LSU Center for Energy Studies

Environmental Regulations Impacting the Electric Power Industry

LPSC ARRA Seminar on Clean Air Markets

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Electric Industry Environmental Regulations – Clean Air Act Rules

National Ambient Air Quality Standards (NAAQS)

- Sets acceptable levels for six criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, sulfur dioxide).
- A network of 4,000 State and Local Air Monitoring Stations is used to determine if geographic areas are meeting or exceeding the NAAQS.

Transport Rule (CATR) [proposed]

- Issued to replace the Clean Air Interstate Rule (CAIR).
- Would require 31 states (and D.C.) to improve air quality by reducing power plant emissions that contribute to ozone and fine particulate pollution in other states.
- Would require significant reductions in SO2 and NOx emissions that cross state lines.
- By 2014, the rule and other state and EPA actions would reduce power plant SO2 emissions by 71% over 2005 levels. Power plant NOx emissions would drop by 52%.

Utility Maximum Achievable Control Technology (MACT) [to be proposed]

- EPA must set emission limits for hazardous air pollutants.
- The rule is expected to replace the Clean Air Mercury Rule (CAMR) and add standards for lead, arsenic, acid gases, dioxins and furans.
- EPA is requesting that owners/operators of all coal- and oil-fired electric utility steam generating units provide information that will allow EPA to assess the emissions of hazardous air pollutants (HAP) from each such unit.

Electric Industry Environmental Regulations – Other EPA Rules

Coal Combustion Residuals (CCR) [proposed]

- Would establish, for the first time under the Resource Conservation and Recovery Act (RCRA) requirements for the proper disposal of coal ash generated by coal combustion at electric power plants.

Power Plant Cooling Water Intake Structures Rule

- Section 316(b) of the Clean Water Act is intended to address environmental impacts from cooling water intake to and discharge from power plant cooling systems.
- Requires that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

National Ambient Air Quality Standards (NAAQS)

- Standards are implemented through state planning authorities' development of State Implementation Plans (SIPs).
- EPA can issue "SIP Calls" requiring upwind states to reduce certain emissions if they are significantly contributing to downwind non-attainment or interfering with maintenance of a NAAQS. States can comply by adopting EPA model rule.
- If states fail to address downwind contribution in a timely manner, EPA can issue a Federal Implementation Plan (FIP).
- EPA is under court order to review its previous revision of the 2006 annual $PM_{2.5}$ NAAQS and has undertaken a separate reconsideration of its 2008 Ozone NAAQS revision in light of filed legal challenges.
- Examining NOx and SO2 secondary standards.
- The $PM_{2.5}$ NAAQS Proposed Rule is due in February 2011; Final Rule is due in November 2011.
- EPA will decide whether to reconsider its Ozone NAAQS by July 2011.

National Ambient Air Quality Standards (NAAQS) Cost Estimate

The EPA developed the following cost and benefit information for its regulatory impact analysis. However, the actual requirements and affected sources will be determined by the individual states. These estimates represent hypothetical strategies of what could be required to achieve a possible NAAQS level.

EPA's NAAQS Rule Cost/Benefit Estimates (2006 $)	Estimated Benefits in 2020	Estimated Costs in 2020
If ozone NAAQS = 0.70 ppm	$13 - $17 billion	$19 - $25 billion
If ozone NAAQS = 0.60 ppm	$35 - $100 billion	$52 - $90 billion
2006 $PM_{2.5}$ NAAQS	$9 - $76 billion	$5.4 billion

Source: Miller, P. A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability. Working Draft, JD Northeast States for Coordinated Air Use Management. January 24, 2011.

Transport Rule

States Covered by the Transport Rule

States controlled for both fine particles (annual SO2 and NOx) and ozone (ozone season NOx) (21 states and DC)

States controlled for fine particles only (annual SO2 and NOx) (6 states)

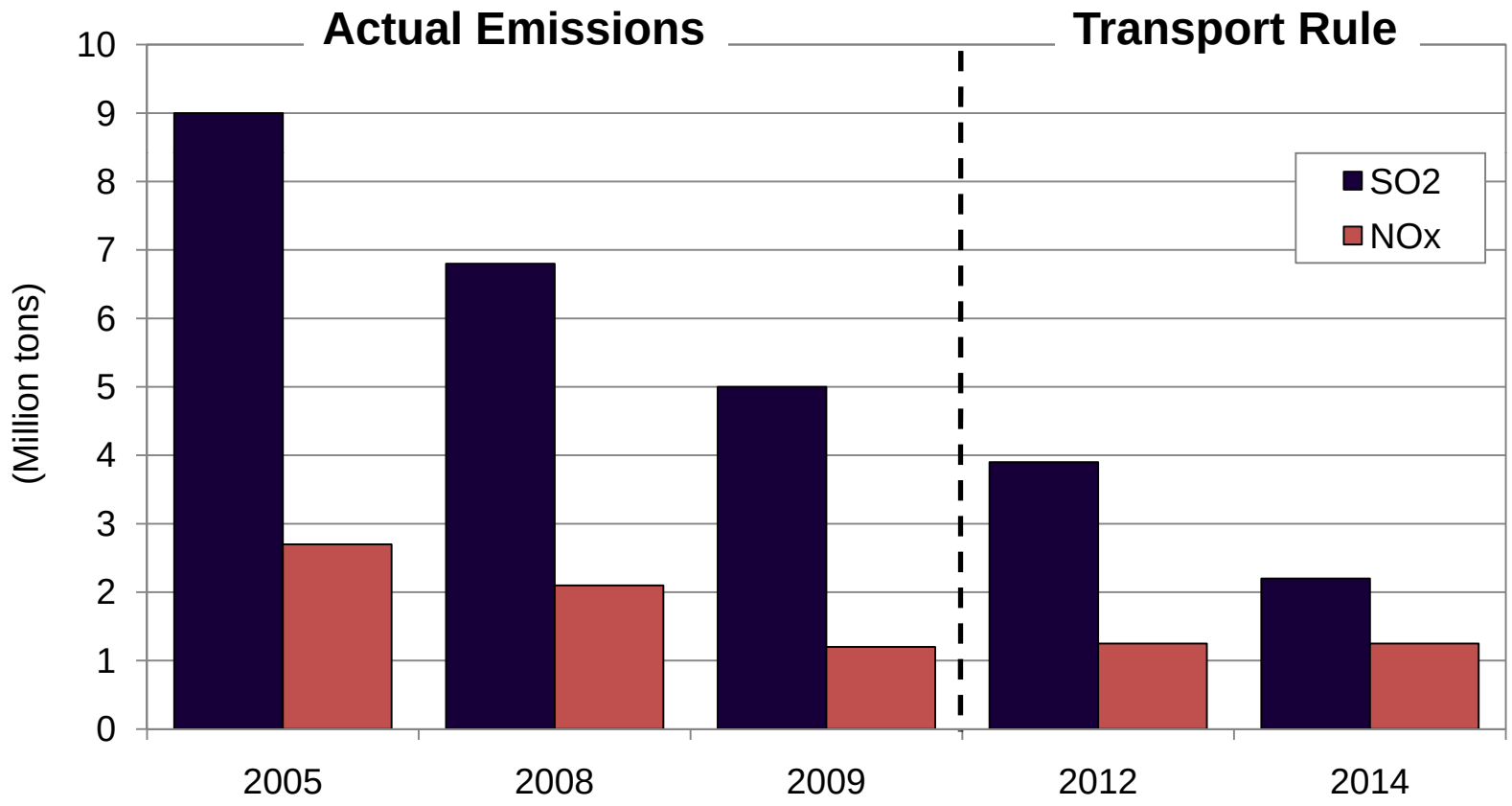
States controlled for ozone only (ozone season NOx) (4 states)

EPA published the proposed Transport Rule in August 2010 and plans to finalize the rule by June 2011.

Addresses emissions of SO2 and NOx in the Eastern U.S., upwind fossil fuel plants that “contribute significantly” to poor air quality in a downwind state.

Transport Rule Compliance

Preliminary SO2 and NOx emissions from covered plants indicate annual emissions are already approaching or at the proposed Transport Rule's 2012 allowances.



Source: Miller, P. A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability. Working Draft, JD Northeast States for Coordinated Air Use Management. January 24, 2011.

Maximum Achievable Control Technology (MACT)

- Pursuant to court order, EPA must set emission limits for hazardous air pollutant emissions from electric generation units.
- This rule is expected to replace the Clean Air Mercury Rule (CAMR) and address mercury emissions as well as hazardous air pollutants such as lead, arsenic, acid gases, doxins and furans.
- The rule has yet to be proposed, so cost impacts are not yet known. It is expected to require:

  Exising Sources – within 3 years from the final rule (+ possible 1 year allowance extension), emissions reductions at least as stringent as the average emission reduction achieved by the top performing 12 percent of sources within the category.

  New Sources – Emissions reduction must be at least as stringent as the emissions reduction achieved by the best single performing plant within the specific category.
- Proposed Rule is due March, 2011; Final Rule is due November 2011.

Coal Combustion Residuals (CCR) Rule

The CCR Rule would establish, for the first time, requirements under the Resource Conservation and Recovery Act (RCRA) for the proper disposal of coal ash by electric power plants.

The Rule provides two options:

1. Regulate coal ash as a "special waste" under RCRA subtitle C.
   - Would require closure of existing surface ash with impoundments within 5 years.
   - Disposal of past and future ash in a regulated landfill with surface water monitoring.

or

2. Regulate coal ash as non-hazardous waste under RCRA subtitle D.
   - Would require removal of solids from impoundment ponds and lining the pond to prevent ground water contamination.
   - New landfills would require liners and existing landfills would need groundwater monitoring.

A proposed rule was issued in June 2010. A date has not been set for the final rule.

Coal Combustion Residuals Rule Cost Estimate

Assumed changes in uses of coal ash produce large differences in the net benefits. The EPA's analysis has been criticized, for overvaluing the beneficial uses of coal ash by an order of magnitude, thus understating the cost associated with reductions in beneficial uses of coal.

EPA's CCR Rule Annual Cost/Benefit Estimates	Subtitle C		Subtitle D	
	Special Waste		Non-hazardous Waste	
	Cost	Benefit	Cost	Benefit
Scenario 1 - Induced increase in beneficial uses of coal ash	$1.5 billion	$6.3 - $7.4 billion	$0.6 billion	$2.5 - $3.0 billion
Scenario 2 - Induced decrease in beneficial uses of coal ash	$1.5 billion	($16.7) - ($15.6) billion	$0.6 billion	$0.1 - $0.6 billion
Scenario 3 - No impact on beneficial uses of coal ash	$1.5 billion	$0.2 - $1.3 billion	$0.6 billion	$0.1 - $0.6 billion

Source: Miller, P. A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability. Working Draft, JD Northeast States for Coordinated Air Use Management. January 24, 2011.

Power Plant Cooling Water Intake Structures Rule

Section 316(b) of the Clean Water Act requires that new power plants use the best available technologies for minimizing adverse environmental impacts.

Addressed aquatic ecosystem impacts include:

- Trapping (impingement) of fish and other aquatic life at cooling water intakes;
- Entrainment of smaller aquatic life (eggs and larvae) in water sucked into intakes;
- Thermal discharges from “open loop” cooling systems discharging warm water creating much warm water bodies.

The proposed rule is due March 14, 2011; The final rule is due July 2012.

Power Plant Cooling Water Intake Structures Rule Impact

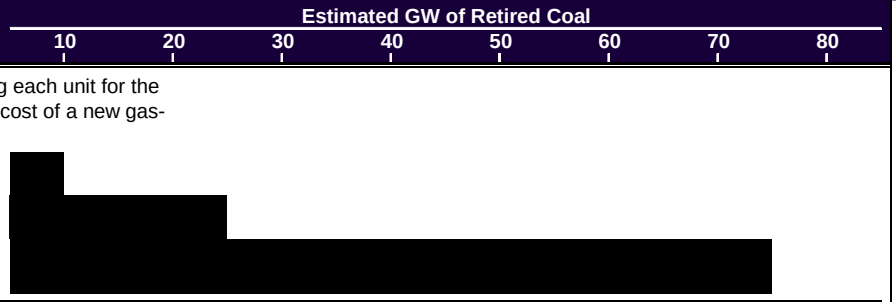
- EPA Administrator Lisa Jackson indicates it is likely to apply equally to all thermal plants.
- EPA has indicated it does not favor a “one-size-fits-all” approach.,
- EPA has flexibility in timing of implementation along with discretion in determining the “best available technology.”
- In a December 16, 2010 letter to incoming House Energy & Commerce Committee Chairman, Fred Upton (R-MI), EPA Administrator Lisa Jackson said the EPA’s upcoming proposal will:

  > reflect a common sense approach that reasonably accommodates site-specific circumstances while keeping faith with the need to minimize adverse environmental impact.

- Utilities estimate that upgrades required by the rule could cause the retirement of 11,000 to 12,000 MW of generating capacity and cost between $100 to $180 billion.

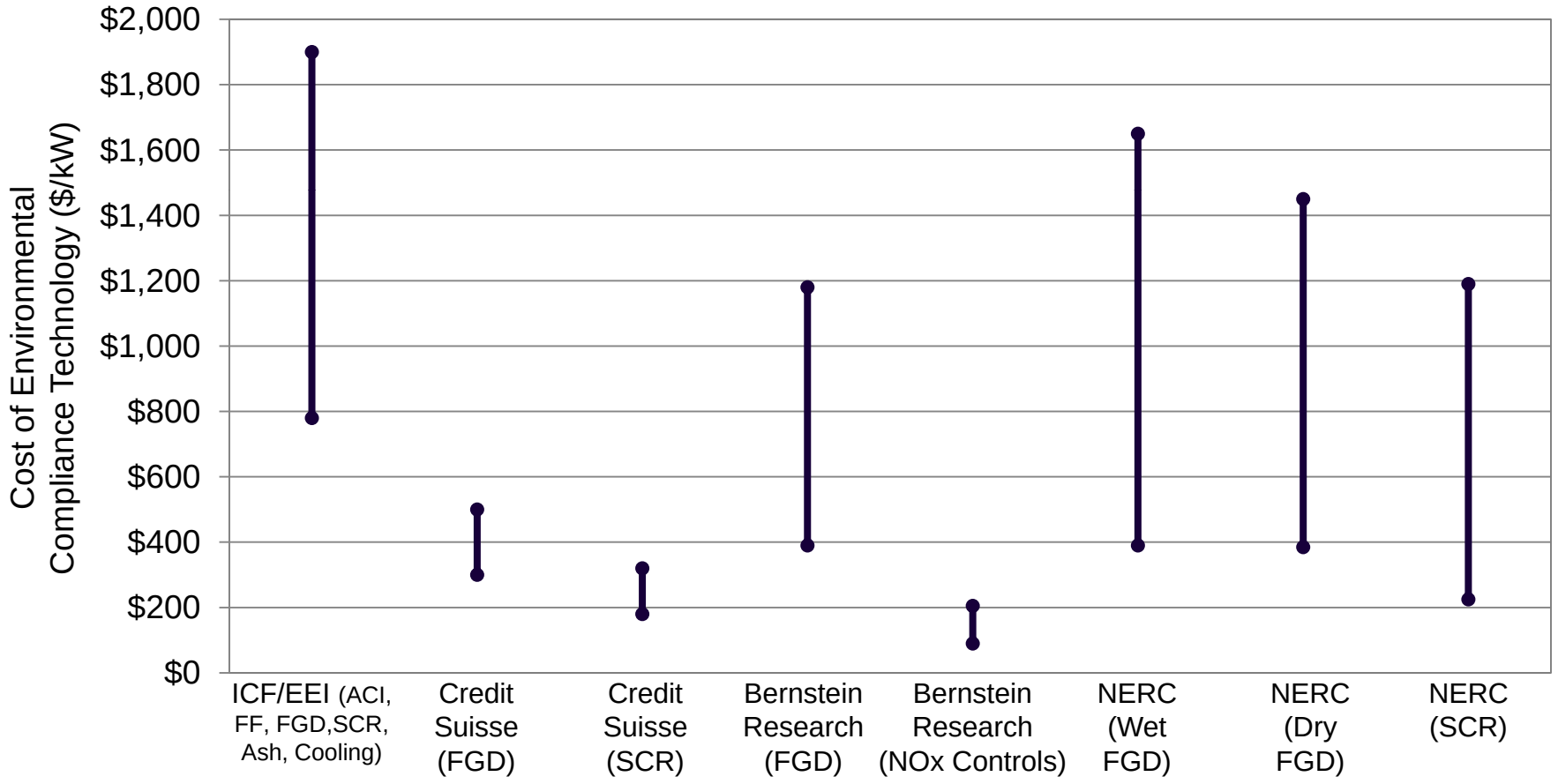
Summary of Retirement Studies Related to EPA Rules

Study	Retired Capacity	Regulation Requirements
NERC (October 2010)	47 to 76 GW by 2018 (total fossil fuel capacity, including oil and gas)	Levelized costs (@2008 CF) after retrofitting each unit for the environmental regulations compared to the cost of a new gas-fired unit. Scenario 1 - Transport Rule Scenario 2 - Transport Rule, MACT Scenario 3 - Transport Rule, MACT, 316(b) Cooling Water, Coal Ash
ICF/IEE (May 2010)	25 to 60 GW by 2015	Cost of retrofitting coal plant compared to cost of new gas CC Scenario 1 - Transport Rule, MACT Scenario 2 - Transport Rule, MACT, CWA 316(b)
Brattle Group (December 2010)	50 to 65 GW by 2020	Regulated Units - 15-year present value of costs > replacement power from a CC or CT. Merchant unit - 15-year present value of cost > revenues from energy and capacity markets. Transport Rule, MACT, 316(b) Cooling Water, Coal Ash
Credit Suisse (September 2010)	60 GW	Size and existing controls Transport Rule, MACT
Charles River Associates (December 2010)	39 GW by 2015	In-house model (NEEMS) optimizing costs of existing capacity and costs of potential new capacity. Transport Rule, MACT
MJ Bradley (August 2010)	30 to 40 GW	Switch to lower sulfur coal, install emission controls, or retire Transport Rule, MACT
Bernstein Research (October 2010)	51 GW	FGS + emissions on all coal fired units by 2015 Transport Rule, MACT



Source: Synapse Energy Economics, Inc., "Public Policy Impacts on Transmission Planning, Prepared for Earthjustice", December 10, 2010; and "Miller, P. A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability. Working Draft, JD Northeast States for Coordinated Air Use Management. January 24, 2011.

Summary of Studies on Cost of Compliance



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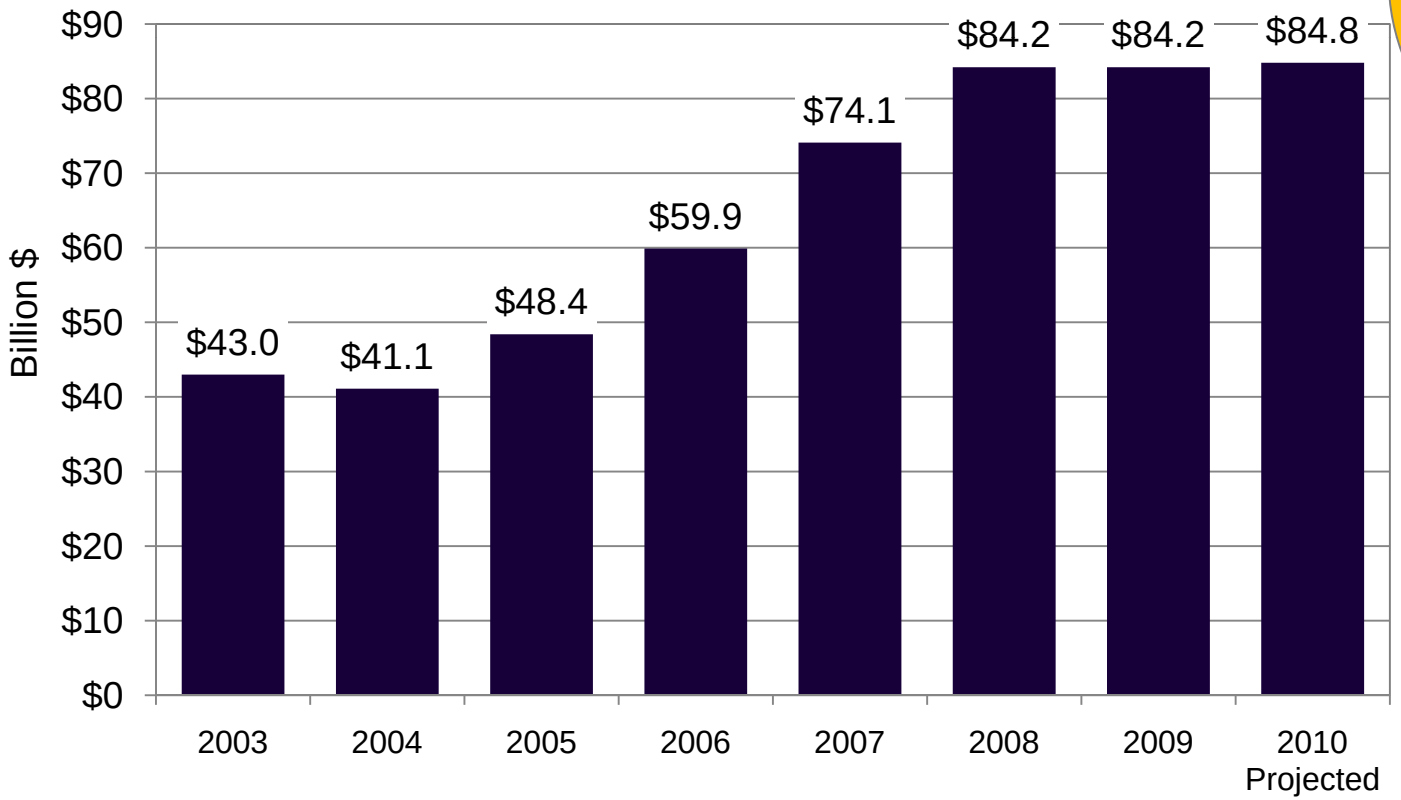
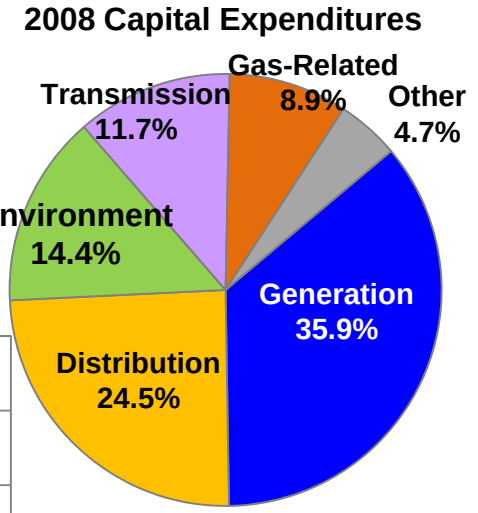
Industry Capital Expenditures (U.S. Shareholder-Owned Electric Utilities)

Increased capital spending is expected to continue.

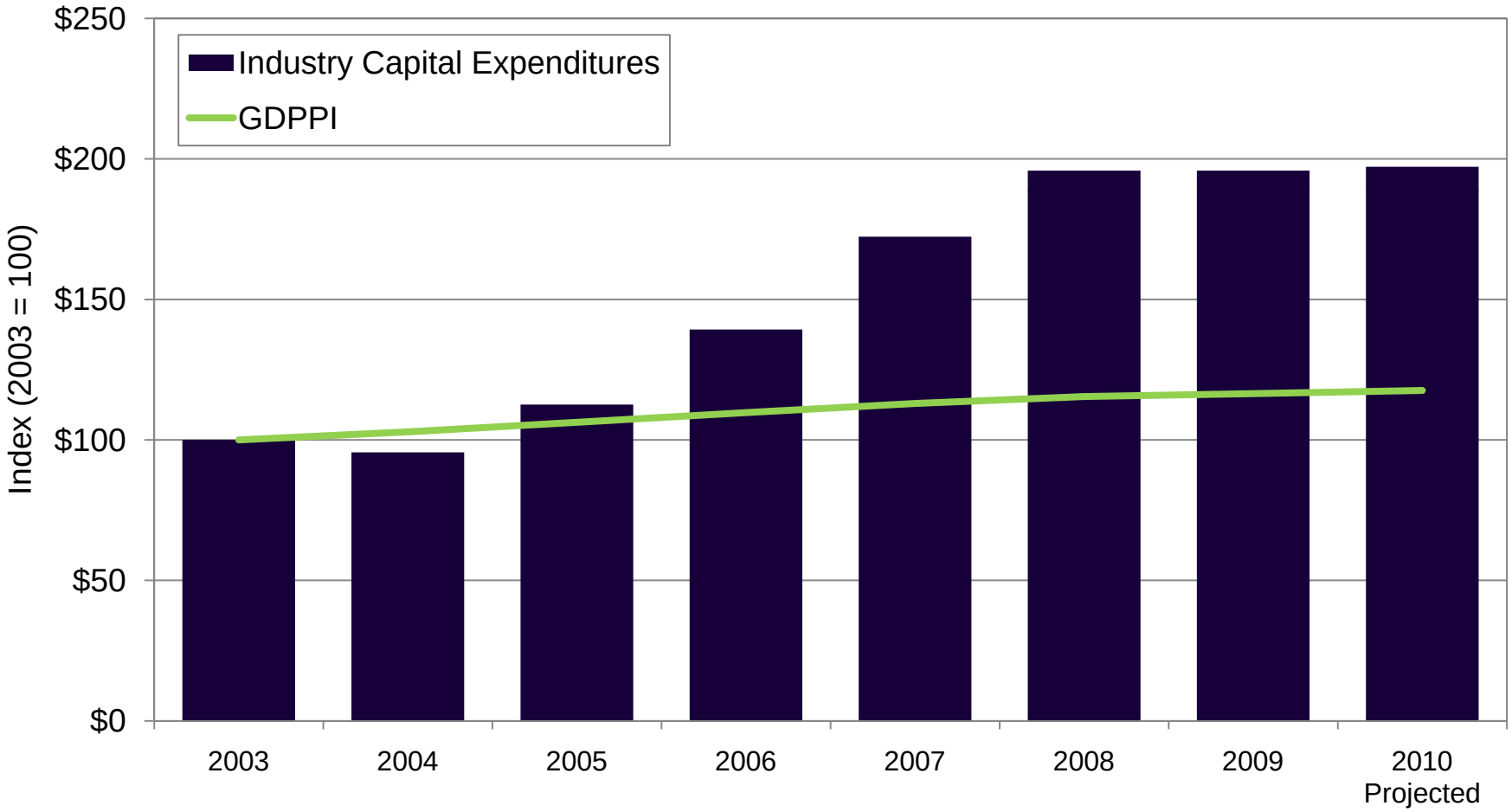
In 2008, environmental compliance costs accounted for 14.4 percent ($12 billion) of capital expenditures.





Source: Edison Electric Institute.

Industry Capital Expenditures (U.S. Shareholder-Owned Electric Utilities)



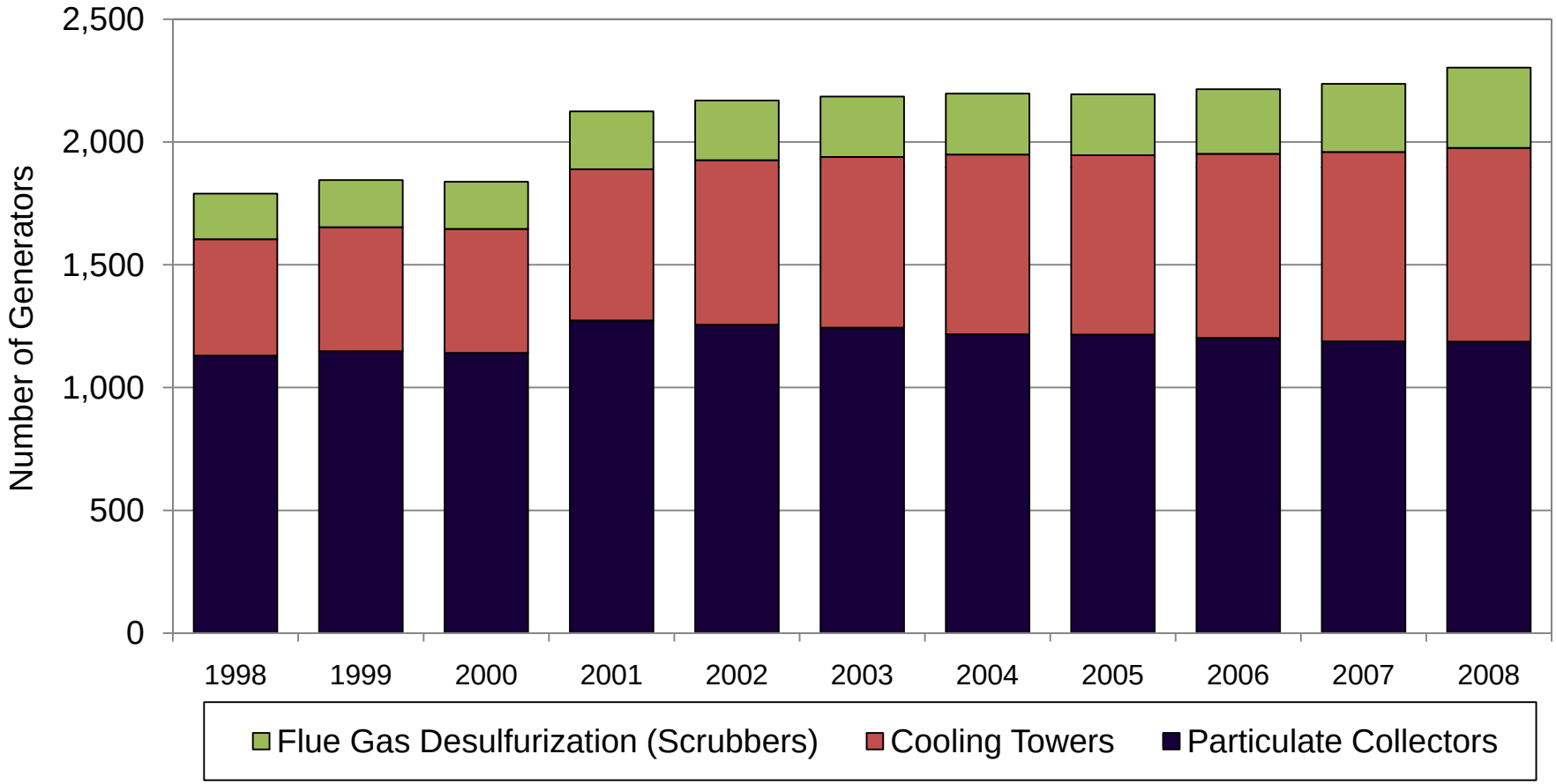
Source: Edison Electric Institute; and Bureau of Economic Analysis, U.S. Department of Commerce.

Environmental Compliance Costs

- From 2002 to 2005, the electric power industry spent at least $21 billion on compliance with federal environmental laws; state and local regulations drive costs even higher.
- The electric power industry spent over $10 billion in 2007 and $12 billion in 2008 on environmental compliance .
- The research, design, development and deployment of new technologies needed to reduce greenhouse gas (GHG) emissions will require additional investments.

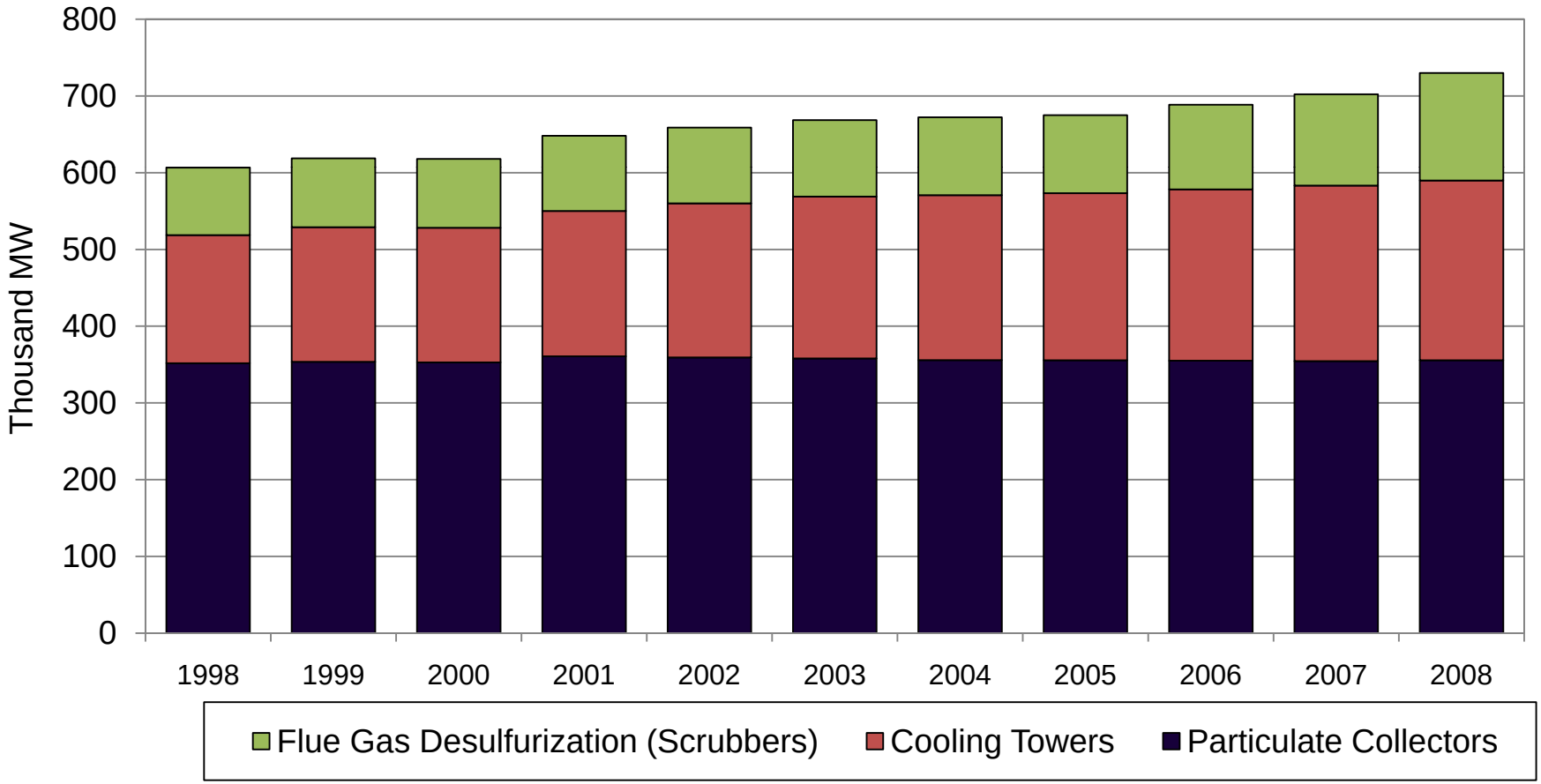
Source: Edison Electric Institute.

Number of Fossil-Fuel Steam-Electric Generators with Environmental Equipment



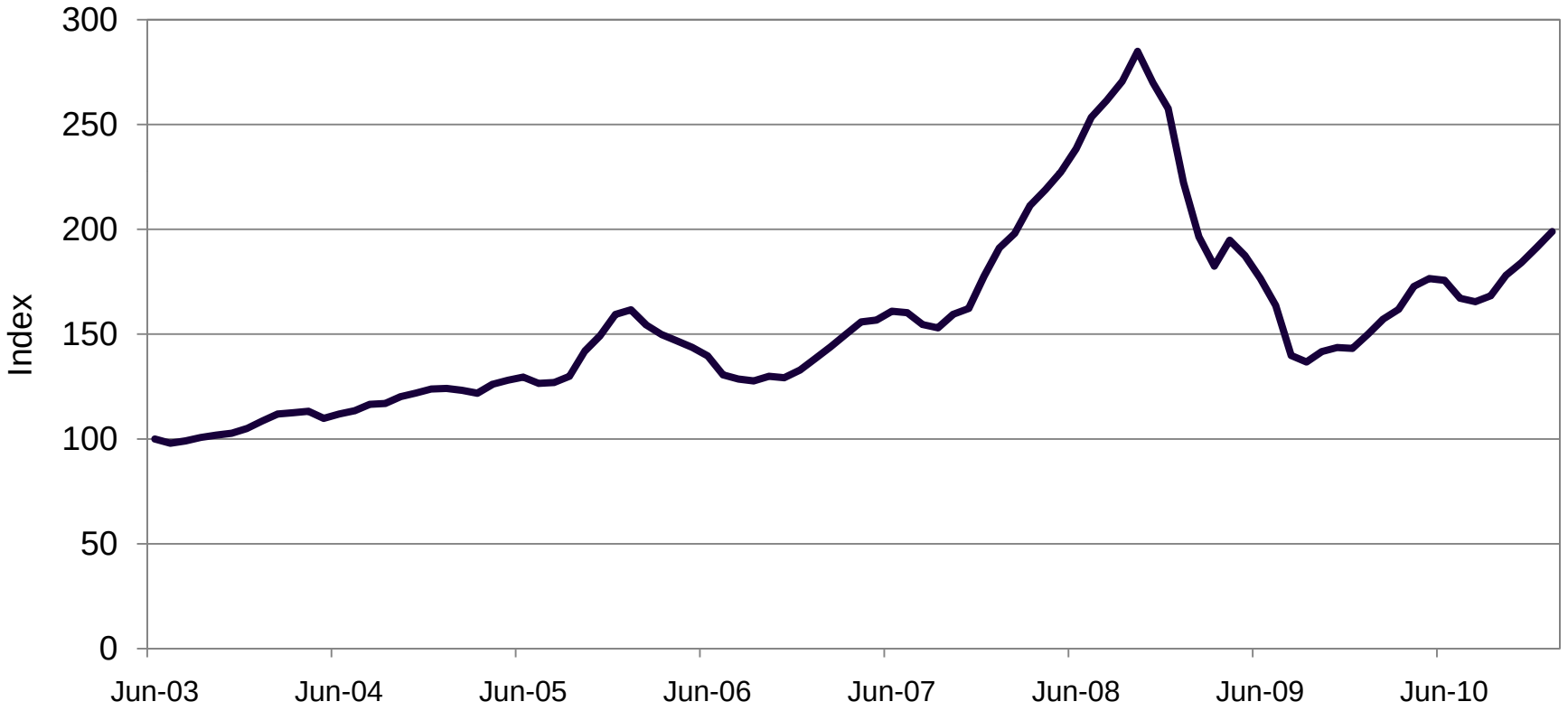
Source: Energy Information Administration, U.S. Department of Energy.

Capacity of Fossil-Fuel Steam-Electric Generators with Environmental Equipment



Source: Energy Information Administration, U.S. Department of Energy.

PPI Index – Synthetic Ammonia, Nitric Acid, and Ammonium Compounds



Source: Bureau of Labor Statistics, U.S. Department of Labor.