Synapse
Energy Economics, Inc.

Economics of Electric Sector CO_2 Emissions Reduction: Making Climate Change Policy that People Can Live With

NASUCA 2008 Annual Meeting

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Bruce Biewald

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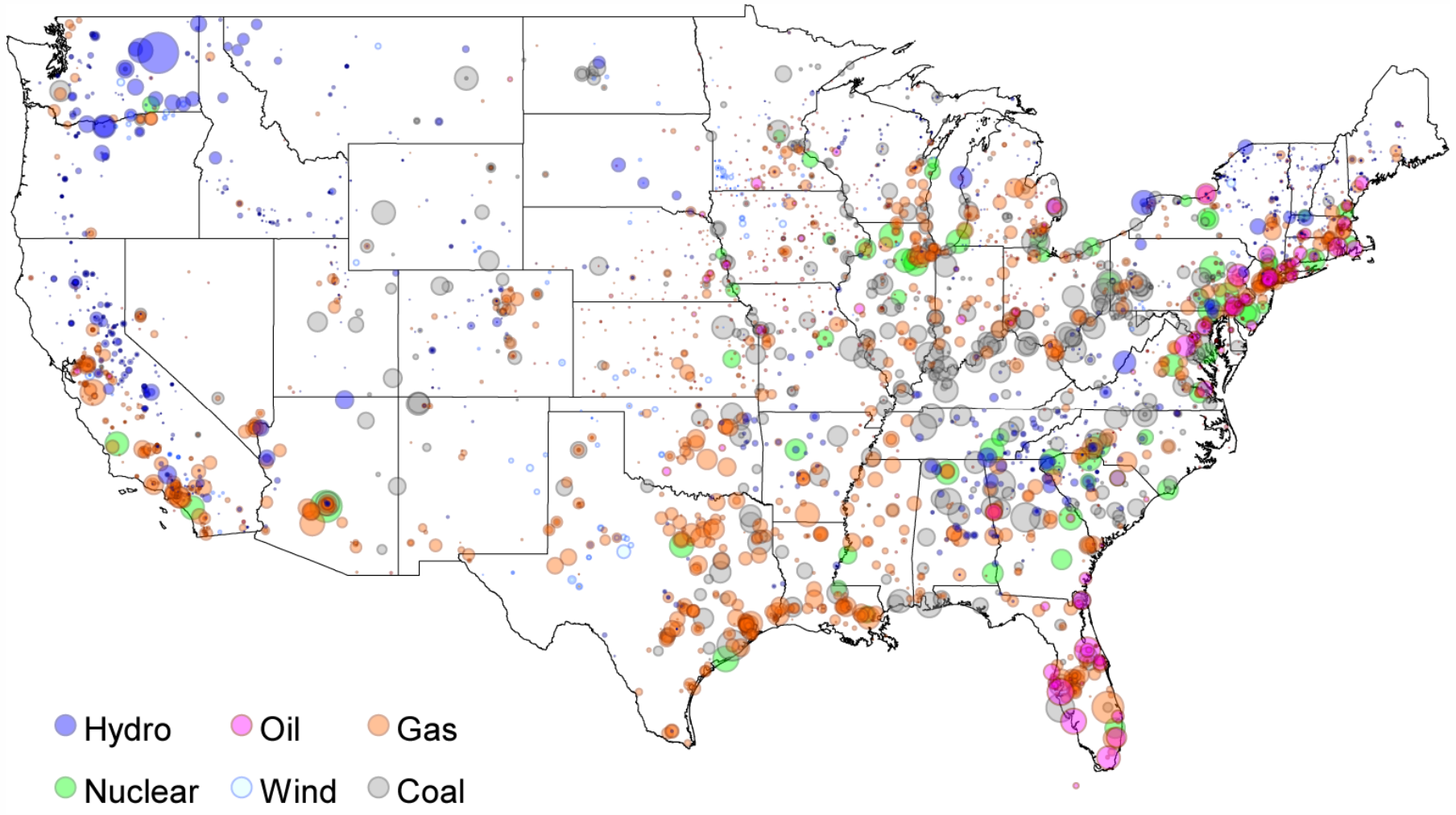
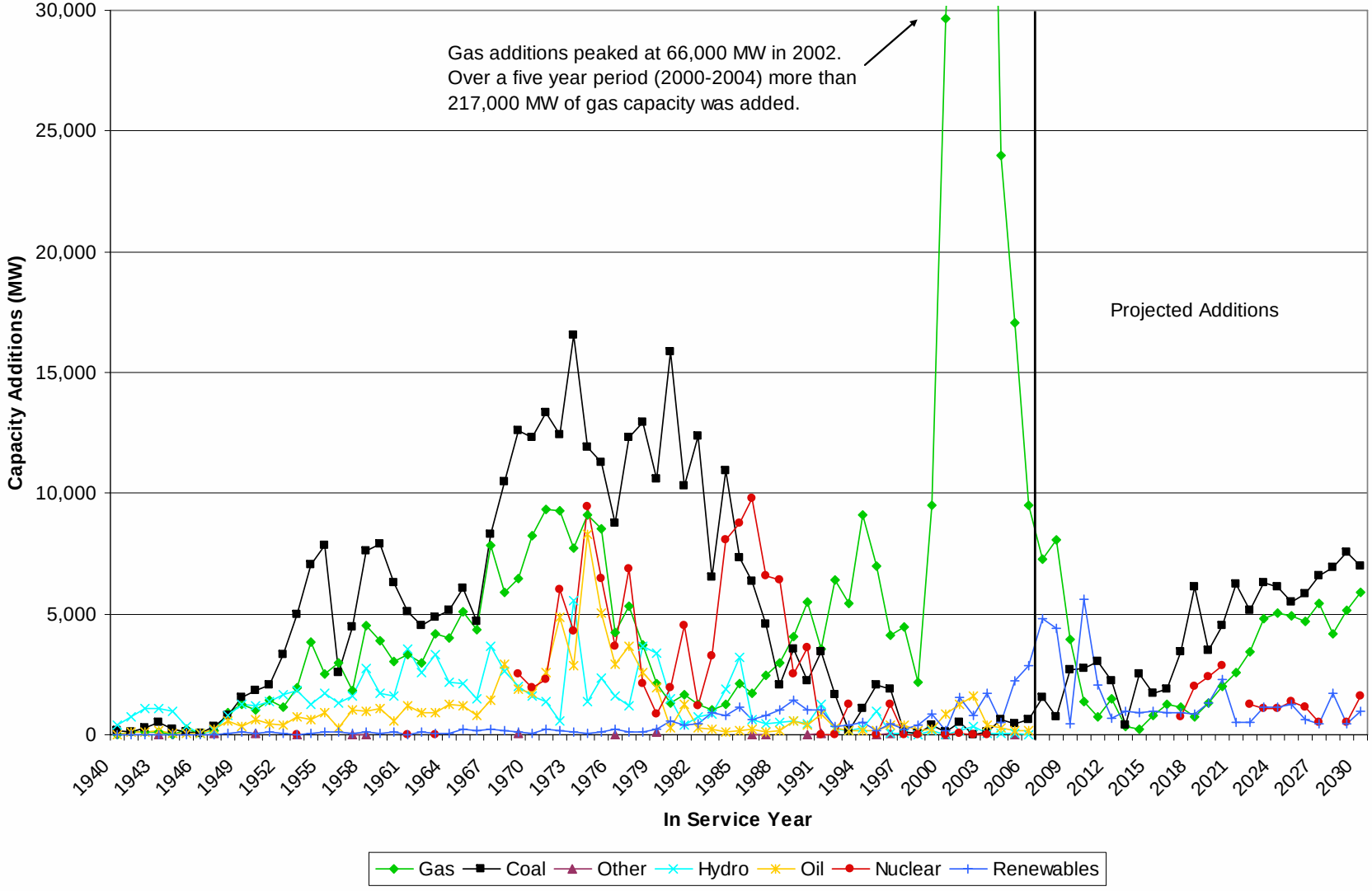
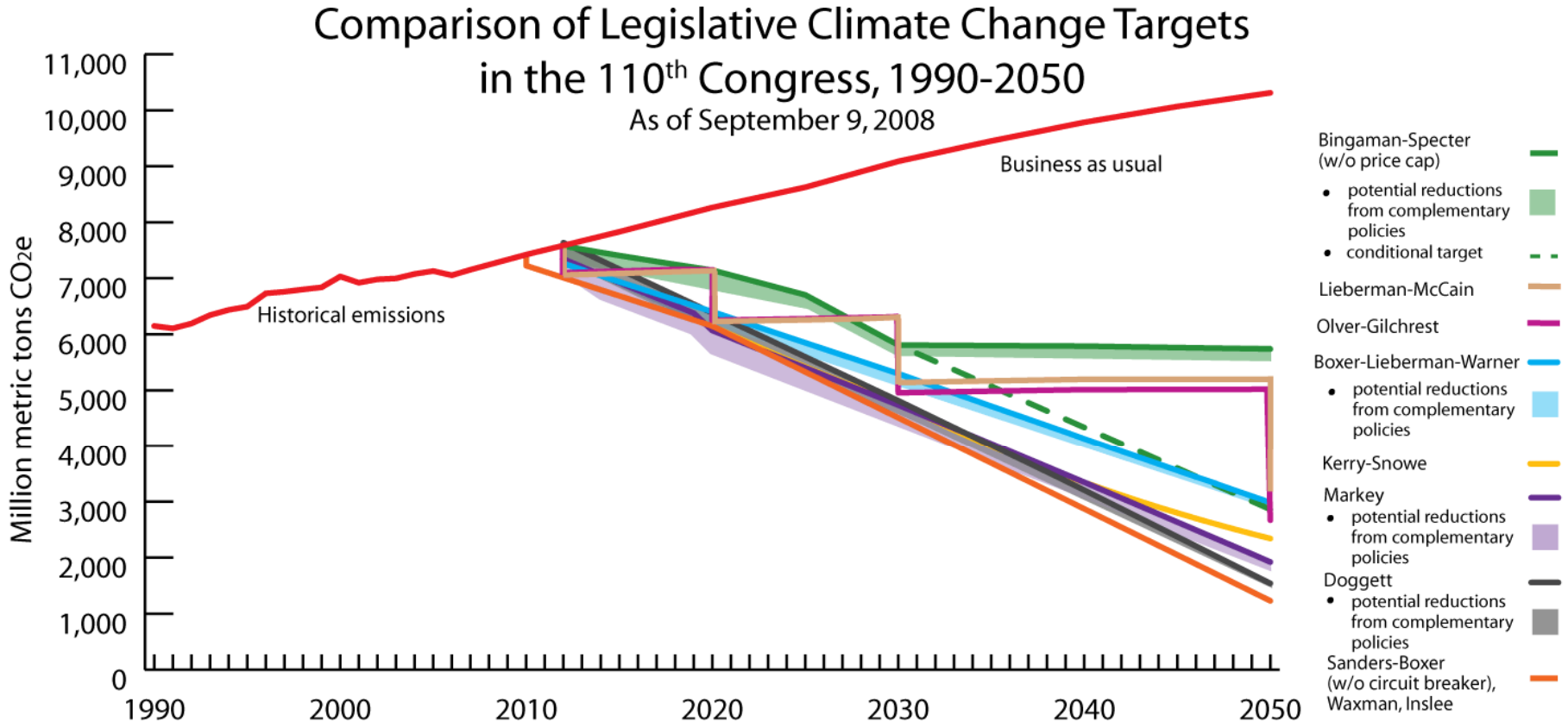
Power Plants in the United States



US Generating Capacity Additions by Vintage and Fuel Type



Carbon Dioxide Emission Trajectories



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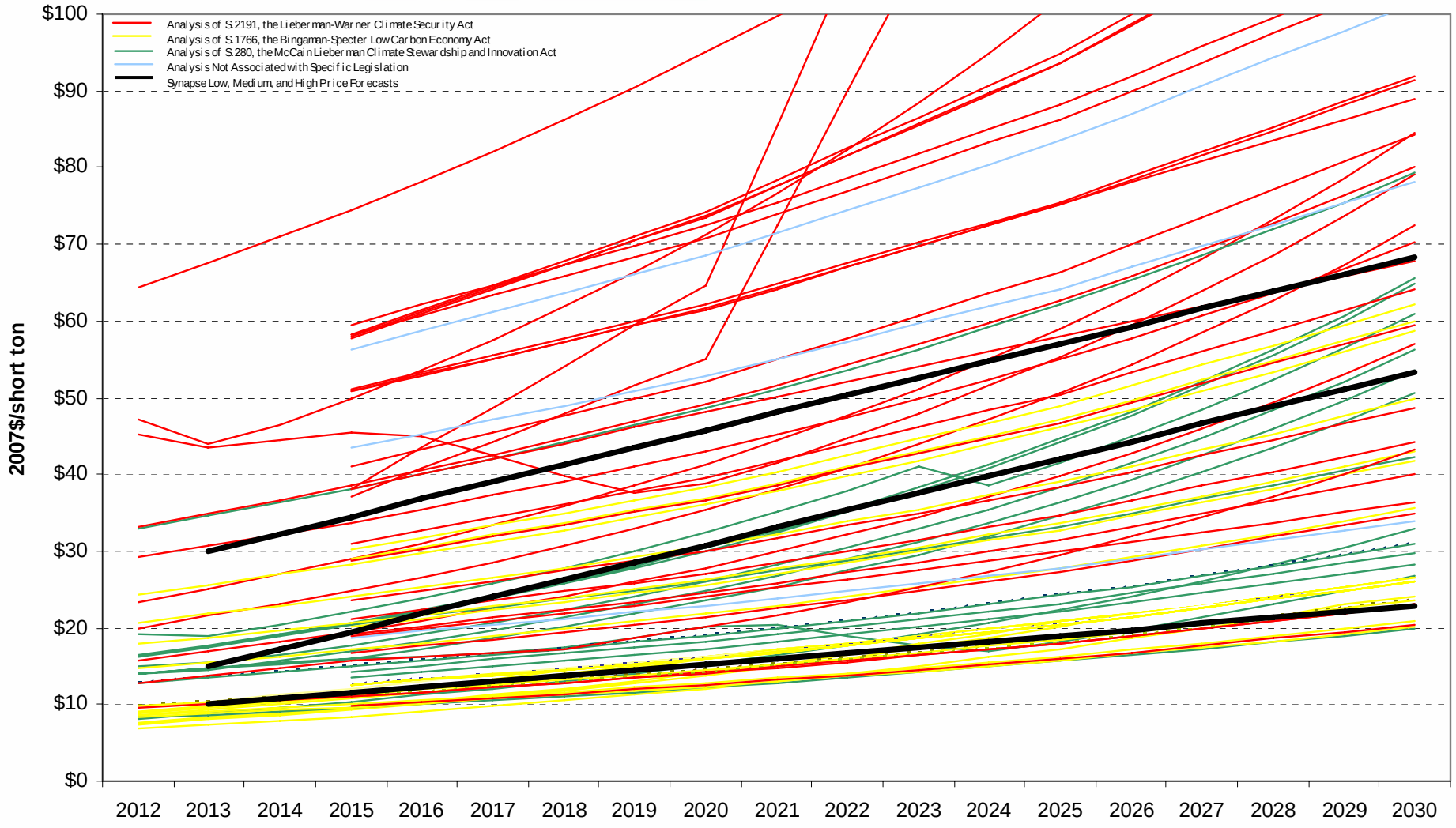
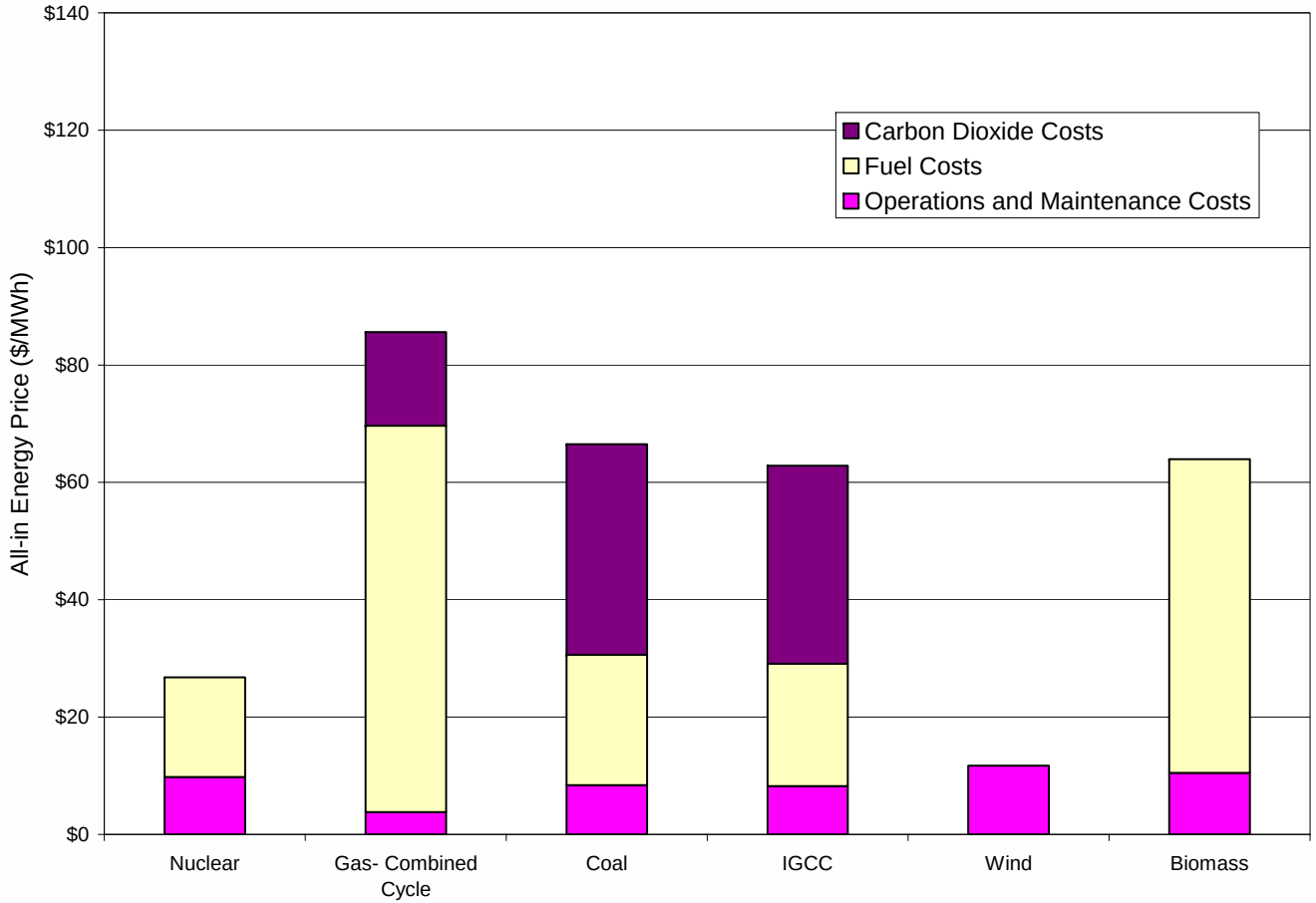
For a full discussion of underlying methodology, assumptions and references, please see http://www.wri.org/usclimatetargets. WRI does not endorse any of these bills. This analysis is intended to fairly and accurately compare explicit carbon caps in Congressional climate proposals and uses underlying data that may differ from other analyses. Price caps, circuit breakers and other cost-containment mechanisms contained in some bills may allow emissions to deviate from the pathways depicted in this analysis.

Carbon Dioxide Price Projections from Analyses of Recent Cap and Trade Proposals

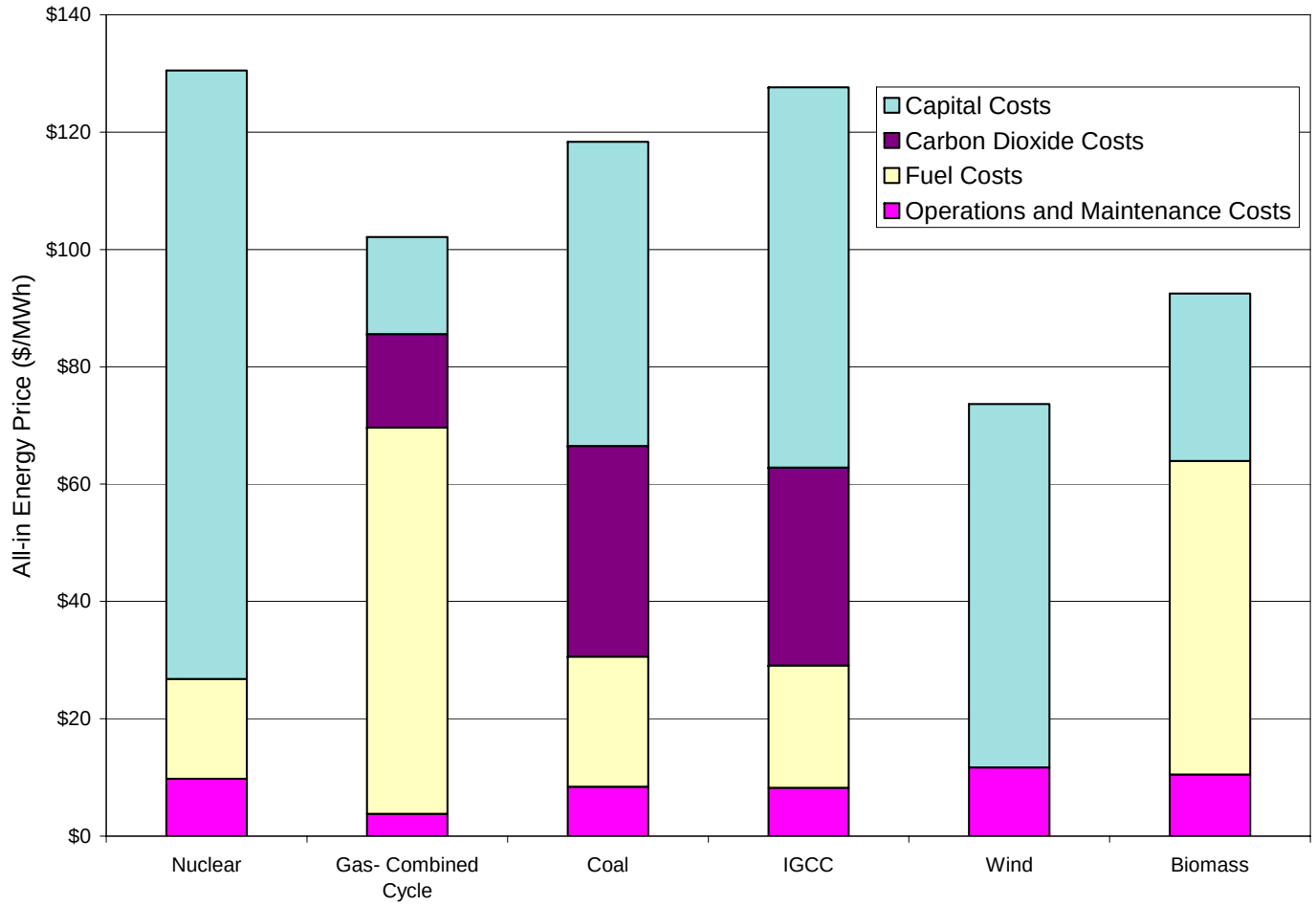


Illustrative Levelized Energy Costs Excluding Capital Costs



- Carbon dioxide price of $39 (2008$) per ton represents Synapse mid-range carbon dioxide price levelized over a period of 2015 through 2034

Illustrative Levelized Energy Cost Including Capital Costs

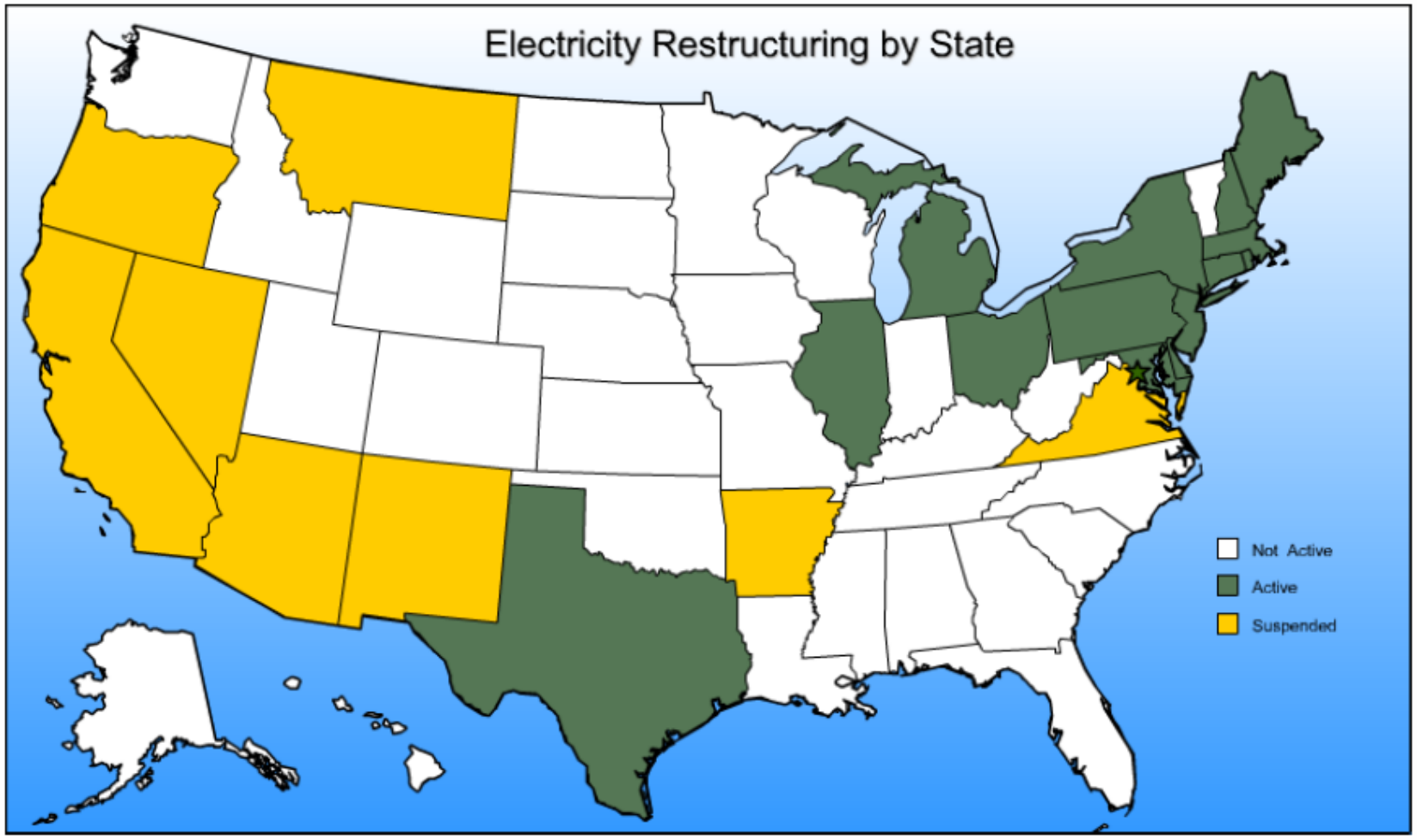


- Carbon dioxide price of $39 (2008$) per ton represents Synapse mid-range carbon dioxide price levelized over a period of 2015 through 2034

Data and Methodological Sources for Levelized Cost Comparisons

- *Annual Energy Outlook 2008.* Energy Information Administration, June 2008
- *Annual Report on U.S Wind Power Installation, Cost, and Performance Trends: 2007.* Lawrence Berkeley National Laboratory, May 2008
- *Avoided Energy Supply Costs in New England: 2007 Final Report Revised.* Synapse Energy Economics, January 2008
- *Coal-fired Construction Costs.* Synapse Energy Economics, July 2008
- *Nuclear Power Plant Construction Costs.* Synapse Energy Economics, July 2008
- *Synapse 2008 CO_2 Price Forecasts.* Synapse Energy Economics, July 2008

EIA on Electricity Restructuring by State



Source: Energy Information Administration, September 2008.

PJM Example: Costs of CO_2 Cap

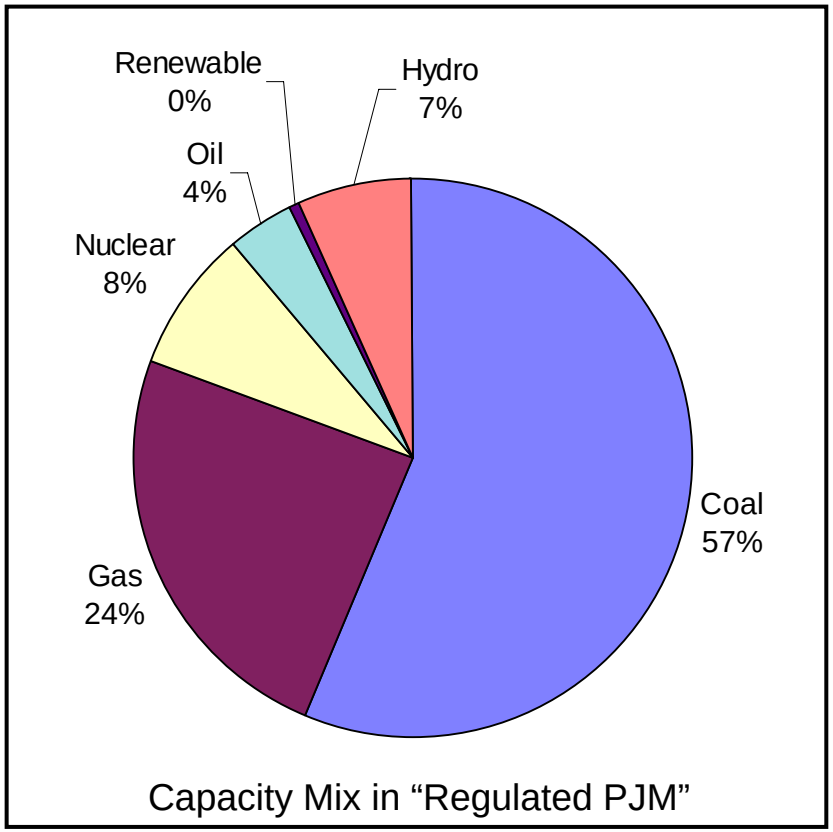
- PJM Interconnection is about 60% regulated and 40% deregulated
- Total emissions in deregulated areas approximately equal to those in (coal-heavy) regulated areas
- Cost of CO_2 regulations to consumers in deregulated areas likely to be 10 TIMES HIGHER than cost in regulated areas
- Is this market efficiency at work???

Regulated PJM

- Ohio, West Virginia, Virginia, Indiana, Kentucky, Michigan, North Carolina

- Total Capacity

~65,000 MW



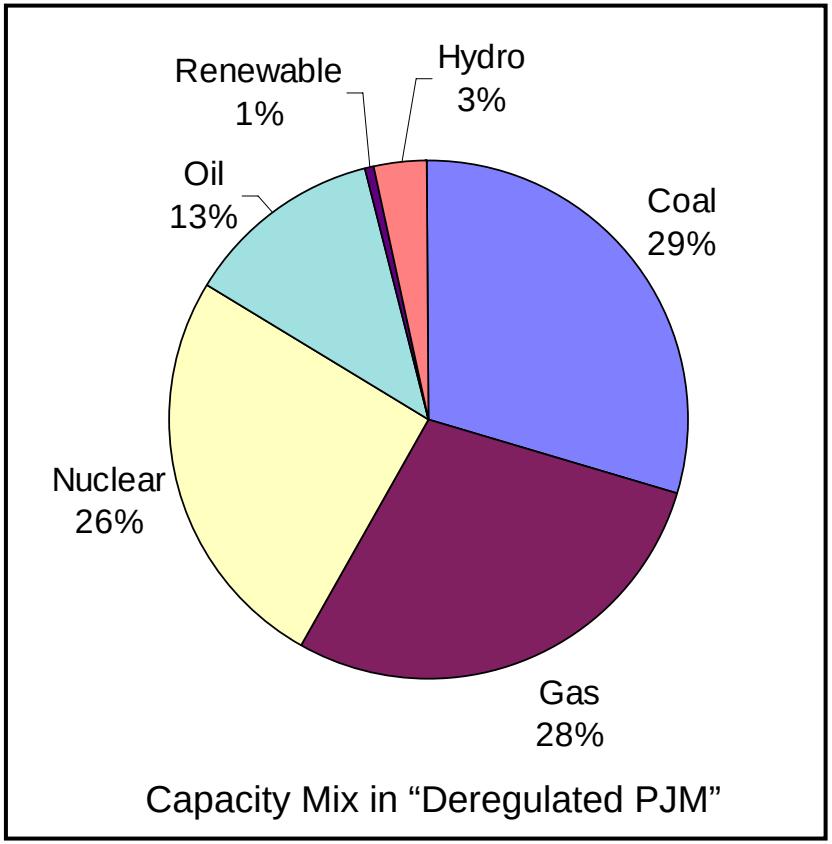
Capacity Mix in “Regulated PJM”

Deregulated PJM

- Pennsylvania, Illinois, Maryland, New Jersey, DC, Delaware

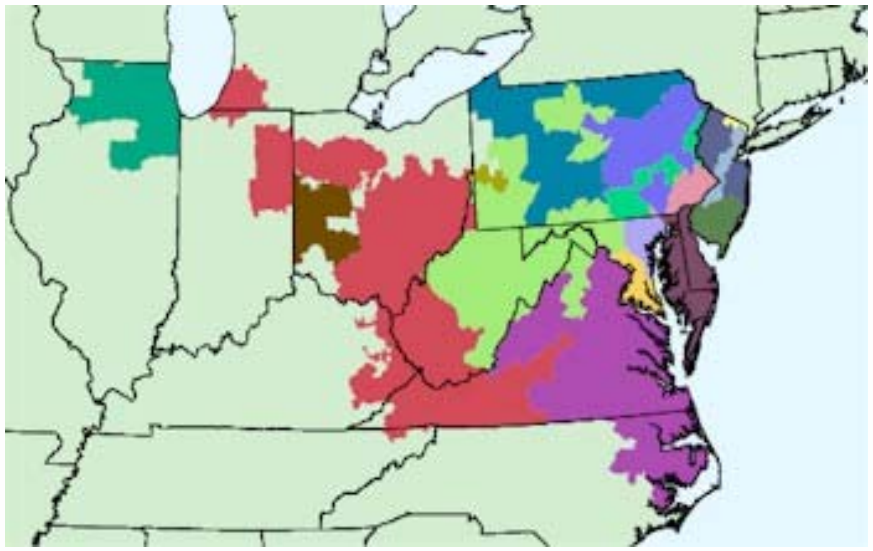
- Total Capacity

~100,000 MW



Capacity Mix in “Deregulated PJM”

Example: PJM under Federal Cap & Trade



- *Reduction target:* to 90% of BAU
- *Allowance trading price:* $20/ton CO2
- *Average cost of abatement:* $10/ton CO2

Three scenarios:

- *Regulated PJM*
- *Deregulated PJM with auction*
- *Deregulated PJM with allocation to generators*

Some Definitions…

- ***Regulated*** implies responsible, hands-on utility regulators who carefully balance rates with cost-based revenue requirements.
- ***Allowance Allocation*** means 100% of emissions allowances are given to emitters, free of charge, in some proportion to their historic carbon emissions.
- ***Allowance Auction*** means 100% of emission allowances are auctioned off, with the proceeds used for the benefit of consumers in some wise and reasonable way.

The Old-Fashioned Way

- In regulated markets, consumers must pay the increased cost of emissions abatement.
  - This is the average abatement cost ($10/ton) times the avoided emissions (about 33 million tons/year) or about $330 Million/year
  - Allowance trading allows the utility to find the optimal balance between reducing emissions and paying for them.

The “Market Efficiency” Way

- Generators must purchase allowances to cover the cost of 90% of 2006 emissions:

  305 Mtons x $20/ton = $6.1 Billion

- Ideally, consumers get the full benefit of this money,
- But…

The "Market Efficiency" Way, Continued

- Price of electricity will rise to reflect marginal emissions cost (about $17/MWh)
- Consumer costs will increase:

  560,000 MWh x $17/MWh = $9.5 Billion

- Assuming allowances were *sold* to generators, the net impact on consumers is a cost of $3.4 Billion.

To Re-cap Impact on Consumers

- Cost of 10% reduction in emissions in regulated part of PJM:

$330 Million

- Cost of 10% reduction in emissions in *deregulated* part of PJM (assuming allowances are sold:)

$3,400 Million

- Cost of 10% reduction in emissions in *deregulated* part of PJM if allowances are allocated to generators for free:

$9,600 Million

Why Won't the Market "Work?"

- Modest reduction goals means most energy still comes from existing (polluting) generators—whose costs are basically covered.
- Carbon market places a premium on "low carbon" resources—but this is mostly existing nuclear generators, who do nothing new but earn a windfall (see next page…)

Winners and Losers: Deregulated Market with Allowance Auction

Technology	Cost of Allowances ($M/year)	Cost of Abatement ($M/year)	in Revenues ($M/year)	Change in Profit ($M/year)
Coal	$ 3,906	$ 217	$ 3,074	**$(1,049)**
Gas	$ 1,720	$ 96	$ 2,499	**$ 684**
Nuclear	$ -	$ -	$ 3,208	**$ 3,208**
Oil	$ 474	$ 26	$ 559	**$ 59**
Renewable	$ -	$ -	$ 39	**$ 39**
Hydro	$ -	$ -	$ 142	**$ 142**

Consumers pay $3.3 Billion for $340 Million worth of abatement.

Winners and Losers: Deregulated Market *with Allowance Allocation*

Technology	Cost of Allowances ($M/year)	Cost of Abatement ($M/year)	Increase in Revenues ($M/year)	Change in Profit ($M/year)
Coal	$ -	$ 217	$ 3,074	**$ 2,857**
Gas	$ -	$ 96	$ 2,499	**$ 2,404**
Nuclear	$ -	$ -	$ 3,208	**$ 3,208**
Oil	$ -	$ 26	$ 559	**$ 533**
Renewable	$ -	$ -	$ 39	**$ 39**
Hydro	$ -	$ -	$ 142	**$ 142**

Consumers pay $9.5 Billion for $340 Million worth of abatement.

Take-Home Messages

- Cap-and-trade regulation of CO_2 emissions will have very different price impacts on regulated vs. deregulated markets, *even within PJM.*
- Customers in regulated markets will pay the cost of abatement, and generators will recover costs.
- Customers in deregulated markets will pay about 10 TIMES the cost of abatement, and many generators will receive a windfall.
- The situation in deregulated markets would be *quite a bit worse* if allowances are distributed for free.

Consumer-friendly Components of an Energy and Climate Policy

- Reduction targets appropriate to avoid dangerous climate change
- Portfolio of policies that spur technology innovation and demand reduction (lowers overall cost of compliance)
- Allowance auctions with proceeds used for public benefit
  - Energy efficiency and renewables (lowers overall cost of compliance and individual bills)
  - Assistance for low- and middle-income consumers (addresses cost impact on specific consumers)
- Job training and other transition assistance for displaced workers and affected communities
- Carbon market monitoring
- Adaptation assistance for impoverished communities
- Preserve states' rights to address climate change

Possible Other Consumer-friendly Policy Components

- Consider load-side cap in electric sector
- Consumer rebates, tax credits
- Compensation for those that bear a disproportionate burden from the policy
- Oversight and evaluation of spending and programs
- SEC rules for reporting on financial exposure from GHG emissions
- Discouraging conventional coal (e.g., emission performance standards, prohibition on cost pass-through for conventional coal) to reduce overall compliance costs and compliance cost risk in regulated states

