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# Gambling with Coal

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



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**Boulder, CO**

**February 26, 2007**





# Overview of the arguments

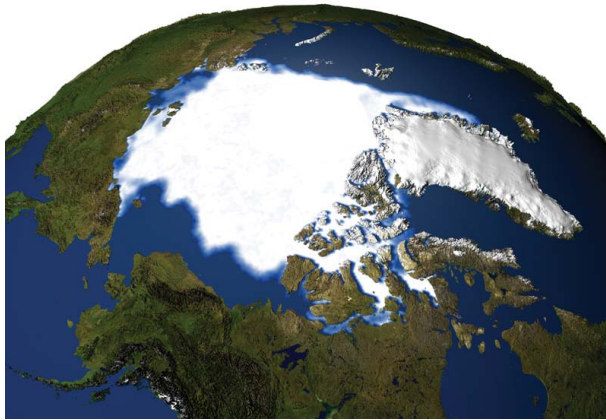
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- **The scientific consensus on global warming**
- **The emerging climate policy response**
  - **International**
  - **State and local**
  - **Congressional**
- **Changing attitudes within the power industry**
- **Changing attitudes on Wall Street**
- **Impact of CO<sub>2</sub> reduction laws on cost of coal power**
- **Ratepayers should not have to bear imprudently incurred costs**

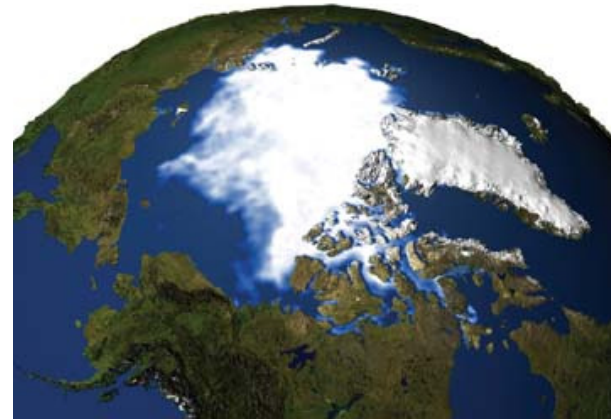


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# Highlighting the science



Arctic sea ice in 1979



Arctic sea ice in 2003

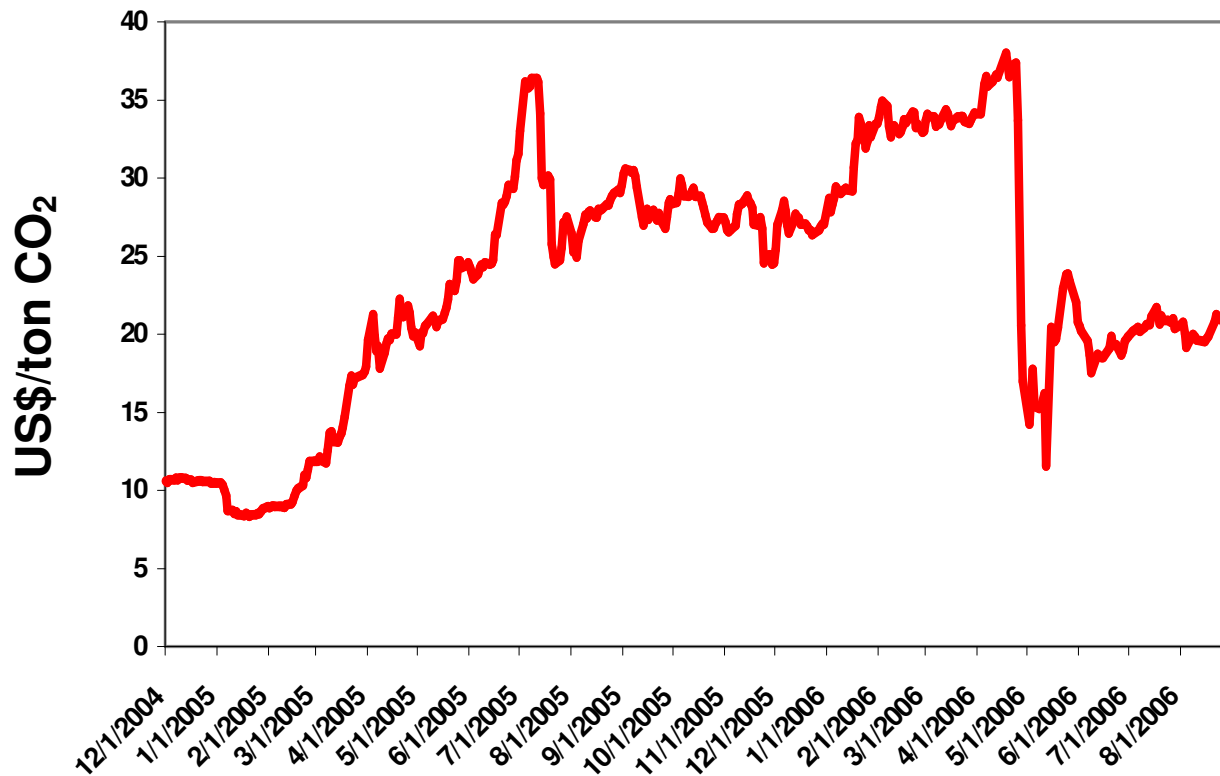
- **Powerful scientific consensus on global warming**
- **Damage already occurring**
- **Much worse lies ahead, including risk of abrupt changes**
- **Major reductions (60-80% by 2050) needed to avoid dangerous warming: CA, NM, EU, UK, New England Governors and Eastern Canadian Premiers**



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# Climate policy response - global

## EU Carbon Allowance Closing Price



- **Kyoto and beyond:  
US isolated and  
under pressure to  
act**
- **EU cap-and-trade  
system**
- **G8 agreement**

Source: EU: PointCarbon.com using an average exchange rate for 2005 of 1.25 US dollars per euro



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# Policy response – state and local

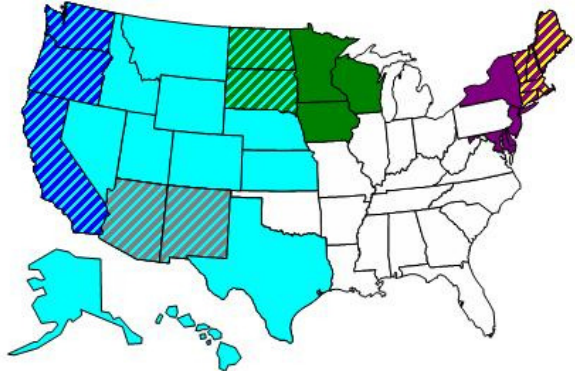
- **Northeast Regional Greenhouse Gas Initiative (RGGI) cap and trade model rule**
- **California climate policies**
  - economy wide cap: 1990 levels by 2020, 80% reduction by 2050
  - CO<sub>2</sub> “adder” in electricity planning and procurement
  - greenhouse gas performance standard for electricity
  - motor vehicle standard: 30% reduction in CO<sub>2</sub> by 2016
- **Renewable electricity standards in 21 states plus DC**
  - covering over 40% of US electricity
- **376 cities (56.4 million Americans) adopted Kyoto targets and pressuring federal government for emissions trading**



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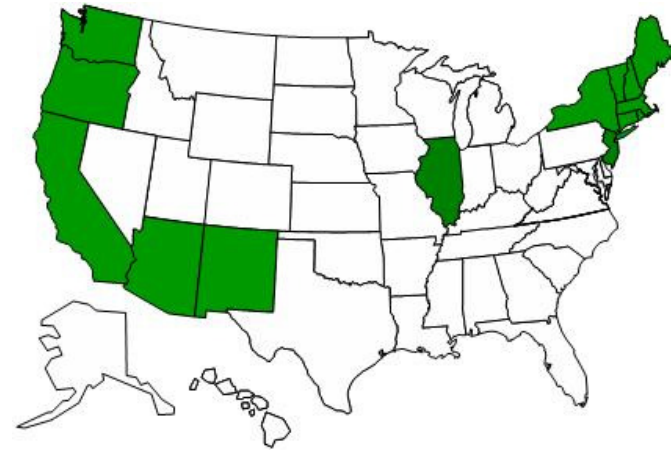
# Policy response – state and regional

## Regional initiatives

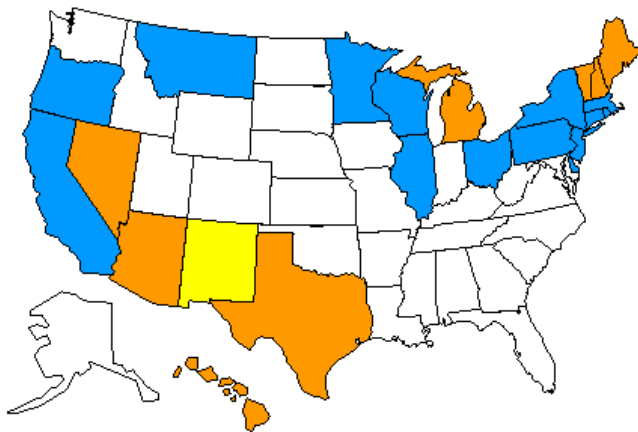


- West Coast Governors' Initiative
- Southwest Climate Change Initiative
- Powering the Plains
- WGA
- NEG-ECP
- RGGI

## State global warming reduction targets

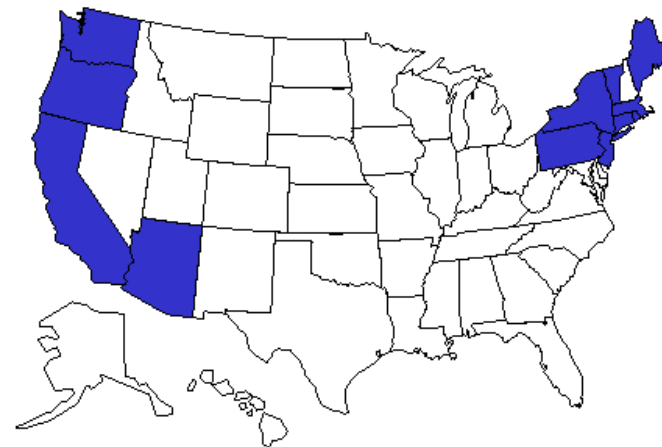


## Public benefits funds



- Funds that Support Energy Efficiency and Renewable Energy
- Funds that Support Energy Efficiency
- Funds in Development

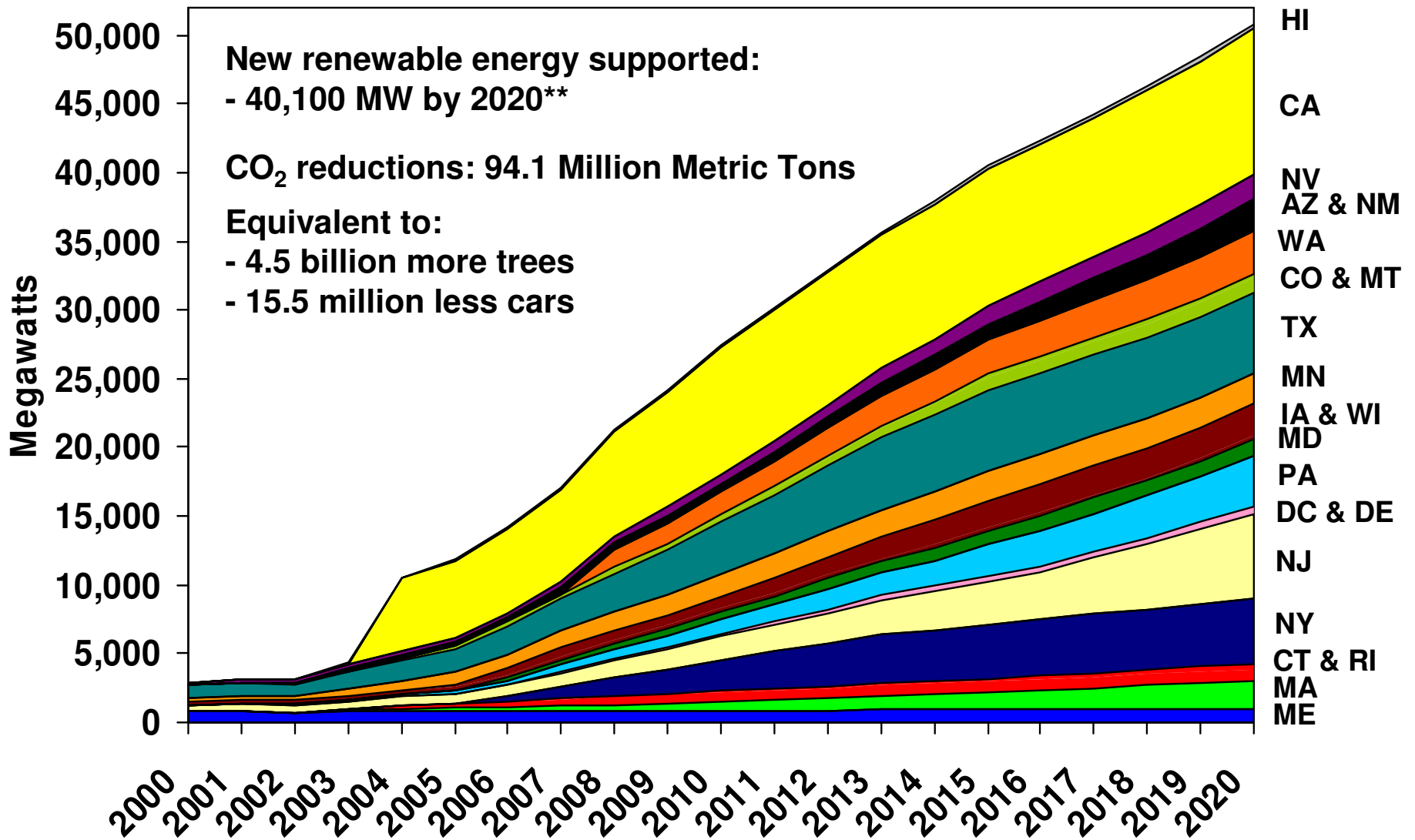
## Motor vehicle emission standards



- States Poised to Follow California's GHG Emissions Standards for Vehicles

Source: Pew Center on Global Climate Change.

# Renewable Energy Expected From State Standards\*



\*Projected development assuming states achieve annual RES targets.

\*\*If achieved, IA, IL, ME and MN goals would support an additional 6,200 MW by 2020.



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# Climate proposals in 109th Congress

## ➤ 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

## ➤ Seven cap-and-trade proposals advanced

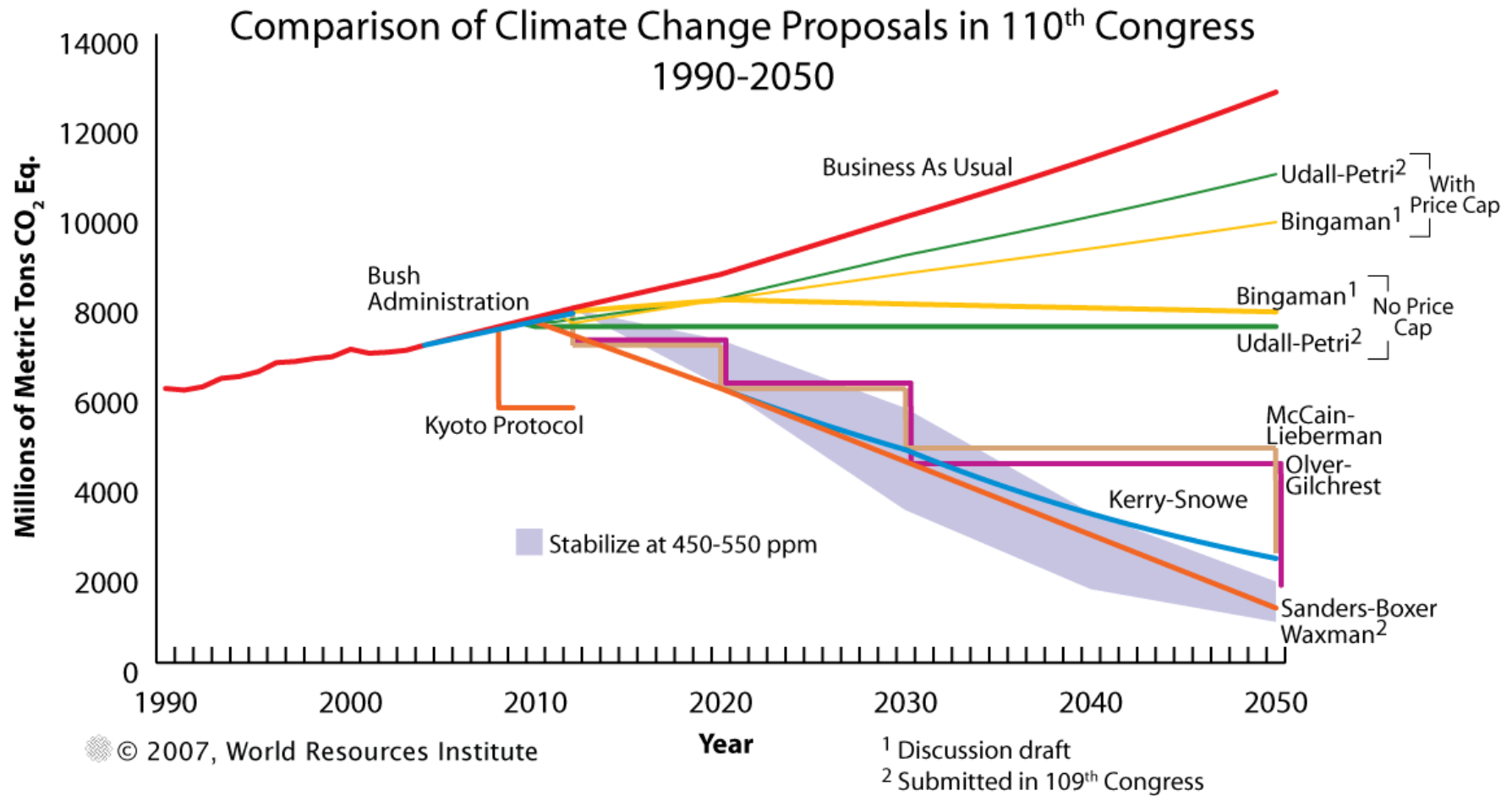
## ➤ Hearings held by Senate Energy Committee on cap-and-trade design





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# Climate proposals in the 110th Congress

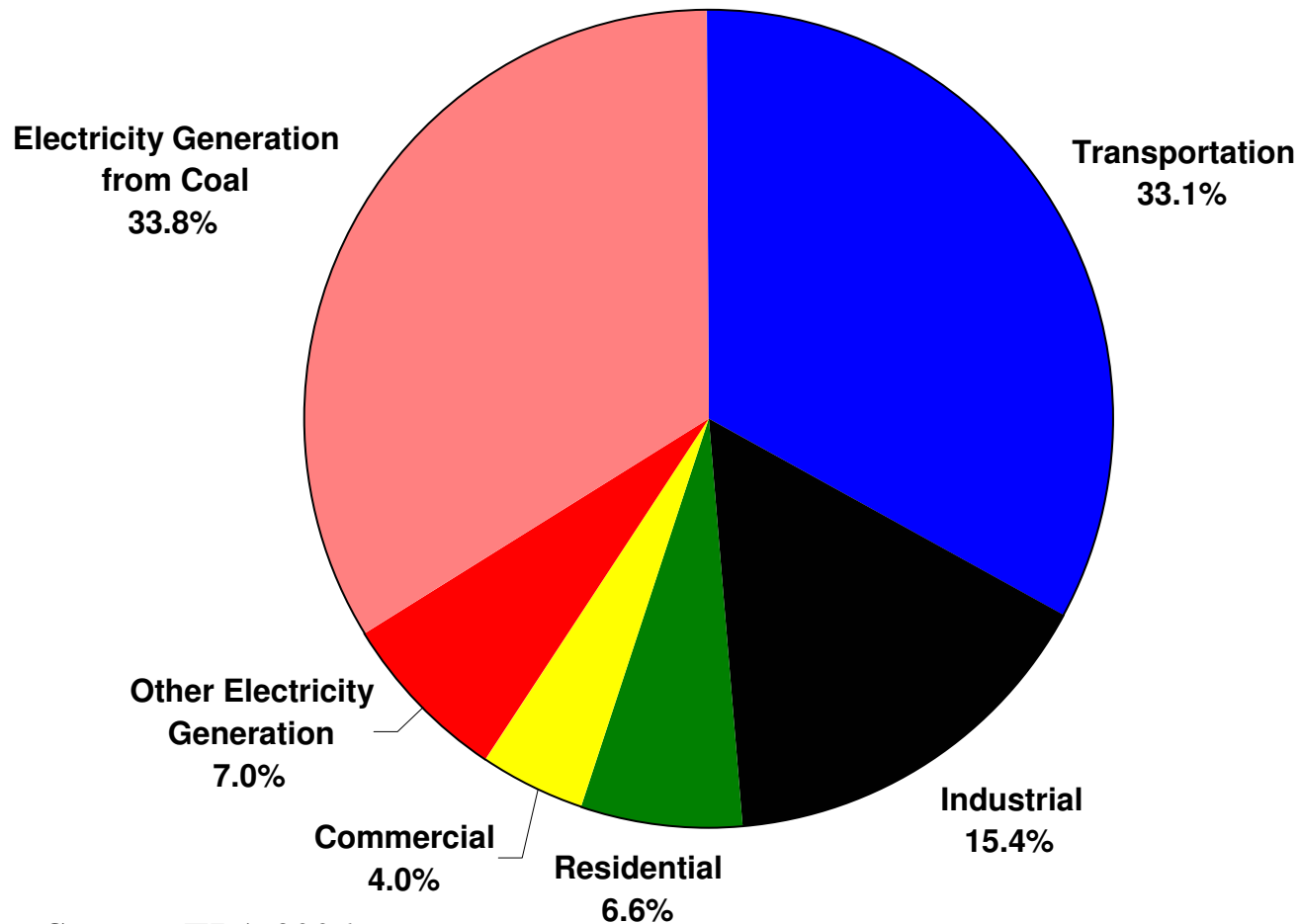




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# Coal plants targeted by all bills

## Sources of U.S. Energy Related CO<sub>2</sub> Emissions: 2004



Source: EPA 2006



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# High natural gas prices driving new coal rush and higher carbon emissions

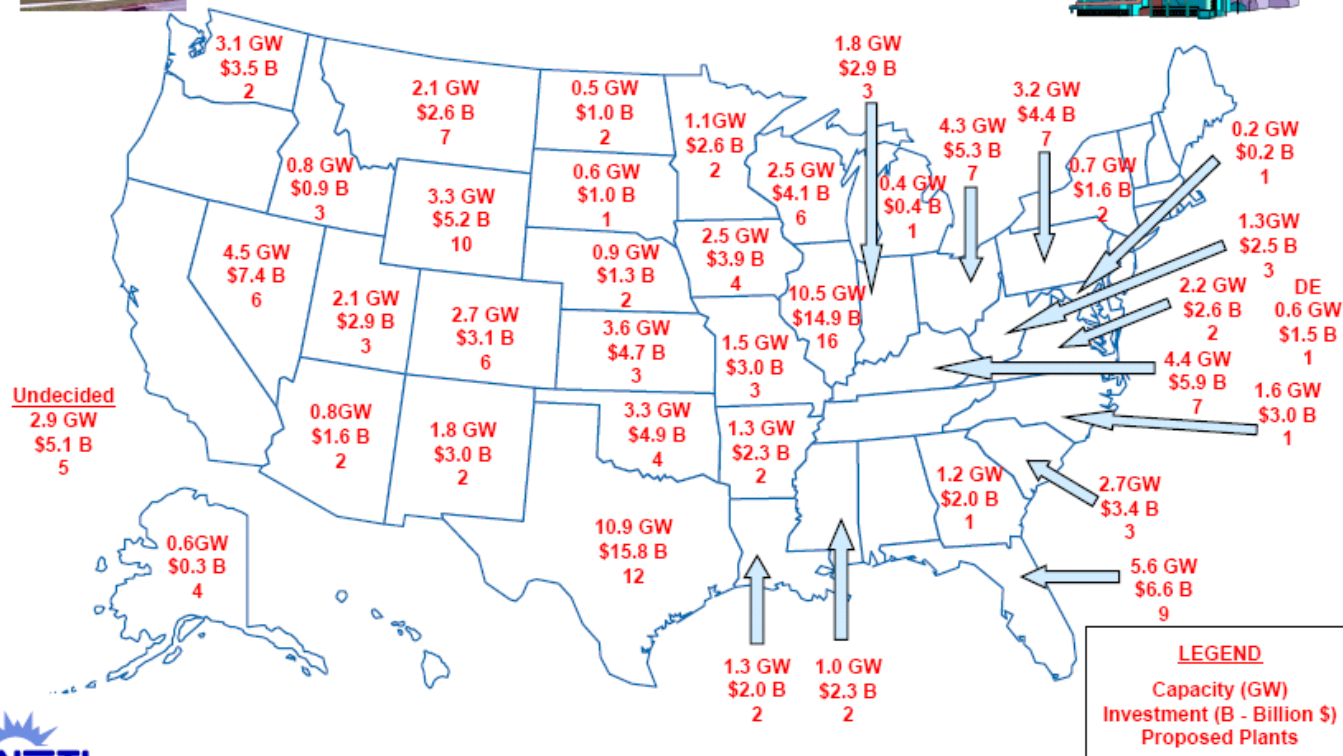
## Coal's Resurgence in Electric Power Generation



Equivalent Power  
for  
96 Million Homes

### Proposed New Plants

159 Plants  
96GW  
\$ 141 Billion



- 159 new plants proposed
- No plans to capture and store CO<sub>2</sub>
- Locks us in for decades to highest-carbon energy, with huge environmental AND financial risk
- Ratepayers shouldn't bear the risk of these imprudently incurred costs



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# Growing support by private sector

- **Five of nation's top 10 power companies support federal CO<sub>2</sub> cap-and-trade legislation**
- **Half of power executives surveyed in 2004 expected CO<sub>2</sub> laws within 5 years**
- **Wal-Mart, GE, Ford, Google & many other major corporations support CO<sub>2</sub> limits**
- **New US Climate Action Partnership report calls for Congress to act “as quickly as possible”**
  - seeks 10-30% emission cuts within 15 years and 60-80% by 2050



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# 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 CO<sub>2</sub> risk, trying to reduce exposure**
- **Banks under pressure to avoid financing new coal plants**





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# Why is CO<sub>2</sub> risk being ignored?

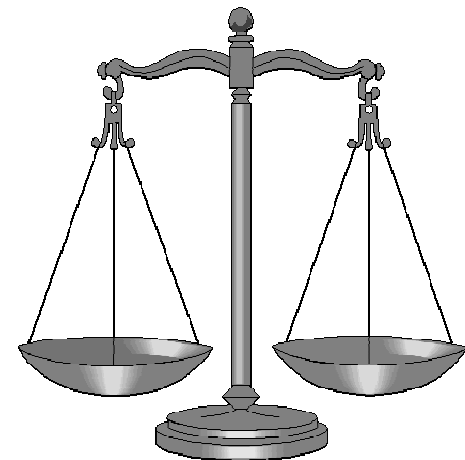


- **IOUs believe they can pass costs on to ratepayers?**
- **History and ratemaking principles suggest otherwise**
- **Last major base-load construction boom in US resulted in**
  - **abandoned nuclear power plants**
  - **lots of excess capacity coal plant**



# 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

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- **If a coal plant is approved, utility should be warned that it is at risk from future CO<sub>2</sub> regulations**
  
- **Importance of creating ongoing incentive for utilities to watch development of CO<sub>2</sub> issue**
  - **Big Stone II utilities, led by Otter Tail Power, claimed not to have given CO<sub>2</sub> limits much thought**
  
  - **Had no opinions about when future regulations likely**



# Utilities expect grandfathering?

- **Betting new plants built “under the wire” will be rewarded with free allowances under climate law**
- **Dangerous gamble: “..this flawed thinking will be a tragedy for the climate because of the additional carbon dioxide emissions this old technology creates. It is also a dangerous business strategy for the utilities’ investors and shareholders...”**
  - Senators Jeff Bingaman and Barbara Boxer, Chairs of Senate Energy and Environment Committees (Dallas Morning News, Jan. 19, 2007)
- **RGGI model rule: At least 25% of allowances must be auctioned; many states have already opted for 100% auction**
- **David Crane, CEO of NRG, renounced carbon windfall from favorable allocations for new coal plants**
- **US Climate Action Partnership: allowances should not be allocated to new coal plants**
- **White paper for TXU indicates they should not reduce CO<sub>2</sub> emissions “in advance of uncertain future emissions regulations.”**



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# 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

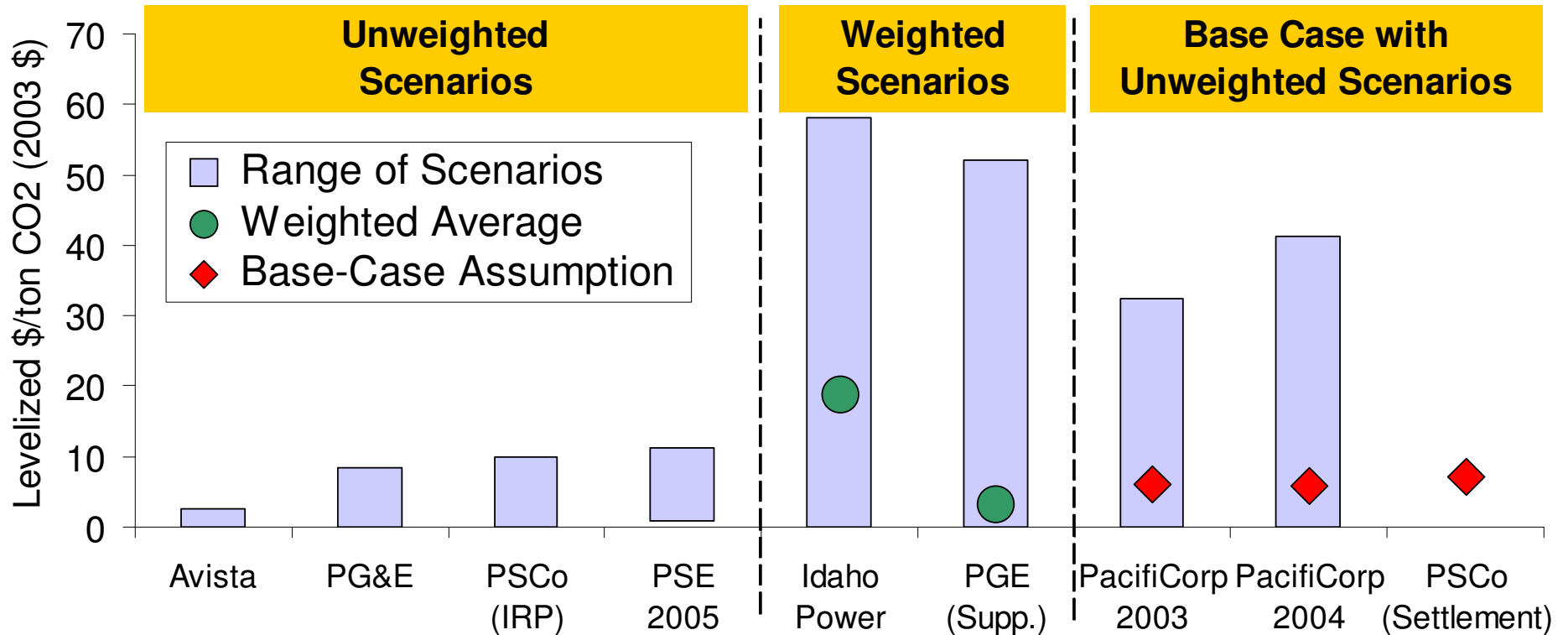
Sources: LBL, *Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans*, August 2005;

CA PUC Decision No. 04-12-048 December 2004, and revised decision in April 2005..



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# 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

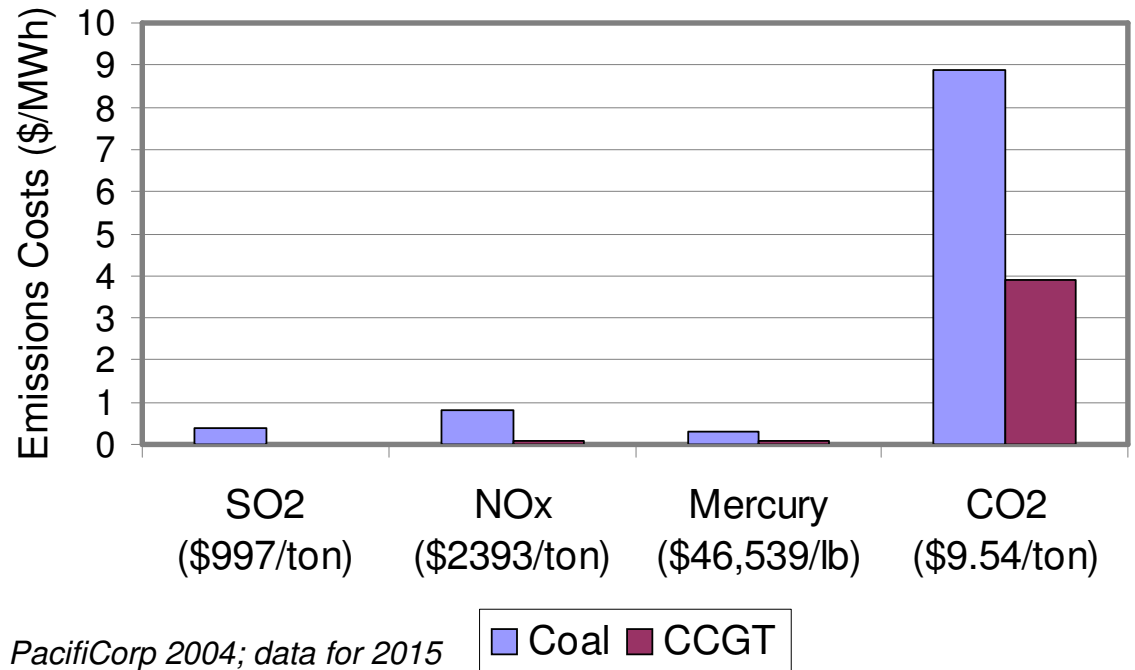
Source: LBL, *Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans*, August 2005.



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# CO<sub>2</sub> is important component of environmental regulatory risk

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

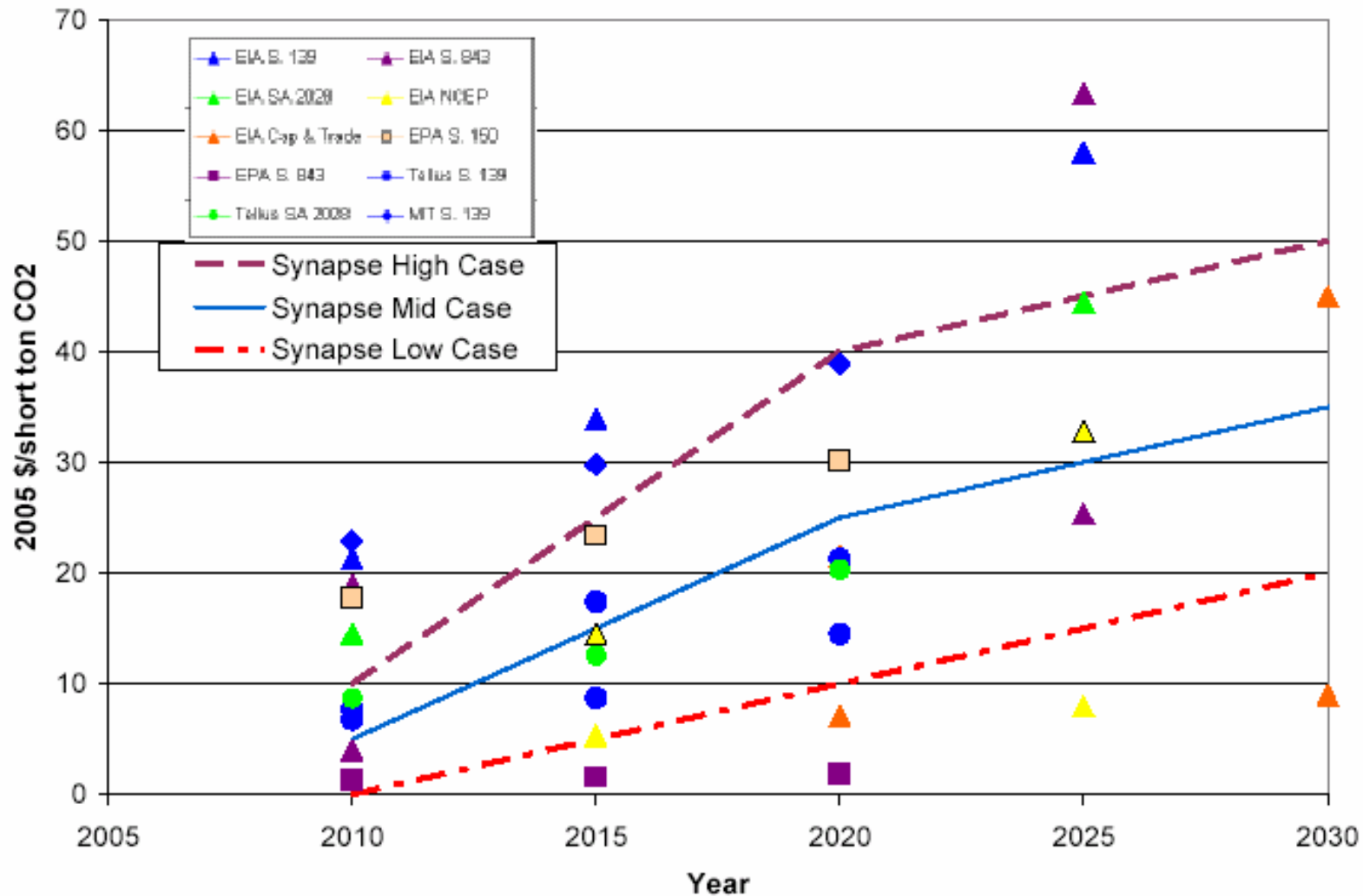


Risk of carbon regulation – at the state or federal level – is likely the most important to consider, but risk of strengthened regulations of SO<sub>2</sub>, NO<sub>x</sub> and mercury also deserve note



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# What is the cost of future CO<sub>2</sub> limits in the US?



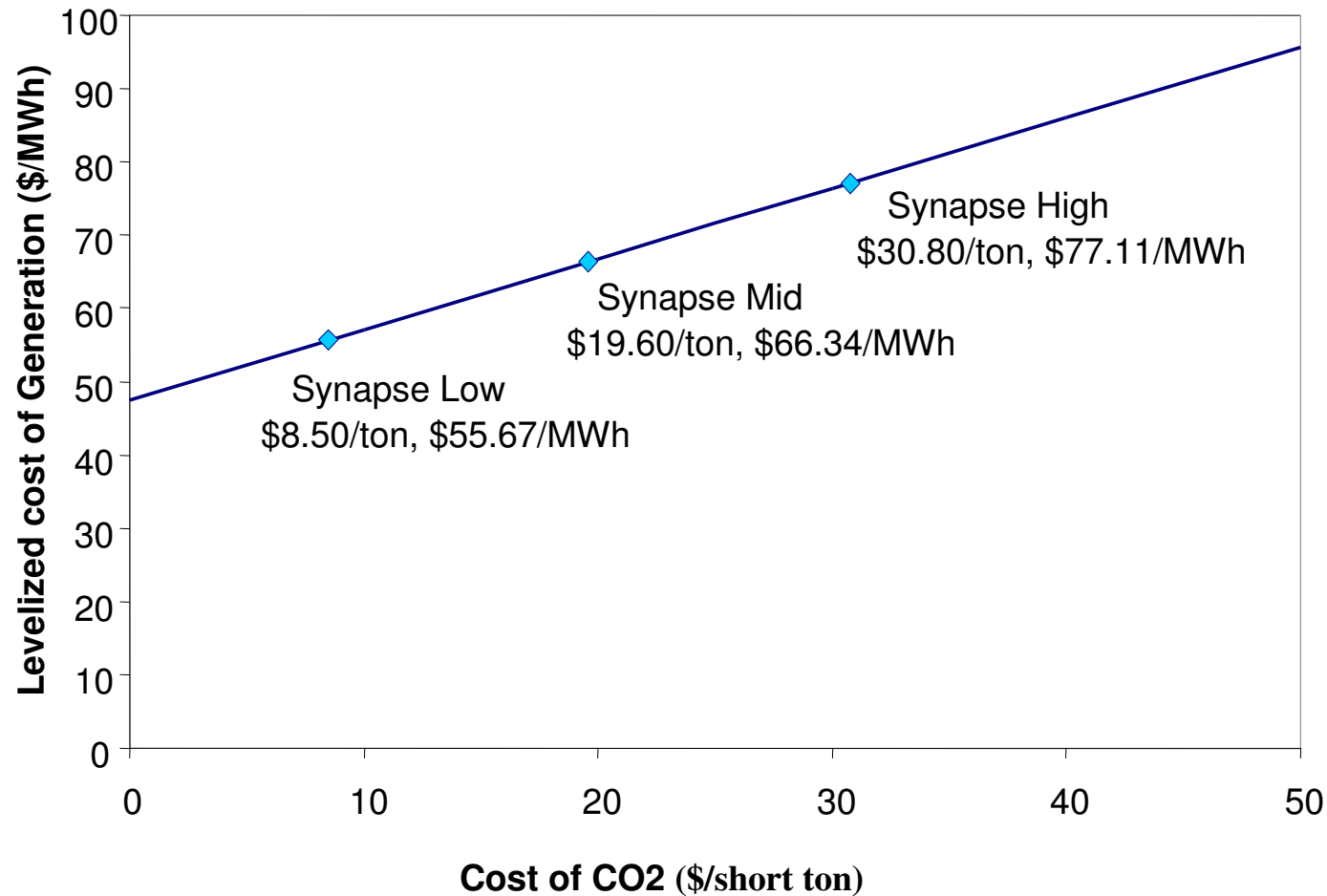
Source: Synapse Energy Economics, *Climate Change and Power: Carbon Dioxide Emissions Costs and Electricity Resource Planning*, May 2006.



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# CO<sub>2</sub> prices greatly increase cost of coal power

**Pulverized Coal costs in 2015 under various CO<sub>2</sub> prices**



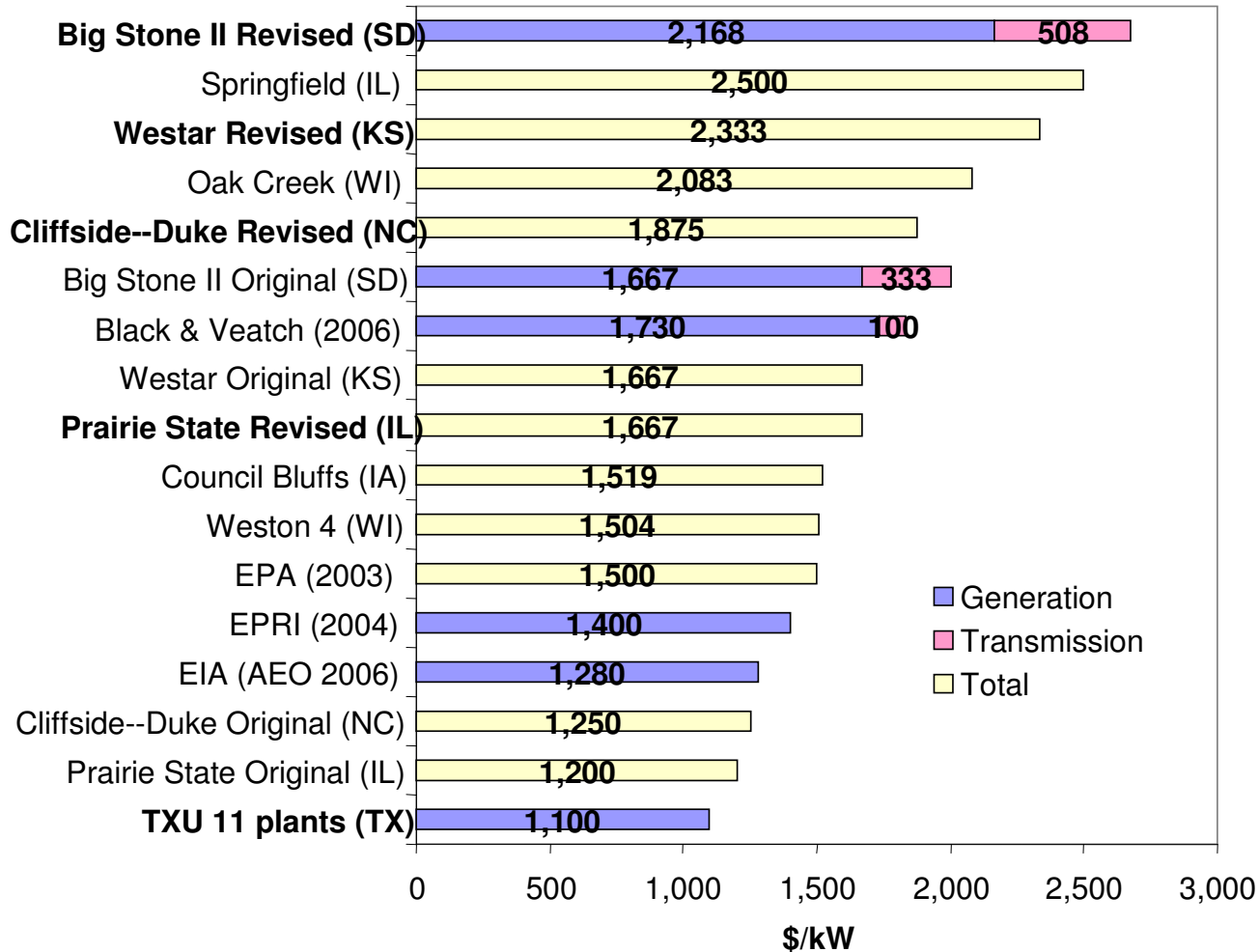
Source: EIA, "NEMS EMM Factors for AEO06," spreadsheet, 2006, and Synapse, 2006. The costs are representative of a new coal plant built in the Midwest in 2015.



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# Costs for new pulverized coal plants are on the rise

New pulverized coal capital costs



➤ US and global coal rush creating supply constraints for equipment and skilled labor

➤ At least 4 plants have announced 30-50% capital cost increases in the past year

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\$ for a supercritical PC plant.



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# 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)

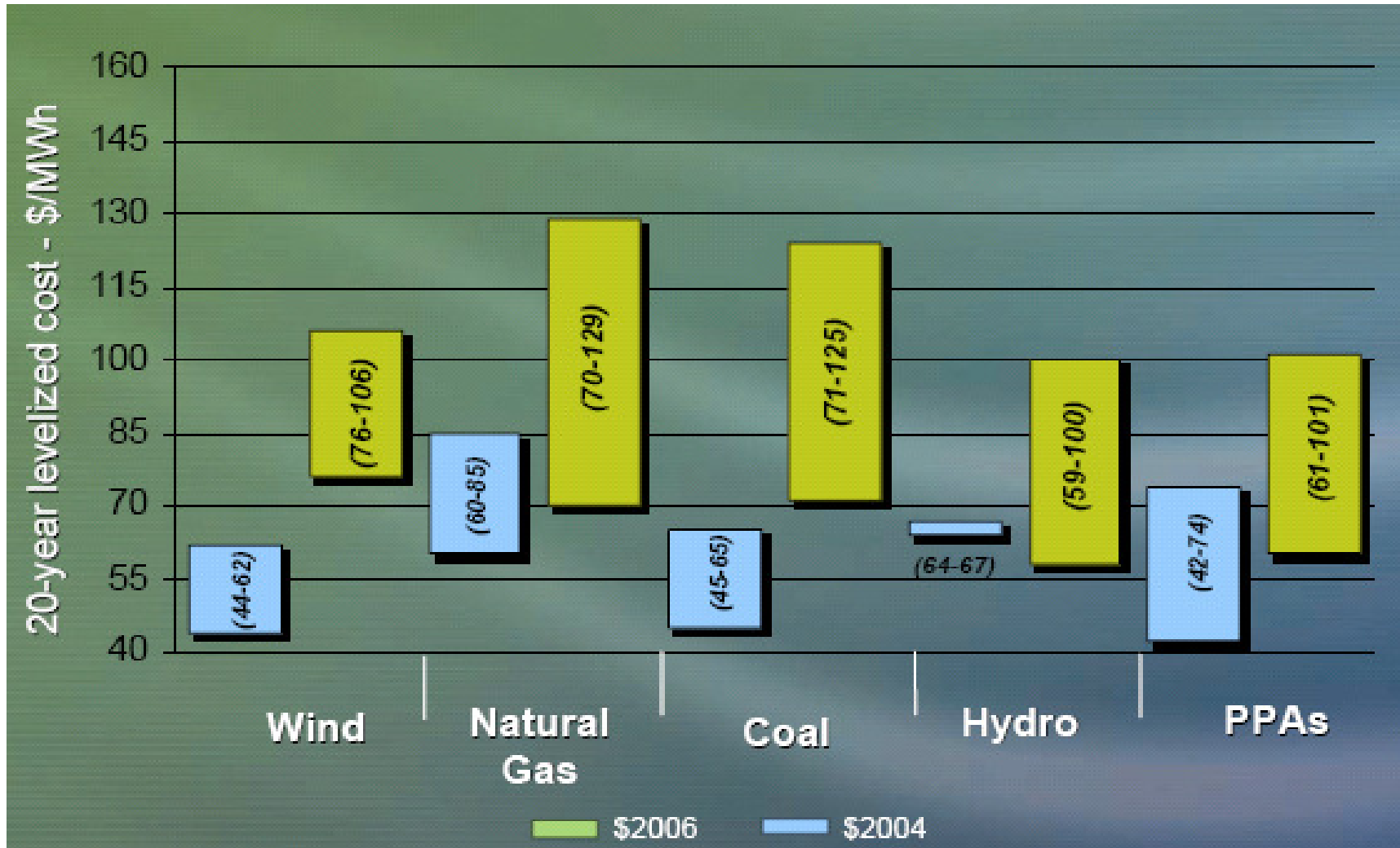
**The E&C Industry Is Also “Tight” With a Limited Number of Capable Players**



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# Costs have increased for all technologies

## Prices from Puget Sound Energy RFPs



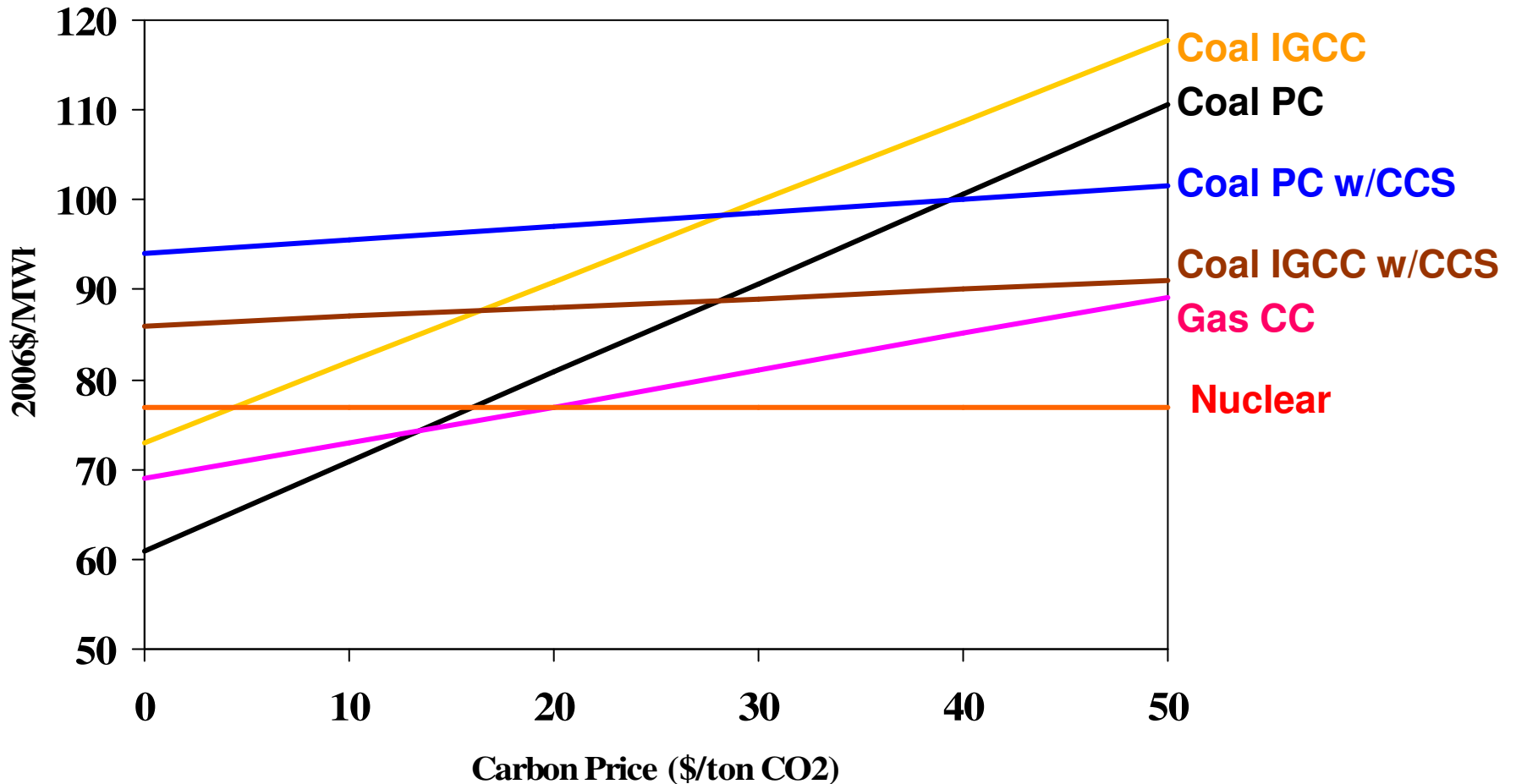
Source: Puget Sound Energy IRPAG, powerpoint presentation, June 22, 2006.



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# CO<sub>2</sub> costs make pulverized coal plants uneconomic

Levelized Cost of Electricity (2010) vs. CO<sub>2</sub> Price



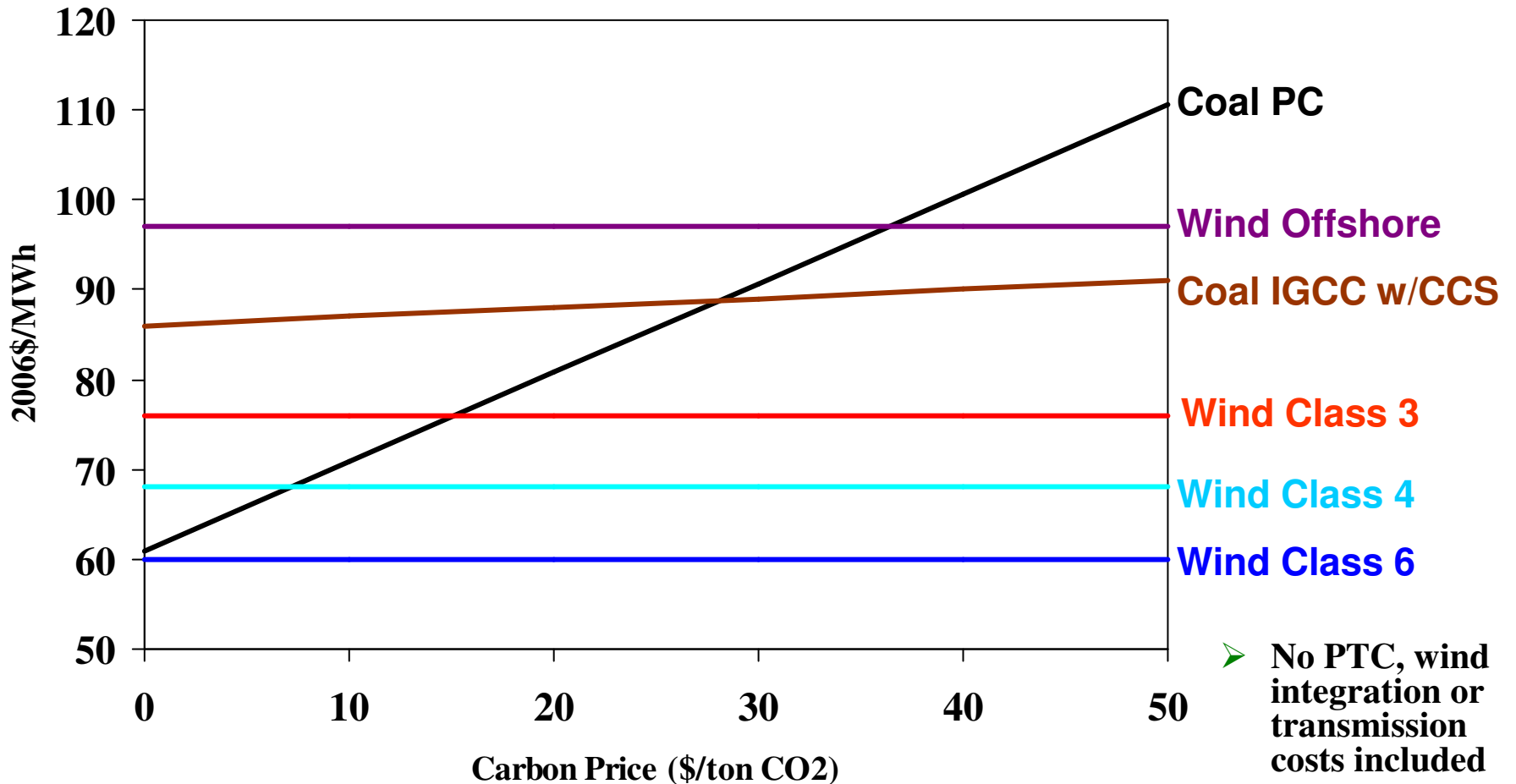
Source: Preliminary information developed by Black & Veatch for AWEA, except Coal PC w/CCS, which adds IPCC estimates for the cost of CCS to Black & Veatch's Coal PC costs.



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# CO<sub>2</sub> prices make wind cheaper than new coal

Levelized Cost of Electricity (2010) vs. CO<sub>2</sub> Price



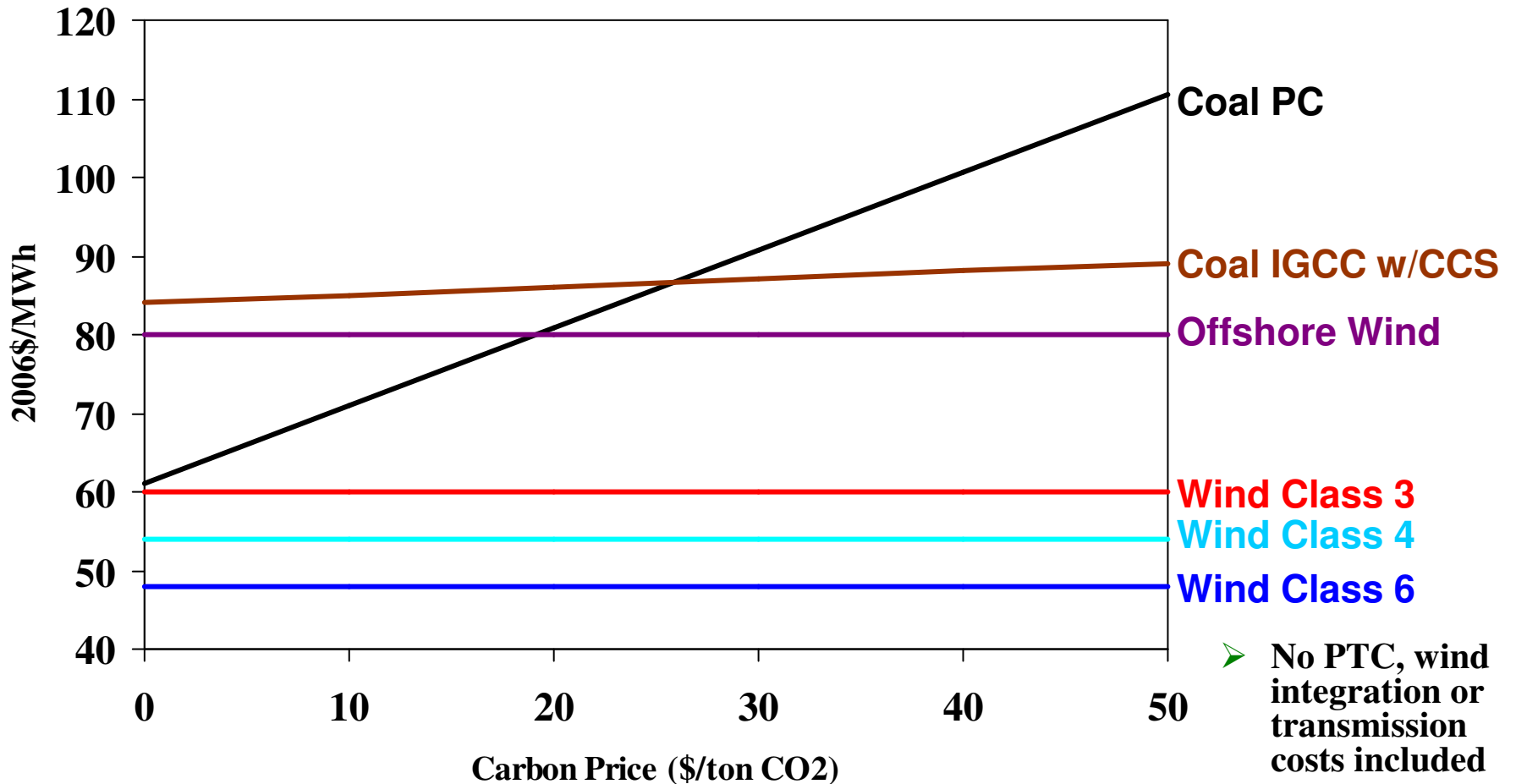
Source: Preliminary information developed by Black & Veatch for AWEA, 2006.



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# Wind becomes even more competitive than new coal by 2015

Levelized Cost of Electricity (2015) vs. CO2 Price



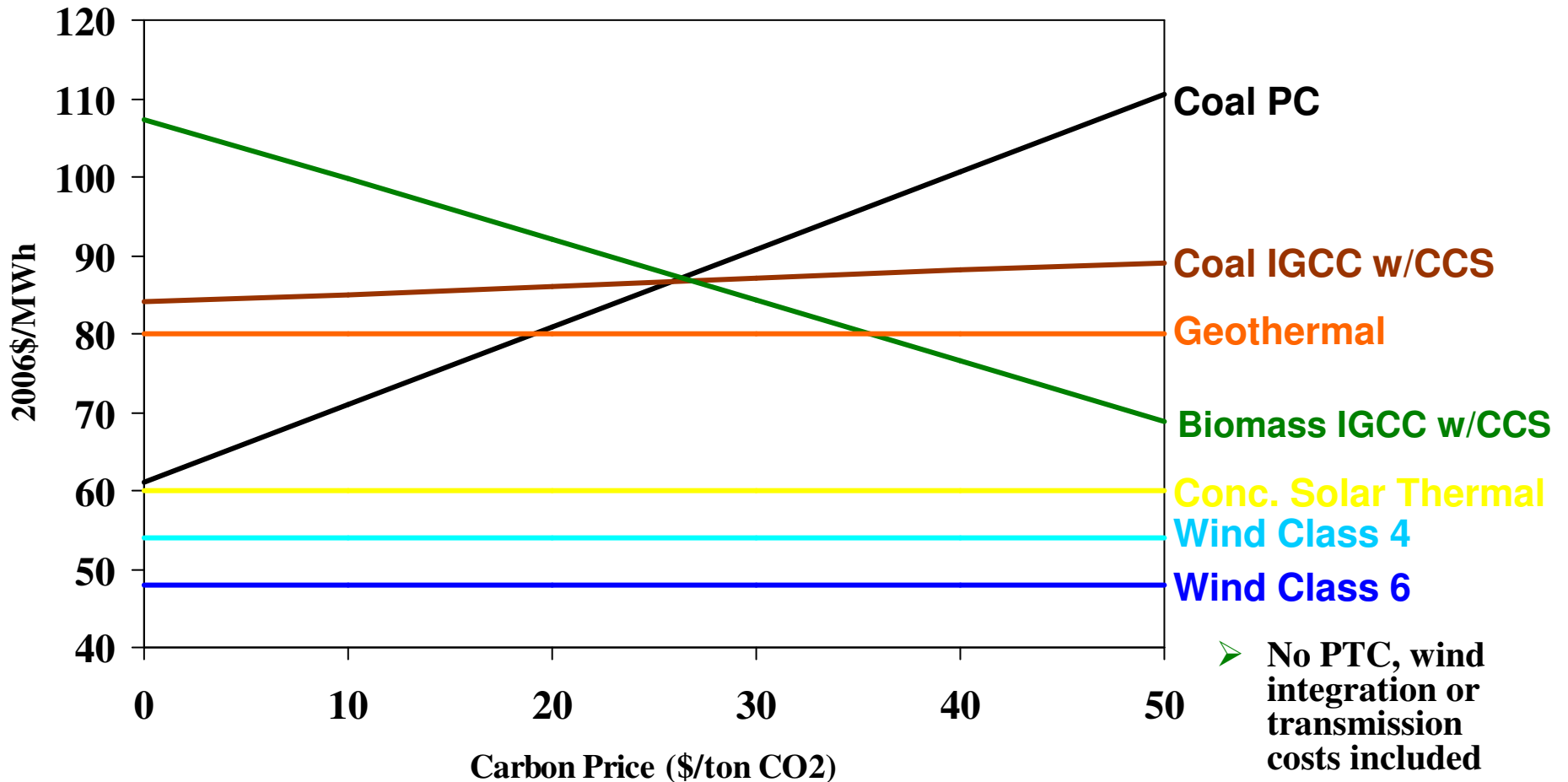
Source: Preliminary information developed by Black & Veatch for AWEA, 2006.



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# CO<sub>2</sub> prices make other renewables cheaper than new coal

Levelized Cost of Electricity (2015) vs. CO<sub>2</sub> Price



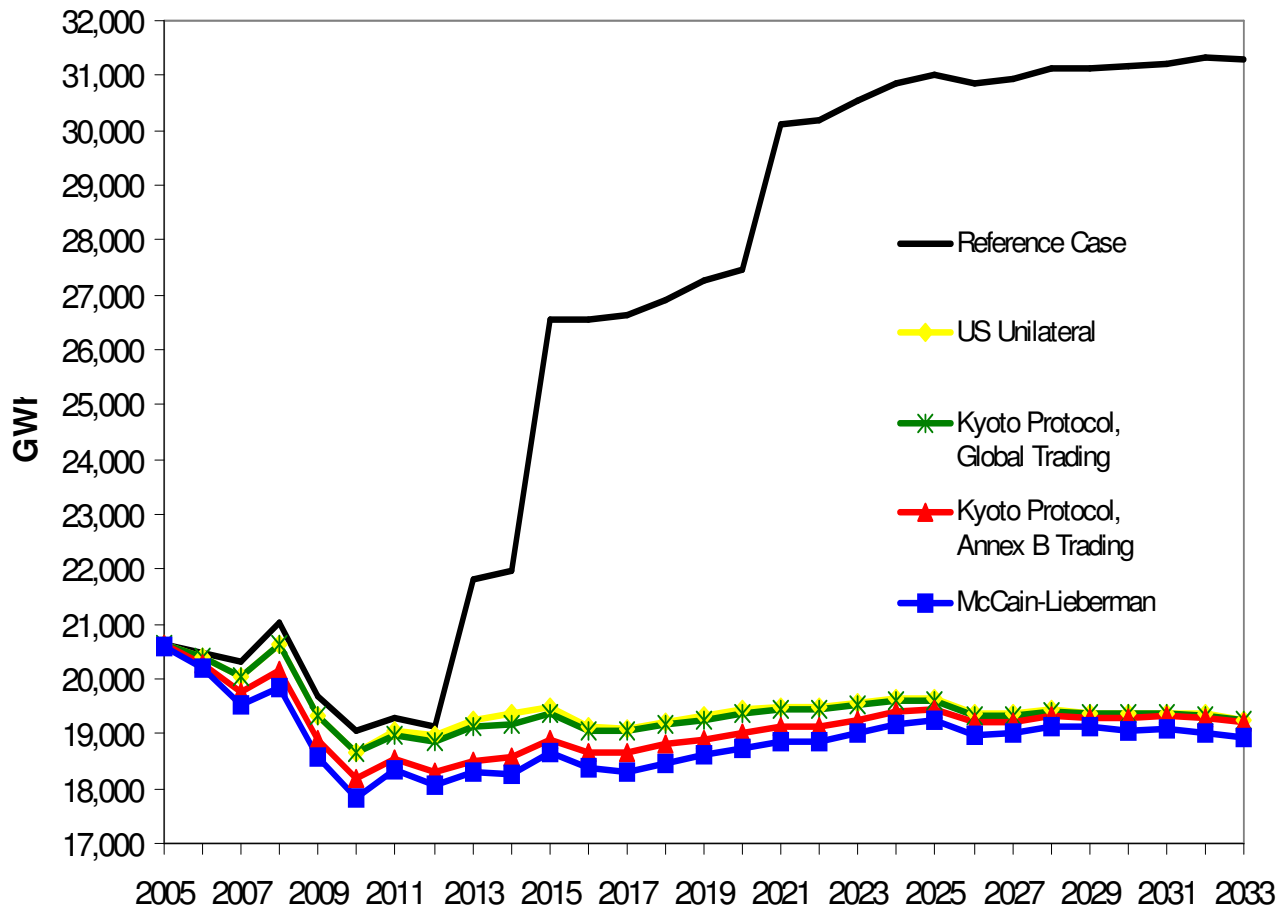
Source: Coal and wind: preliminary information developed by Black & Veatch for AWEA; Concentrating solar thermal and geothermal: WGA; Biomass IGCC w/CCS: IEA (2004) and Rhodes and Keith (2005).



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# CO<sub>2</sub> costs change economics of electricity generation options

## Coal Generation under Xcel's Preferred Plan (Reference Case) and Carbon Regulatory Scenarios (GWh)



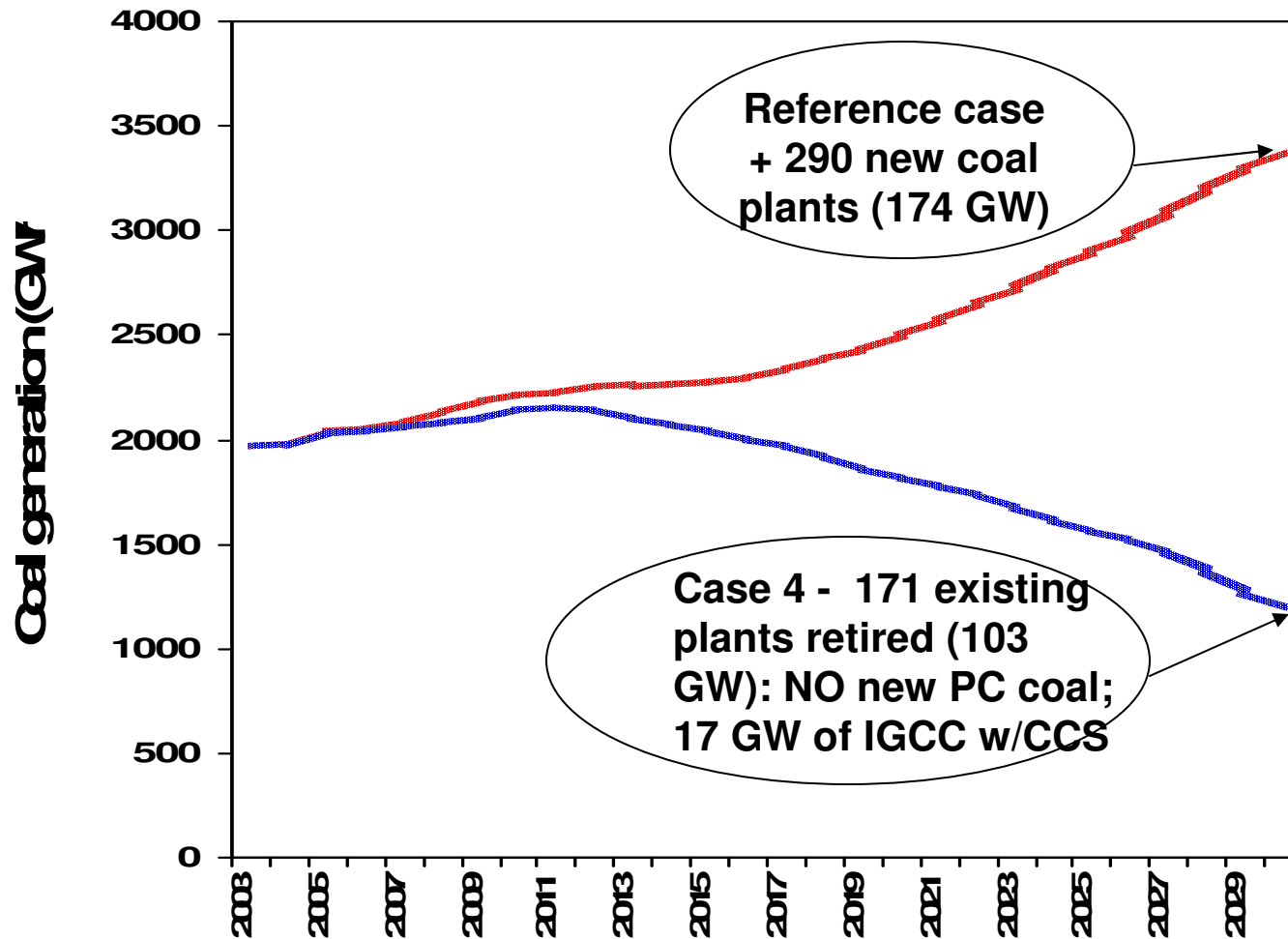
- Xcel Energy's 2004 IRP in MN included 1125 MW of new coal in its "Preferred Plan."
- When future CO<sub>2</sub> costs were included in Xcel's model, **ALL THE NEW COAL GENERATION DISAPPEARED**, even using CO<sub>2</sub> costs similar to Synapse's low case forecast.
- Xcel now proposing wind-hydro "baseload" alternative after follow-up analysis showed cheaper than new coal @ \$9/ton of CO<sub>2</sub>.

Source: Xcel responses to IWLA/ME3/UCS/MCEA Information Requests 7d and 19b.



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# 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



# Conclusions

- **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 CO<sub>2</sub> with complementary policies for efficiency and renewables has lowest costs and greatest benefits**
- **Utilities should factor CO<sub>2</sub> into resource planning and procurement and aggressively pursue cleaner alternatives**
- **Regulators should require utilities to take these steps and shareholders not ratepayers to bear the risk**
- **Shareholders and investors should recognize inevitability of CO<sub>2</sub> 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 CO<sub>2</sub> costs in rates, oppose construction of new conventional coal plants, and support investments in cleaner alternatives**