Synapse
Energy Economics, Inc.

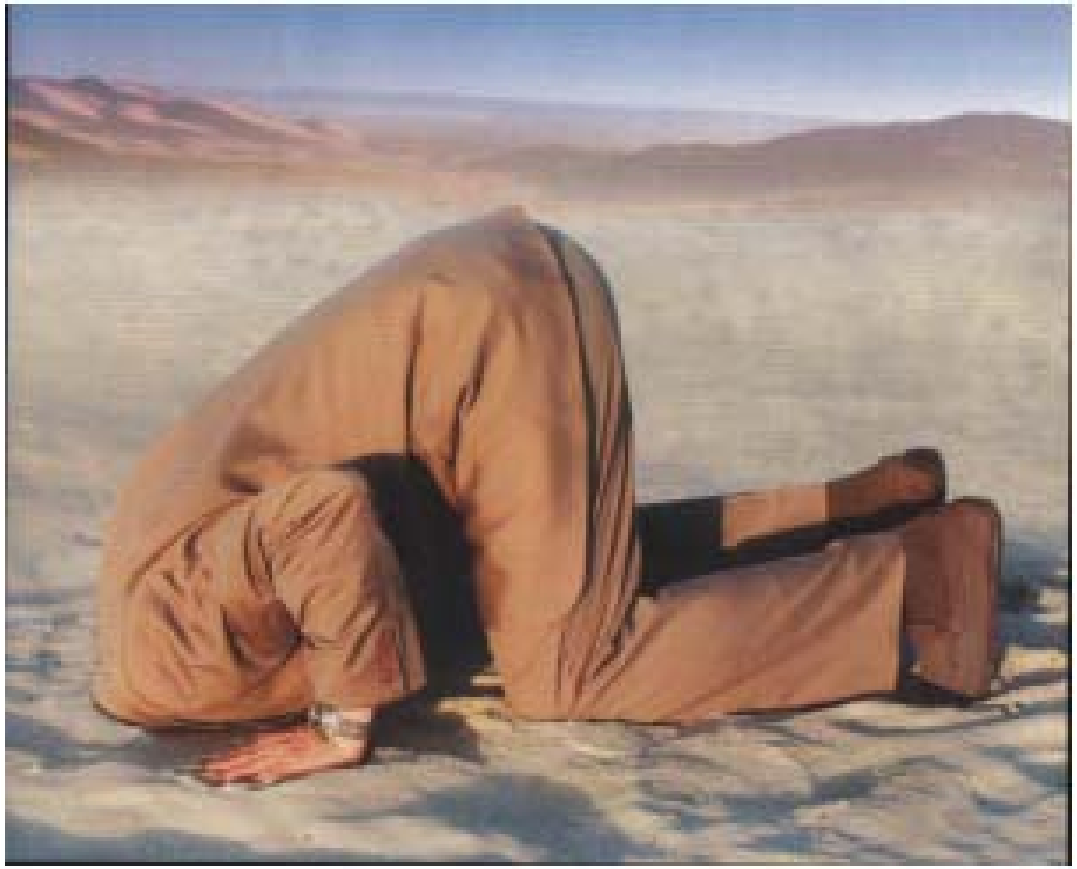
Don’t Get Burned: The Risks of Investing in New Coal-Fired Power Plants

ERG Colloquium
October 8, 2008
David Schlissel

Uncertainties and Risks Facing Investments in New Coal Plants Today

1. Skyrocketing plant construction costs and extended schedules
2. The inevitability of a comprehensive federal system of mandated reductions in greenhouse gas emissions.
3. State mandated reductions in greenhouse gas emissions and the adoption of policies promoting increased use of energy efficiency and renewable resources.
4. Uncertainties surrounding the technical and economic viability of post-combustion carbon capture and sequestration for pulverized coal-fired power plants.
5. Coal price increases and supply disruptions.
6. More stringent regulation of the current criteria pollutants.
7. Water use and availability.

Ignoring Risks or Pretending There Will Be Easy Solutions Will Lead to …



A Train Wreck for Consumers, Investors, the Economy and the Environment

The Paradigm Must Change – New Solutions Are Needed

Financial Community Warnings

- Standard & Poor's – January 2008

  What To Do About Coal?

  "The single biggest challenge regulated electric utilities will tackle is the discharge of carbon dioxide (CO_2) into the air…. Three items that will have the biggest credit impact are integrated resource plans that reduce or eliminate the building of new coal-fired power plants, the need for carbon sequestration on existing coal units to meet newer, more exacting standards, and research and development for cleaner coal technologies. All are potentially large ticket items that electric utilities might have to confront."

Financial Community Warnings (2)

- Standard & Poor's – March 2008

  Credit Week Issue *The Credit Cost of Going Green for U.S. Utilities*

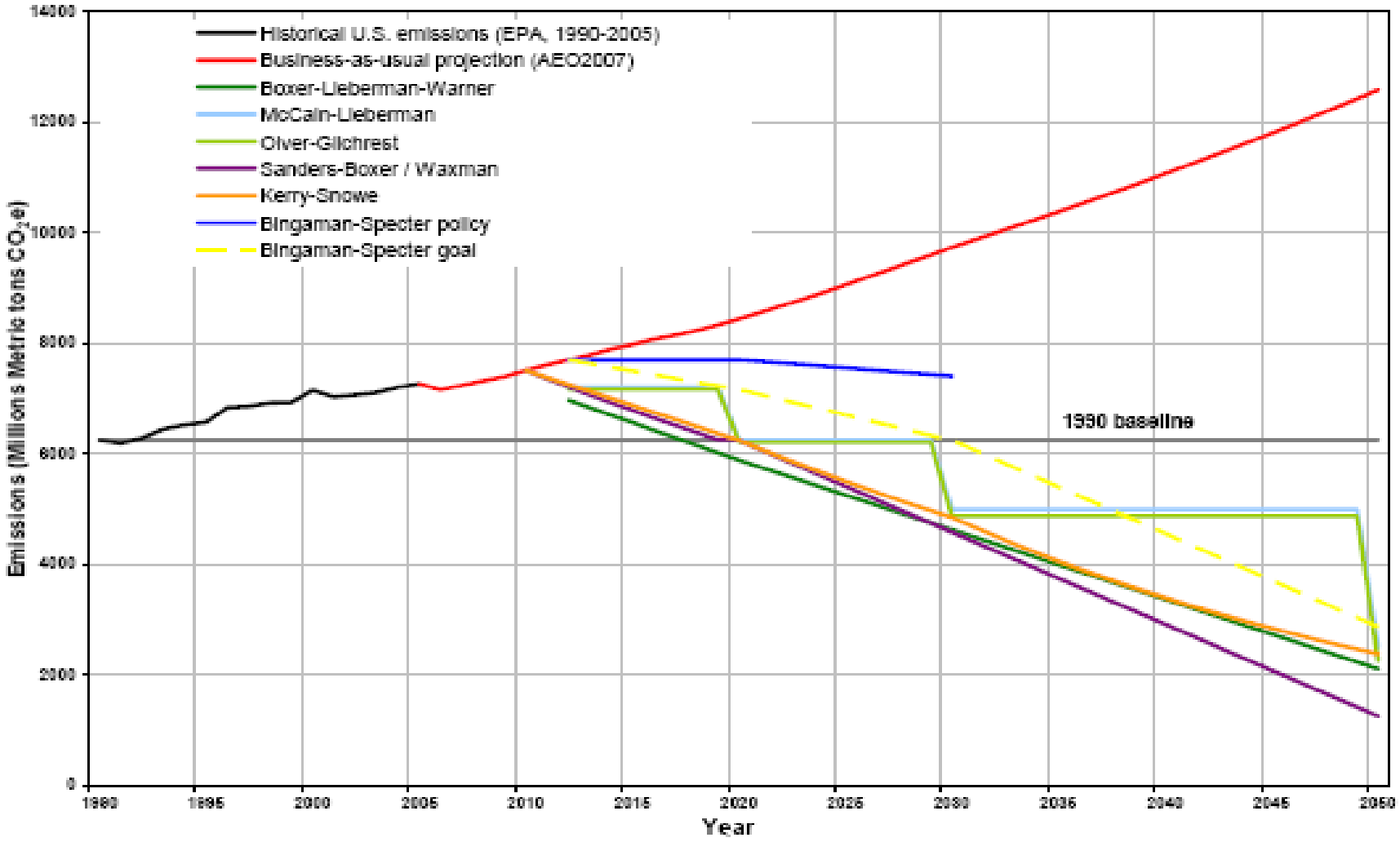
  "Among the risks are that CO_2 compliance costs could spiral out of control, those costs could be up for rate recovery at the same time that other expenses are rising, and the costs could then get "crowded out" if regulators try to ease customer rate shock. Any disallowance would not necessarily be explicit, since it is difficult and legally suspect to keep prudent, legislatively mandated costs out of rates."

Financial Community Warnings (3)

- Standard & Poor's – March 2008 (continued)

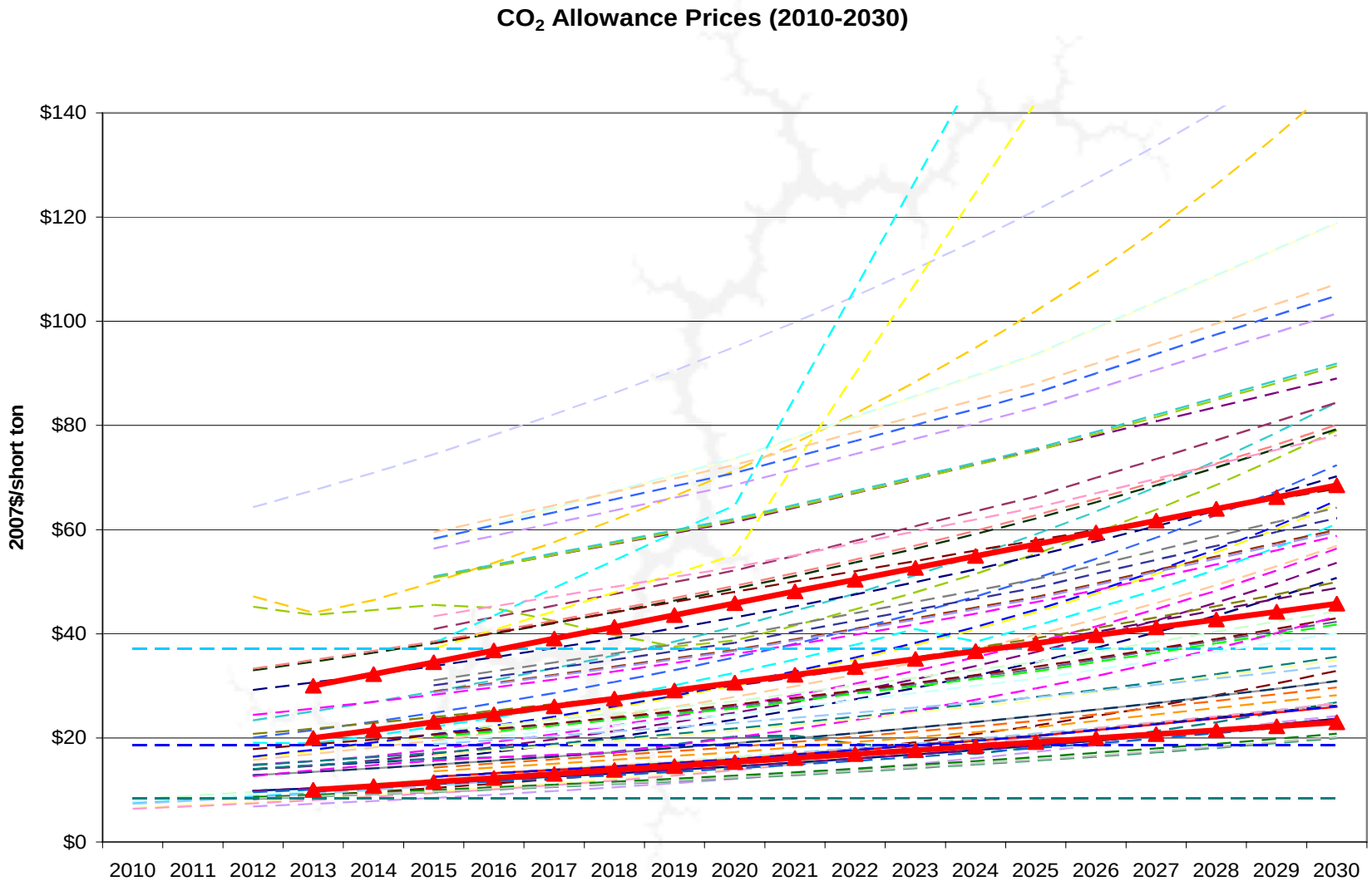
  "The real risk to credit quality is the prospect that CO_2 compliance costs will be the proverbial straw that leads to harsh regulatory responses such as a disallowance or deferral because of cost pressures tied to commodity prices, more capital spending for basic reliability needs on the transmission and distribution system, and added construction costs for new generation to meet rising demand….. *Clearly, the pursuit of a cooler planet will leave utilities sweating over the risk to their credit quality."* (Emphasis added)

Federal Regulation of CO_2 Emissions is a Matter of When, Not If

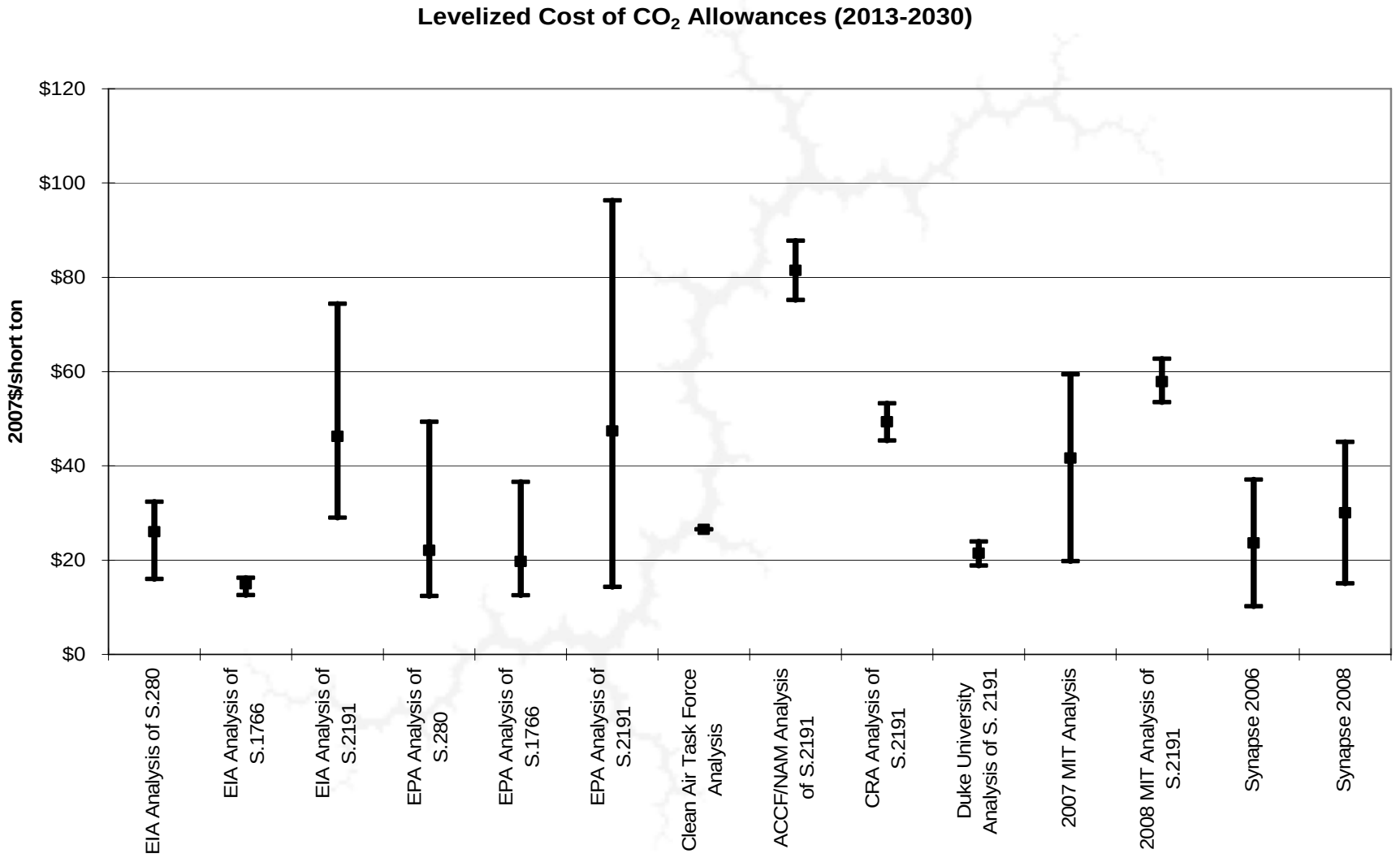


Pew Center on Global Climate Change

Results of Modeling of Current GHG Legislative Proposals (Annual CO_2 Prices)



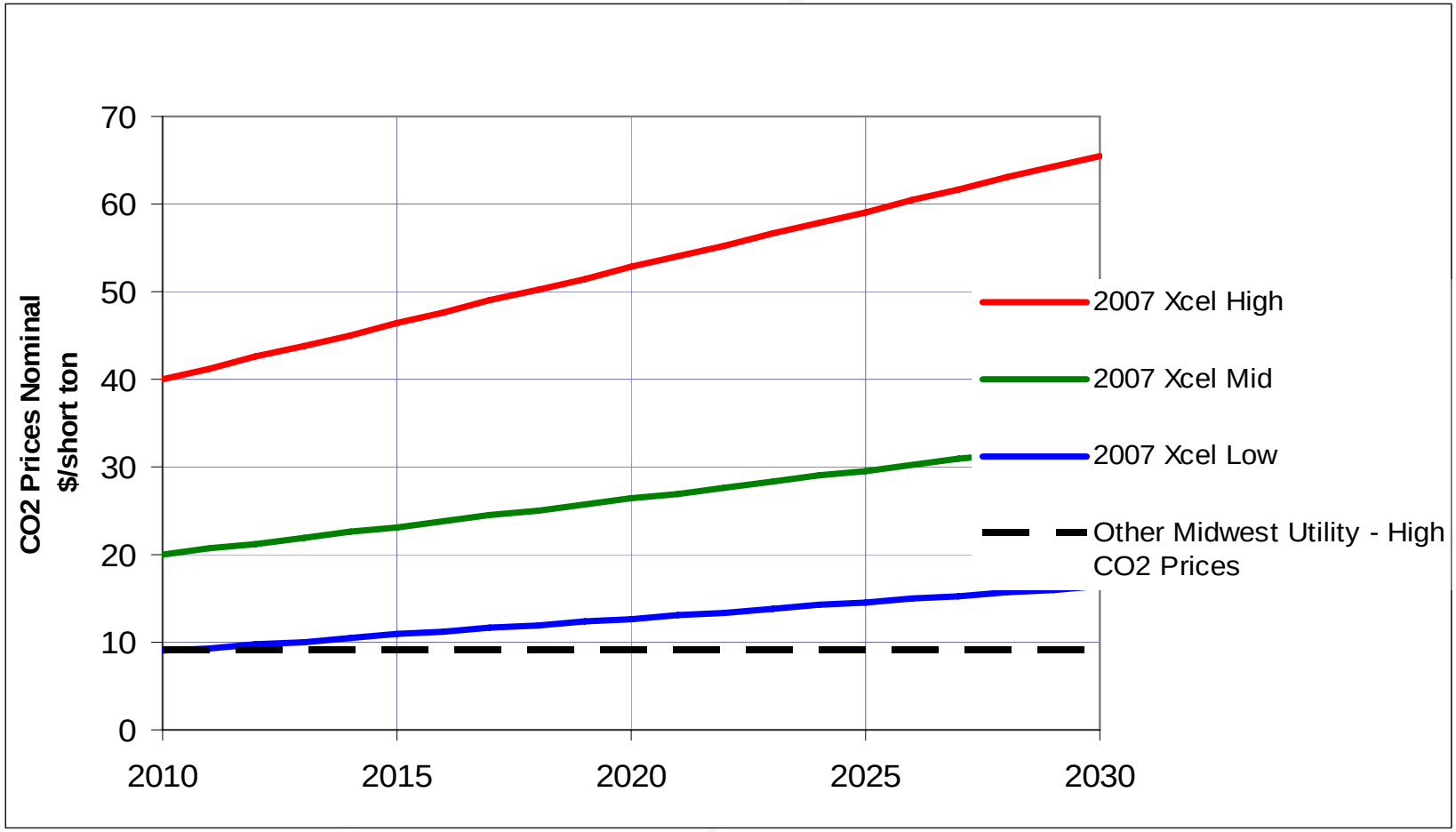
Results of Modeling of Current GHG Legislative Proposals (Levelized Prices)



Examples of Meaningful Ranges of CO_2 Prices Adopted for Recent Resource Planning

- **New Mexico Public Regulation Commission (June 2007)**
  - $40/metric ton “High” CO2 price
  - $20/metric ton “Mid” CO_2 price
  - $8/metric ton “Low” CO_2 price
  - All three prices start in 2010 and escalate at 2.5% per year
- **Xcel Energy (December 2007)**
  - $40/ton “High” Case
  - $20/ton “Mid” Case
  - $10/ton “Low” Case
  - All start in 2010 and escalate at 2.5% per year

CO_2 Prices Used in Resource Planning – Xcel Energy and Other Midwest Utility



New Climate Change Related Risks for New Coal Plants

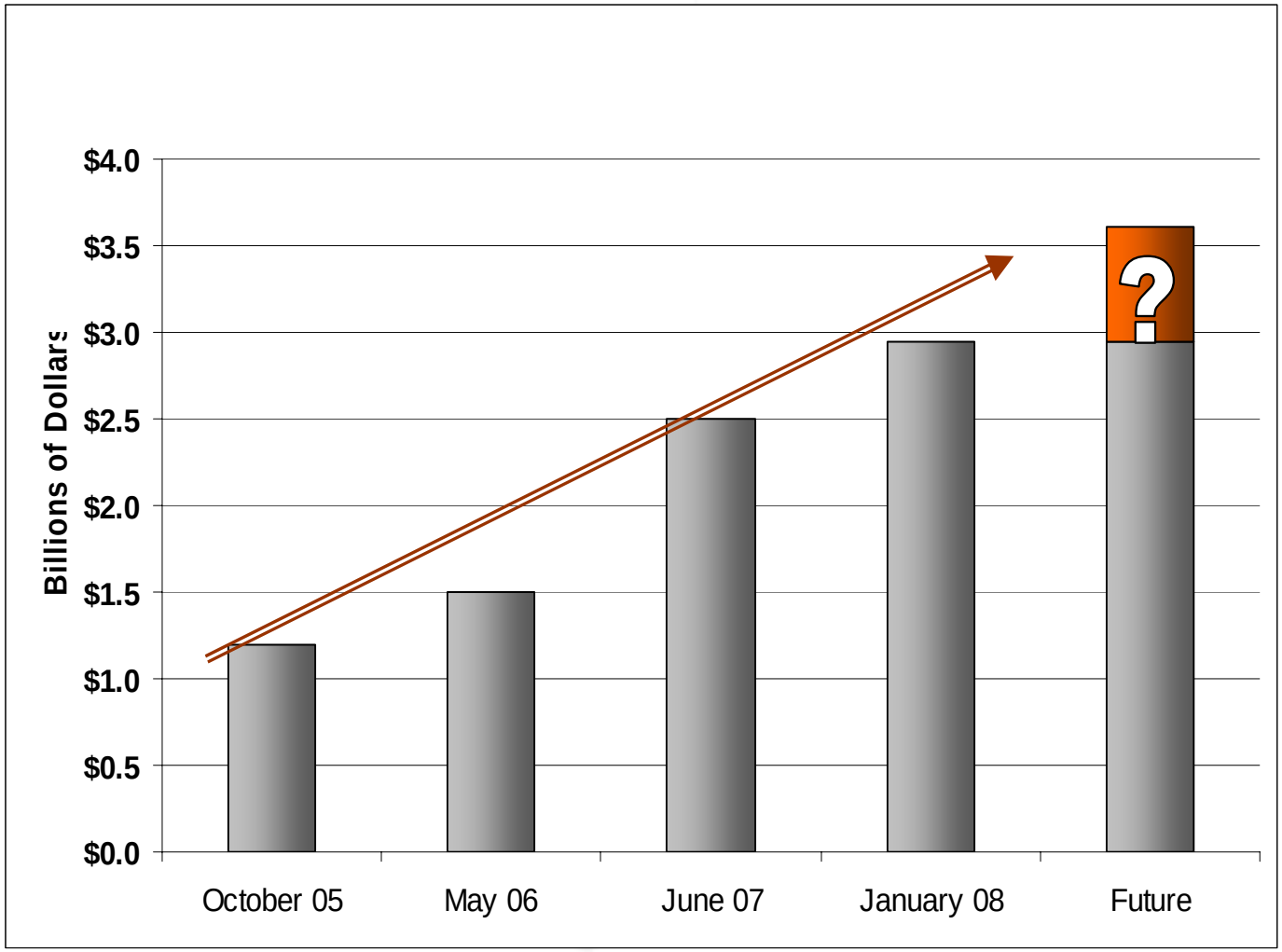
- Adoption of carbon principles by the Citibank, J.P. Morgan, Morgan Stanley and Bank of America – need to perform enhanced due diligence and consider CO_2 costs. (February 2008)

- Georgia state court decision on Longleaf Project – a PSD air permit cannot be issued without CO_2 emissions limitations based on a BACT analysis. (June 2008)

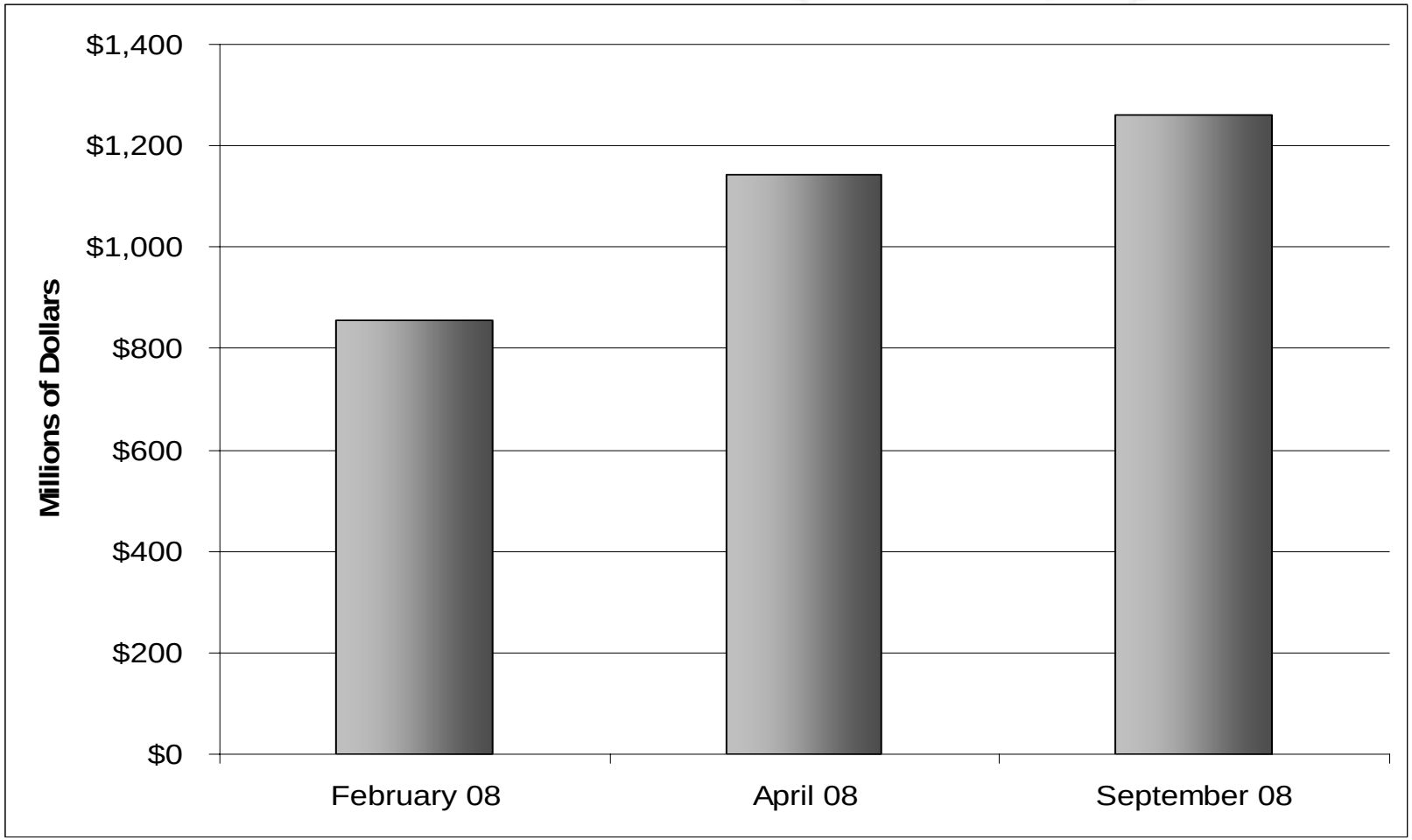
Costs of New Power Plants Have Skyrocketed

- Power plant construction costs have increased dramatically since early 2000's.
  - in 2002 estimated costs for new coal plants were in the range of $1500/kW
  - by 2006 estimated costs grew to $2000-2500/kW
  - in 2008 estimate costs have increased above $3500/kW
- Descriptive terms used to describe construction costs are "skyrocketing," "staggering" and "sticker shock."
- But many cost estimates remain unrealistically low.

Proposed 960 MW AMP-Ohio Coal Plant - Increases in Estimated Construction Costs



Proposed 300 MW Nelson Dewey 3 Coal Plant - Increases in Estimated Construction Costs



Other Examples of Coal Plant Cost Increases Announced in 2008

- Estimated cost of the Iatan 2 project in Missouri increased by 15% in April 2008. Project already under construction with completion due in 2010 - even projects under construction are susceptible to increasing costs. (April 2008)
- Estimated cost of Duke Energy Indiana's Edwardsport IGCC Project increased by 18 percent from spring 2007 to spring 2008. Company says costs increased when it went out for actual project contracts and procurement. (May 2008)
- Alliant Energy subsidiary IPL increased the estimated cost of its proposed Marshalltown coal plant by 26 percent in September 2008.

Factors Which Have Led to Rising Power Plant Construction Costs

- Cost increases are due, in large part, to significant increase in worldwide demand for power plants. Demand for plants is straining supply of design and construction resources.
- Increased demand from China and India.
- Despite recent cancellations, there is strong U.S. demand for new power plants and pollution control projects for older plants.
- Limited capacity of EPC (Engineering, Procurement and Construction) firms and manufacturers.
- Fewer bidders for work, higher prices, earlier payment schedules and longer delivery times.

Factors Which Have Led to Rising Power Plant Construction Costs (2)

- Significant cost increases for critical power plant commodities.

Commodity	Average Annual Escalation Dec. 2003 – April 2007
Nickel	60%
Copper	69%
Cement	12%
Iron & Steel	20%

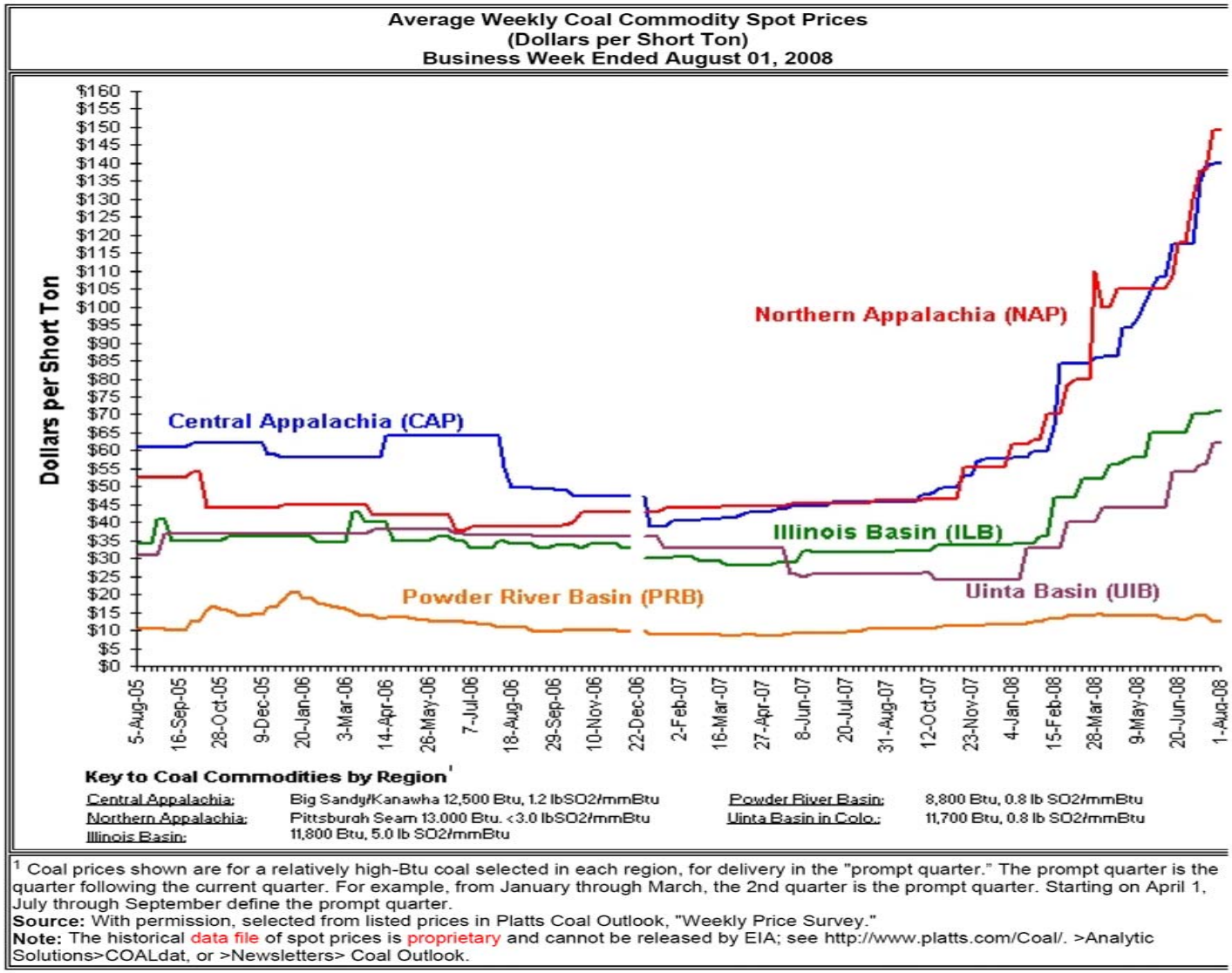
- Wall St. Journal – Steel prices up 40% to 50% in 2008.
- Worldwide competition for resources and supply and manufacturing bottlenecks unlikely to clear in the foreseeable future.

No Commercially Viable Carbon Capture Technology for Pulverized Coal Plants

- Timeline for developing commercially viable post-combustion carbon capture and sequestration technology uncertain.
- Pilot projects being planned for near future.
- Impact on cost of generating power currently expected to be significant – 60% to 80%, perhaps \$40-\$80/ton CO_2e avoided.

Source	Projected Increase in Cost of Electricity from Addition of CCS
Duke Energy Indiana	69%
MIT Future of Coal Report	61%
Edison Electric Institute	79%
National Energy Technology Laboratory	81%

Increasing Coal Fuel Prices



[1] Coal prices shown are for a relatively high-Btu coal selected in each region, for delivery in the "prompt quarter." The prompt quarter is the quarter following the current quarter. For example, from January through March, the 2nd quarter is the prompt quarter. Starting on April 1, July through September define the prompt quarter.

Source: With permission, selected from listed prices in Platts Coal Outlook, "Weekly Price Survey."

Note: The historical data file of spot prices is proprietary and cannot be released by EIA; see http://www.platts.com/Coal/. >Analytic Solutions>COALdat, or >Newsletters> Coal Outlook.

Electricity: 3.3 billion gallons H_2O consumed per day

- Generators rely on a clean, reliable source of water for:
  - Hydroelectric generation
  - Boilers
  - Cooling (condensation)
  - Fuel processing
    - Coal processing (10-50 gal / MWh)
    - Gas separation (IGCC)
    - Oil shale (100-250 gal / MWh)
  - Chemical processing
    - SO_2 (dry / wet scrubbing)
    - NO_x (SCR / SNCR)
- Water losses
  - Evaporation from reservoirs
    - Average loss of 4,500 gal / MWh
    - Total loss of 3.8 billion gallons (11,700 acre feet) per day
  - Open-loop cooling
    - 1% of water withdrawn is lost to evaporation
    - Only ~10 thermoelectric plants built open-loop since 1980
  - Cooling tower / pond
    - Draw 95% less water than open-loop
    - Loose most water to evaporation

Climate Change and Water Use

- Climate change threatens to tighten already short water supplies: *plan for climate change*
- Thermoelectric generators are being built today without a clear understanding of future water risks
- Carbon capture and sequestration technologies are water intensive: it may be difficult to incorporate CCS in water-limited regions
- Few, *if any*, regions of the country where water consumption does not need to be seriously evaluated in planning

Poor Electric Resource Planning Practice

- Passive attitude toward information.
- Rely on out-of-date construction cost estimates.
- Ignore CO_2 price, look at a single, low set of CO_2 prices, or treat CO_2 "at the end" as a sensitivity case.
- Overly constrain alternatives such as renewables and energy efficiency.
- Claim that the proposed coal plant is part of a strategy or plan for reducing CO_2 emissions.

IMPRUDENT!

Good Electric Resource Planning Practice

- Actively seek out relevant information.
- Rely on up-to-date and realistic construction cost estimates.
- Include reasonable CO_2 price forecasts in the reference case, and analyze high and low sensitivities.
- Include full consideration of alternatives.

PRUDENT!

Virginia SCC Decision Denying Request to Build New Coal Power Plant (April 2008)

- VA SCC Press Release headed “SCC denies APCo request for rate increase and approval of new power plant; cites uncertainties of costs, technology, unknown federal mandates.”
- Found Company’s (APCo) cost estimate for project “not credible” -- had not been updated since November 2006.
- SCC said “… APCo has no fixed price contract for any appreciable portion of the total construction costs; there are no meaningful price or performance guarantees or controls for this project at this time. This represents an extraordinary risk that we cannot allow the ratepayers of Virginia in APCo’s service territory to assume.”
- SCC also noted the uncertainties surrounding federal regulation of carbon emissions and carbon capture and sequestration technology and costs and observed that the Company was asking for a “blank check.” On this basis, the Commission concluded that “We cannot ask Virginia ratepayers to bear the enormous costs – and potentially huge costs – of these uncertainties in the context of the specific Application before us.”

Questions, Comments, Follow-up

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