Gambling with Coal
How Future Climate Laws Will Make New Coal Power Plants More Expensive

Barbara Freese, Attorney and Consultant
Steve Clemmer, Clean Energy Research Director
Union of Concerned Scientists

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Overview of the Arguments:

- The Science
- The Emerging Policy Response
  - International
  - State and local
  - Congressional
- Changing Attitudes within the Power Industry
- Changing Attitudes on Wall Street
- Impact of CO2 Laws on Cost of Coal Power
- Ratepayers Should Not Have to Bear Imprudently Incurred Costs
Highlighting the Science:

- Powerful scientific consensus on global warming
- Damage already occurring
- Much worse lies ahead, including risk of abrupt changes
- Steep reductions (60-80% by 2050) needed to avoid dangerous warming: CA, NM, EU, UK, New England Governors and Eastern Canadian Premiers
Policy Response - Global

Kyoto Protocol to the UN Framework Convention on Climate Change

CONFERENCE OF THE PARTIES
Third Session
Kyoto, 1-10 December 1997

- Kyoto and Beyond: US isolated and under pressure to act
- EU cap-and-trade system
- G8 agreement
Policy response – state and local

- Regional Greenhouse Gas Initiative (RGGI) cap and trade model rule
- California CO2 Cap
  - CO2 “adder” in energy planning
  - performance standard under development
  - motor vehicle standard
- Renewable Energy Standards in 20 states plus DC
  - covering 40% of US electricity
- Local efforts
  - 270 cities (48 million Americans) aiming to reach Kyoto targets and pressure federal government for emissions trading
Sense of the Senate Resolution

“It is the sense of the Senate that Congress should enact a comprehensive and effective national program of mandatory, market-based limits and incentives on emissions of greenhouse gases...”

- adopted June 22, 2005, supported by 54 Senators
- co-sponsored by: Bingaman (D-NM), Specter (R-PA), Byrd (D-WV), Domenici (R-NM)
- Bingaman & Domenici White Paper and hearings on regulatory design elements
- Similar resolution passed by House Appropriations Committee in 2006
Seven cap-and-trade proposals:

- Sens. McCain/Lieberman
  - hearings by Senate Energy and Natural Resources Committee
- Sen. Carper
- Reps. Udall/Petri
- Sen. Feinstein
- Sen. Jeffords*
- Reps. Waxman/Hinchey*

*seek to reduce CO2 emissions to 80% below 1990 levels by 2050
Cap-and-trade systems

- national CO2 cap set and allowances issued
- plant operators would need to own CO2 allowances
- allowances are traded among operators, with allowance price set by market forces
- widely support for cap-and-trade within industry, even evangelical Christian “Call to Action”
Coal power targeted by all bills:

- Coal plants are responsible for one-third of US CO2 emissions
- Largest source category: more than from all cars, trucks, planes, and trains combined
  - 500 MW coal plant = 600,000 cars CO2
- EIA studies show reducing coal use is most cost-effective way to reduce CO2
  - power plants account for 66-85% of reductions
Five of nation’s top 10 power companies support CO2 cap-and-trade legislation:
- Calpine, Duke, Entergy, Exelon, and FP&L
- AEP, Southern and Xcel: oppose legislation but executives have said it’s coming, and they are trying to shape it

2004 survey:
- half of power executives expected CO2 laws within 5 years
- 60% expected limits within 10 years

Wal-Mart, GE, Ford, many other major corporations supporting CO2 limits
Pressure from Investors:

➢ Investor Network on Climate Risk
  – manages $3 trillion in assets
  – 5 times bigger than in 2003

➢ Carbon Disclosure Project (international)
  – manages $31 trillion in assets

➢ Major Banks and Investment firms analyzing CO2 risk, trying to reduce exposure
  – Bank of America
  – JP Morgan Chase
  – Lehman Brothers
  – Citigroup
IOUs believe they can pass costs on to ratepayers?

History and ratemaking principles suggest otherwise

Last major base-load construction boom in US resulted in
- abandoned nuclear power plants
- lots of excess capacity coal plant
Shareholders versus ratepayers

- Two lines of case law suggest shareholders should bear risk for investment mistakes
  - Prudent investment: was the decision to invest -- and to keep investing when circumstances changed -- prudent when made? If not, no rate recovery
  - Shared costs: even if the decision was prudent, shareholders should bear some of the costs of the unsuccessful investment

- Focus on creating ongoing incentive to reevaluate investment decision
Put Utilities on Notice:

- If a coal plant is approved, utility should be warned that it is at risk from future CO2 regulations

- Importance of creating ongoing incentive for utilities to watch development of CO2 issue
  - Big Stone II utilities, led by Otter Tail Power, claimed not to have given CO2 limits much thought
  - Had no opinions about when future regulations likely
Utilities expect grandfathering?

- Betting allowances would be allocated, not auctioned
- Betting allocation would cover upcoming plants
- Dangerous gamble:
  - opposition to full allocation in RGGI states
  - opposition to allocation in Domenici/Bingamen White Paper
  - would be rewarding utilities that purposely increase exposure by building coal plants after Senate resolution
- Wall Street, western utilities, western states see future CO2 regulations as new costs, not windfall
Utilities are increasingly evaluating carbon risk

- 7 of 12 western utilities considered carbon risk in latest resource plans, representing 30% of western electricity supply
  - 10 of 12 plans will consider in next round: 42% of western electricity

- CA PUC requires utilities to include “adder”
  - $8/ton initially rising at 5% year
  - Required to include in long-term planning and evaluating bids

Methods and Approach to Carbon Risk Evaluation Vary

Lawrence Berkeley Lab recommends that...

- all utilities evaluate carbon risk
- a greater level of consistency in evaluation approaches be sought
- a broad range of possible regulatory environments be considered

Environmental regulations are likely to change over the lifetime of electric supply investments, and utility planning should evaluate these risks, and mitigate them if cost-effective to do so.

Risk of carbon regulation – at the state or federal level – is likely the most important to consider, but risk of strengthened regulations of SO₂, NOx and mercury also deserve note.

What is the cost of CO₂ limits?
Recent Market Prices in Europe

EU Carbon Allowance Closing Price

Source: EU: PointCarbon.com using an average exchange rate for 2005 of 1.25 US dollars per euro
What is the cost of future CO₂ limits in the US?

CO₂ prices greatly increase cost of coal power

Wind-gas alternative is cheaper than proposed Big Stone II plant in South Dakota

EIA: Reducing carbon in electricity means replacing or decarbonising coal

- National Commission Case 4 (2x rate of reductions; $49/ton ceiling)
- Only scenario with overall carbon reductions
  - 10% power plant carbon reductions by 2021
  - 44% by 2030
- Coal makes the difference

Xcel Energy’s 2004 IRP in MN included 1125 MW of new coal in its “Preferred Plan.”

When future CO₂ costs were included in Xcel’s model, ALL THE NEW COAL GENERATION DISAPPEARED, even using CO₂ costs lower similar to Synapse’s low case forecast.

New coal plants become uneconomic when CO₂ regulations are included.

Costs have increased for all technologies
Prices from Puget Sound Energy RFPs

Increasing coal plant costs

Escalation Summary – Market and Sourcing

Increasing Coal Plant Costs

- Price Escalation on Commodities Such as Steel, Copper and Alloy Have Driven Prices and Lead Times Up Dramatically

- AQCS Equipment Extremely Tight Market Due to Ongoing Retrofit Work (30% Materials Required)

- Boiler Prices Increasing (30% Materials Required)

The E&C Industry Is Also “Tight” With a Limited Number of Capable Players

Source: Black & Veatch, MMEA presentation, Building New Baseload in the Midwest, May 11, 2006
Drivers for cost increases

Source: Preliminary information developed by Black & Veatch for AWEA
Pulverized coal capital costs vary greatly

Pulverized coal plant capital costs

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<th>Project</th>
<th>Generation</th>
<th>Transmission</th>
<th>Total</th>
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<tr>
<td>Big Stone II Revised (SD)</td>
<td>2254</td>
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<td>Springfield (IL)</td>
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<td>Oak Creek (WI)</td>
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<td>Big Stone II Original (SD)</td>
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<td>Black &amp; Veatch (2006)</td>
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<td>Council Bluffs (IA)</td>
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<td>Weston 4 (WI)</td>
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<td>EPA (2003)</td>
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<td>EIA (AEO 2006)</td>
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Notes: EIA, EPRI, EPA, and Black & Veatch estimates are overnight costs and don’t include interest during construction (IDC). It’s not clear whether the other estimates include IDC. Most of the estimates are in 2005$ and for a supercritical PC plant.
Wind costs have also increased... but are projected to fall again

Source: EIA, Annual Energy Outlook 2006, NREL Government Performance Review Act FY07, Black & Veatch data based on preliminary information developed for AWEA
CO2 costs make pulverized coal plants uneconomic

Source: Preliminary information developed by Black & Veatch for AWEA
CO2 prices make wind and biomass cheaper than coal PC and IGCC

Levelized Cost of Electricity (2010) vs. CO2 Price

- Biomass IGCC w/CCS
- Coal IGCC
- Coal PC
- Wind Offshore
- Wind Class 4
- Wind Class 6
- No PTC, wind integration or transmission costs included
- Biomass IGCC with CCS cheaper at ~$25/ton

Source: Preliminary information developed by Black & Veatch for AWEA, except for Biomass IGCC w/CCS, which is based on data from IEA (2004) and Rhodes and Keith (2005), and assuming biomass fuel costs of $2.50/MMBtu
Future limits on global warming emissions are coming soon

These limits pose a major financial risk to utilities and ratepayers and will raise the cost of electricity from fossil fuels

Mandatory market based limits on CO₂ with complementary policies for efficiency and renewables has lowest costs and greatest benefits

Utilities should factor CO₂ into resource planning and procurement and aggressively pursue cleaner alternatives

Regulators should require utilities to takes these steps and shareholders not ratepayers to bear the risk

Shareholders and investors should recognize inevitability of CO₂ regulations, require reporting and accountability, and invest in companies that are proactively managing these risks

Ratepayers and consumer groups should oppose efforts by utilities to recover CO₂ costs in rates, oppose construction of new conventional coal plants, and support investments in cleaner alternatives