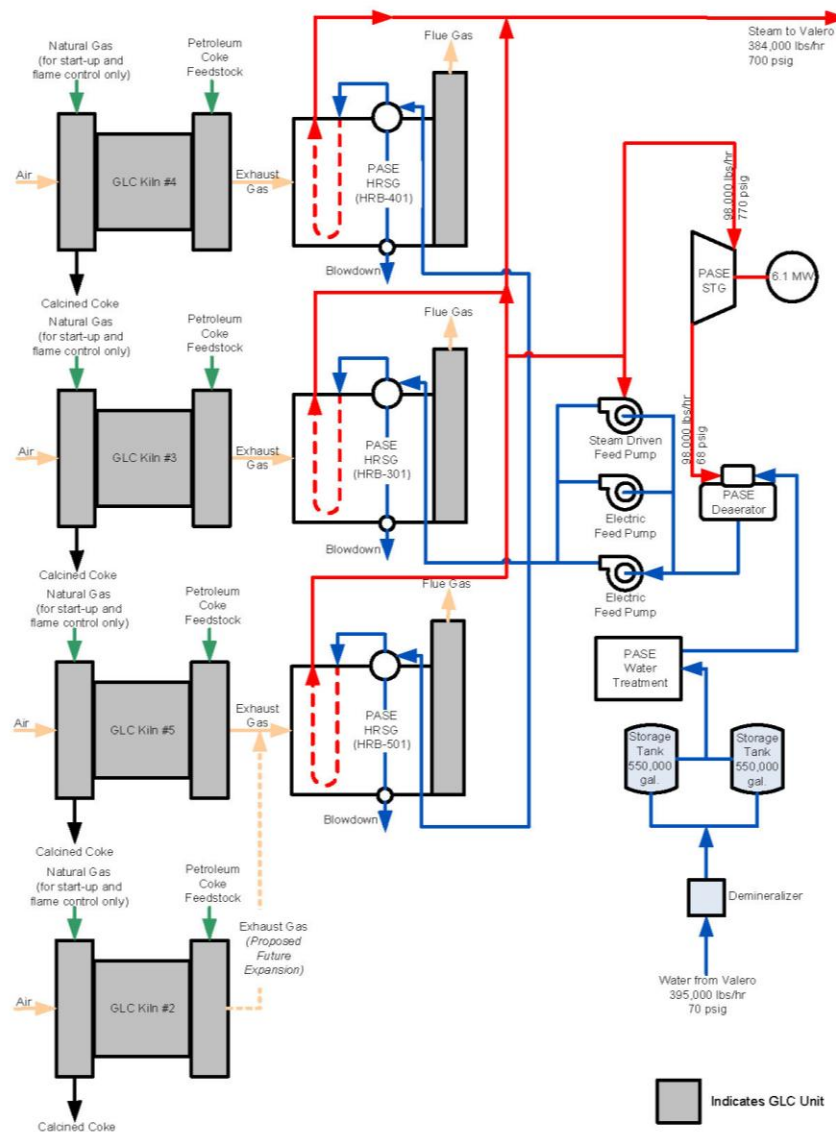


Port Arthur  **Steam Energy LP**
A Green Energy Facility

Ray Deyoe
Managing Director
Integral Power, LLC

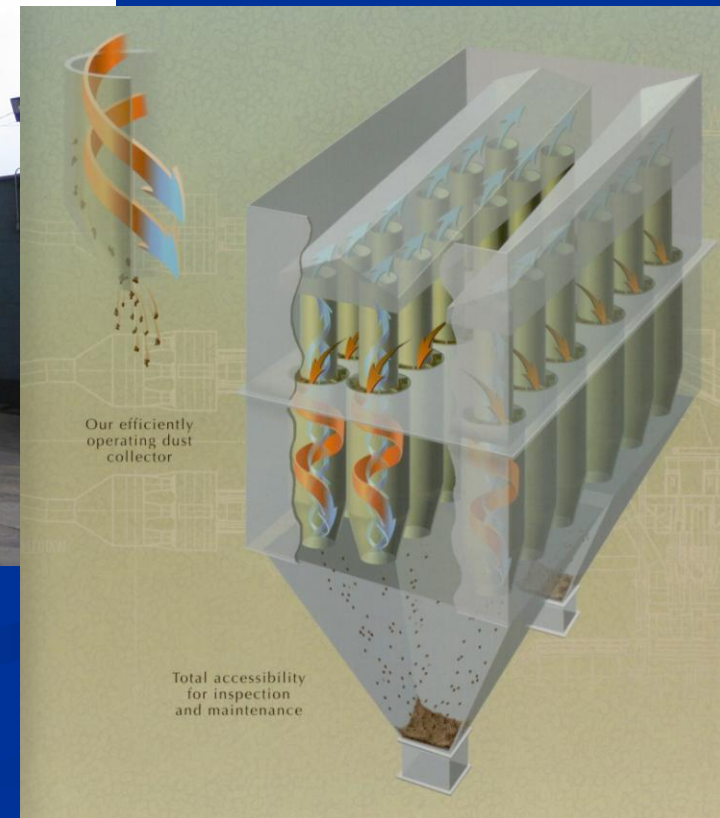


- ✓ Re-development of Dynegy Cogen plant (1983 vintage)
- ✓ 3 x Heat Recovery Boilers
- ✓ 2.5 mile steam pipeline
- ✓ 400,000 lb/hr steam export
- ✓ 5 MW power production
- ✓ ~55 MW equivalent output



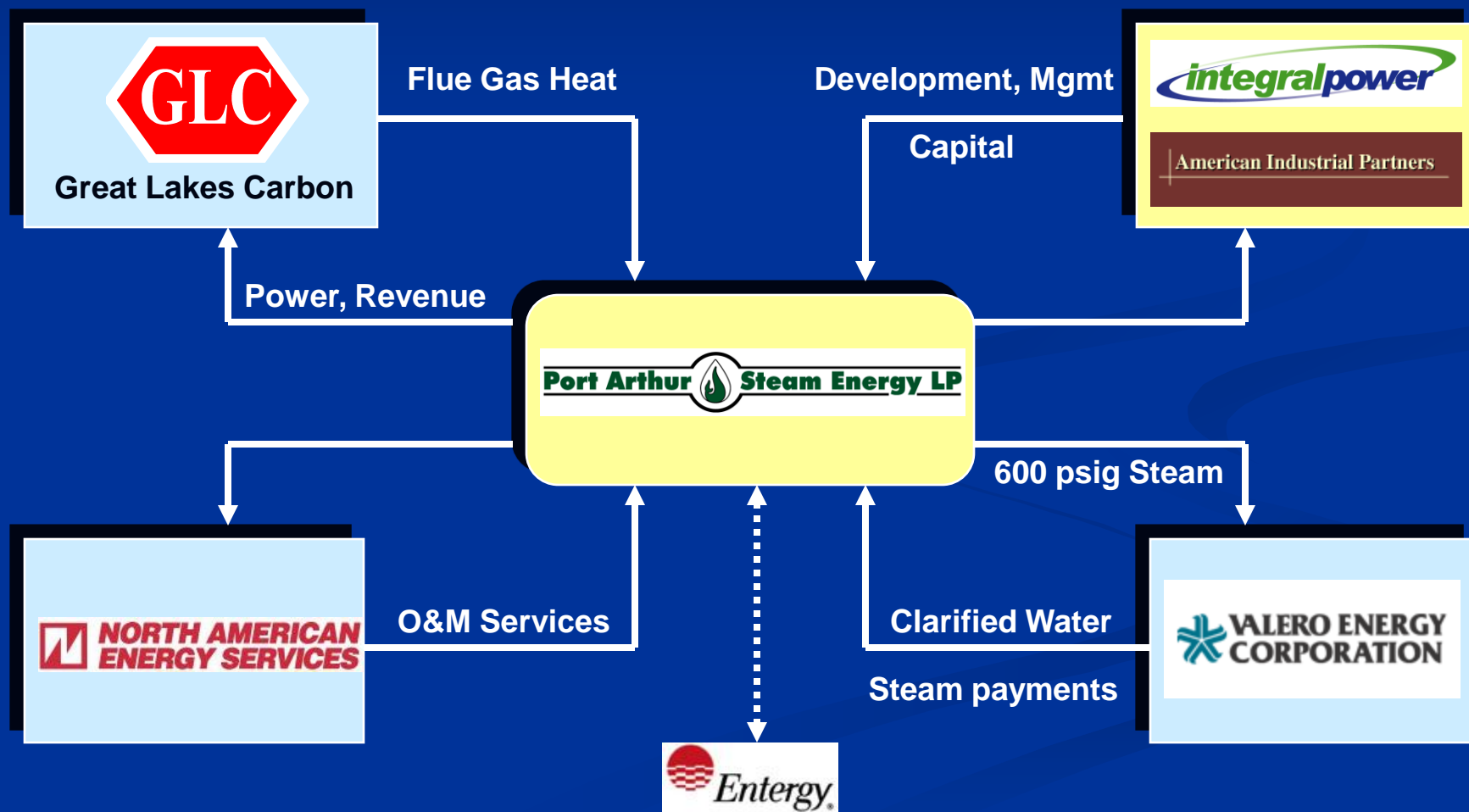




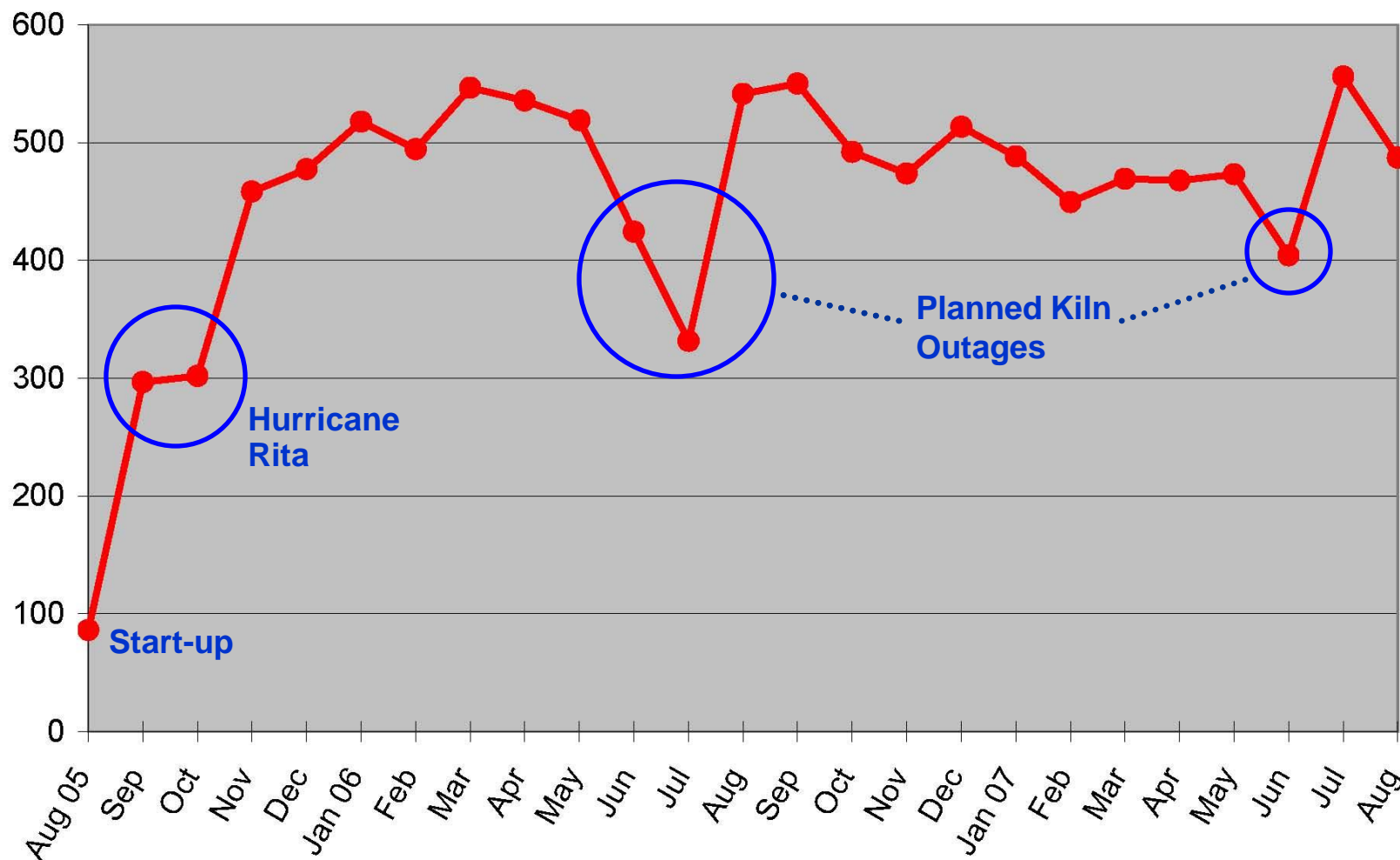




Commercial Structure



Monthly Average MMBTU/hr Delivered to Valero



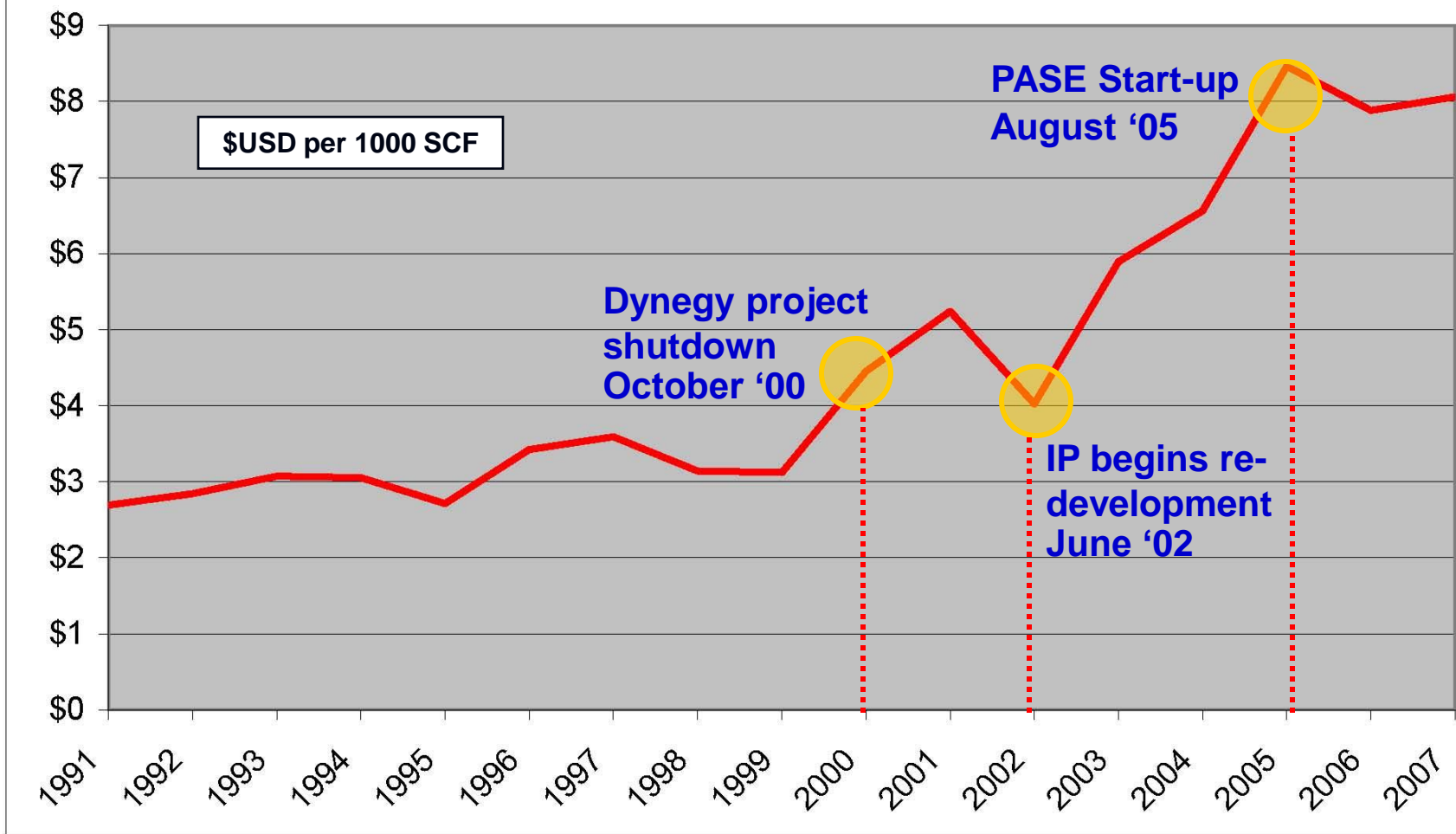
Key Commercial Points

- ☑ **Great Lakes receives value for waste heat via share of revenue**
 - ☑ **PASE provides all of GLC power requirement at discount**
 - ☑ **Great Lakes retains air emissions**
-
- ☑ **Valero provides clarified water, receives HP steam**
 - ☑ **Steam priced on net BTUs metered tied to nat gas market index**
 - ☑ **Long term agreements on both sides**

General Project Drivers

- 👍 Waste heat = NO FUEL BILL
- 👍 Natural hedge against rising energy prices
- 👍 Waste heat = NO incremental EMISSIONS
- 👍 “Green” project = sustainable development, great P.R.
- 👍 State provides expediting permitting via “Standard Permit”

Natural Gas Pricing - Industrial Sector National Avg EIA Monthly Energy Report



GREAT LAKES

- ✓ Revenue for waste heat
- ✓ Reduced electricity cost
- ✓ Increased electricity reliability
- ✓ Reduced raw water cost

NAES (3rd party O&M)

- ✓ Revenue from O&M Mgmt Fees
- ✓ 23 full time jobs created

PASE OWNERS

- ✓ Revenue from Operations
- ✓ Expand asset base

VALERO

- ✓ Savings vs gas firing in boilers
- ✓ Reduced boiler fan HP
- ✓ Water treatment savings
- ✓ Capital and O&M avoidance
- ✓ Reduced Emissions

Steam Savings – Example Fuel Component

**Based on: 100,000 lbs/hr steam @ 600 psig/750 °F (1378.6 BTU/lb)
95% availability:**

Natural Gas HHV	Refinery Boiler @ 81% eff	Project Price @ 1.0 factor	Fuel Savings	Fuel Savings	Yearly Fuel Savings
\$/MMBTU	\$/steam MMBTU	\$/steam MMBTU	%	\$/steam MMBTU	\$
6.00	7.41	6.00	19%	1.41	\$1,617,652
7.00	8.64	7.00	19%	1.64	\$1,881,524
8.00	9.88	8.00	19%	1.88	\$2,156,869

Project Challenges

- 👉 **Discretionary project for both Great Lakes & Valero**
- 👉 **Steam & power generation outside of GLC core business**
- 👉 **Plot constraints (original project)**
- 👉 **High installed capital cost (original project)**
- 👉 **Boiler isolation ...*do not want the tail wagging the dog!***
- 👉 **Greed – difficult to conclude negotiations**



Key Project Issues

- Heat flow ...*economy of scale is huge*
- Reliability / availability of heat source
- Ability to isolate is a must
- Length of tie-in pipe (2-3 miles max) or wires
- Permit constraints drive configuration and operation
- Plot constraints can drive capital up sharply
- Other commercial issues:
 - *credit worthiness of counterparties*
 - *history and future longevity of the facility*

Conclusion

- **PASE is a huge WIN for all parties and the community**
- **Nearly 5,000,000 MMBTU per year recovered**
- **Displaces ~200 tons/yr NOx & ~280,000 tons/yr CO2**
- **PASE is a model for industrial efficiency and cooperation!**