

May 17, 2011

The Honorable Lisa Jackson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C.

Dear Administrator Jackson:

I wanted to follow up on a report I sent to the EPA several months ago on the impact of the agency's upcoming proposed air rules on electric system reliability. That report, which I co-authored with Michael J. Bradley and others, concluded that electric reliability will not be compromised if the industry proactively manages the transition to a cleaner, more efficient fleet.

Since then, I have analyzed carefully many other reports written on this topic in the "field guide" enclosed, and pointed out the many ways that different participants in the electric industry can take steps to respond cost-effectively to the new regulations, per my recent speech at MIT, enclosed.

I continue to believe that given its many tools and dynamic markets, the electric industry is well-positioned to respond to EPA's proposed rules. A recent example can be found in the results of the market response to the May 13th PJM forward capacity auction. I thought it was worth bringing these results to your attention in light of some recent reports claiming that EPA rules would threaten reliability by causing the retirement of too many power plants. **The results of this auction confirm that the 13-state PJM region will have ample electricity supply after proposed EPA air and water rules take effect on or before January 2015.**

As you may know, PJM operates the nation's largest integrated power market that includes hundreds of generating units providing electric power to 54 million customers in 13 mid-Atlantic and Midwestern states, as well as the District of Columbia. With over one-sixth of total U.S. generating capacity, PJM is also home to many of the nation's coal plants, most of which will fall under the proposed Clean Air Transport Rule (CATR) and the Air Toxics rules.

Each year, to assure that there is sufficient generating capacity to meet future demand

in upcoming years, PJM solicits proposals from power suppliers willing to provide capacity to the market three years forward. The winners in each year's PJM Reliability Pricing Model (RPM) auction commit to being available to provide electric service during that future time period.

As indicated by the results of last week's RPM auction for power supply for the period from May 31, 2014 through June 1, 2015, PJM will have more than enough capacity to meet federal reliability standards set by North American Electric Reliability Corporation (NERC) in the year in which both the EPA's proposed CATR and Air Toxics rules would be in effect. Notably, more than 4 GW of new capacity came into the market with this auction, including new generation and new demand-side resources such as energy efficiency and demand response. This outcome shows the variety of ways in which market participants are providing efficient responses to power requirements as well as environmental requirements.

In addition, power companies in PJM that do not participate in the capacity auction, like AEP and Duke-Ohio, are required to certify that they have adequate capacity to ensure reliable service. These companies have confirmed that they have sufficient electric capacity to meet their needs through June 1, 2015 – more than five months after the EPA rules are expected to take effect.

As you know, potential reliability impacts were mentioned by utilities that rely heavily on coal in their testimony on April 15th, 2011, before the House Subcommittee on Energy and Power. They cited Edison Electric Institute's (EEI) 2010 modeling of the impact of EPA regulations on the electric power sector. I co-authored the enclosed peer review of the EEI modeling released last week and concluded it was based on worst-case assumptions that have not materialized and climate change legislation that was not enacted into law. PJM's capacity auction results confirm that the EEI model is based on unreasonable assumptions that led to overestimates of the number of power plant retirements.

The PJM auction results also reinforce a key finding in my August 2010 report and many analyses since then: the system has the tools to address the retirement of old, inefficient coal-fired units and preserve reliable service for customers. We do not need to trade off improvements in public health for lower electric reliability; both of these are essential "givens" for Americans. This investment in cleaning up and modernizing the nation's power supply system is important and do-able.

Hopefully, these new facts will help put to rest claims that EPA regulations will cause the lights to go out and end the argument that Americans must choose between reliable electricity and clean air.

Sincerely,

A handwritten signature in cursive script that reads "Susan F. Tierney".

Susan F. Tierney, Ph.D.
Managing Principal
Analysis Group

cc: The Honorable Regina A. McCarthy, Assistant Administrator for Air & Radiation

Enc:

- S. Tierney and C. Cicchetti, "The Results in Context: A Peer Review of EEI's "Potential Impacts of Environmental Regulation on the U.S. Generation Fleet," May 2011.
- S. Tierney, "Electric Reliability under New EPA Power Plant Regulations: A Field Guide," January 18, 2011
- S. Tierney, "EPA Regulations, Power Generation Capacity & Reliability," MIT Center for Energy & Environmental Policy Research Workshop – May 5, 2011.

The Results in Context:

**A Peer Review of EEI's "Potential Impacts of Environmental Regulation on the U.S.
Generation Fleet"**

May 2011

PREPARED BY

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Summary

In January of 2011, the Edison Electric Institute ("EEI") released a report entitled "Potential Impacts of Environmental Regulation on the U.S. Generation Fleet" ("Report") focusing on possible impacts of federal environmental laws and regulations on the electric power industry. Recently, the Report was cited in testimony before the United States House of Representatives Energy and Commerce Committee, and in a variety of other forums, to support the claim that new environmental regulations will trigger as much as 70-80 GWs of coal plant retirements by 2015¹. This peer review analysis evaluates the Report's findings in light of the actual proposed Utility Air Toxics and cooling water intake regulations which the Environmental Protection Agency ("EPA") released in March 2011, two months after EEI issued the Report. **We conclude that the Report was based upon worst-case assumptions which have not materialized and upon climate change legislation never enacted into law.**

The Report does not adequately distinguish between the non-environmental drivers of changes in the electricity industry and the various EPA rulemakings. There is also inadequate discussion of the non-traditional alternatives available to meet system requirements, or of various initiatives underway to strengthen the resiliency and reliability of the electricity network. The Report's excessively conservative and often misleading assumptions affect EEI's modeling results.

¹ See Subcommittee on Energy and Power, Committee on Energy and Commerce, United States House of Representatives Hearing, April 15, 2011, Thomas A. Fanning, Chairman, President, and Chief Executive Officer, The Southern Company, Transcript at line 2112, p. 104.

There is one reference case and 9 scenario runs in the Report². We reproduce the Report’s Table 1³ and annotate it with information on these assumptions.

**Table 1 –
Summary of Scenarios
Modeled by EEI with Estimated Coal Plant Retirements:
Reasonable V. Unreasonable Scenarios**

National Coal Retirements (GW)

GW of Retirements due to market fundamentals, not EPA regulations

GW of Retirements due to EPA regulations

Run	Scenario	Planned Coal Retirements		Unplanned Coal Retirements		Total Coal Retirements		Incremental Coal Retirements	
		2015	2020	2015	2020	2015	2020	2015	2020
1	Reference Case	6	16	19	22	25	0	0	
2	Scenario 1	6	50	50	56	56	30	31	
3	Scenario 1 + Alt Air	6	41	41	46	46	24	21	
4	Scenario 1 + Alt Water	6	49	50	55	55	33	30	
5	Scenario 2	6	73	90	79	95	57	71	
6	Scenario 2 + Alt CO2	6	66	73	71	79	50	54	
7	Scenario 2 + Alt Air	6	64	77	70	82	48	58	
8	Scenario 2 + Alt Ash	6	75	96	81	101	59	76	
9	Scenario 2 + \$1.50 Gas	6	47	56	52	61	31	37	
10	Scenario 2 + \$3.00 Gas	6	33	36	38	41	17	17	

The shaded rows contain unrealistic assumptions, summarized below:

1. That Waxman-Markey climate bill is enacted and goes into effect by 2016 with a \$26/ton carbon price (all Runs except #1, #2, #3, #4)
2. That EPA water regulations impose a “one-size-fits all” requirement that all coal plants over a certain size need a cooling tower (all Runs except #1 and #4)
3. That all coal plants would have to install a scrubber rather than use lower-cost control technologies (all Runs except #1 and #3)

Source of underlying table: Table 1 from the EEI Report, with annotations by authors Tierney & Cicchetti

Although not apparent from the labels used for the different scenarios, all of the facility retirement scenarios contain one or more of the following assumptions that were unreasonable at the time that EEI’s consultants conducted their study: (1) that the Waxman-Markey climate change bill passed both houses of Congress, *despite the fact that the legislation failed over ten*

² The Report includes a reference case and 9 alternative scenarios that reflect different combinations of assumptions regarding EPA regulations and natural gas prices. The six scenarios that reflect a carbon price are the Report’s Scenarios: “2”; “2+Alt CO2”; “2+Alt Air”; “2+Alt Ash”; “2+\$1.50 gas”; “2+\$3.00 gas.”

³ See EEI, ICF “Potential Impacts of Environmental Regulation on the U.S. Generation Fleet”, January 2011, (“Report”) Table 3.1, “National Coal Retirements (GW)”, p.11.

*months ago;*⁴ (2) that EPA would impose a one-size-fits-all cooling tower requirement on U.S. power plants over the course of the next decade, *despite the fact that EPA Administrator Jackson confirmed in an December 16, 2010 letter to Congress that EPA rejected a one-size-fits-all approach (a position that now can be seen in the new regulations proposed in March 2011);*⁵ or (3) that industry could not use less costly, alternative technologies and resource options to reduce air toxics emissions *despite the fact that many coal plants already do use these technologies and many utilities now use different options to meet customers' reliability requirements.*

Reliance on so many fundamentally unrealistic assumptions undermines the usefulness of the Report's overall results, since these unreasonable assumptions overstate the impact of environmental regulations. As such, the results could lead policymakers to an unreasonable and unsupported conclusion that Americans must chose between improving the nation's health and affordable, reliable electricity.

Moreover, contrary to some testimony before the House Energy and Commerce Committee, the Report does not support the proposition that new EPA regulations will drive 70-80 GWs of retirements by 2015. Only two scenarios – "Scenario 2" (Run 5 in Table 1) and "Scenario 2 + Alt Ash" (Run 8 in Table 1) – showed more than 70 GWs of incremental retirements by 2020, not by 2015. These scenarios contained all three of the erroneous assumptions described above.

We agree with EEI that competitive pressures from natural gas-fired plants fueled by

⁴ This assumption is in the Report's Scenarios: "2"; "2+Alt CO2"; "2+Alt Air"; "2+Alt Ash"; "2+\$1.50 gas"; "2+\$3.00 gas."

⁵ Report Scenarios: "1"; "1+Alt Water"; "2"; "2+Alt CO2"; "2+Alt Ash"; "2+\$1.50 gas"; "2+\$3.00 gas".

relatively inexpensive shale gas are forcing some inefficient, older coal plants out of business.⁶ This is shown in the Reference Case, estimating that 22 GW of coal plants will retire by 2015 based on current fuel price and other economic assumptions as well as all policies currently on the books (e.g., state mercury regulation, state-based renewable standards, the Clean Air Interstate Rule).

The most reasonable scenario of the 9 modeled in the Report is the "Scenario 1 + Alt Air" (Run No. 3), which predicts 24 GWs of incremental coal retirements beyond the Reference Case. Market forces alone will cause approximately one-half of the retirements (22 GW) under this scenario without any new EPA regulations. To put the incremental 24 GWs into perspective, the U.S. currently enjoys over 100 GWs of excess capacity and has a demonstrated track record of building new capacity⁷ when needed. In just three years between, between 2001 and 2003, electric generators in the U.S. added 160 GWs of new gas-fired generation.⁸ Likewise, the electric industry has a proven track record of timely installing mandated environmental controls. Well over half of the industry already is in compliance and control technology experts have reported that the remaining plants can install controls within the compliance timeline.

To conclude, the Report's scenario assumptions have turned out to be overly aggressive compared to EPA's actual proposed rules, and as a consequence, the Report overstates cost and retirement impacts related to the EPA rules. Nothing in the Report alters our conclusion that the industry is well positioned to comply with the actual regulations on the proposed schedule.

⁶ These retirements are shown in the Reference Case results.

⁷ North American Electric Reliability Corporation ("NERC"), 2009 Long-Term Reliability Assessment: 2009-2018, October 2009.

⁸ Energy Information Administration ("EIA") Annual Electric Generation Report: Form EIA-860, 2008.

The Results in Context

A. Key Assumptions in the Report Lead to Overstated Retirements and Compliance Costs

EEI prepared its Report before EPA had issued its proposed cooling water intake regulations and Utility Air Toxics Rule. The Report's authors made certain binding assumptions about the impending rules that we now can test against EPA's actual proposals. Although the Report's scenarios were intended to bracket the range of possible outcomes, all nine of EEI's scenarios depict far more aggressive environmental standards than the actual proposed regulations and laws. Indeed, in some cases, EEI's assumptions even conflict with facts known prior to the Report's preparation. For example:

- Six of the nine scenarios⁹ modeled (Runs 5-10) contain an underlying assumption that the Waxman-Markey bill went into law, imposing a rising price on carbon dioxide ("CO₂"), starting at \$26/ton beginning in 2016. It was well-known in January when the report was carried out, however, that Congress did not enact Waxman Markey and no federal legislation or regulation imposes a price on CO₂.
- Eight of the nine scenarios¹⁰ modeled (Runs 2, and 4-10) failed to consider less costly methods of controlling certain air emissions through dry sorbent injection, even though Midwest Generation,¹¹ one of the largest merchant coal generators in the nation, had announced that these less costly technologies could be deployed to control emissions and would not require plant retirements.

⁹ The Report includes a reference case and 9 alternative scenarios that reflect different combinations of assumptions regarding EPA regulations and natural gas prices. The six scenarios that reflect a carbon price are the Report's Scenarios: "2"; "2+Alt CO₂"; "2+Alt Air"; "2+Alt Ash"; "2+\$1.50 gas"; "2+\$3.00 gas."

¹⁰ Report Scenarios: "1"; "1+Alt Water"; "2"; "2+Alt CO₂"; "2+Alt Ash"; "2+\$1.50 gas"; "2+\$3.00 gas".

¹¹ In its third quarter 10-Q filed on October 29, 2010, Midwest Generation stated: "Testing of [dry scrubbing with sodium-based sorbents] demonstrated significant reductions in SO₂ emissions and...is expected to require substantially less capital and installation time....", 10-Q at p.55.

- Eight of the nine scenarios¹² modeled (Runs 2, 3 and 5-10) assumed EPA would require cooling towers as a "one-size-fits-all" mandate on every U.S. fossil and nuclear power plant over the next decade. Yet, in a December 16, 2010 letter to Congressman Fred Upton, EPA Administrator Lisa Jackson advised Congress that: "I do not favor a one-size-fits-all federal mandate."

Finally, the report ignores an important fact for policymakers to consider: a significant portion of the industry has already installed the types of control equipment anticipated in the new air regulations. Over 150 GWs of the total 320 GWs of coal units in the U.S. have such controls and another 55 GWs are installing the equipment now.¹³ In sum, over two thirds of the nation's coal plants are either complying or soon will comply with the regulations and remain in business.

B. Low Natural Gas Prices Drive About 50 Percent of Predicted Retirements

Since 2008, natural gas prices have fallen over 60 percent¹⁴ as a result of the opening up of abundant, new domestic natural gas from shale formations.¹⁵ In turn, low gas prices have been a primary driver of wholesale electricity prices being down over 30 percent.¹⁶ In many

¹² Report Scenarios: "1"; "1+Alt Air"; "2"; "2+Alt CO2"; "2+Alt Air"; "2+Alt Ash"; "2+\$1.50 gas"; "2+\$3.00 gas."

¹³ M. J. Bradley & Associates/Analysis Group, "Ensuring a Clean Modern Electric Generation Fleet while Maintaining Electric System Reliability," August 2010, p. 18.

¹⁴ On July 1, 2008, gas peaked at \$13.60 per MMBtu its current price is \$4.38, or about 68 percent lower.

¹⁵ With new technologies to access the gas, shale gas production has increased 14 fold in 10 years, and the estimated size of the resource base itself has grown more than 20-fold. Compare, for example, the following estimates that indicate the effect of new drilling technologies that increased the estimated size of the accessible U.S. shale gas resource base: 34.7 trillion cubic feet ("TCF:"), estimated by the National Petroleum Council in 2003; 125 TCF/320 GWs of capacity,¹⁵ TCF, estimated by ICF International ("ICF") in 2008; 631 TCF, estimated by ICF in 2009; and 827 TCF, estimated by EIA in 2011. Sources: NPC, "Balancing Natural Gas Policy: Fueling the Demands of a Growing Economy, Supply," September 2003, Table S2-21; EIA, Annual Energy Outlook, Early Release Overview, page 1; ICF study for the Interstate Natural Gas Association of American, "Availability, Economics, and Production Potential of North American Unconventional Natural Gas Supplies, 2008, Table 7.

¹⁶ The load-weighted energy prices in PJM were \$71.13 in 2008 as compared to \$48.35 in 2010. See Monitoring Analytics, *2009 State of the Market Report for PJM*, Volume 1, March 11, 2010; Monitoring Analytics, *2010 State of the Market Report for PJM*, Volume 1, March 10, 2011.

regions of the U.S., efficient natural gas-fired plants are cheaper to operate and are displacing some output from older, less efficient coal plants.

The Report correctly recognizes the impact of these low gas prices on coal plant retirements.¹⁷ Notably, approximately half of the predicted coal plant retirements in "Scenario 1 + Alt Air" is expected to occur due to market fundamentals, even if EPA somehow avoided its legal obligation to promulgate these new rules.

EEI analysis and our own work confirms that we are entering a new era where important natural gas resources that are now economically accessible are triggering a transition in America's power sector from coal to gas *while simultaneously reducing power prices in many parts of the U.S.* Although unwelcomed by some, this transition reflects the use of a domestic fossil fuel (not unlike coal). Nonetheless, this replacement will result in lower emissions and new jobs as old and inefficient power plants are replaced with newer units that are more efficient and that have a lower overall emissions footprint relative to coal. Nearly, 60 percent of the existing coal fleet is over 40 years old – the design life for most units.¹⁸ The oldest and most inefficient of these are generally also the dirtiest, since they have not installed controls in the two decades since President Bush signed the Clean Air Act Amendments of 1990.

These plants – and in some cases, the consumers of their power – have had the economic advantage of operating for decades without modern pollution controls. While understandably attractive to consumers' wallets, these plants emit unhealthful levels of air pollutants, well

¹⁷ According to the Report, 22 GWs of retirements in 2015 and 25 GWs in 2020 "are mostly due...to a generally low natural gas price forecast that makes it uneconomic to continue to operate these typically smaller and older units. These retirements are forecast to occur absent any new air, ash and water regulations". Report, p. 11.

¹⁸ M.J. Bradley, *supra*, Table 5, p. 20. Almost 60% of the coal fleet is older than 40 years old with nearly 36% of the fleet older than 50 years old. These older power plants tend to be smaller and less efficient (more costly to operate) than coal plants built in the 1970s or later. These older power plants also disproportionately represent the category of plants without pollution controls and that could be forced to retire as a result of low gas prices and environmental costs.

beyond the compliance runway originally envisioned when Congress passed the 1990 amendments to the Clean Air Act.

Overall, claims of compliance challenges in meeting EPA's deadlines sound reasonable, but do not square with history. A company that begins planning for the Utility Air Toxics rule today (May 2011) will have at least 43 months and as much as 55 months to comply with the final rule.¹⁹ Past experience demonstrates that this time period is ample. For example, in a June 17, 2005 filing with the Georgia Public Service Commission, Georgia Power notified the Commission of its intent to file for permits to install scrubbers at several of its plants and that Georgia Power "expects a three year construction cycle for each scrubber" and needed the scrubbers to comply with federal and state clean air rules "some of which were recently finalized and others of which are still under development."²⁰ Similarly, Southern Company reported that it installed its Plant Wansley retrofit in about 30 months,²¹ and its Plant Crist project in 31 months.²² Southern expects that its Plant Daniel scrubber project should start this year and be operational by late 2014, to comply with EPA's air regulations.²³

Such time frames are consistent with industry data from construction firms that manage and oversee pollution control installations. According to the Institute of Clean Air Companies

¹⁹ EPA is subject to a court-imposed deadline to finalize its Utility Air Toxics Rule by November 2011. The Clean Air Act allows three years for existing sources to comply, with the possibility of a unit-specific, one-year extension to complete pollution control installations, for a total of up to 55 months from May.

²⁰ Letter to Mr. Reece McAlister, Executive Secretary, Georgia Public Service Commission from Oscar C. Harper, Manager, Regulatory Affairs, Georgia Power, June 17, 2005.

²¹ See, *Georgia Power cutting emissions at Plant Wansley by 95 percent with new scrubbers*, available at http://times-georgian.com/view/full_story/3283571/article-Georgia-Power-cutting-emissions-at-Plant-Wansley-by-95-percent-with-new-scrubbers

²² This is based on a launch date of May 2007 and a completion date of December 2009. See relevant Southern Company Press Releases available at: http://www.southerncompany.com/news/iframe_pressroom.aspx and http://www.southerncompany.com/news/iframe_pressroom.aspx.

²³ See relevant Mississippi Power Press Release available at: http://www.mississippipower.com/environment/cleaner_air.asp

("ICAC")²⁴ and AFL-CIO Buildings and Construction Trades Department,²⁵ labor availability or equipment system availability should not constrain timely implementation of new EPA air regulations. In fact, these groups report that they welcome the substantial employment and economic benefits created by the new infrastructure investment required to modernize the electric generation fleet. Given current low interest rates, surplus equipment, high unemployment in related skill trades, and otherwise favorable conditions produced by low natural gas prices, this happens to be a highly favorable time to invest in a cleaner, more modern generation fleet. These investments will produce economic benefits and increase health benefits.

C. EEI's "Scenario 1+Alt Air Case" is the Most Plausible Scenario, But Still Overstates Retirements

We noted previously our concerns about EEI's modeling assumption that the Waxman-Markey bill passed in Congress and became the law of the land. This did not happen, yet two thirds of EEI's modeling scenarios assumed that it has been enacted into law and will go into effect within a few years.

EEI modeled three scenarios that did not include a price on carbon: Scenario 1, "Scenario 1 + Alt-Air" and "Scenario 1 + Alt Water," which respectively produced 56, 46 and 55 GWs of retirements. Taking into account the substantial retirements that relatively low natural gas prices will induce, the factors unrelated to new EPA regulations drive almost half, or in one case even more than half, of the estimated coal retirements:

²⁴ See, e.g., the ICAC letter to Senator Thomas Carper, November 3, 2010; http://www.icac.com/files/public/ICAC_Carper_Response_110310.pdf; pp. 1, 3,

²⁵ See, the AFL-CIO Building and Construction Trades Department letter to Senator Thomas Carper, November 5, 2010.

Table 2
Estimated Coal Plant Retirements Under EEI Alternative Scenarios

Run	Scenario	Total Coal Retirements (GW)		Coal Plant Retirements due to Market Factors (GW)		Coal Plant Retirements (%) due to Market Factors		Incremental Coal Retirements from EPA Regulations (GW)	
		2015	2020	2015	2020	2015	2020	2015	2020
1	Reference Case	22	25	22	25	100	100	0	0
2	Scenario 1 (assuming strict hazardous air pollutant, coal ash, and water regulations)	56	56	22	25	40	45	34	31
3	Scenario 1 + Alt Air (less strict hazardous air pollutant, and otherwise Scenario 1)	46	46	22	25	48	54	24	21
4	Scenario 1 + Alt Water (Fossil and nuclear units of certain size and with once-through cooling that withdraws water from sensitive water bodies must install cooling towers.)	55	55	22	25	40	45	33	30

Furthermore, “Scenario 1” and “Scenario 1 + Alt Water” both contain the unrealistic assumption that every coal plant must install a scrubber to achieve air compliance and cannot use less costly technologies (such as TRONA or dry sorbent injection (“DSI”). Many coal fleet owners already have rejected this premise. Others can reasonably be expected to do so. DSI technology has been used successfully for acid gas control for more than twenty years. The Air Toxics Rule allows this less costly compliance option, which can be applied to SO₂, SO₃, sulfuric acid and other acid gases such as hydrochloric acid. This option has been endorsed by major

technology vendors,²⁶ and may reduce compliance costs relative to wet scrubbers, especially for units burning low carbon/low sulfur coals.

One scenario ("Scenario 1 + Alt Air") acknowledges these less costly technologies and provides the most reasonable estimate of retirements under the proposed EPA regulations. Even this scenario overstates retirements in light of its assumption that all plants must and eventually will install cooling towers – which is not what EPA has proposed. Thus "Scenario 1 + Alt Air" should be rejected as unreasonable, or at most viewed as the upper end of the bracket, not the lowest end as represented in the Report.

D. Putting 24 GWs of Retirements into Perspective

The 24 GWs of incremental capacity in Scenario 1 + Alt Air that is estimated to retire as a result of the EPA regulations represents less than 8 percent of the nation's coal fleet (which totals approximately 320 GWs of capacity²⁷). Coal plants generate approximately 45 percent of the total power in the U.S.²⁸ Notably, between just 2001 and 2003 the U.S. electric industry constructed 160 GW of new combined cycle generation, over six times the amount of retirements predicted under EEI's most plausible scenario.²⁹

The Report's scenarios do not consider current electricity demand forecasts. For example, EIA's most recent long-term forecast (2011) lowers the demand forecast for the years

²⁶ http://www.epa.gov/airmarkets/progsregs/epa-ipm/docs/append5_4.pdf,
<http://www.unitedconveyor.com/CatalogItem.aspx?id=396>,
<http://www.netl.doe.gov/technologies/coalpower/cctc/ccpi/pubs/SOx-NOx%20Reduction%20at%20PIPP%20-%20Topical%20Report%20Final.pdf>

²⁷ M.J. Bradley, *supra*, p. 18.

²⁸ US EIA Energy Outlook-2011, April 26, 2011.

²⁹ EIA, Annual Electric Generator Report: Form EIA-860, 2008.

2015-2020 by 2.5 percent relative to the 2010 forecast used in the Report.³⁰ Similarly, PJM, the grid operator in parts of the Mid Atlantic/Midwest regions, recently released new forecasts showing that because of economic factors including cost-effective energy efficiency and demand response programs, demand for electricity will be substantially lower than previously forecast.³¹ PJM now predicts that some parts of its region will not reach the demand previously forecasted for 2014 until at least 2020.

Furthermore, the Report does not consider that compliance can be achieved not only by building new power plants or retrofitting existing ones, but also through cost-effective demand response, energy efficiency, transmission additions or reconfigurations, or various combinations of strategies. The Report assumes both a static transmission grid (rather than one incorporating the smart grid technologies proposed or already implemented in various parts of the country) and lack of expanded energy efficiency and demand-reduction measures. Advanced smart metering and demand side technologies reduce the need to add capacity for resource adequacy purposes, allow for system operation with greater efficiency and flexibility, and provide customers with more visible price signals to incentivize switching electricity use to less expensive, off peak times.

As many studies have confirmed,³² demand levels, transmission utilization and demand side technologies are critical factors in determining resource adequacy. The Report's failure to consider these relevant factors further reduces the reasonableness of its results.

³⁰ This is based on evaluating the EIA 2011 AEO's estimates for electricity use in 2015 and 2020 (shown in document ref2011.d120810c), compared to the EIA 2010 AEO's estimates for the same years.

³¹ "2011 PJM Load Forecast Report," PJM Resource Adequacy Planning Department, January 2011.

³² See, for example, the "Scenario Analyses" performed by the ISO-New England at the request of the New England state regulators, to ensure that that grid operator evaluated the implications of various resource options on reliability requirements and system production costs. http://www.iso-ne.com/committees/comm_wkgrps/othr/sas/mtrls/elec_report/scenario_analysis_final.pdf.

Conclusion

Because of various inappropriate and unrealistic assumptions, the Report's scenarios overstate cost and retirement impacts. The scenarios assumed, for example, a one-size-fits-all cooling tower mandate and most scenarios were based on climate change legislation never enacted into law. Neither of these is grounded in real world realities today.

In stark contrast to others that conclude that EPA regulations could lead to 70-80 GW of coal retirements by 2015, we conclude that the most plausible scenario ("Scenario 1 + Alt Air") estimates that there will be no more than 24 GW of incremental retirements from EPA regulations. Even this 24 GW scenario overstates retirements since it assumes that all plants must install cooling towers – which is a more conservative assumption than what EPA has recently proposed.

Moreover, the Report acknowledges that approximately one half of the total retirements predicted under the most plausible scenario result from market fundamentals – primarily low gas prices - and will occur absent any new EPA regulations. To put the incremental 24 GW of retirement into context, there is currently over 100 GW of excess capacity in the US and a proven history of building new capacity when needed. Accordingly, nothing in the Report changes our conclusion that the industry is well-positioned to comply with the actual regulations on the proposed schedule and yield significant benefits to the Nation.

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Electric Reliability under New EPA Power Plant Regulations: A Field Guide

By Susan Tierney, Ph.D. on January 18, 2011

Tags: energy EPA regulation us policy



Photo credit: flickr/Nick Humphries

Keeping track of reports on the potential impacts of EPA regulations is becoming a full time job. Dr. Susan Tierney, Managing Principal at the Analysis Group and WRI Director, provides a “field guide” to these studies, and explains what they might mean for the power supply landscape in the next few years.

The Environmental Protection Agency (“EPA”) is proposing new regulations designed to reduce the emissions of harmful and toxic pollutants released to the air by electric power plants, as required by the Clean Air Act. Other EPA regulations under existing laws would affect water and waste systems of certain power plants. While power plants would be brought into compliance gradually over the next decade, questions have been raised about the reliability of the electric power system as the industry responds to the new regulations. Several new studies have weighed in on the debate. This article provides a “field guide” to these reports and their conclusions.

EPA, Greenhouse Gases, and the U.S. Economy

*As the U.S. Environmental Protection Agency uses its authority to limit greenhouse gases and other pollutants, members of Congress are wondering what these rules mean for the people and industries in their states. **In this series, the non-partisan World Resources Institute examines pending actions and what they mean for the U.S. economy:***

- [What Are Limits on EPA? Clean Air Act Holds Answers](#)
- [EPA, The Clean Air Act, and U.S. Manufacturing](#)
- [For EPA Regulations, Cost Predictions Are Overstated](#)
- [Response to EEI's Timeline of Environmental Regulations For the Utility Industry](#)
- [EPA Regulations: Not a Moratorium on Industrial Construction](#)
- [Electric Reliability under New EPA Power Plant Regulations: A Field Guide](#)
- [Myths & Facts About U.S. EPA Standards](#)

My own conclusion, based on their findings, and my own study for the [Analysis Group/MJ Bradley Associates](#), is that EPA regulations are manageable and will render the resulting fleet of power generators more efficient and with lower emissions. We do not need to trade off cost-effective benefits in the form of public health for lower electric reliability; both of these are essential “givens” for Americans. This investment in cleaning up and modernizing the nation’s power supply system is important and ultimately do-able.

State of Play

Keeping track of every new report on the potential impacts of planned federal environmental regulations is becoming a full time job. In the past few months alone, several new studies have outlined their authors’ views of the different implications for power plant retirements that could result from EPA’s proposed air and water regulation affecting existing generating units. ([See list below.](#))

Some observers have suggested that many, if not all, of these regulations need to be delayed in order to ensure that upcoming retirements of coal-fired power plants do not lead to adverse impacts on the reliability of the electric grid, while others have pointed out the various ways that the industry and its regulators are well-equipped to take the actions needed to ensure that public health is protected while keeping the lights on everywhere as uneconomical plants proceed to retirement.¹

While there are some common themes, it can be hard to pinpoint the reasons why reports on this subject sometimes come to different conclusions about potential retirement implications of the new regulations. Some of the studies look at the impacts of air regulations alone, but not water regulations. Others study the impacts of EPA actions relating to new greenhouse gas (GHG) emission regulations, while others do

not. Some studies are clear about their assumptions regarding important factors such as natural gas prices; others are not. These differences make it difficult for the most experienced analysts to make sense of why the studies come to different conclusions.

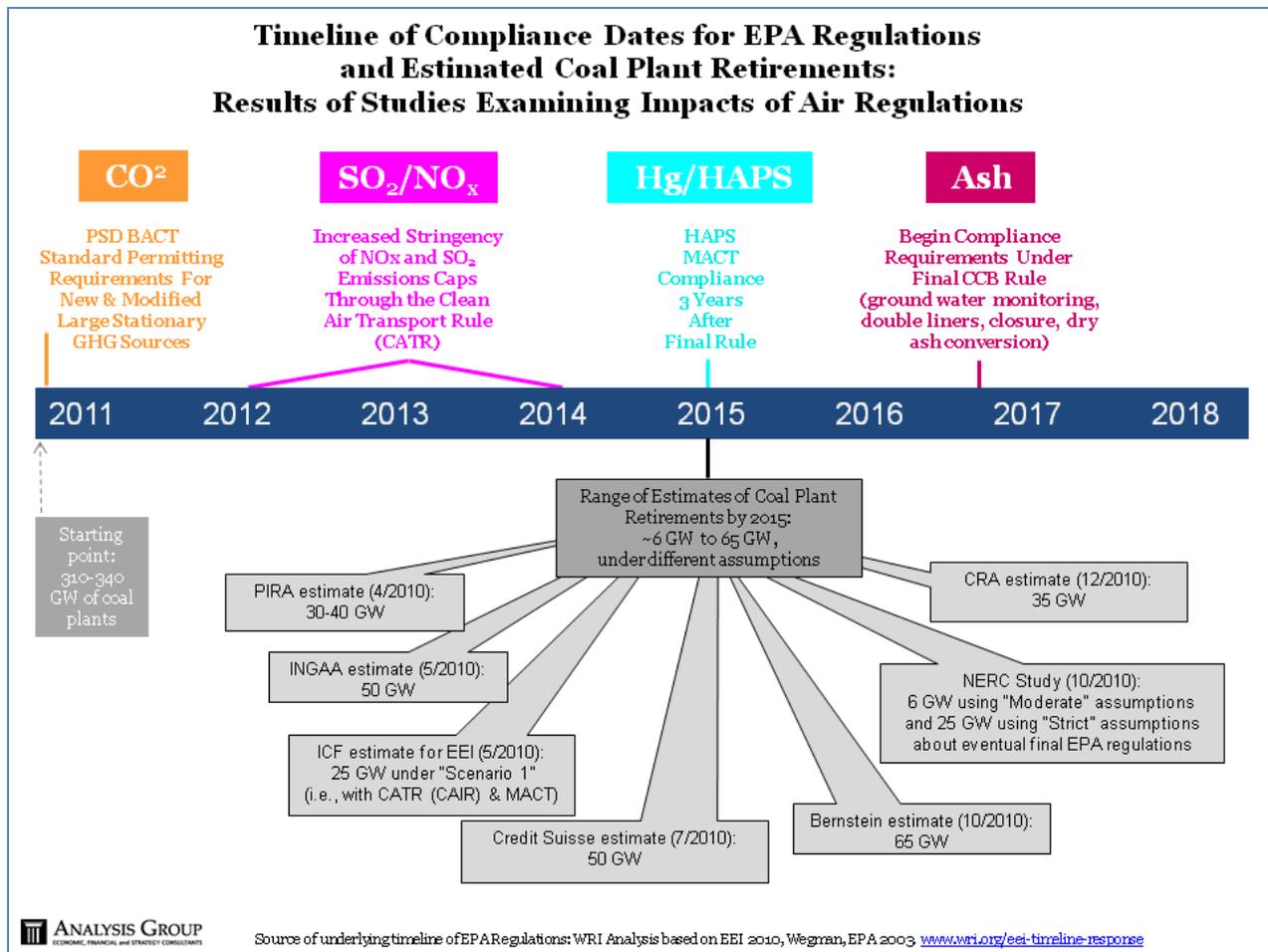
EPA regulations are manageable and will render the resulting fleet of power generators more efficient and with lower emissions.

Given the abundance of studies - and the significance of the issues - it's important to understand what's what. This blog post aims to provide a "field guide" to these reports – to explain what they might mean for the power supply landscape in the next few years. This "field guide" focuses on the air regulations that primarily affect existing fossil fuel power plants and that are not related to GHG emissions, since these are the regulations with the earliest compliance dates for power companies.

Results of studies on EPA proposed regulations

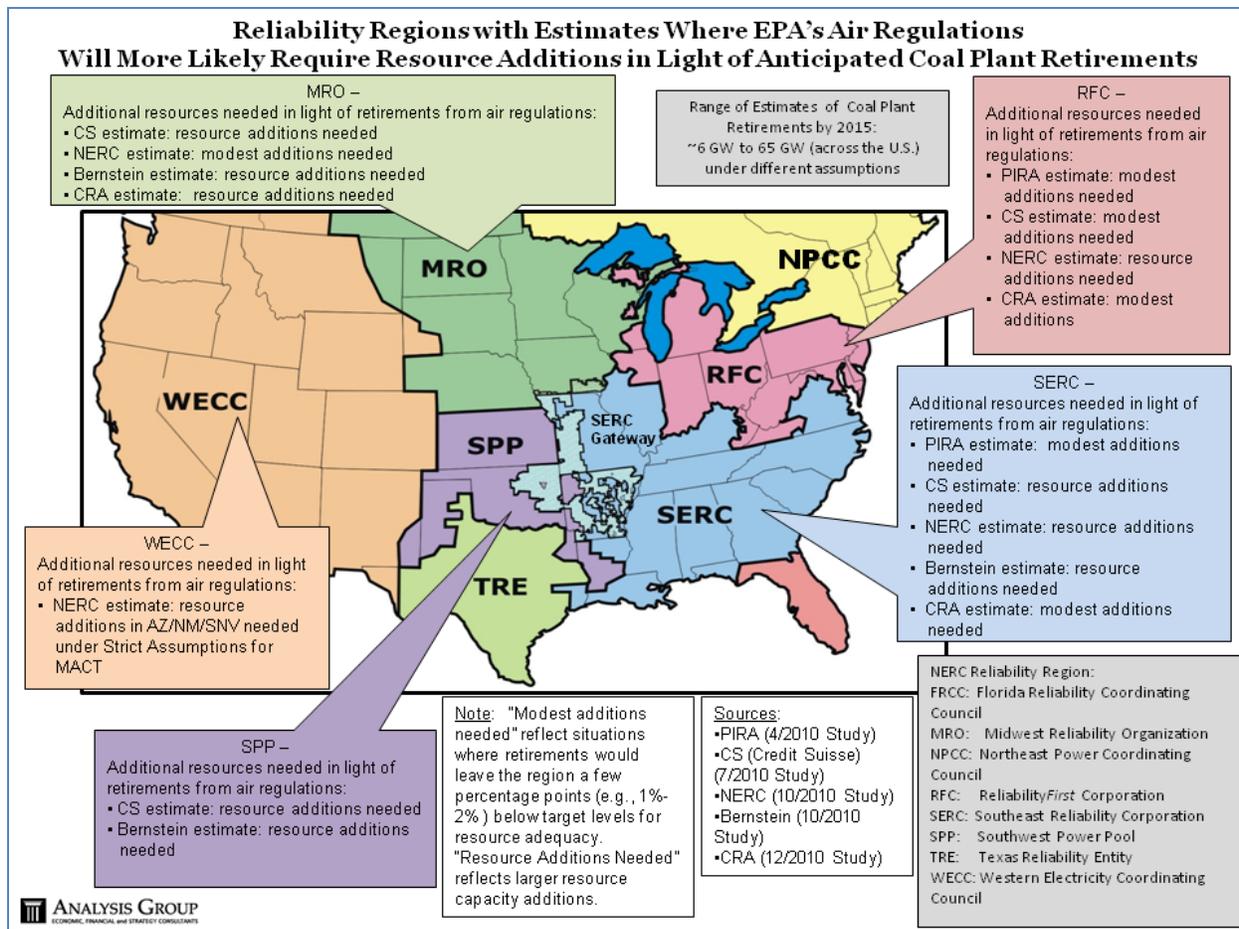
In sum, the many reports suggest that the impacts of air regulations (i.e., those affecting sulfur dioxide ("SO₂"), nitrogen oxides ("NO_x") and mercury)) are relatively modest in the near term – the period during which the industry will need to respond to regulatory signals. Assuming a compliance period starting in 2015 for such air regulations, the estimates range from 6 gigawatts ("GW") to 65 GW, with most of the studies falling into a range of approximately 25 GW to 50 GW, compared to a total coal-fired resource base of approximately 310-340 GW.² The amounts compare to an estimated 1,045 GW base of generating capacity in the U.S. in the year 2015.³ The results of the studies are shown in the figure below and do not include those that look at impacts including either GHG emission regulations and/or water regulations.⁴

The parts of the country with potential exposure to relatively high retirements in response to the air regulations are, not surprisingly, the portions of the country with a high percentage of coal plants (especially older and less efficient plants) and with lower existing reserve levels at present. These regions are shown in the figure below.



Credit: Analysis Group. [View larger](#)

As I and others have written about elsewhere, there are various tools that different players in the industry have at their disposal to ensure that these resource additions are undertaken in a timely way so that regions have sufficient power plant and other capacity (such as demand-reduction capability, transmission reconfigurations) to ensure that reliability requirements are met.⁵ Undoubtedly, there is work that still needs to be done to make sure that appropriate parties – power plant owners, state and federal regulators, regional transmission organizations, demand-side service providers, investors, and others – take action expeditiously to make prudent decisions. Nevertheless, the actions necessitated by the proposed EPA regulations are manageable and will render the resulting fleet of power generators more efficient and with lower emissions.



Credit: Analysis Group. [View larger](#)

Background: The Regulations

Several EPA regulations will affect portions of the nation's existing power plants. [Prior WRI blogs](#) (and other observers) have outlined the major air and water rules, so I won't repeat them here.

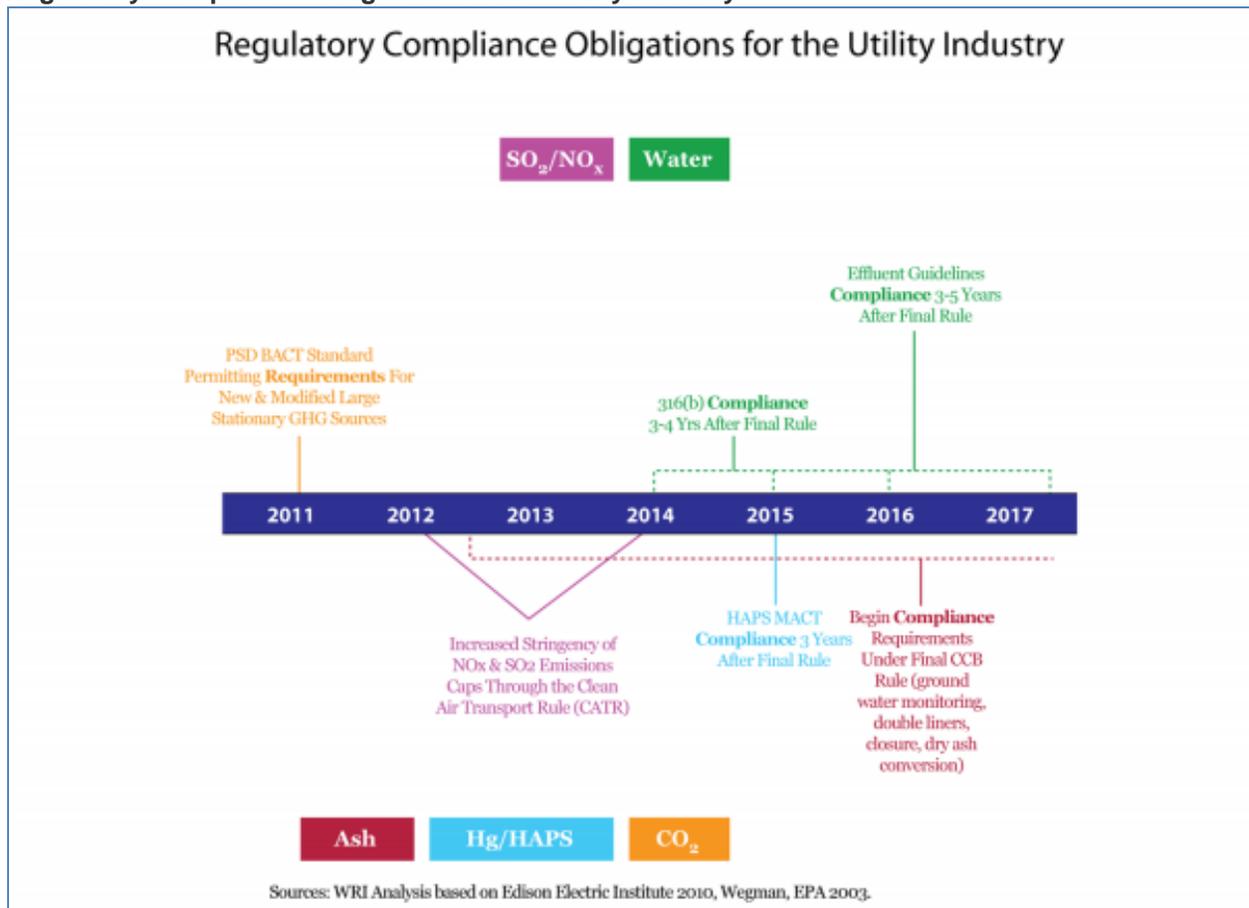
All in all, each regulation affects different groups of generating units over different time frames and in different parts of the country:

- The [Clean Air Transport Rule](#) ("CATR") principally affects fossil plants in the Eastern half of the U.S., and focuses on reducing SO₂ and NO_x emissions that are affecting both in-state and downwind air quality. The CATR follows upon the [Clean Air Interstate Rule](#) ("CAIR"), which court orders have required the EPA to revise.
- The regulations affecting various hazardous air pollutants ("HAPs"), including mercury ("Hg") among others, and introducing a requirement for [Maximum Achievable Control Technologies](#) ("MACT") for power plants; the utility MACT rule mainly affects coal-fired power plants.

- The regulations affecting the disposal of coal combustion residuals (or the so-called “coal ash”) rule, also affecting certain coal-fired power plants.
- The Clean Water Act regulations (the so-called “316(b)” regulations) that will affect the water intakes and discharges of cooling systems of certain thermal power plants that use “once-through” cooling systems (and which may include many other power plants besides coal-fired power stations).
- New regulations that would regulate GHGs from new and existing power plants. The regulations affecting new power plants went into effect on January 1, 2011, and regulations affecting emissions from existing power plants have yet to be proposed.

In light of statutory requirements and court orders, EPA has different amounts of flexibility in modifying current versions of these regulations, where such already exist. A [WRI timetable for drafting and finalizing regulations](#), as well as the periods during which the affected power plants would need to be in compliance, is summarized in the chart below by WRI Senior Associate John Larsen.

Regulatory Compliance Obligations for the Utility Industry



The Studies: Key Differences and Omissions

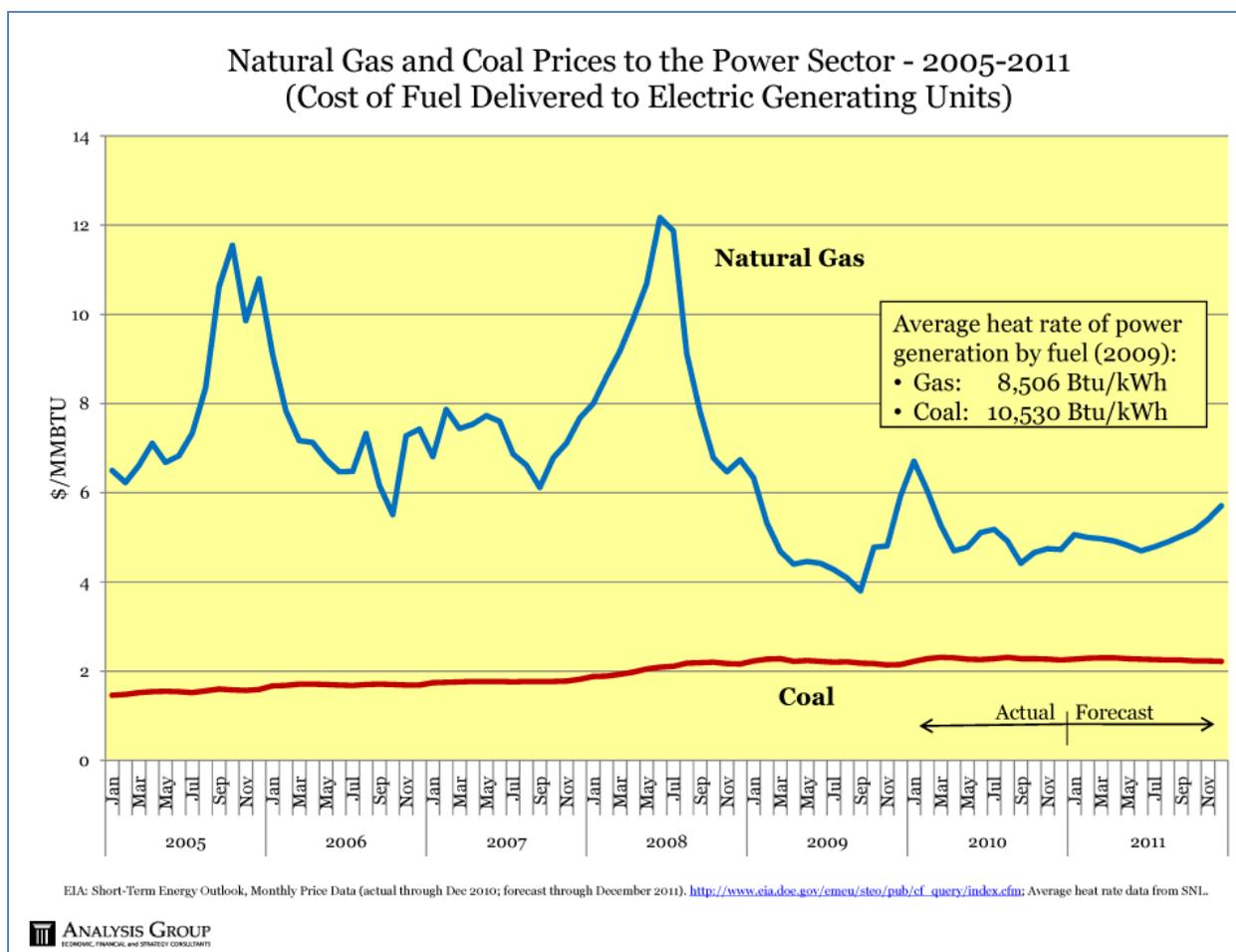
The many studies published (and in some cases, released) during the last year come from various authors or sponsors, including consultants, investor analysts, industry trade associations, and reliability organizations. They differ tremendously in terms of how they treat – and how transparently they report⁶ – their assumptions. Some of the more important assumptions clearly shape the results of their studies. These include such critical factors as: the role of natural gas supply and prices in adversely affecting the fundamental economics of coal plants (especially the older and less efficient ones); the as-yet-to-be-revealed response of the markets in providing new capacity to replace power plant capacity that is derated or retired; the time frames needed for the market to respond in one form or another; or the extent to which investment choices and resource options differ in light of whether a plant is in a regulated utility's rate base or in a merchant power market.

Important differences among the studies include:

- **Varying assumptions about regulatory impact:** A few of the studies (notably the one prepared by the North American Electric Reliability Corporation ([NERC report](#), 10/2010)), studied not only the impact of EPA regulations affecting traditional air pollutants (SO₂, NO_x, mercury) but also the impacts of the 316(b) and ~~GHG~~ coal-ash regulations. NERC identified the 316(b) regulations as having the biggest impact on retirements of coal plants with concerns raised for reliability, especially if EPA's 316(b) regulations are "strict".⁷ (I note that EPA Administrator [Lisa Jackson](#) wrote on December 16, 2010, that "EPA last month sought and received consent [from the court] to delay the deadline for a proposed rule by four months, to March 14, 2011" and with final action by July 2012. She said further that the "proposal that EPA issues next March will reflect a common-sense approach that reasonably accommodates site-specific circumstances while keeping faith with the need to minimize adverse environmental impact.") The [Brattle Study](#) did not distinguish between impacts of the air rules only and the impacts of all of EPA's upcoming regulations. The [ICF-Fine Study](#) includes the impact of GHG regulations. And the [ICF-EEI](#) looked at scenarios including 316(b) and GHG regulatory impacts.
- **Varying assumptions about market responses:** Many of these reports make it clear that action needs to be taken soon by a variety of parties to assure that the estimated amounts of retirements do not adversely impact reliability. NERC makes this clear, as does the [MJBA-AGI Study](#), the [CRA Study](#), and several of the studies done by investment analyst firms ([DB Study](#), [CS Study](#), and [Bernstein Study](#)). The studies do not, however, make assumptions about how the market will respond as retirements are announced or anticipated. Conditions will change over time as electric supply and demand markets evolve. Most of the studies, therefore, serve as a

call to action: as they overstate the resource adequacy gaps that will occur by 2015, they signal to various market participants – owners of retiring power plants, other power plant developers, buyers of power to replace that retiring capacity with other resources (e.g., newly built power plants, underutilized power plants, transmission reconfigurations, demand-side resources) – the need for new actions to meet upcoming electricity customer requirements. Lead times for many options fit well within the time frame identified by the studies.

- **Varying assumptions about fundamental power plant economics:** Many of the studies (CRA, Bernstein, DB, Brattle, ICF-Fine, ICF-EEI, NERC) use different technical assumptions about key parameters that affect a power plant owner’s decision about whether it is more economical to add new pollution-control equipment on an existing coal plant or to retire the unit instead. Relevant key assumptions include the cost of replacement power, the cost of back-end control equipment, the types of equipment that are suitable for compliance with EPA rules, the amount of time that an existing plant will continue to operate in the future, the amount of time that the new plant will be dispatched to produce power in future electricity markets, the regulatory and tax treatments afforded to different types of plants, and the level of demand for electricity in the first place. As every technical analyst of electric systems knows, these assumptions shape the output, as do the features of the financial and dispatch models used in these studies.
- **Distinguishing the underlying impacts of low gas prices from the impacts of the EPA regulations:** Importantly, rarely do the studies make it clear that low gas prices have fundamentally worsened the economics of coal plants, even in the absence of the EPA regulations. The relative attractiveness of producing power from natural gas compared to coal results from significant shifts in the prices of these two fuels over the past few years. Although gas plants on average tend to produce power relatively efficiently (i.e., with a lower “heat rate” (Btu per kWh produced)), coal plants (with higher average heat rates) have had a power production advantage due to relatively cheap fuel prices. This advantage has significantly eroded, as shown in the figure below, as gas and coal prices have changed over time (2005-2011). Coal plants with high heat rates (e.g., the ones that are older and smaller) are especially vulnerable to this change.



Credit: Analysis Group. [View larger](#)

This is an important part of the story about expected power plant retirements. If gas/coal market fundamentals were not where they are today – with relatively low gas prices as a result of newly opened and economically accessible natural gas fields, and rising coal prices (especially relative to natural gas) – then we would not expect to see as many coal-plant retirements in the face of the EPA regulations. The studies themselves are based primarily on gas price forecasts created in 2010 (including those used in last year’s [Annual Energy Outlook](#) prepared by the U.S. Energy Information Administration). It is clear that [more recent estimates](#) show that gas price forecasts and futures are lower than they were last year. With lower gas prices, one would expect more retirements of coal plants than with higher gas prices, something that various studies (e.g., the May 2010 [ICF study](#) prepared for EEI that was released to a congressional committee) have recognized. This is a market-driven outcome, rather than one resulting fundamentally from EPA air regulations.

- **Singular focus on “resource adequacy”:** The studies that look at “system reliability” mainly focus on resource adequacy (i.e., are there enough resources available to provide power when

needed, under reasonable outlooks for demand?) rather than operational security (i.e., can the system keep the lights on in all places and at any time of day in ways consistent with reliability standards?). As NERC stated in its study, “The impacts of potential EPA regulations may also have second tier effects on reliability, beyond resource adequacy. Resource deliverability, outage scheduling/construction constraints, local pockets of retirements, and transmission needs may also affect bulk power system reliability. While these issues were not studied in this assessment, the industry will need to resolve these concerns.”⁸ Clearly, more analysis is needed and the tools are available to do so.

- **Focusing on regional costs without looking at regional benefits:** Finally, virtually none of the studies I've identified above (except perhaps [the one I participated in](#)) attempt to connect the dots between the places where air quality will improve (i.e., the geographic location of benefits) as a result of EPA's regulations, and the regions where the power plant fleet will undergo modernization (i.e., the geographic locations of areas with potential cost increases). The cost increases will result from a variety of factors: plant owners adding new pollution control equipment; the need to replace capacity and energy from retiring plants; and so forth. Many of the benefits will occur in regions with cost impacts. In this sense, the people who will be experiencing the long-run health benefits and lower medical costs are the same people who may pay somewhat higher electricity bills.

Conclusion

After analyzing the range of reports produced on the proposed EPA regulations and their timelines for compliance, I am not persuaded to alter the view I expressed with my co-authors in our August 2010 report, [Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability](#). “We conclude that, without threatening electric reliability, the industry is well-positioned to respond to EPA's proposed road map to ‘help millions of Americans breathe easier, live healthier,’ provided that EPA, the industry and other agencies take practical steps to plan for the implementation of these regulations and adopt appropriate regulatory approaches.” We can do this, and we must.

Dr. Susan Tierney is Managing Principal of the [Analysis Group](#), and serves on the World Resources Institute Board of Directors. Dr. Tierney is an expert on energy policy and economics, specializing in the electric and gas industries. She has consulted to companies, governments, non-profits, and other organizations on energy markets, economic and environmental regulation and strategy, energy and renewables policy, and energy facility projects.

Recent Studies of Upcoming EPA Regulations and Coal Plant Retirements

- “Bernstein Study” (10-2010): Hugh Wynne et al., Bernstein Research, [U.S. Utilities: Coal-Fired Generation Is Squeezed in the Vice of EPA Regulation; Who Wins and Who Loses?](#)
- “Brattle Study” (12-2010): Metin Celebi, Frank Graves, Gunjan Bathla, and Lucas Bressan (Brattle Group), [Potential Coal Plant Retirements Under Emerging Environmental Regulations](#).
- “CRA Study” (12-16-2010): Ira Shavel and Barclay Gibbs (Charles River Associates), [A Reliability Assessment of EPA’s Proposed Transport Rule and Forthcoming Utility MACT](#).
- “CS Study” (7-2010): Credit Suisse, “A Thought... CATR is First Step in Changing the Coal Fleet.”
- “DB Study” (11-2010): Deutsche Bank Group Climate Change Advisors, [Natural Gas and Renewables: A Secure Low Carbon Future Energy Plan for the United States](#).
- “ICF-EEI Study” (5-2010), ICF prepared for Edison Electric Institute, [Preliminary Reference Case and Scenario Results](#).
- “ICF-Fine Study” (10-2010); Steven Fine (ICF), [Clean Air, Ash and Water Regulations: Potential Impact of EPA Proposed Rules](#).
- “ICF-INGAA Study” (5-2010): ICF prepared for Interstate Natural Gas Association of America, [Coal-Fired Electric Generation Unit Retirement Analysis](#).
- “Kaplan-EIA Study” (11-2010): Stan Kaplan, Energy Information Administration, [Potential for Displacing Coal With Generation from Existing Natural Gas Plants](#), presentation to the National Capitol Area Chapter, U.S. Association for Energy Economics.
- “MJBA-AGI Study” (8-2010): MJ Bradley et al of MJ Bradley Associates and Susan Tierney and Paul Hibbard of Analysis Group (prepared for the Clean Energy Group), [Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability](#).
- “NERC Study” (10-2010): North American Electric Reliability Corporation, [2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulation](#).
- “PIRA Study” (4-2010): “North American Environmental Markets Service: EPA’s Upcoming MACT: Strict Non-Hg Regs Can Have Far-Reaching Market Impacts.”

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1. I note my own contribution to this debate: Michael Bradley and Chris Van Atten et al (M.J. Bradley Associates) and Susan Tierney and Paul Hibbard (Analysis Group), "[Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability](#)," August 2010. For more on the different points of view, see the videos and presentations posted on the website of the Bipartisan Policy Center, which has hosted two workshops on "Environmental Regulation and Electric System Reliability." The first workshop (at which I presented) was held on [October 22, 2010](#) and the second one on [December 7th, 2010](#). The third in the BPC's series will take place on [January 19, 2011](#). ↩
 2. The studies even differ in terms of what they assume about the starting baseline of coal-fired power plants – that is, which new additions are included, and which already announced retirements are excluded. This is the reason for this range as a starting point. ↩
 3. This figure is based on [NERC's Special Reliability Assessment](#) which uses as its reference case for 2015 the "Adjusted Potential Capacity Resources" of 1,045 GW – representing existing and planned capacity, along with potential announced capacity adjusted for a confidence factor (p. 60). ↩
 4. The studies that include GHG emissions are: the [ICF-Fine Study](#), the [Brattle Study](#) and the [DB Study](#). For studies (such as the [NERC Study](#), the [ICF-EEI Study](#), and the [Bernstein Study](#) that included separate scenarios that broke out impacts of air regulations from the impacts of either GHG and/or water regulations, my analysis only used the scenarios reflecting the air regulations. ↩
 5. See our discussion in Michael Bradley and Chris Van Atten et al (M.J. Bradley Associates) and Susan Tierney and Paul Hibbard (Analysis Group), "[Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability](#)," August 2010. See also Susan Tierney, "[Toolkit for Ensuring Reliable, Economic Responses to EPA's Proposed Air Regulations](#)," presentation to the annual meeting of the National Association of State Utility Regulators (NARUC), November 17, 2010. ↩
 6. Many of the reports describe their assumptions, but not necessarily at the level of detail that would allow for apples-to-apples comparisons across studies, either in key elements of models or data/parameter assumptions (e.g., on equipment cost). Some of the more transparent studies are those prepared by investment analysts (e.g., the [DB Study](#), the [Bernstein Study](#)), some of the consultant studies (e.g., the [CRA Study](#), the [Brattle Study](#) and the [NERC Study](#)). ↩
 7. "The Strict Case scenarios reflect the coupled effects of a higher increase in costs with more stringent requirements for the proposed rules." [NERC Study](#), page 5. For the 316(b) proposed regulations, NERC assumed a 25% increase in compliance costs. ↩
 8. North American Electric Reliability Corporation, "[2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulation](#)" (October 2010), page 6. ↩

Related Information

[U.S. Federal Climate Policy](#)

Related Links

- [U.S. Federal Climate Policy](#)
- [Climate, Energy & Transport](#)

- [Dialogue on Performance Standards for Existing Power Plants: Participant Comments to EPA](#)
- [Old Roads to a New Destination](#)
- [Myths and Facts about U.S. EPA Standards](#)

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EPA Regulations, Power Generation Capacity & Reliability

Sue Tierney

MIT Center for Energy & Environmental Policy Research
Workshop – May 5, 2011



Some key issues:

Upcoming federal air regulations affecting power plants

Implications and options for energy resources

Tools to manage through the transition in a reliable way

Air policy affecting fossil power plants

UPCOMING AIR REGULATIONS

Emissions from power plants

✓ “Primary Pollutant” under the Clean Air Act (CAA)

NO_x (Nitrogen Oxides): ✓

- Cause ground-level ozone, another primary pollutant under the CAA

SO₂ (Sulfur Dioxide) ✓

- Causes acid rain and regional haze (addressed in two parts of the CAA)

Particulates (fine and course particles) ✓

- Affect the heart and lungs and cause serious health effects when inhaled

Mercury, Acid Gases, Arsenic, and Other Toxics

- Affect various aspects of human health
- Addressed under toxics air pollutants provisions of the CAA

Greenhouse Gases (“GHG”) – CO₂, methane and others

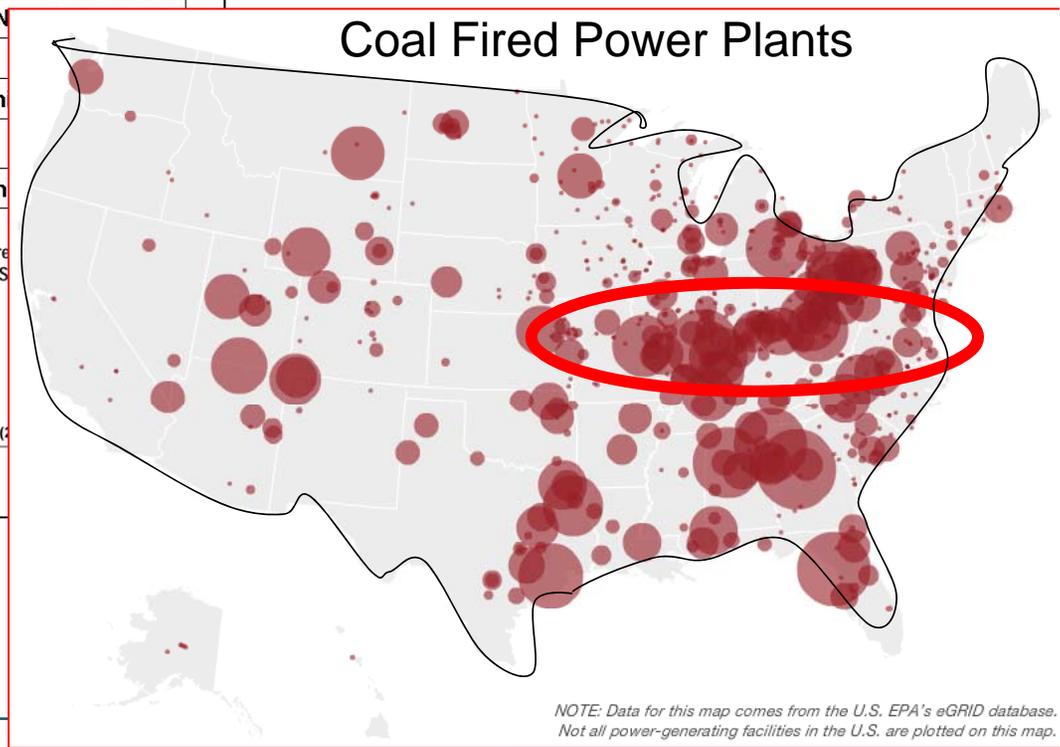
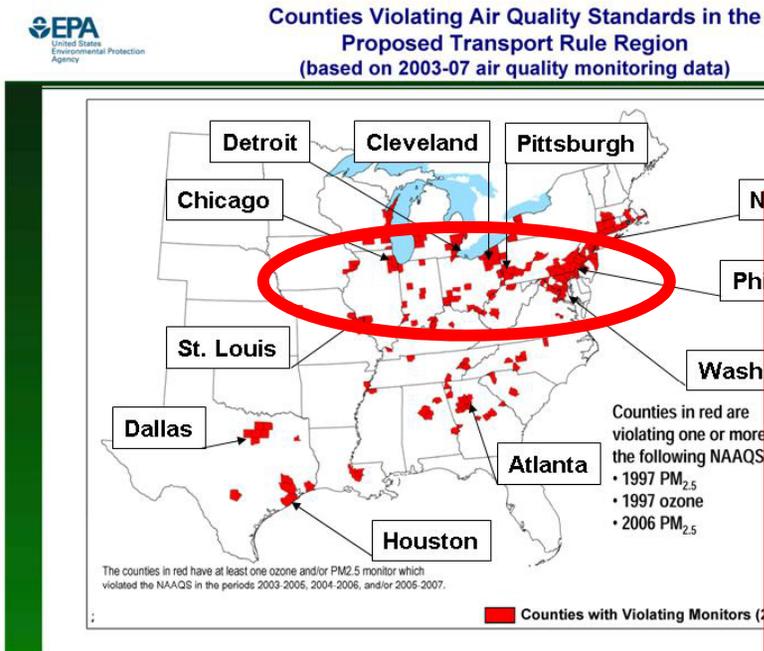
- Contributes to global climate change

New/upcoming EPA air regulations affecting the power sector

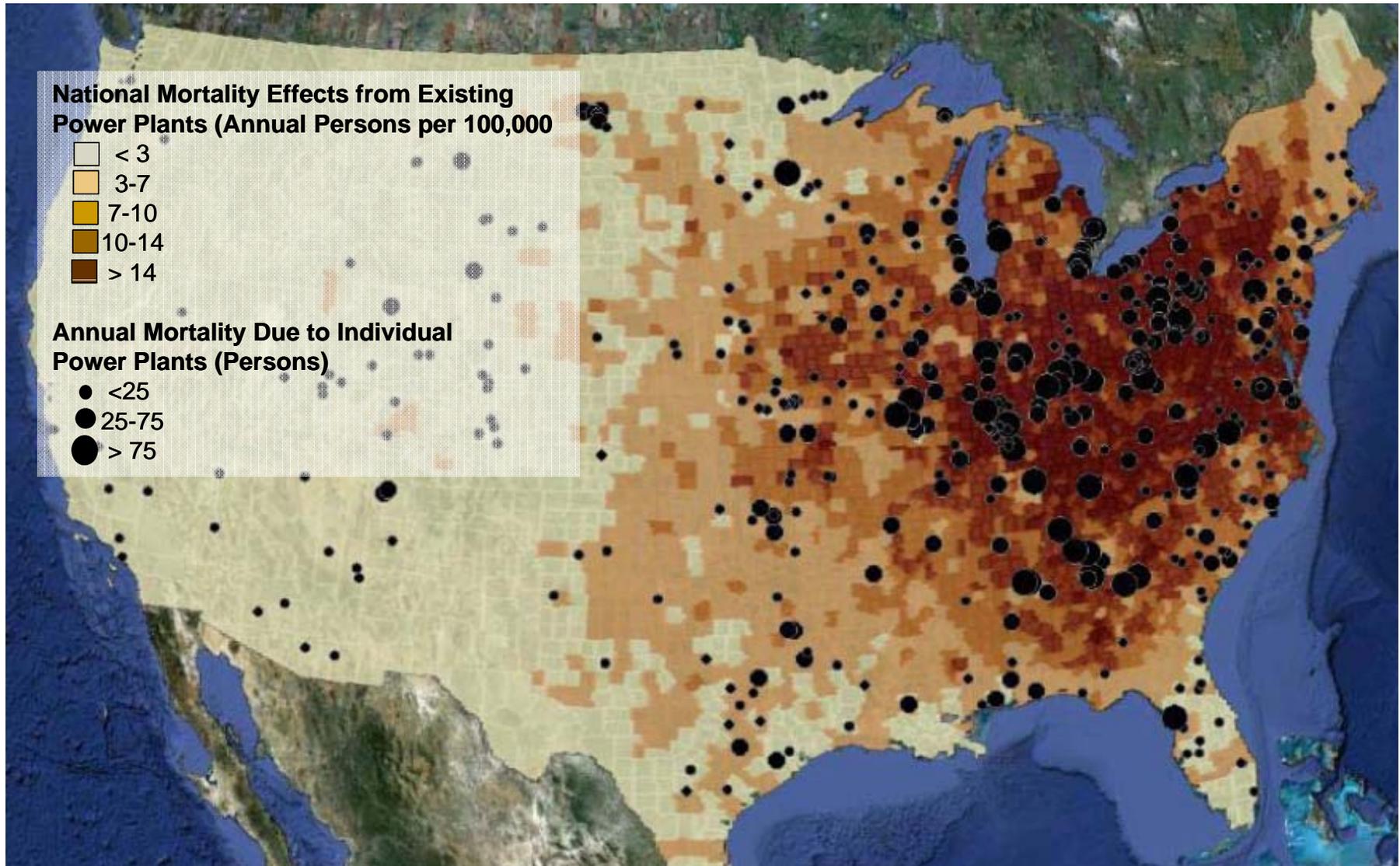
- **Clean Air Transport Rule (“CATR”) – proposed 7/2010, final 6/2010**
 - Proposal to regulate emissions of SO₂ and NO_x from fossil-fueled power plants (over 25 MW) in the Eastern part of the U.S.
 - Replaces proposed rule (CAIR) that was sent back to EPA to fix, many years ago
 - Compliance by 2014 (phase 2), with preferred approach allowing trading
- **Mercury and Air Toxics Rule – proposed 3/2011, final 11/2011**
 - Proposal to regulate emissions of toxic air pollutants (mercury, lead, acid gases, arsenic, etc.) at coal and oil plants larger than 25 MW in U.S.
 - Requires Maximum Achievable Control Technology (“MACT”), with various technology options and station-level trading
 - Compliance by 2015 (with possible 1-year extension on plant-specific basis)
- **Other EPA regulations for which EPA has more discretion in timing/compliance:**
 - Coal Combustion Residues Rule (coal ash disposal/management) – proposed 6/2010, timing of final rule has not been set
 - Cooling Water Intake Rule (addresses thermal units with once-through cooling) – proposal 3/2011, proposed to be finalized in Summer 2012

EPA's upcoming air regulations – Implications for electric system modernization?

Worst Air Pollution Near Population Centers



Impacts from electricity produced at coal power plants



Air regulations affecting fossil power plants

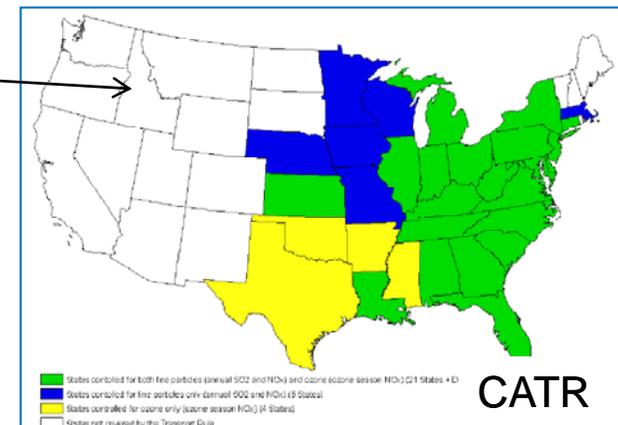
SOME IMPLICATIONS

Impacts of EPA's New Regulations on the Power Sector:

- Marginally economic plants are likely candidates to retire
- Different regulations affect different generating units in the U.S.

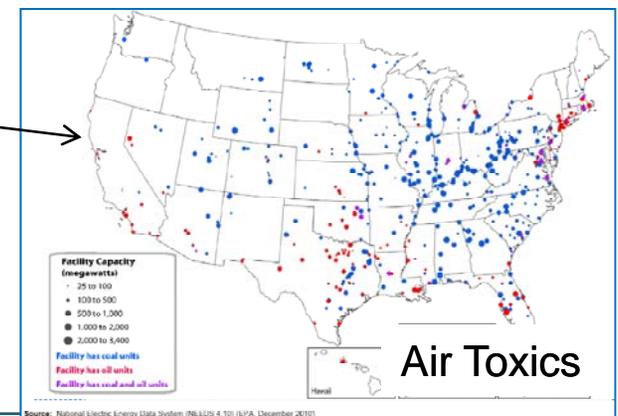
– CATR:

- Covers most fossil plants in the Eastern Interconnection and Texas
- Many plants already comply
- May tip into retirements some coal plants that are already economically challenged



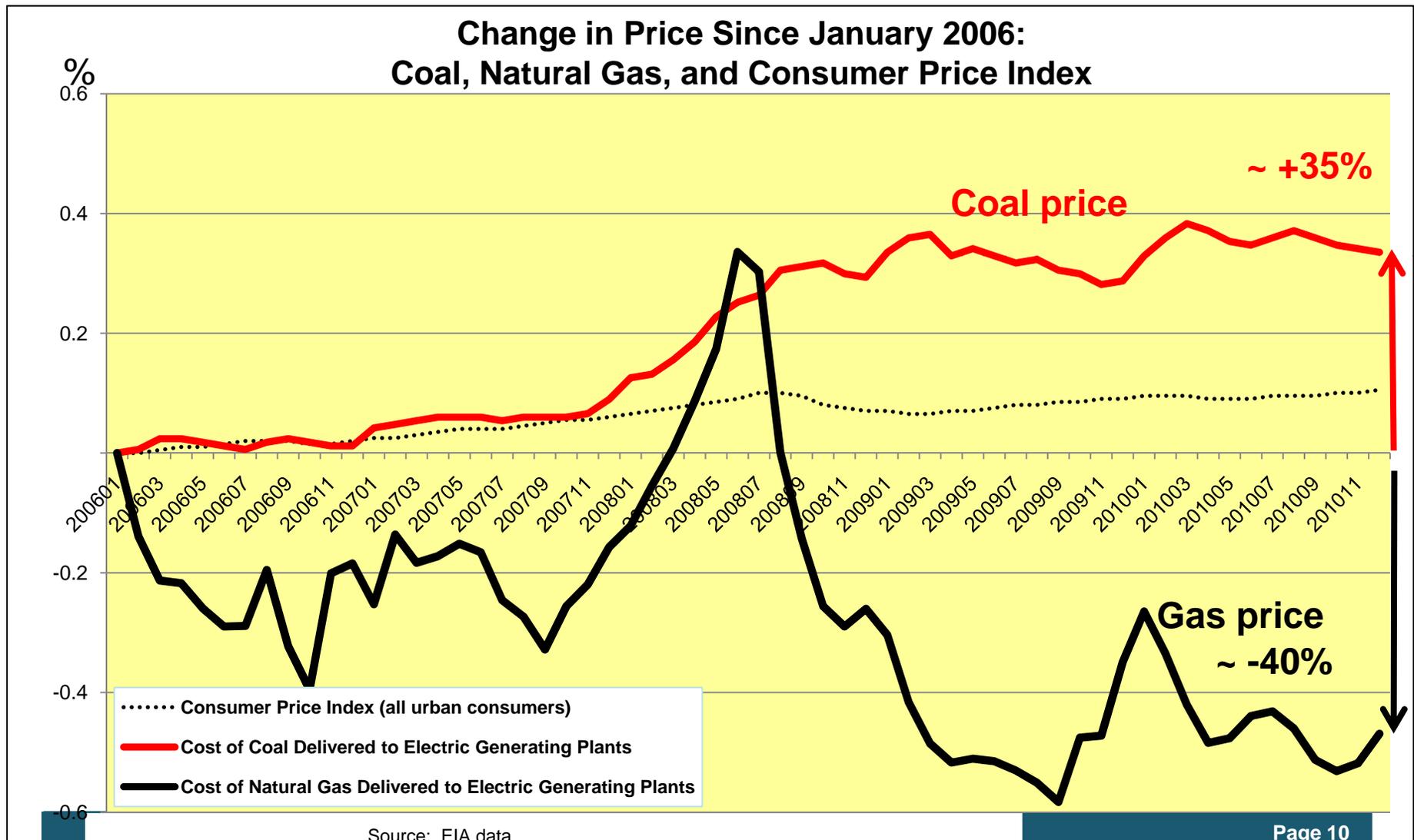
– Air Toxics:

- Covers coal and oil plants in the entire U.S.
- Some plants already comply
- Mainly affects coal-fired power plants (due to emissions of mercury and acid gases).



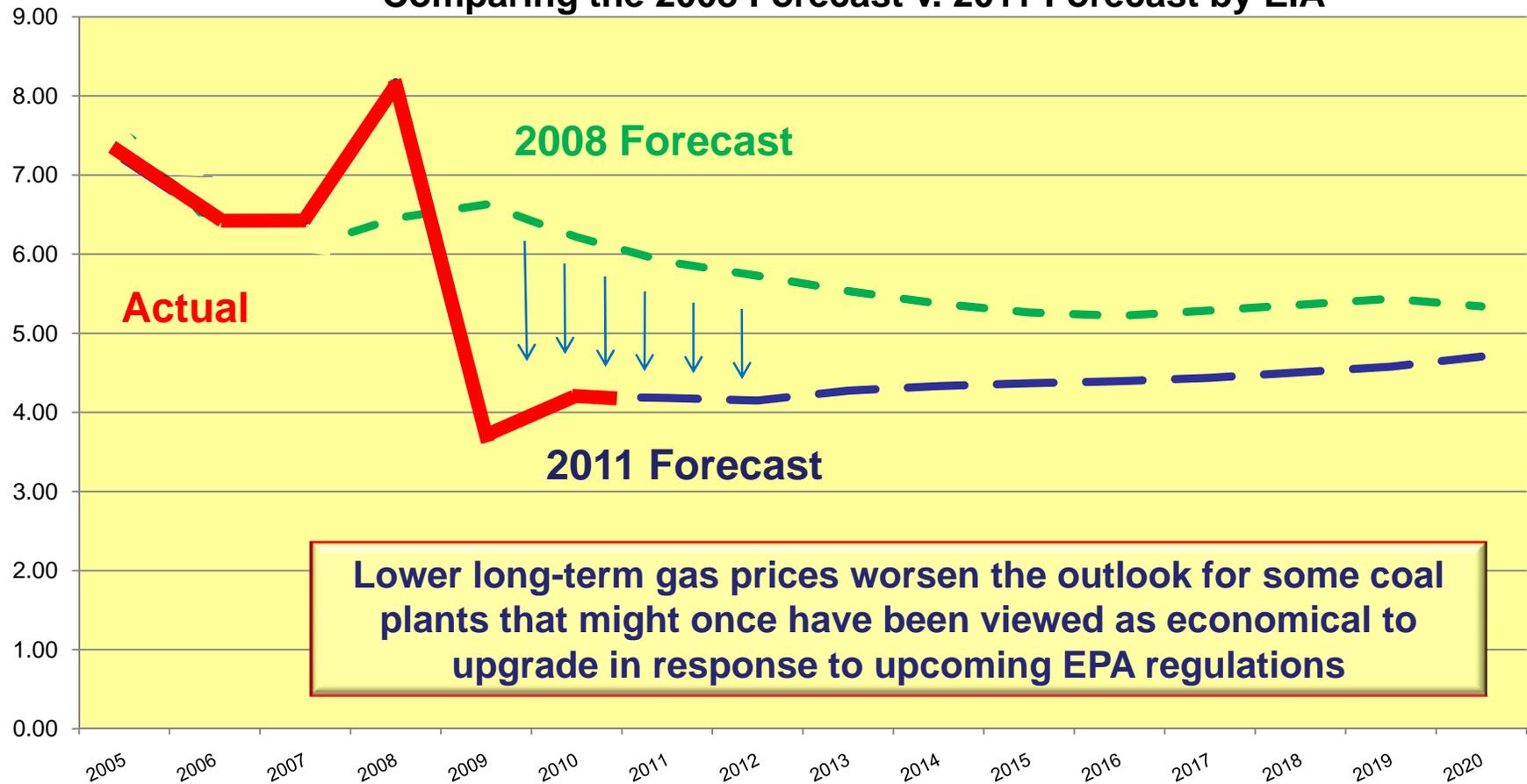
Source: National Electric Energy Data System (NEEDS) 4.701 (EPA, December 2010)

Gas/Coal price differentials have shifted in recent years – Putting pressure on less efficient coal plants

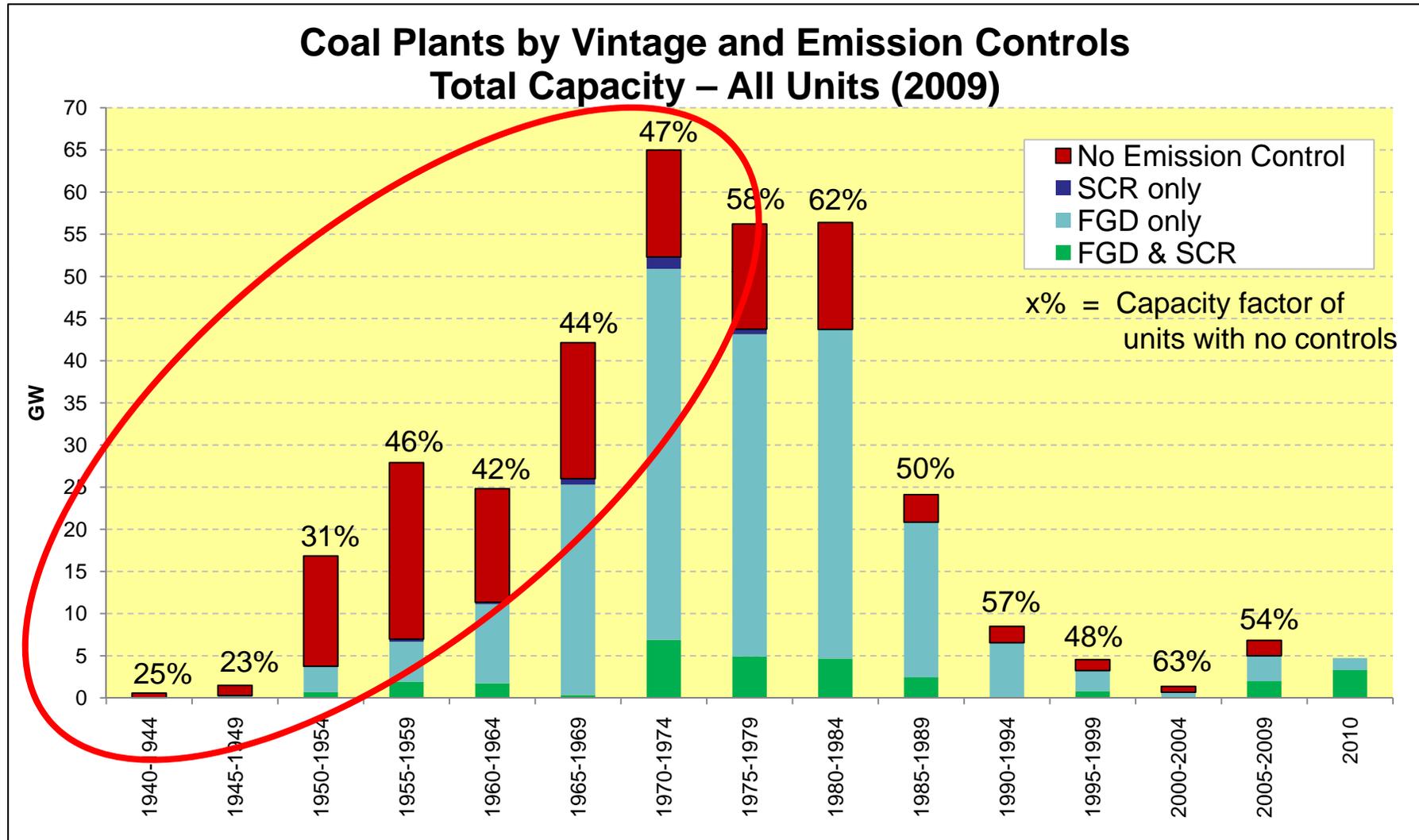


The outlook for natural gas has improved in light of new supply

U.S. Wellhead Prices of Natural Gas (2009\$)
Comparing the 2008 Forecast v. 2011 Forecast by EIA

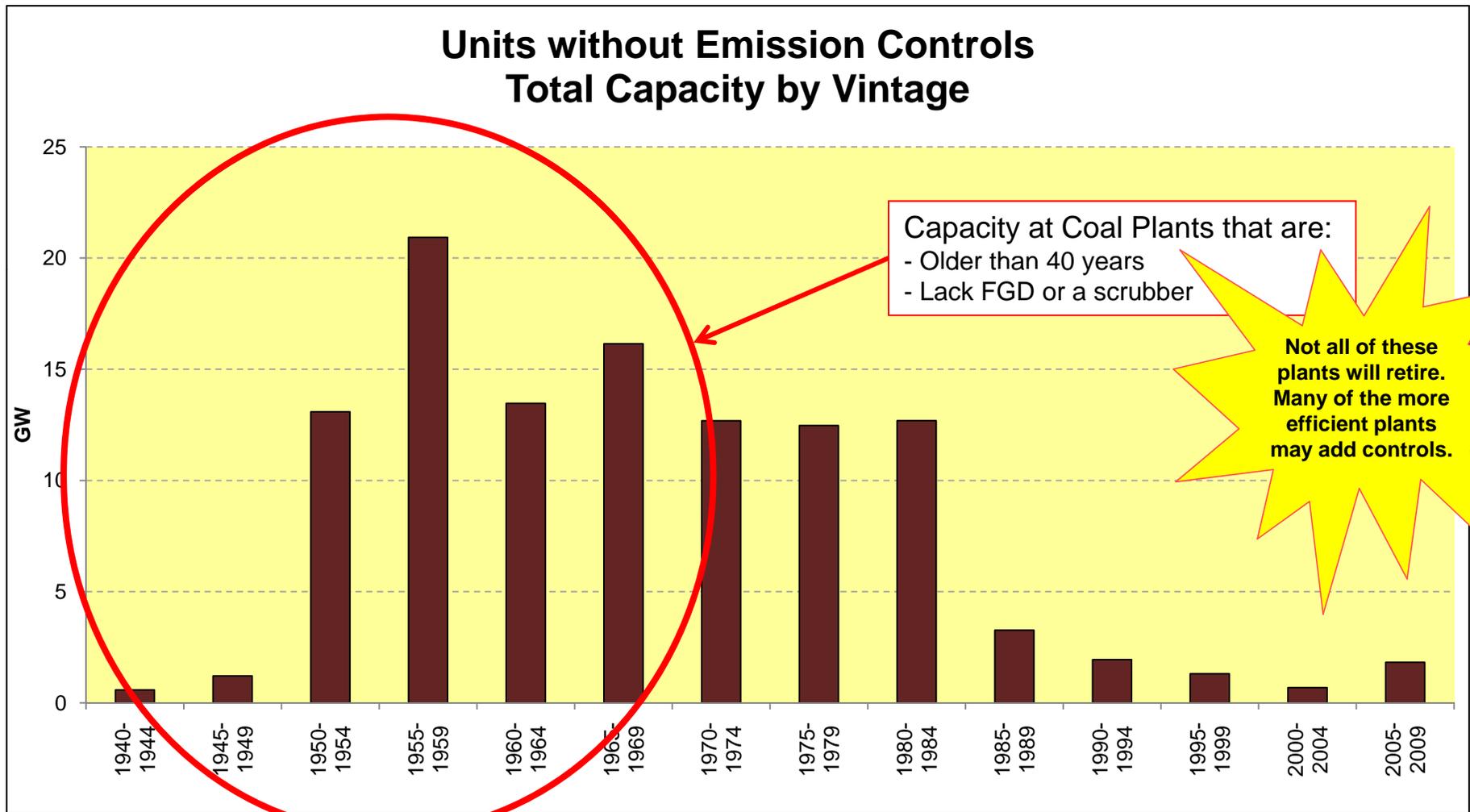


Many older coal plants have fewer air-pollution controls, operate less



Notes:[1] Totals do not include Alaska or Hawaii.
Source: SNL data.

Older coal plant capacity that will require air-pollution controls to remain in operation



Notes:

[1] Totals do not include Alaska or Hawaii.

[2] Units without emissions are those units without SCR or FGD systems.

Source: SNL data.

Flexibility in implementing regulations

- **TIME EXTENSIONS:**

- EPA can grant time extensions for power plants to install pollution control equipment on a case-by-case basis under the CAA.

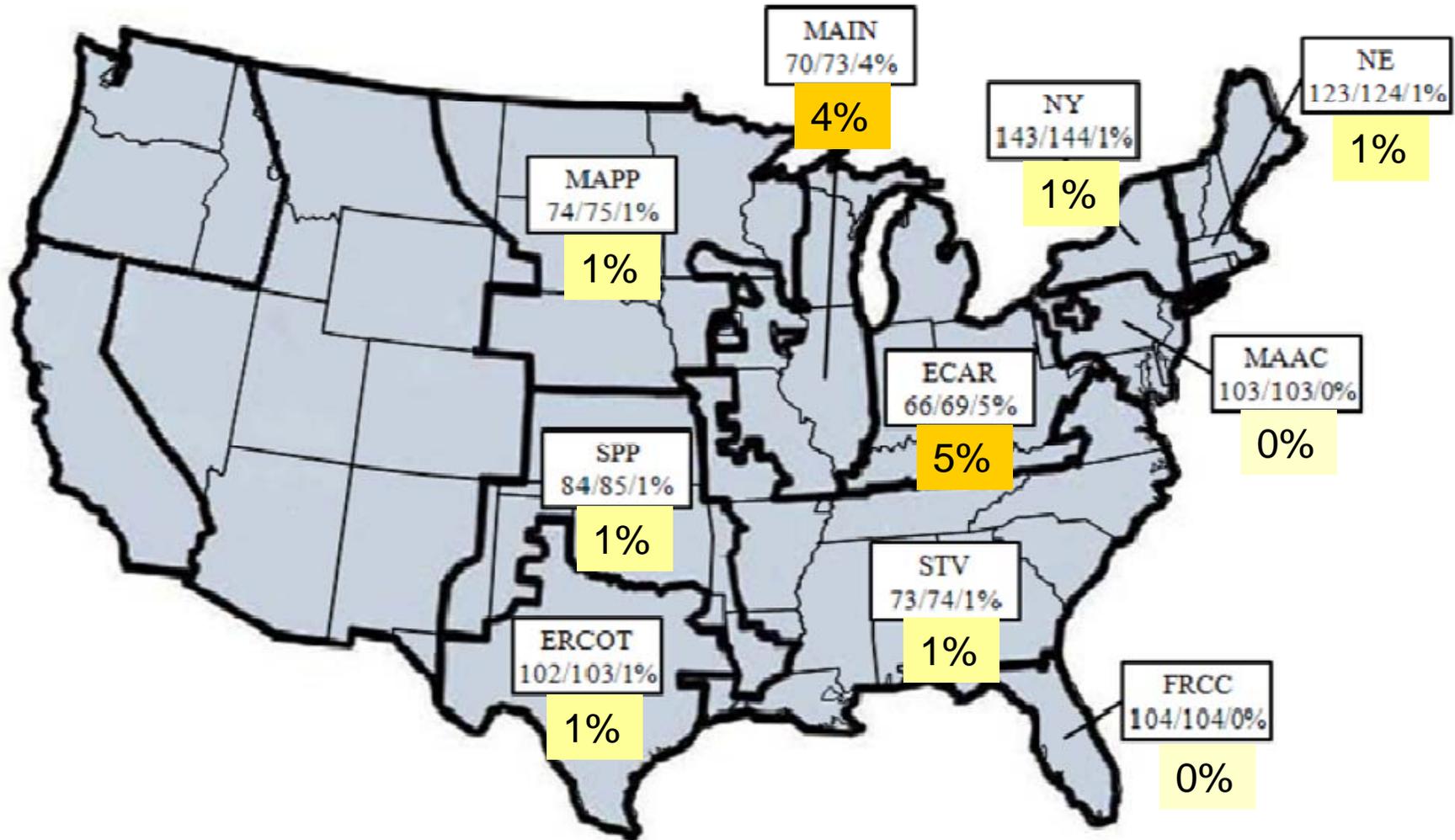
- **EMERGENCIES:**

- The DOE can override CAA control requirements under §202(c) of the Federal Power Act in limited emergency circumstances.
- The EPA and the President have the authority to extend deadlines for the Utility MACT rule as necessary to preserve electric system reliability.

- **CONSENT DECREES:**

- The EPA and DOE can establish consent decrees with power plants that allow them to run under specific and limited circumstances to maintain reliability while avoiding the full extent of possible exceedances of national air quality standards.

EPA estimates of impacts of the CATR:

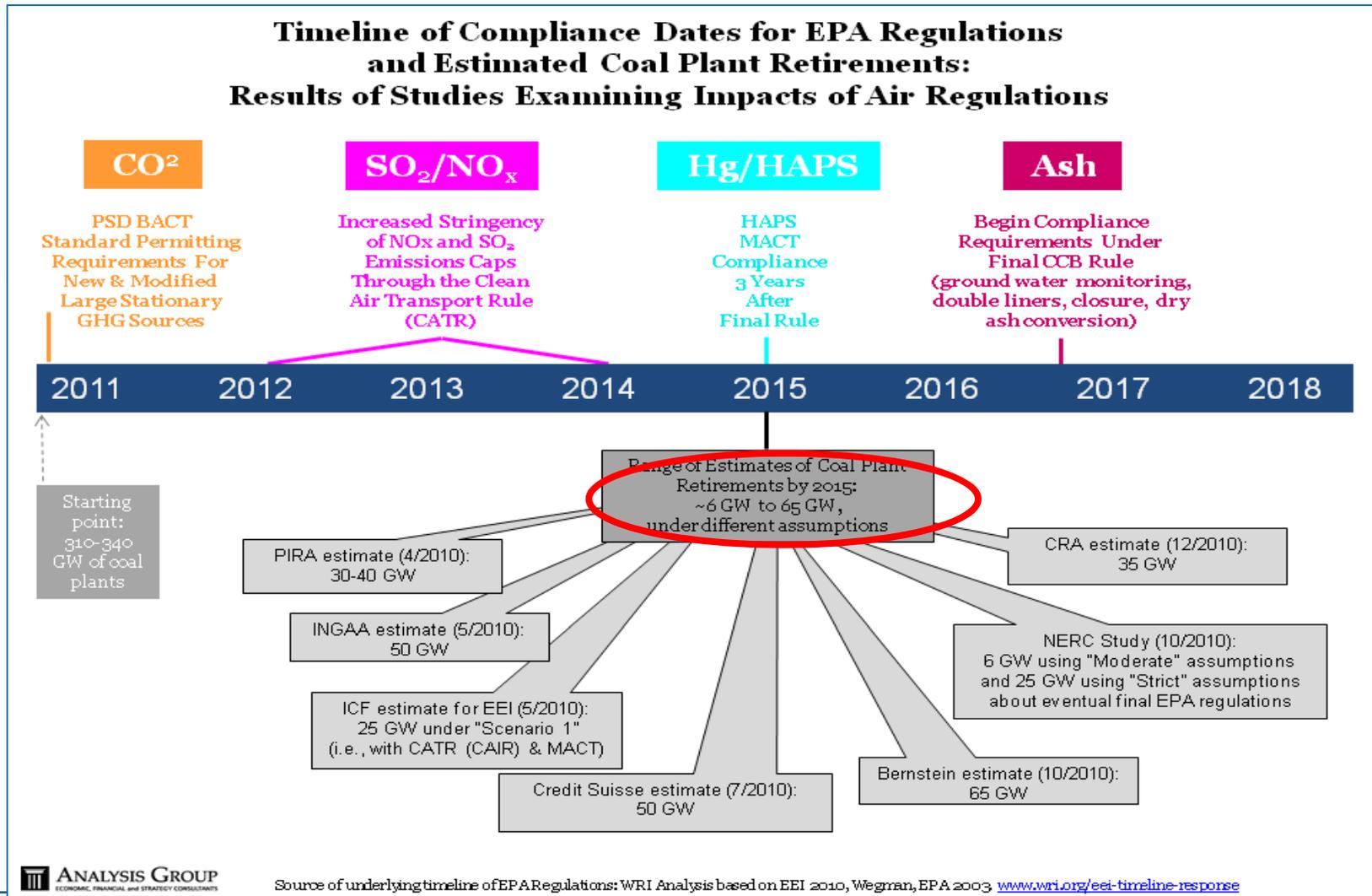


Schmalensee and Stavins, "A Guide to Economic and Policy Analysis of EPA's Transport Rule," March 2011, based on EPA estimates of rate impacts

Air regulatory policy affecting fossil power plants

**SOME IMPLICATIONS:
MANAGING THE TRANSITION**

Impacts of EPA’s New Regulations on the Power Sector:



EEI/ICF study – Jan 2011 analysis of impacts of EPA regulations on the power sector

- **Sensitivity analyses about impacts, assuming different rules.**
- **These overstate the costs/reliability impacts because:**
 - **2/3 of scenarios assume that the U.S. has a mandatory national CO₂ cap in 2016. (This accounts for 23 GW of unplanned coal-plant retirements by 2015.)**
 - **All scenarios assume that every U.S. fossil and nuclear power plant (over a certain size) will need a cooling tower. (This is not the EPA proposal.)**
 - **7 of the 9 scenarios did not consider less costly technologies for air emissions that have already been tested/installed. This overstated retirements by at least 10 GW.**
 - **The Report does not mention that:**
 - **Already over 150 GWs of coal units have such controls, with another 65 GWs with planned installations. 2/3 of U.S. coal plants are absorbing the types of costs anticipated in the report.**
 - **Gas prices are driving 40% of the retirements**
 - **There are options besides adding controls or retiring/replacing units.**

Options for responding to these regulations

- **Some options are obvious – the “classic” toolkit.**
- **Other options are well-understand by the industry and its regulators –**
 - although not necessarily being discussed in every place where investment decisions are being analyzed
- **Different tools and actions are in the hands of various players –**
 - not just the owners of plants that are affected by the EPA regulations.

The “Classic”: The tool that some industry participants are using.....

Build a new power plant
to replace a retiring
one’s capacity



Retrofit a
power plant
with pollution
control
equipment

Seek a delay:

- The entire rule, or
- The rule’s application to a particular plant,
- A temporary delay (e.g., RMR)

The “Champ”: The tool we need



The “Champ”: The tool we need

PUCs: ask DEPs to provide information about plants in the state

PUCs: ask plants owners to submit plans ASAP

PUCs/FERC: refresh understanding of backstop issues to ensure reliability

PUCs: update avoided cost estimates to reflect new costs

Regulators: ask TOs and RTOs to perform “what if” analyses

RTOs and TOs: identify potential transmission capacity opened up by retirements

Get critical information into the public domain

The “Champ”: The tool we need

PUCs: ask DEPs to provide information about plants in the state

PUCs: discuss expectations about what is/may not be prudent responses to EPA rules

RTOs and TOs: conduct transmission planning with “what if” scenarios

RTOs and regulators: Establish forward capacity markets reflecting real compliance cost assumptions

PUCs: address long-term contracting, stranded cost issues

Legislatures/PUCs: consider health benefits along with power system costs

RTOs and TOs: ensure that opened-up transmission capacity is available to the market on non-discriminatory basis

Ensure that market/regulatory rules support robust responses

The “Champ”: The tool we need

PUCs: in traditionally structured states, ask for and review compliance plans within LCP frameworks

PUCs: in traditionally structured states, require competitive procurements to compete with utility compliance plans

RTOs and TOs: examine transmission options (economic, reliability) as alternatives to generation options

PUCs in traditional and regulated states: Deploy cost-effective demand-side options, including ratemaking issues

Seek competitive and/or least-cost) options

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