


Power Generation in 2006

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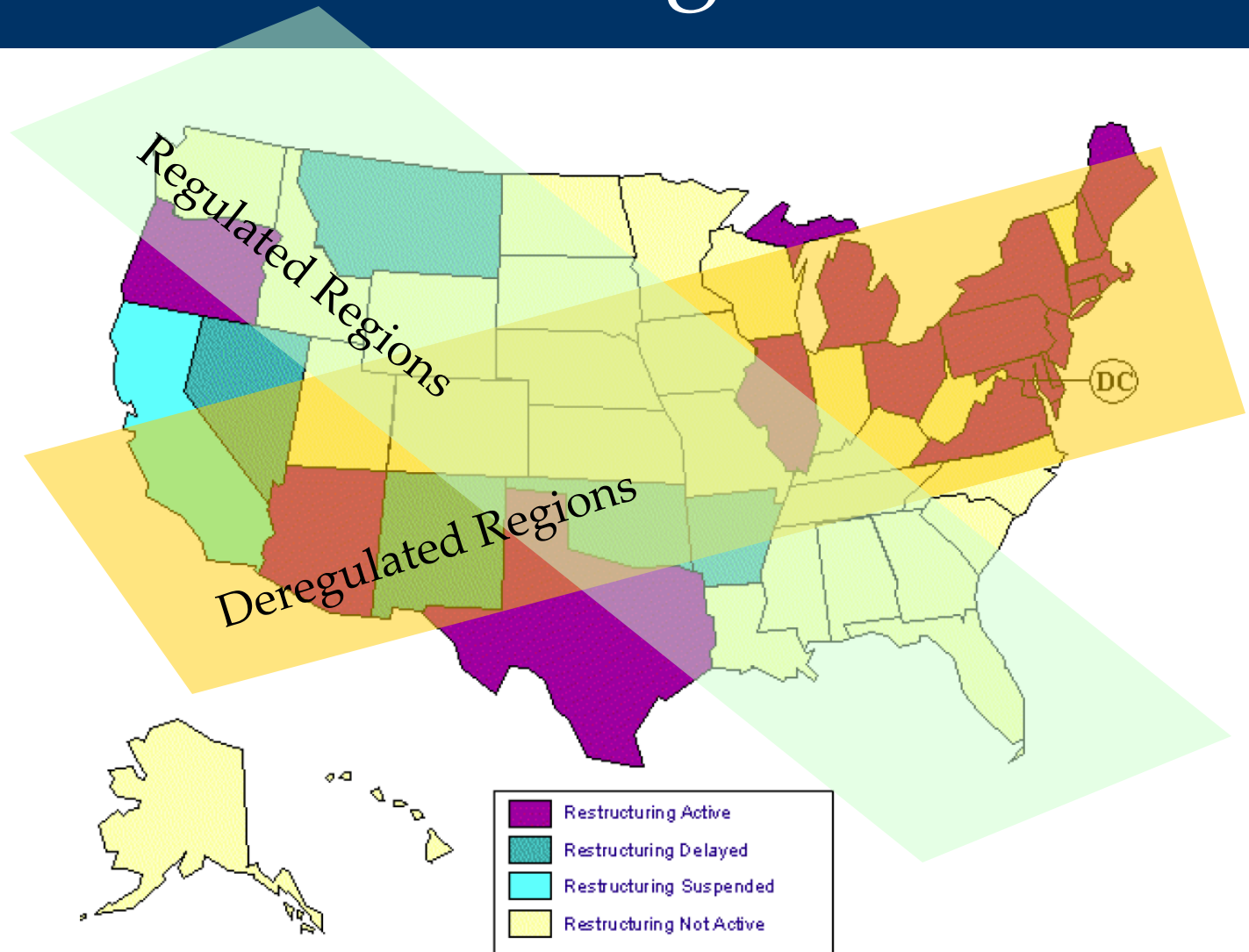
The End of Growing Pains?

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- The interactions of markets in which boundaries (both physical and otherwise) are important defining characteristics have produced complex investment dynamics
 - Overlapping Boundaries
 - Fuel Markets
 - Power Markets
 - Regulatory Compliance Regions
 - Transportation/Transmission Networks
 - Shifting boundaries
 - Rapid construction of new facilities led to volatile power flows across transmission networks
 - Jurisdictional and legislative uncertainty led to confusing and often inconsistent regulatory guidance
 - This complexity led to a painful adolescence for newly-deregulated power markets

A Tale of Two Worlds

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- With time, markets and market participants have settled into accommodating both regulated and deregulated regimes
 - Those regions that are regulated are comfortable remaining regulated
 - The Northwest-Southeast Axis
 - Those regions that are deregulated have developed stable, functional market environments
 - The Southwest-Northeast Axis


Regional Divide



Stable Markets

Region	Latest “State of the Market” Report Conclusion
PJM	Energy and capacity markets are “competitive”
NYISO	“Markets continued to perform competitively”
ISO-NE	Results were “consistent with those expected in a competitive market”
ERCOT	“Systematic inefficiencies” currently being addressed by alternative wholesale market design
CAISO	“Solid performance despite tough market challenges”
MISO	LMP began in 2005; the design of the LMP market allowed the Midwest ISO to “efficiently manage transmission congestion and set transparent market-clearing prices

Looking Forward

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- With the markets more stable, the industry now faces more “conventional” challenges and opportunities
 - What can markets expect in 2006?
 - Post-PUHCA Shake-up
 - Shifting Fuel Dynamics
 - Transmission
 - New Capacity
 - Market Structure Refinements
 - Carbon Constraints

Life After PUHCA

- Section 1236 of the Energy Policy Act of 2005 repealed PUHCA, a 1935 law that limited the consolidation of utilities
 - The “single integrated system” requirement
 - Limits on voting control by non-utility investors
- PUHCA was seen as a barrier to consolidation and a constraint on the provision of new capital to the industry

New Possibilities for Consolidation

- Several transactions contemplated a repeal of PUHCA because they clearly failed the “integrated system” requirement
 - AEP-Central & Southwest
 - Duke-Cinergy
- The repeal of PUHCA will continue to encourage consolidation plays that emphasize diversification (*e.g.*, Duke-Cinergy, FPL-Constellation)
- Diversification will help deregulated/deregulating firms to deal with the risks of competitive markets
- Consolidation will bring economies of scale to the numerous smaller utilities operating around the country at a time when infrastructure investment is picking up

Confronting Growing Capital Demands

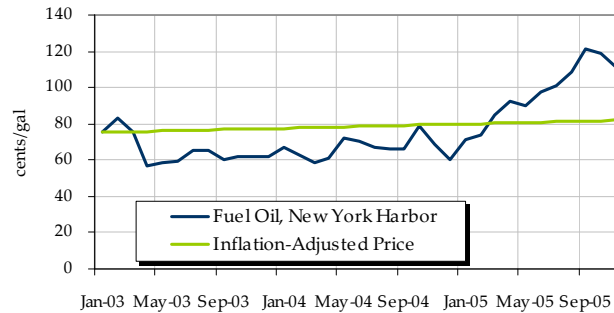
- Utilities are voracious consumers of capital
 - Transmission upgrades
 - Environmental controls
 - New generating capacity in some markets
- PUHCA limited investment in utilities because ownership by unrelated third-parties was restricted
- By opening the door to non-utility investors, utilities will benefit not only from additional sources of capital, but also from bringing in an entirely new perspective and set of objectives
 - MidAmerican-PacifiCorp (Berkshire Hathaway)
 - Private funds

Shifting Fuel Dynamics

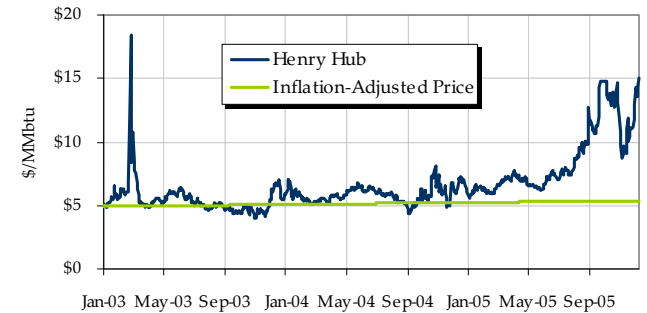
- 2005 was a year of unprecedented commodity price volatility
 - Oil
 - Natural Gas
 - Coal
 - Uranium
- In competitive markets, these variable costs drive power prices higher across the board
 - Average Cost vs Marginal Cost pricing
 - A windfall for solid-fuel generators & renewables
- On “windfalls”: These prices are not “windfalls” as so often described; they are signals indicating scarcity and calling for a new reallocation of capital – precisely what competitive markets are supposed to do.

Soaring Fuel Costs

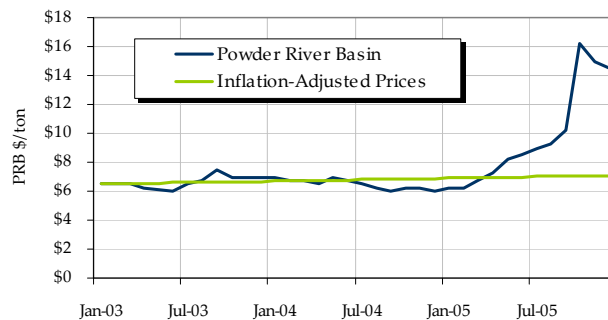
Residual Fuel Oil



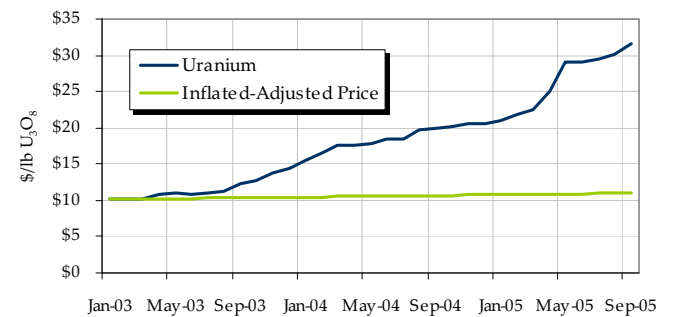
Natural Gas



Coal

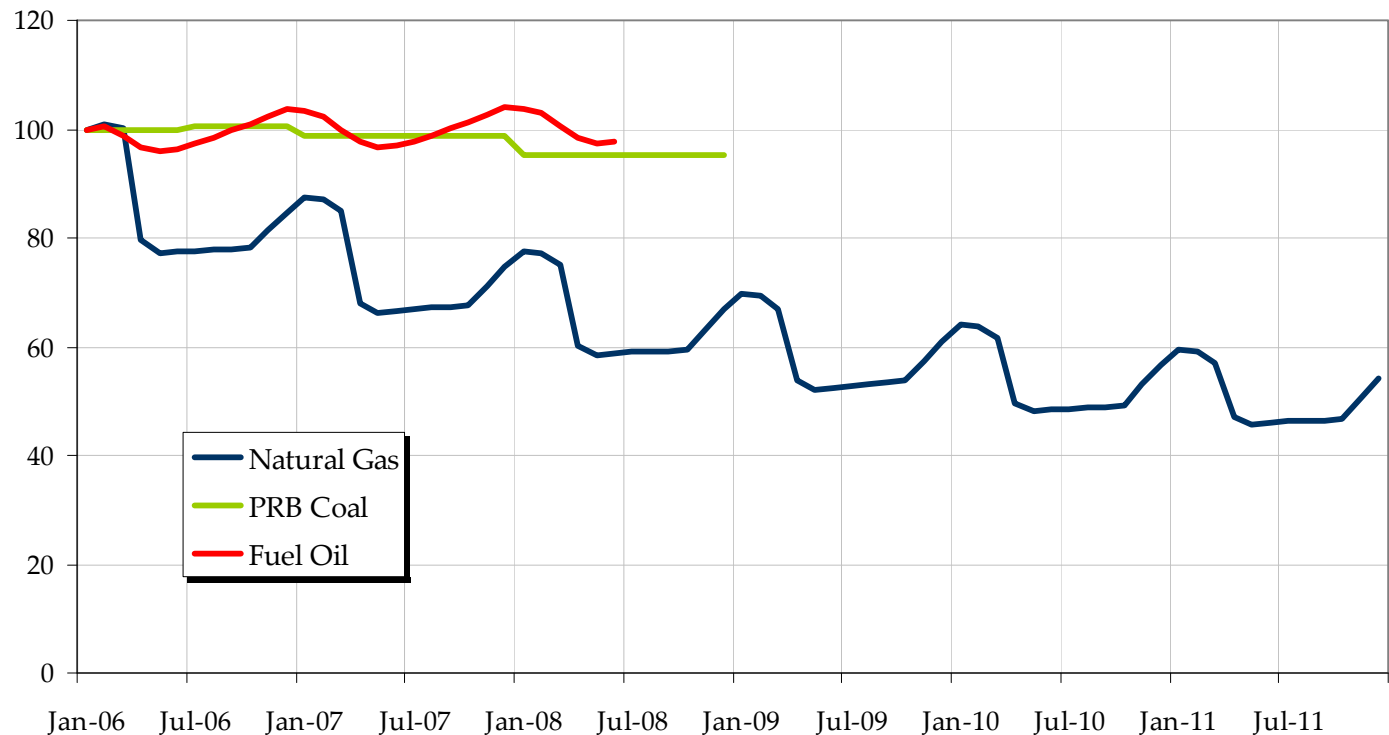


Uranium



Fuel Costs Appear to Have Peaked...

Futures Price Relative to December 2005



Prices have been normalized so that December 2005 prices equal 100

...But High-Cost ^{Fossil} Fuel is Here to Stay



Demand Not Abating

- Strong worldwide demand for energy
- GDP Growth* through 2010: Middle East (5%), Russia (5%), India (7%), China (8%)

* Estimated U.S. growth is 3%


Imports Not Viable Total Solution

- LNG is not an immediate solution
- U.S. terminals at ~50% of import capacity because of very strong European demand
- Prices in Europe \$2-\$6/MMbtu higher than U.S.

Domestic Infrastructure in Progress

- Domestic infrastructure ramp-up is time-consuming
 - Most major gas fields developed
 - Re-opening of uranium mines/processing facilities will take time
- Alternative sources (tar sands, etc)

Linked Fuel Markets

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- To generate electricity, most fuel sources are close substitutes from the consumer's perspective
 - As a result, strong price movement in one fuel tends to cascade through to others
 - Economists refer to this as the substitution effect, and for power generators it governs price dynamics
 - Witness the run-up in coal in 2005: high natural gas prices drove many generators back to coal, increasing demand

Substitutability

- To get 1 MWh of power requires any of the following:

Fuel	Quantity	Unit Cost
Coal (minemouth, PRB)	0.41 tons	\$14.50/ton
Natural Gas	7 MMbtu	\$12.50/MMbtu
Fuel Oil (RFO, NY)	1.7 bbls	\$50/bbl
Wood Waste	1.4 tons	\$30/ton
Nuclear	0.007 lbs	\$625/lb
MSW	2.1 tons	***

Prices as of December 2005

- Substitutability provides bounds on how far prices can change, but can also exacerbate the speed and intensity of the market's readjustment process

Electric Power-Equivalent Prices

- As of December 2005, these prices imply the following fuel-only[†] energy costs for power:

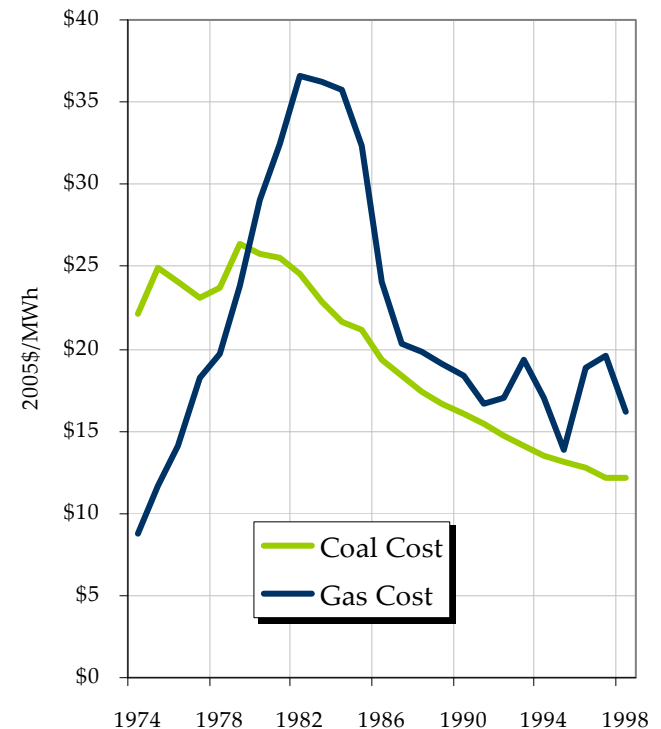
Fuel	Fuel Costs
Coal	\$5.95/MWh
Natural Gas	\$87.50/MWh
Fuel Oil	\$85.00/MWh
Wood Waste	\$42.00/MWh
Nuclear	\$4.38/MWh
MSW	N/A

- Today, of course, coal looks cheap, but it wasn't always that way.
- Return to 1998...

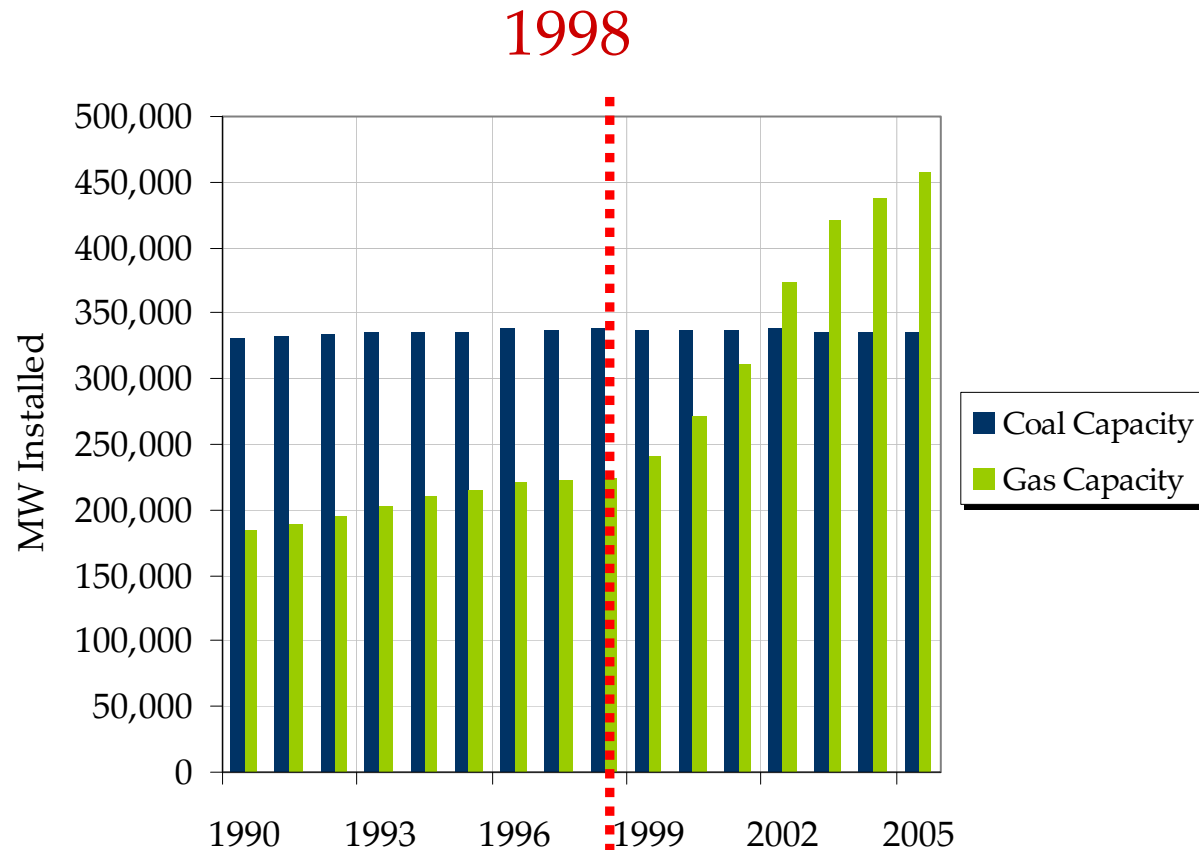
[†] Prices reflect commodity only and exclude transportation

Coal vs. Natural Gas: 1998

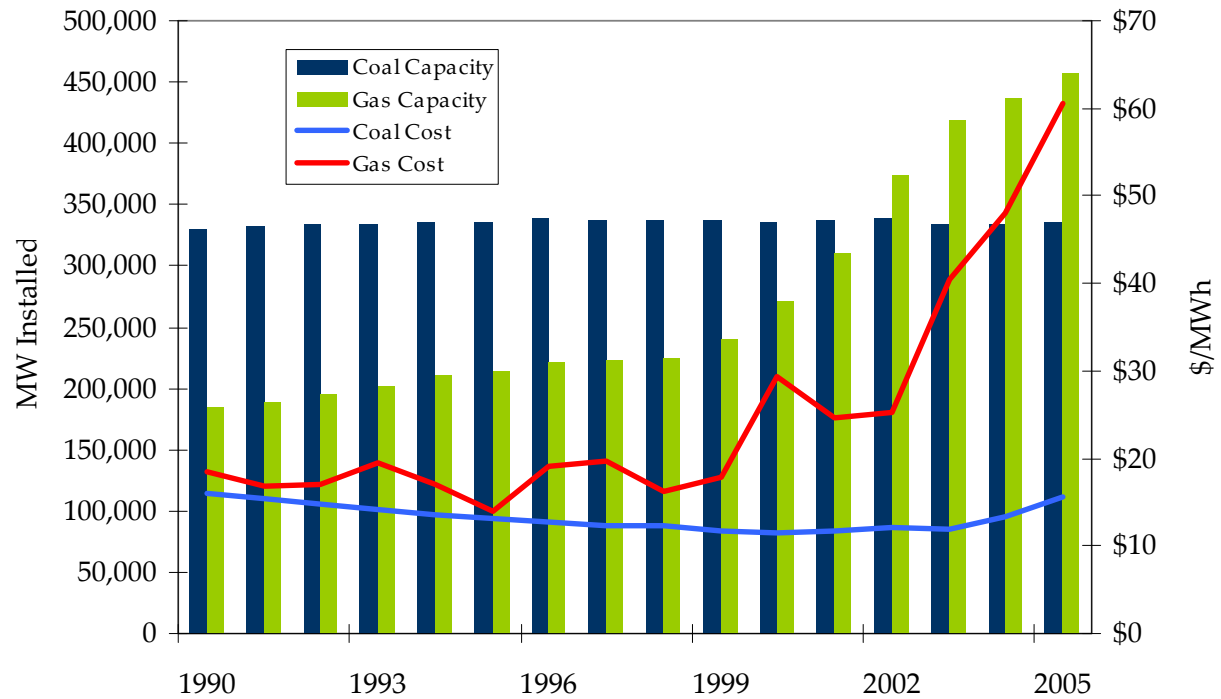
- Natural gas appeared finally as economical as coal – and without the environmental baggage
- Plus, gas-fired plants were faster and cheaper to build
- Investment Thesis:
 - Gas is cheap
 - Gas is plentiful
 - Gas is clean



The Gas-Fired Generation Boom



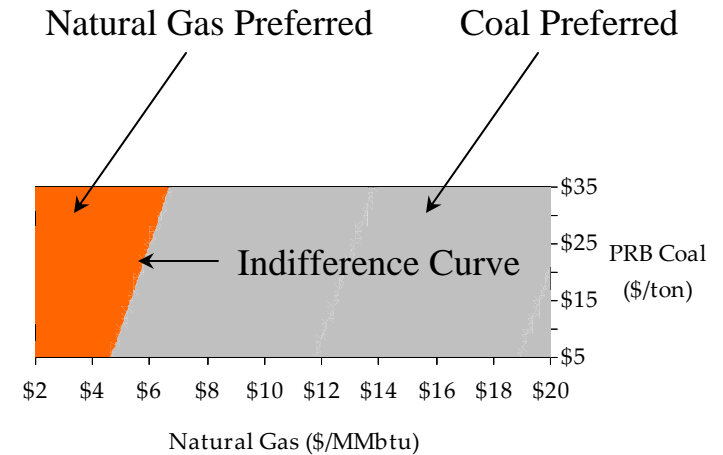
Market Feedback



- Adding so much gas-fired capacity to the system so quickly placed incredible demands on the natural gas infrastructure, pushing prices up
- Generators are beginning to substitute away from natural gas and back toward coal and nuclear


All-In Costs

	Fuel/VC (\$/MWh)	Capital/ FC (\$/MWh)	All-In Total Cost (\$/MWh)
Coal	\$5.95	\$21.55	\$27.50
Natural Gas	\$87.50	\$15.55	\$103.05
Fuel Oil	\$85.00	\$20.73	\$105.73
Wood	\$42.00	\$43.53	\$85.53
Nuclear	\$4.38	\$29.32	\$33.70



Includes \$25/ton carbon tax


Consequences & Outlook


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- Coal looks very compelling
 - Nuclear (new and old) looks very compelling
 - Renewables are finally taking off in a big way

 - These are big investments in high-fixed cost, low-variable cost assets, meaning that these decisions will influence the industry for a long time
 - What “feedback” might reasonably be expected?
 - Natural gas prices fall, coal prices rise?

 - Return to the “space” concept:
 - Coal is largely domestic with established transportation channels
 - Natural gas is increasingly transportable
 - Natural gas has many non-power industrial uses
 - Fuel diversity remains very important; a balanced approach to multiple fuel types is critical to long-term success

Transmission (Still)

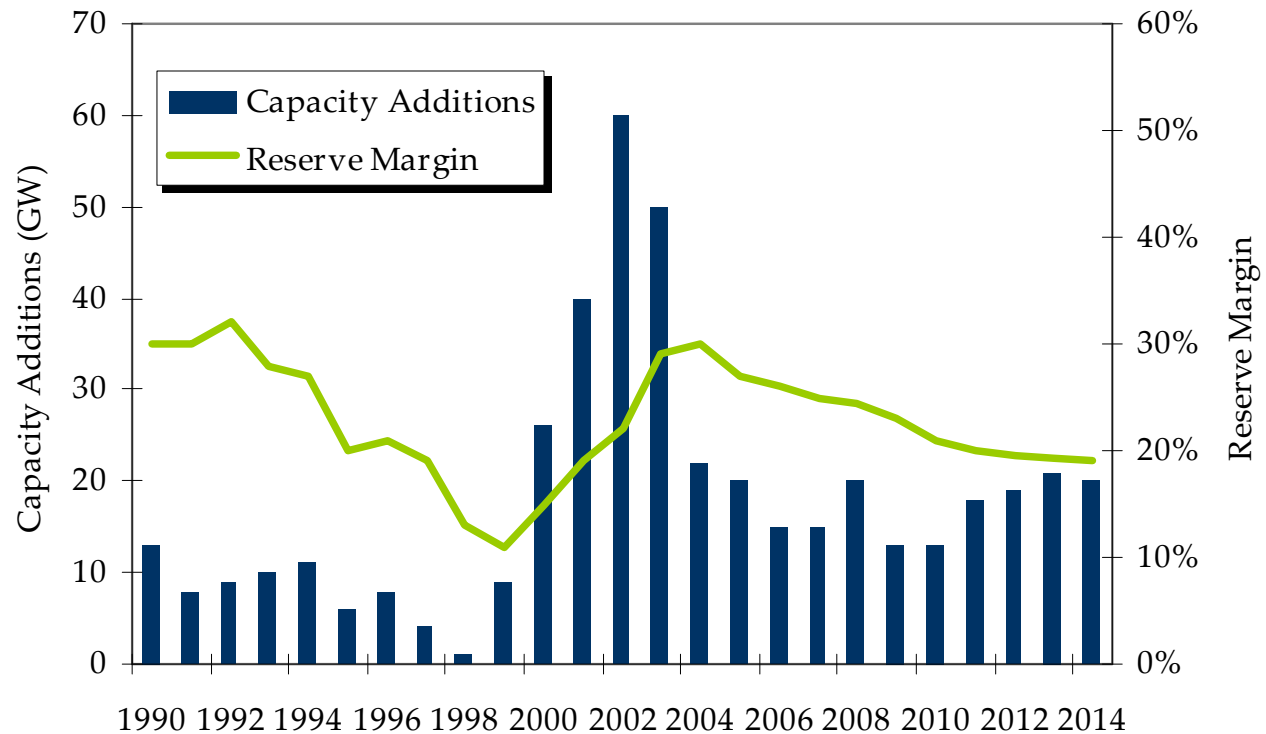
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- For the better part of the last decade, transmission has remained on the industry's "to-do" list
 - The extent of the national consensus has been merely that "someone ought to do something"
 - As the regulated bridge between two deregulated/ing islands, however, it has been fraught with difficulty
 - Low regulated returns
 - Siting difficulty

- 
- The 2005 Energy Policy Act gave FERC siting authority for transmission projects in “corridors of national interest”
 - A limited authority, but at least it’s a start
 - A “90/10 Rule”? Most of the congestion comes from a small number of bottlenecks
 - Increased prevalence of LMP markets provides a more robust mechanism for recovering transmission returns
 - Short-term “solution” to transmission problem may be as easy as improving market design and resolving a handful of local bottlenecks
 - Long-term solution must involve a more viable merchant transmission model – or more flexible regulators
 - This is a challenge...

New Capacity

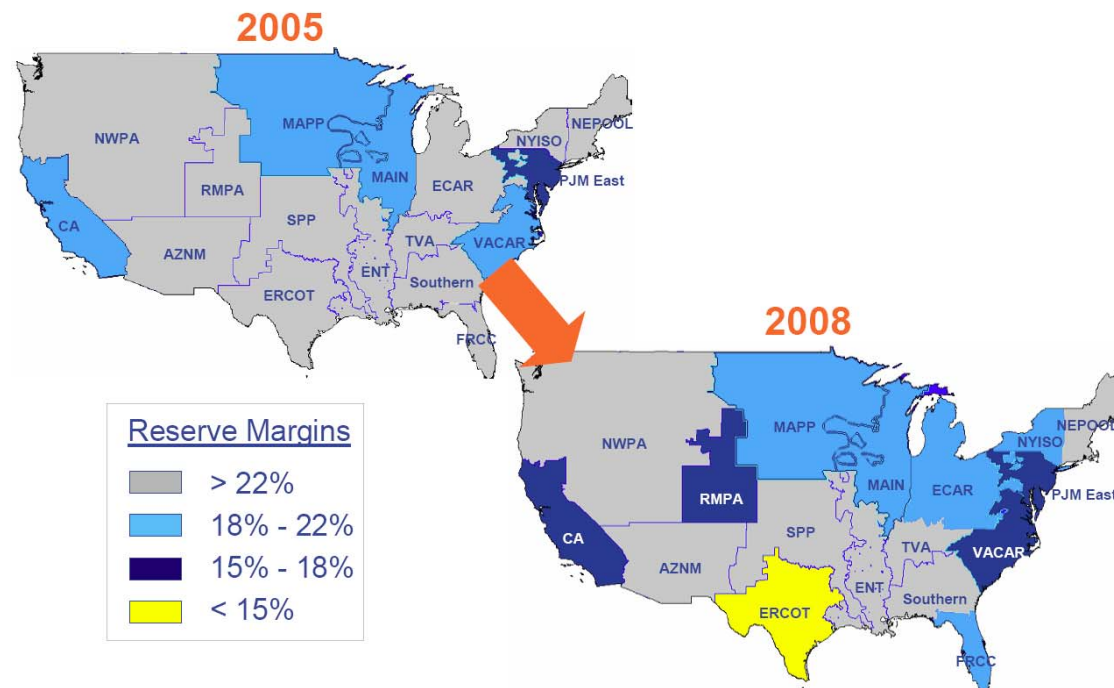
- After so many years in an overbuilt condition, the development of new capacity seems like a new experience
- It will be the first *major* addition of capacity occurring *entirely* under a deregulated regime
 - Should be more controlled
- To be sure, many regions are still substantially oversupplied...

Increasing Development Activity



Favorable Economics in Select Regions

- ...however, pockets of opportunity are clearly visible.
 - California
 - ERCOT
 - Atlantic coast
 - Capacity types: peaking



Will more gas be added...

- LNG is part of the solution, but by no means all of it – at least for some time

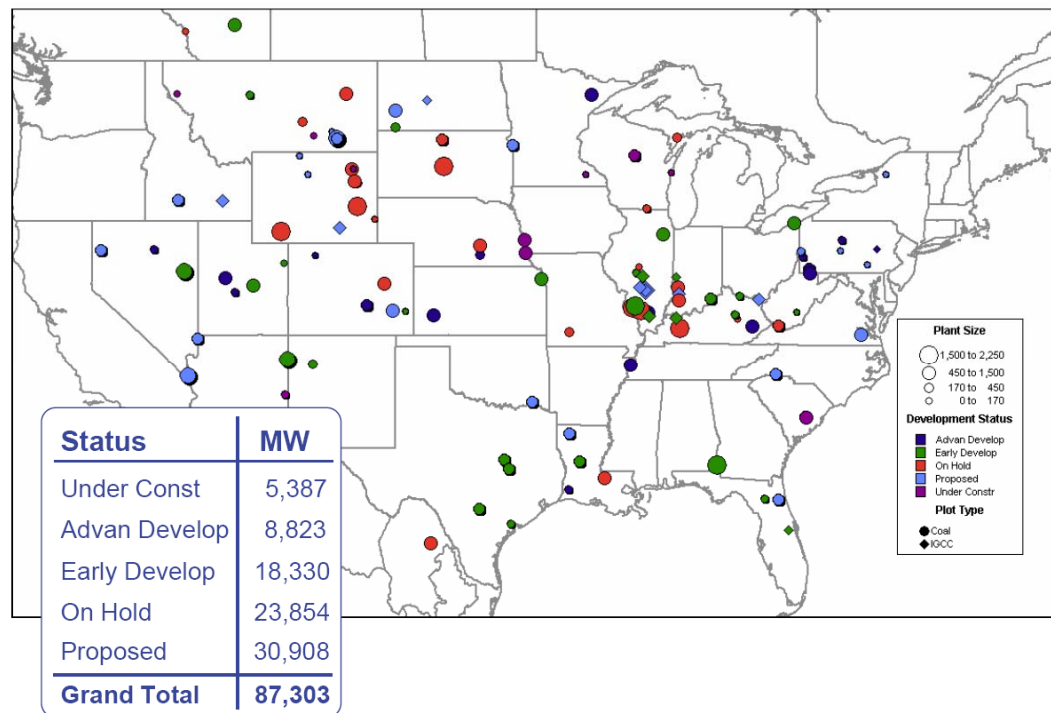


19 Approved Terminals and Expansions
21 Proposed Terminals

- It's easy to be environmentally sensitive with \$2/MMbtu natural gas...

...or will more coal be added?

- ...but at \$15/MMbtu gas, coal looks incredible – the cost differential *even for IGCC and “clean coal”* is simply too great

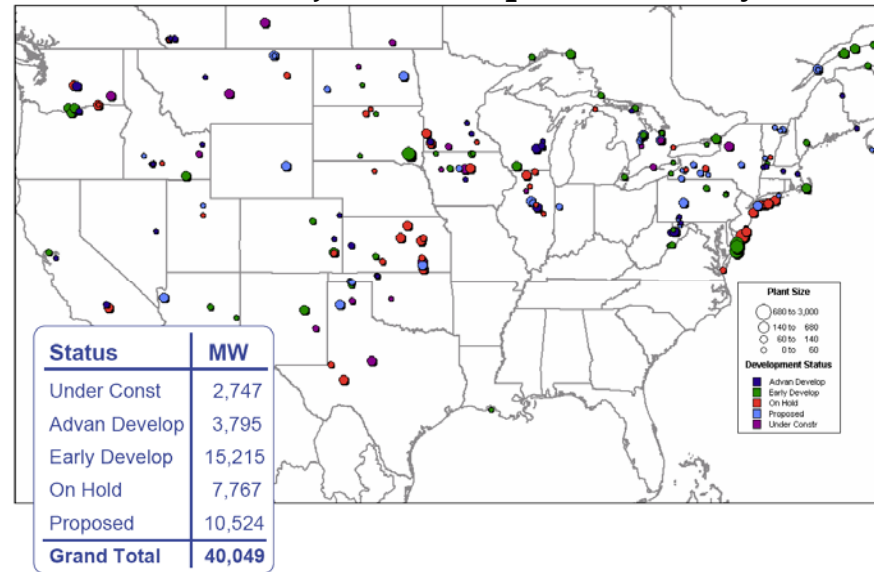


Other Low Variable Cost Options

- Renewables have come into their own

- Wind
- Solar
- Biomass

Wind Project Development Activity



- Fixed Costs falling, Variable Costs low

- Most renewables have high fixed costs, but low variable costs. Development of renewables requires a sustained belief that prices will be high because it is the fixed costs, rather than the variable costs that must be covered

Revitalization of Long-Dormant Technologies

- Although the simple economics are clearly compelling, the Energy Policy Act provides additional incentives to two long-dormant technologies
- Coal
 - IGCC tax credit
 - DOE loan guarantees for clean coal
- Nuclear
 - Production tax credit
 - Price-Anderson extension
 - Loan guarantees
 - Streamlined NRC approval process

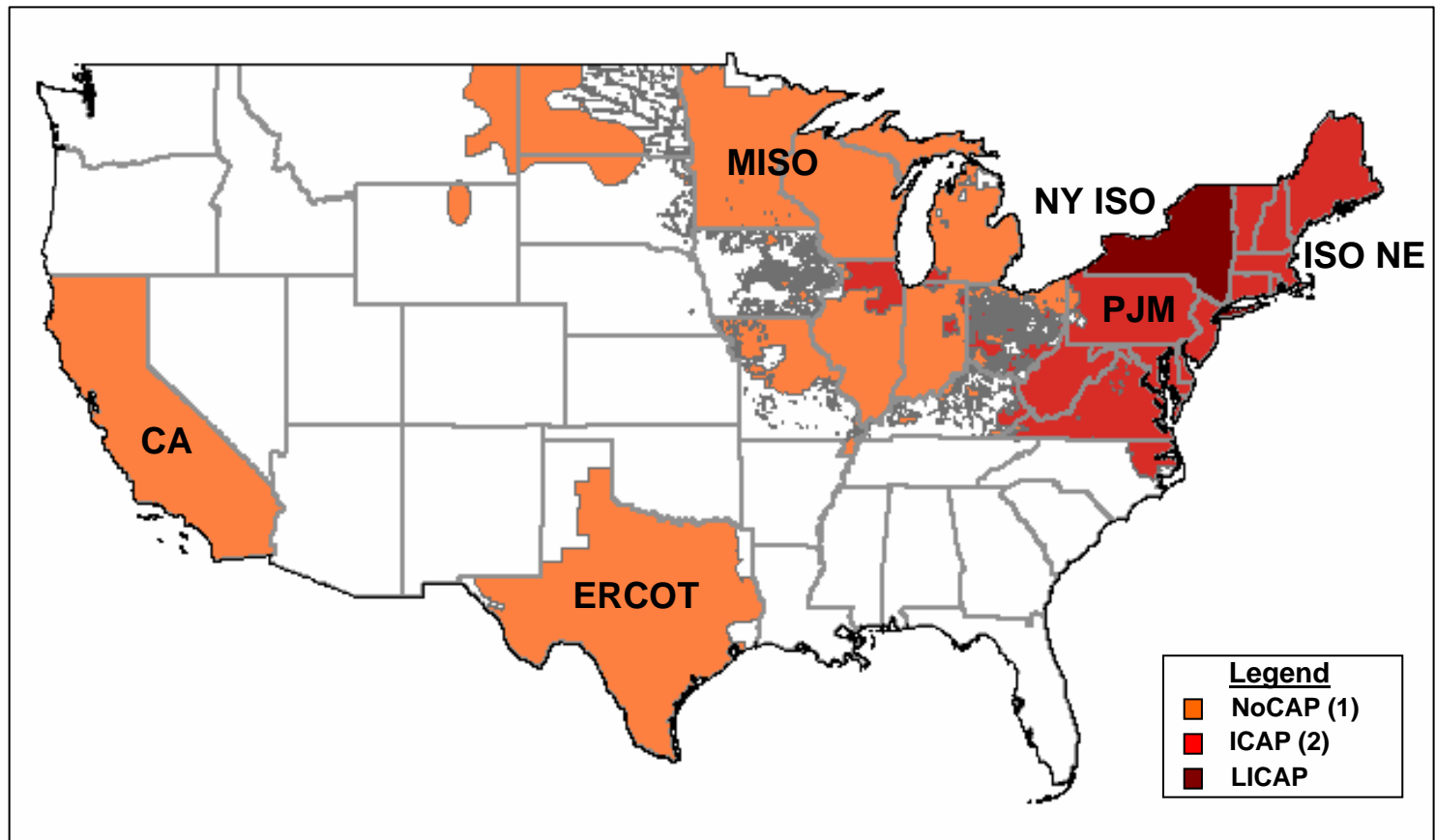
Market Structure Refinements

- Among deregulated markets, LMP has emerged as the design of choice
- Holdouts
 - ERCOT: moving toward “alternative wholesale market design” with LMP under consideration
 - CAISO: LMP under consideration
- Nevertheless, markets are stable and immediate future developments consist of two “refinements”

- Many regions (PJM, NYISO, ISO-NE) have installed capacity (ICAP) markets
- These markets recognize supply excesses and deficiencies on a region-wide basis, neglecting specific locally-constrained locations
 - NYISO vs NYC, ISO-NE vs SWCT
- Regulators are currently considering developing a *Locational* ICAP market (LICAP)
 - Think LMP for capacity markets

- NYISO was first in this area in implementing a location-related ICAP product that priced capacity by zone
 - Capacity prices in NYC and Long Island are high; elsewhere prices are near zero
- ISO-NE has proposed a LICAP market but has met with resistance
 - FERC has requested settlement talks with a resolution by the end of January 2006
 - Better financial support may be available for generators in traditionally-constrained areas
- PJM is also considering LICAP
- CAISO may also consider LICAP with implementation no earlier than 2007/2008
 - This is a bigger step for California, which currently has no capacity market


Current State of Capacity Markets



Ancillary Services Markets

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- Most ancillary services markets around the country remain underdeveloped relative to energy and capacity markets
 - With structures for energy and capacity markets maturing, attention will shift to refining markets for the key ancillary services
 - Reliability/spinning reserves
 - Black start
 - Voltage support
 - Northeast markets have been leaders in this area

Carbon Constraints

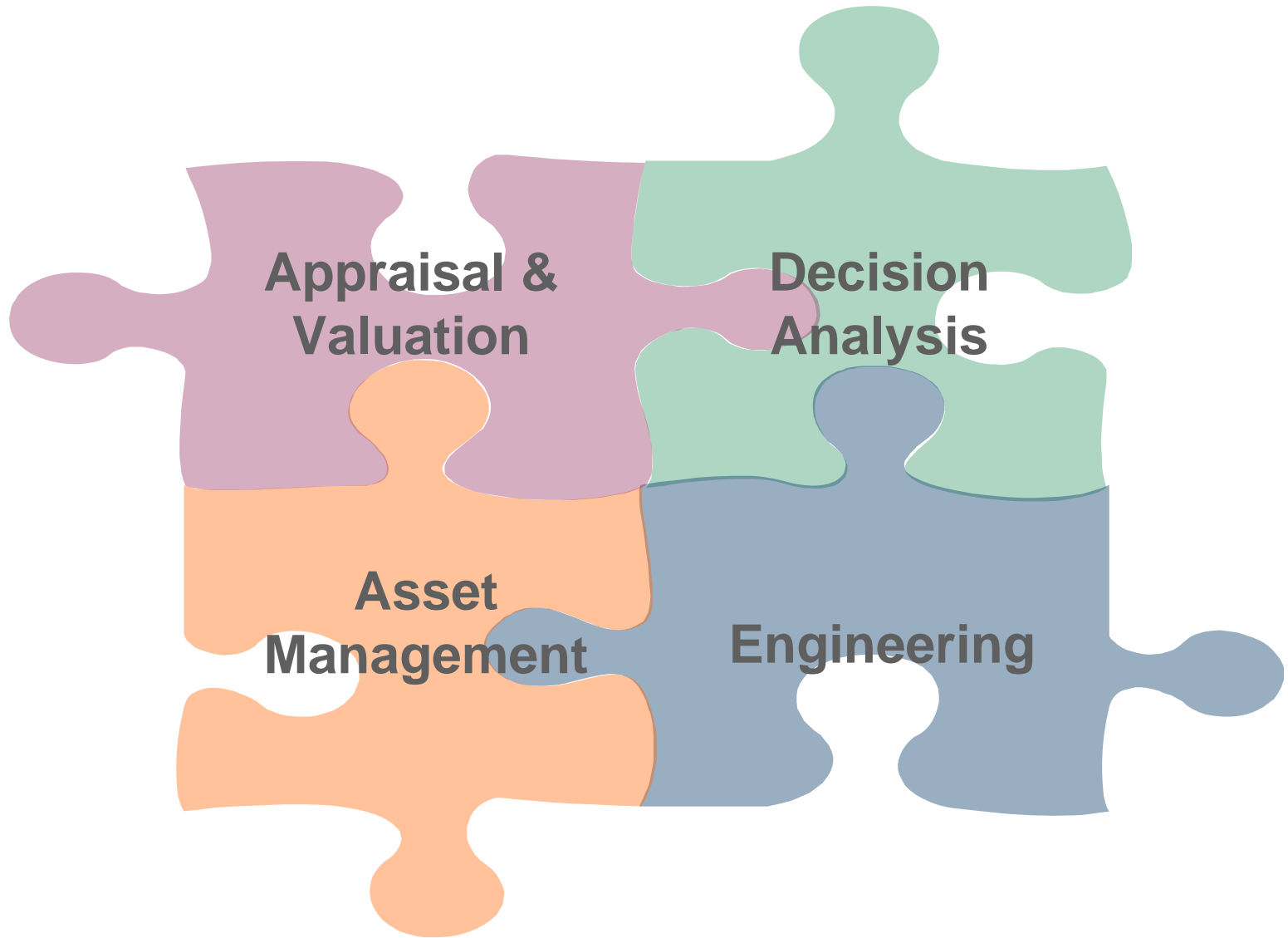
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- Not if, but when
 - Not likely before 2008 at the earliest, but prudent planning must start now since development of new coal-fired projects can take years
 - Although scientific evidence remains mixed, even heavy coal users are beginning to take a carbon-constrained world as an inevitability
 - Duke CEO Paul Anderson has argued for a Federal carbon tax in order to prevent “50 different state ones”
 - AEP’s Board of Directors’ position statement: “Enough is known about the science and environmental impacts of climate change for us to take actions to address its consequences.”

Planning for a Carbon Constrained World

- Encourage efficient regulatory mechanisms
 - Cap-and-trade programs are vastly preferred by industry, but would almost certainly require Federal preemption of state regulators to be effective
 - Coal is such a large portion of the U.S.'s capacity stock that simply mandating lower emissions or shutting down coal plants would not be feasible
- Operational Efficiency
 - Older coal plants were once significantly threatened by the prospect of carbon regulation
 - High natural gas prices may provide enough cover for older coal plants to upgrade or be retired in an orderly fashion
 - Older coal plants should be focusing on upgrades to enhance their operational efficiency as a means of reducing their environmental risks
- Technological Innovation
 - New technologies (IGCC and carbon sequestration) will be emphasized (as in the EPA CT)
 - Thanks to higher gas prices and the prospect of costly emissions credits at older facilities, the higher fixed costs of these new technologies may be offset by their ability to burn cheap coal

Conclusions

PUHCA	Consolidation and asset re-shuffling will continue. Capital availability to the power sector will continue to deepen as capital needs grow.
Fuel Prices	Once winter ends, fuel prices will retreat from current elevated levels, but high fossil fuel costs are here to stay. Demand is strong and there are real limits to expanding supply.
Transmission	Select important locations are likely to receive attention. Buying assets <i>solely</i> because of a transmission-constrained location is going to become increasingly risky.
New Capacity	The economics of new coal and nuclear capacity are extremely compelling in many markets (those with significant gas exposures). New projects will deemphasize natural gas.
Market Structure	LICAP will encourage development of projects in previously-constrained areas thanks to the prospect of greater capital recovery – but capacity prices in other areas will decline.
Carbon Constraints	Upgrades and new technologies once seen as too expensive will receive serious attention from utilities. High NG prices will allow coal plants to explore previously infeasible options.



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Recent Power Project Transaction Experience



\$30 Million

Sale of
Gas Turbine Peaking Plant



\$90 Million

Sale of
Gas Turbine Combined
Cycle Plant



\$325 Million

Purchase of
Gas Turbine Peaking Plant



\$488 Million

Sale of
Coal-fired Steam Plant



\$133 Million

Sale of
Gas Turbine Combined
Cycle Plant



\$76 Million

Sale of
Gas Turbine Combined
Cycle Plant



\$175 Million

Sale of
Gas Turbine Combined
Cycle Plant



\$198 Million

Purchase of
Gas Turbine Combined
Cycle Plant



\$150 Million

Sale of
Gas Turbine Combined
Cycle Plant

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\$561,000,000

Market advisory services on the acquisition
& Term Loan 'B' financing of a gas turbine
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July 2005



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\$465,000,000

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geothermal projects, 144A Offering

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\$165,000,000

Market advisory services for a portfolio of
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\$65,000,000

Market advisory services for a portfolio of
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May 2005





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