ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

The Positive Outlook for Cleaner Air and Reliable Electric Service

Executive Summary and Report With Appendix

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Executive Summary

The Environmental Protection Agency's Mercury and Air Toxic Standard ("MATS") is designed to provide Americans healthier, cleaner air by substantially reducing emissions of hazardous air pollutants from coal- and oil-fired power plants. Some parties seek Congressional action to delay MATS implementation everywhere in the U.S., by claiming that timely compliance would harm electric reliability. The facts, however, do not support these claims. Fortunately, Americans need not compromise cleaner air for affordable reliable electricity.

This report and its Appendix examine the outlook for reliable electric service assuming that MATS compliance deadlines are not extended, and conclude that recent, positive developments make it clear that timely MATS compliance will not harm the Nation's electric reliability. In particular:

- **System operators responsible for ensuring reliability for most of the Nation's electric grid expect to have adequate resources.** In its most recent capacity auction, for example, PJM, the Nation's largest grid operator spanning 13 MidAtlantic/ Midwest states and the District of Columbus, procured ample resources to reliably meet electricity needs during 2015/2016, the critical period following MATS compliance. Similarly, grid operators in other regions – the Southwest Power Pool ("SPP", covering all of Oklahoma, Kansas and Nebraska, and parts of five other states), New York, and New England's six states – expect to maintain reliability post-MATS compliance with fewer power plant retirements than previously projected. The reliability organization for 11 Western states continues to indicate any EPA reliability issues are manageable. All told, entities responsible for electric reliability in all or parts of at least 39 of the lower 48 states indicate a positive outlook as the industry complies with MATS.

- **Other regions are proactively addressing any potential reliability impacts.** In particular, the "ERCOT" area of Texas already faces near-term challenges unrelated to EPA rules. In the "MISO" area in the Upper Midwest and Northern Plains, a recent, initial assessment that included a combination of unlikely scenarios is encouraging early actions to address reliability issues. Both regions are proactively assessing and addressing options to ensure adequate future resources, with measures including reactivating mothballed power plants, adding new transmission, and coordinating retirement- and retrofit-related outages. In other areas such as the Southeast, utilities are either already well-prepared or are adding new gas-fired power plants, as well as planning to add pollution controls on some of the more-efficient coal plants.

- **The final MATS rule provides substantial compliance flexibility, clear guidelines for how power companies can get more time to comply, and a wider array of technology**

options that will facilitate compliance at a lower cost. As a result, grid operators expect fewer coal plants will be impacted.

- **Sustained low natural gas prices are facilitating the Nation's transition to a cleaner fleet.** Production of gas from domestic supply basins has significantly lowered gas prices. This new reality – unrelated to EPA air regulations – has rendered many of the Nation's oldest and least-efficient coal plants uneconomic. The outlook for sustained low gas prices is a key driver in retirement decisions. These low gas prices enable increased use of existing gas-fired plants, and are prompting new ones to emerge. Such plants are relatively fast to develop, permit and build.

- **Numerous expert studies informed by the actual, flexible elements of the final MATS rule provide evidence to counter the claims that an across-the-board delay of MATS is needed for reliability.** A May 2012 study by Resources for the Future, for example, concludes that "these regulations are unlikely to create the shock to the system as some worry. They lead to little change in generation capacity."

- **The heads of companies owning a significant share of the nation's coal fleet indicate the EPA rules are manageable.** These owners, representing about half of the nation's coal-fired capacity and 11 out of the top 15 largest coal fleets, include AES, Ameren, Buckeye Power Coop, Calpine, CMS Energy, Constellation, Dominion, Duke, Dynegy, Edison International, Exelon, FirstEnergy, GenOn, Great Plains Energy, NextEra, Northeast Utilities, NRG, PowerSouth Electric Coop, PPL, Progress, PSEG, Santee Cooper, SCANA, Seminole Electric Coop, TECO, TVA, Wisconsin Energy, and Xcel.

The bottom line? Americans can and should, without delay, enjoy the benefits of cleaner air and reliable electricity. Substantial compliance progress to date, combined with on-going coordination and proactive planning, provide strong evidence that Congress should not seek to delay MATS compliance and its tremendous health benefits.

Region	Recently Assessed as Reliable After MATS?
PJM	Yes
SPP	Yes
NY-ISO	Yes
ISO-NE	Yes
WECC	Yes
MISO	Extreme cases under review
ERCOT	Under review
Southeast	Yes, plus under review

The Positive Outlook for Cleaner Air and Reliable Electric Service

Introduction

Two years ago, the electric industry, policy makers and many others began to focus in earnest on the EPA's air pollution regulations' implications for electric system reliability. Back then, some observers asserted the industry could not comply with these rules without threatening electric reliability. Recently, some parties are seeking Congressional action to block implementation of EPA's final MATS rule everywhere in the U.S. They claim that timely compliance would harm electric reliability. Such action, however, would unnecessarily delay MATS demonstrated substantial health benefits in reducing power plants' emissions of hazardous air pollutants. Moreover, the facts do not support the claim that MATS implementation will lead to unreliable power. The reality is recent positive developments have reinforced that America need not compromise cleaner air for reliable electricity. It can and should have both.

This report examines recent positive signs reinforcing the conclusion that the Nation can get the benefits of both clean air and reliable electricity supply. These signs include: substantial increased compliance flexibility in the final MATS rule; grid operators' assessments confirming their regions will have adequate supplies; other regions' proactive efforts to manage any reliability issues; the positive support provided by the Nation's abundant supply of low-cost gas; and increased coordination among industry grid operators and regulators.

EPA's Final MATS Rule Provides Substantial Flexibility Needed to Address Reliability and Compliance Issues

Among the EPA air rules, MATS has the greatest impact on uncontrolled coal plants and the economics of deciding whether to retire a plant or add equipment to control emissions of hazardous air pollutants.

EPA's final MATS rule provides substantially more flexibility and clearer guidance on compliance strategies than originally expected. (For more detail see the Appendix section "What We Know About the EPA's Air Regulations (2010-2012)".) In particular, the Final MATS Rule offers proven technology options to reduce hazardous air pollutants and a clear roadmap for obtaining longer compliance timelines. For example, the rule provides three years, in the first instance for companies to comply: this means an initial deadline of April 2015 for compliance. The EPA's formal guidance, however, specifies that the state permitting authorities will have discretion to grant an additional year (i.e., to April 2016) for existing power plants to comply, if needed. Additionally, EPA has identified a clear pathway for plants needed for reliability to receive up to one further year (i.e., to April 2017) to comply, with such authorizations issued on a case-by-case basis.

Notably, none of the parties that filed court complaints to contest various aspects of the MATS rule requested that its implementation dates be stayed. (This differs from the complaints filed with respect to the CSAPR rule, many of which requested stays of the rule during the court's consideration of the CSAPR regulation.)

These more-flexible deadlines, combined with technology options identified in the rule, mitigate substantially some of the early concerns about reliability, as well as cost impact. The head of Southern Company, for example, reported during the company's April 2012 earnings call that the provisions in the final MATS rule are likely to allow the company to incur a much-lower capital budget in order to comply with the rule.[1]

In fact, a significant portion of the nation's fleet of coal plants already complies with MATS and the units that don't are relatively old, inefficient and already operating infrequently due to uneconomic pressures from sustained low natural gas prices.[2]

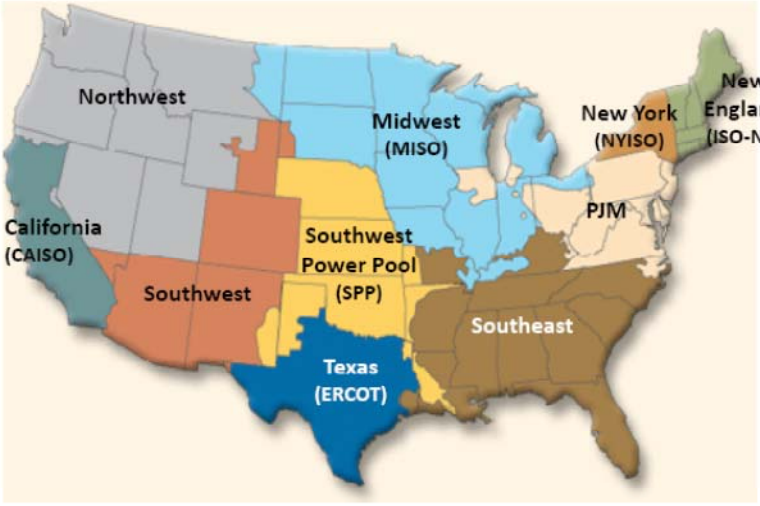
Most Grid Operators Project Adequate Resources Without Delaying MATS

Power markets have responded well to retirements driven by sustained low natural gas prices and more stringent air emission standards. For example, in May 2012, PJM published the results of its latest competitive auction to procure capacity resources three years in advance to ensure electric system reliability during the June-2015-through-May-2016 period, the critical period following MATS compliance deadlines. PJM's results confirm that even with a substantial number of coal retirements, the region will have more than enough resources to meet electricity needs. As one of its senior executives emphasized, "PJM is effectively, efficiently and reliably handling a massive shift in generation from coal to natural gas."[3]

Other regions have had similar results. In most regions of the U.S., grid operators and regional transmission organizations ("RTOs") have indicated they can reliably manage the impacts of EPA's air regulations. These RTOs include the Southwest Power Pool ("SPP"), covering all of Oklahoma, Kansas, Nebraska, and parts of Arkansas, Louisiana, Missouri, New Mexico, and Texas; the New York Independent System Operator ("NYISO) in New York; and the New England ISO ("ISO-NE"), covering Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

Similarly, reliability assessments for 11 states in the contiguous U.S. West, have continued to reconfirm that they expect adequate resources in the post-MATS compliance period.

Map of Regional Transmission Organizations and other Areas of the Lower 48 States



Source: Federal Energy Regulatory Commission, http://www.ferc.gov/market-oversight/mkt-electric/overview.asp

PJM and the Midwest/MidAtlantic Region: PJM's recent forward-capacity auction results indicate that even with "an unprecedented amount of electric generation retiring within the next three years, PJM's … capacity market secured record amounts of new generation, demand resources and energy efficiency to keep the grid reliable." These new resources are entering the market in part in response to "the relative competitiveness of natural gas compared to coal."[4] Andy Ott, PJM's senior vice president for Markets, stressed that PJM's capacity auction has successfully addressed, "in a quick and orderly manner, what could have been a prolonged and uncertain process to identify replacement resources…."[5] In fact, after expected retirements, in 2015/2016 post-MATS compliance period, PJM will still have a 20.6-percent reserve margin, far in excess of its 15-percent reliability target.[6]

PJM'S auction obtained offers for 8,207 MW in new power plant capacity as well as over 4,300 MW of demand-side resources, including demand response and energy efficiency. As shown in the table below[7], gas-fired power plants comprised the bulk of the new generation.

Incremental Capacity Resource Additions and Reductions by Year: Results of PJM Forward Capacity Auction (Base Residual Auction ("BRA")) Based on Resources in the Auction in Each Year				
Capacity changes (in ICAP)	Capacity (in ICAP MW)			
	2012/2013 (BRA conducted in 2009)	2013/2014 (BRA conducted in 2010)	2014/2015 (BRA conducted in 2011)	2015/2016 (BRA conducted in 2012)
Increase in Generating Capacity	1,893.5	1,737.5	1,582.8	8,207.0, including: 1,382.5 MW of new gas-fired CT/GT 5,914.5 MW new gas-fired CC 149.2 MW nuclear uprates 216.8 of peaking unit uprates 72 MW natural gas CC uprates 129.0 of wind capacity 16.0 of solar capacity 326.9 other new capacity and uprates
Decrease in Generating Capacity	-3,253.9	-1,924.1	-1,550.1	-6,432.6
Net Increase in Demand Resource Capacity	7,938.1	2,993.3	2,514.4	4,200.5
Net Increase in Energy Efficiency Capacity	632.3	101.1	73.1	101.3
Net increase in Installed Capacity	7,210.0	2,907.8	2,620.2	6,076.2
Source: PJM, 2015/2016 RPM Base Residual Auction Results, Tables 7 and 8. "ICAP" refers to Installed Capacity, and differs from MW reported in "UCAP" according to a derating of capacity to reflect unforced outages by type of technology or resource. "CC" is combined cycle, and "CT" is combustion turbine.				

PJM highlighted the market's successful response to coal retirement market signals noting:

> Over the next three years an unprecedented amount, over 14,000 MW, of generation retirements have been announced driven largely by environmental regulations…. The announced generation retirements send a strong signal that there would be a need for new resources, and this auction witnessed a record number of new generation offers, 6,854 MW; a record number of demand resource offers, 19,956.3 MW; and a record number of energy efficiency

> resource offers, 940.3 MW….The auction results also represent the continuing trend, starting in the 2014/2015 BRA, of a significant decline in the amount of coal-fired generation cleared and a significant shift to increased amounts of new natural gas-fired generation cleared.[8]

The bottom line is that the market responded effectively and promptly to the strong signal that increased retirements would necessitate new resources. PJM's President and CEO Terry Boston indicated that the recent auction successfully navigated this challenging transition while minimizing wholesale electricity costs for consumers in PJM's region noting: "Even with the retirement of older coal-fired generators, we will have enough existing and new resources in the region to keep the lights on."[9]

The Southwest Power Pool area (SPP): To update its earlier EPA air rule impact assessment conducted before finalization of the MATS rule, SPP conducted a survey to identify the final MATS rule's projected impact on power plants in SPP. As reported in April 2012 to the SPP Strategic Planning Committee, the new survey results indicate much smaller impacts than previously anticipated,[10] with reserve margins remaining strong through 2015.

In the survey, the generation companies indicated that, of the total 17,962 MW of capacity in SPP affected by EPA's air rules, some 720 MW was expected to switch from coal to natural gas, another 460 MW would be retired or derated, and approximately 12,983 would be retrofitted with emission controls. Further, these impacts would be spread across SPP's 72,200-MW territory, with the reductions "less that 1% of the available capacity in the SPP footprint."[11] In fact, in the period following MATS compliance, SPP would maintain a capacity reserve margin of about 22 percent in the summer of 2015, far exceeding SPP's targeted capacity margin of about 12 percent.[12]

In reviewing the survey results at its April 2012 meeting, the vice chairman of the SPP board of directors, Harry Skilton, was reported to have asked whether the new study meant that "EPA [was] right all along that the rules wouldn't cause a problem?" He added, "I guess the point is we're guardedly optimistic…."[13]

NYISO (New York): NYISO estimated recently[14] that the MATS rule would affect 10,800 MW of its 37,707 MW[15] of capacity in New York State. Given prior investments at these 32 plants, however, "most of the coal-fired capacity is relatively near compliance level emissions with existing environmental control equipment." Based on updated information about MATS, NYISO estimates that approximately 8,000 MW of heavy oil-fired capacity also will need to switch to cleaner fuel blends.

Although unlike PJM, NYISO does not have a long-term forward capacity market and procures capacity only goes 6 months ahead of when it is needed, NYISO has adequate resources and has been successful in procuring demand-response resources on a relatively fast pace.[16]

ISO-NE (New England states): In early April 2012, ISO-NE held its most-recent long-term, forward capacity auction with offers to provide capacity in 2015/2016 totaling 36,456 MW, approximately 3,000 MW more than needed. "In total, the auction procured 30,757 MW of generating resources, 3,628 MW of demand resources, and 1,924 MW of imports"[17] and accepted 1,889 MW[18] of requests to "delist" (i.e., to withdraw from the market or retire).

ISO-NE reports that because most of the region's generating capacity already has MATS compliant air-pollution-control equipment, related retirements are likely to be less than 1,000 MW.[19] Specifically, ISO-NE cites EPA's decision to add a "limited use oil-fired subcategory" as "significantly lessen[ing] the risk of environmental retirements by 2015 in New England."[20]

California, the Northwest, the Southwest, and the Rockies (the "WECC" region): Starting two years ago, reliability assessments of the impacts of the EPA air rules on power plants in the WECC region indicated that, even under stringent assumptions, EPA rules would cause no resource adequacy problems in the WECC.[21] With the final MATS rule's increased flexibility, the projected impacts are now even smaller.

Actions in Other Regions:

Other regions also are proactively addressing their reliability needs. For example, the ERCOT portion of Texas, and the MISO region covering Upper Midwest and Northern Plains states, are actively exploring options. Unlike PJM, NYISO, and ISO-NE which have forward capacity markets, ERCOT and MISO have centrally-administered, energy-only markets without a mechanism to procure long-term capacity ahead of the time of need.

ERCOT (Texas): Independent of the EPA rules, ERCOT Texas has faced growing demand, unprecedented recent heat waves, and the past effects of drought. These have created resource adequacy challenges in ERCOT.[22] For example, in the summer of 2011, Texas experienced its hottest summer on record, and had to institute emergency operating procedures to maintain power supplies to consumers.[23]

In conjunction with state utility regulators (the Public Utility Commission of Texas ("PUCT"), power generators and others, ERCOT is taking proactive[24] steps to increase its resources. At the request of the PUCT,[25] for example, ERCOT is reactivating about 2,000 MW of older, previously mothballed natural-gas-fired power plants.[26] One power company, Luminant, reversed its earlier decision to mothball two coal units totaling 1,130 MW.[27] ERCOT has also contracted for generation and load resources on an emergency basis, relying upon "switchable units" whose output can be switched over to serve ERCOT loads, using capacity from private networks.[28] ERCOT's May 2012 summer reliability assessment also recognizes the value of "more than 2,075 MW of wind power in the coastal region, which tends to be available to the grid during the late afternoon when it is needed most in the summer," as well as the projections of "1,500 MW of demand response resources."[29]

Further, the PUCT has proposed allowing energy market price caps to be raised substantially to induce new resources to enter the market, consistent with ERCOT's energy-only market design.[30] Previously, the PUCT had also mandated installing approximately 6 million real-time electricity meters by 2013, to reduce usage during both peak periods and scarcity conditions, improve utility operations and enhance the ability to rely on demand response.[31]

Adding new generation capacity, expanded fuel-switching, completion of transmission lines under development, and more aggressive deployment of demand-side resources, will help ensure ERCOT's reliability post implementation of EPA air regulations.

MISO (Midwest): Half of MISO's generating capacity is coal-fired, comprising a fifth of the Nation's coal-fired generating capacity.[32] MISO announced recently that it expects no reliability problems from the upcoming EPA regulations during 2012.[33]

As with ERCOT, the Midwest grid operator has taken early steps to assess how best to plan longer term for projected coal plant retirements and retrofit outages. These proactive efforts comport with industry recommendations to conduct "early in the compliance period," "sound technical assessment of the potential reliability and system adequacy impacts of utility compliance plans on both an individual utility basis and a consolidated regional or even cross-regional basis to assure that such plans do not unnecessarily harm, or threaten to harm, local or regional reliability…."[34]

MISO commissioned the Brattle Group to assess the reliability issues associated with anticipated plant retirements and retrofit outages. The report, "Supply Chain and Outage Analysis of MISO Coal Retrofits for MATS,"[35] concludes that MATS compliance will be challenging for MISO, especially under scenarios that assume a combination of extreme, unlikely conditions.[36] The report also assumes much-longer lead times for new generating capacity additions, which conflict with the industry's experiences in the past 15 years when much larger amounts of generating capacity were developed and built by non-utility companies and utilities.[37] Moreover, the report fails to examine the potential to add demand-side resources and/or transmission in locations where and when needed.

Further, the additional compliance flexibility under the final MATS rule, providing guidelines to obtain up to five years when warranted (i.e., up until April 2017), combined with MISO's early comprehensive assessments, will facilitate ensuring continued reliability post compliance.

Also, in the Southeast, companies such as Progress Energy, Duke Energy, Kentucky Utilities/Louisville Gas & Electric, SCANA, PowerSouth Electric Coop, NextEra, TECO, Santee Cooper, Seminole Electric, have indicated they are well-positioned for compliance with MATS. Many of them, along with Southern Company, are building new gas projects to help ensure reliable and low-cost supply for their customers as they manage their EPA compliance.

A Brighter Outlook Compared to Two Years Ago

Since 2010, when some raised concerns about EPA air rules' impact on electric reliability, much has happened to address these issues. (See the Appendix, sections on "How Things Looked in 2010".) Most notably:

- The tightening gas-to-coal fuel price differential has decreased coal plants' profitability tremendously. Independent of EPA air regulations, the current and historically low gas prices are a primary driver of retirements of many older, inefficient coal plants. Many retirements are being announced to occur even before the compliance deadlines, strongly suggesting that market fundamentals are motivating such retirements.

- These low natural gas market conditions are facilitating increased utilization of existing gas-fired power plants, as well as inducing new proposals to build new gas-fired power plants. (See the Appendix sections, "What's Happened with Market Dynamics (2010 to 2012)" And "What's Happening with New Power Projects.") Even operators of the largest fleets of coal-fired power plants (such as AEP[38] and Southern[39]) have substantially increased their natural gas output. New power plant infrastructure is in the development pipeline, with over 40 GW already under construction in various regions around the country.[40] Of this, approximately 22.4 GW is new natural-gas-fired generating capacity. By 2015, prior to expected MATS-compliance deadlines, a total of 31.7 GW of new gas-fired capacity is expected to enter the market from plants already under construction or in advanced development.[41] Moreover, in places where retirements are anticipated and elsewhere, grid operators and utilities have proposed, and are developing, transmission upgrades to address reliability issues. Over 17,800 circuit miles of new transmission is planned to come on line by 2015, and another 2,300 circuit miles was already under construction as of last year.[42]

- Given the increased flexibility EPA provided in the final MATS rule, the estimates of retirements driven primarily by EPA air rules, have shrunk substantially. (See the Appendix, "What We Know About the Reliability Outlook Today")

    - In 2011, numerous expert assessments of EPA air rules' reliability impact, including ones by the Bipartisan Policy Center, Department of Energy, North American Electric Reliability Corporation, Congressional Research Service, Resources for the Future ("RFF"), Electric Power Research Institute ("EPRI"), highlighted that many earlier studies over-estimated the incremental effects of the air regulations as they assumed the rules would be more stringent than those EPA actually adopted.

    - For example, RFF's study, which focuses solely on EPA's air rules, concludes "these regulations are unlikely to create the shock to the system as some worry. They lead to little change in generation capacity."[43]

- Further, the cost impact of the air rules is also likely to be lower than initially assumed:

    - RFF concludes that the "large costs associated with investments in pollution control technologies are partially offset by a decrease in the cost burden associated with tradable emissions allowances. The combined effects contribute to a one percent increase in retail electricity prices and a decrease in producer profits of about $3–$5 billion in 2020. Though it varies across scenarios and regions, over the simulation horizon, consumers pay approximately 70 percent of total costs. In 2020, for example, total annual costs are between $6.6 billion and $7.1 billion."[44] For context, total electric revenues in the U.S. in 2012 were $372 billion.[45]

    - Southern Company now estimates that the final MATS rule may allow the company to spend between 25-to-40 percent less capital to comply than previously estimated.[46]

- Notably too, even the heads of companies owning a significant portion of the nation's coal fleet have indicated the EPA rules are manageable. (See the Appendix, "What We Know about Power Companies' Readiness Today.")

    - The heads of companies owning about half of the nation's coal-fired capacity and 11 out of the top 15 largest coal fleet have indicated that they are well-positioned to comply with the EPA air rules. The companies include AES, Ameren, Buckeye Power Coop, Calpine, CMS Energy, Constellation, Dominion, Duke, Dynegy, Edison International, Exelon, FirstEnergy, GenOn, Great Plains Energy, NextEra, Northeast Utilities, NRG, PowerSouth Electric Coop, PPL, Progress, PSEG, Santee Cooper, SCANA, Seminole Electric Coop, TECO, TVA, Wisconsin Energy, and Xcel.

    - Progress Energy's CEO recently stated that, with regard to Duke Energy and Progress – which intend to merge if approved by regulators – "Both companies got an early start on retiring old coal units…Duke did some of that by replacing it with a modern supercritical coal plant. We did it by building gas combined-cycle, and Duke is also building gas combined-cycle.[47]

- Additionally, state and federal regulators have increased their focus on ensuring industry preparedness. Federal policy officials in environmental and energy agencies, and state air and utility regulators, are coordinating fully regarding industry compliance to help maintain electric reliability.

    - Federal and State energy regulators have established a forum to explore power-sector EPA-related reliability issues. Members of the forum include the commissioners of the Federal Energy Regulatory Commission ("FERC") and

representatives from state members of National Association of Regulatory Utility Commissioners ("NARUC").

- Additionally, state energy and environmental regulators are collaborating to share information as the federal government moves forward with new environmental regulations. Of particular interest is implementing these environmental initiatives and reaping the associated benefits while not compromising energy reliability. These cross-state discussions include representatives of NARUC as well as from the National Association of Clean Air Agencies and the National Association of State Energy Officials.

These encouraging developments confirm the early view of many that the industry is well-positioned to respond effectively and creatively to the EPA regulatory requirements.[48] Power companies, regulators, grid operators, and stakeholders are coordinating proactively and effectively to create "incentives for action in the face of regulatory uncertainty."[49]

By acting proactively and employing a full suite of available tools, the industry and regulators will be able to ensure reliable supply at minimum cost. These tools include not only investment in pollution-control technologies and new power plants, but also fuel-switching and retrofits, repowering and reactivating moth-balled plants, energy efficiency, demand response, enhanced outage coordination, reserve sharing, coordinated planning studies, and new transmission.

When combined with the enhanced flexibility EPA built into the final MATS rule, this wide range of tools provides the means to address any remaining, local reliability concerns on a case-by-case basis.

Conclusion: Americans Can Timely Comply With MATS Without Compromising Reliability

Two years ago in testimony before the Senate,[50] I highlighted that the U.S. electric industry has a proven track record of successfully complying with environmental regulations while maintaining reliability, and I emphasized that the Nation need not choose between clean air and reliable electric supply. Recent positive developments in the intervening two years have only reinforced and strengthened that view.

In particular, the industry and regulators have made substantial progress to achieve both compliance and continued reliability. The final MATS rule offers flexible compliance approaches, with proven-technology options and a clear path to achieve additional compliance time if warranted, significantly reducing rule-related retirements. And historically low natural gas prices have helped to lower average electricity prices, enabling the nation to better absorb the investment needed to provide Americans with cleaner air and a more modern electric generating fleet.

All of these developments reinforce the conclusion that Congress should not delay MATS and its tremendous health benefits for the U.S. Americans can and should have the benefit of both clean air and reliable electricity.

Endnotes

[1] Southern Company, Q1 Earnings Report conference call, April 25, 2012: Chairman, President and CEO Thomas Fanning stated that the original estimate that the company would need to spend up to $2.7 billion over a three-year period is now "somewhere between $0.5 billion to $1 billion less, depending on the number of bag houses, the extent to which we'll have to expand transmission system, gas pipelines and a variety of other issues."

[2] Further, the CAIR rule remains in place pending court reviews of the agency's CSAPR.

[3] PJM press release, May 18, 2012, quoting Andy Ott, PJM senior vice president – Markets.

[4] PJM press release, "PJM Capacity Auction Secures Record Amounts of New Generation, Demand Response, Energy Efficiency: Auction Maintains Reliable Power Supplies for Consumers," May 18, 2012.

[5] PJM press release, May 18, 2012, quoting Andy Ott, PJM senior vice president – Markets.

[6] PJM, 2015/2016 RPM Base Residual Auction Results, PJM DOC#699093, pages 2, 26-27.

[7] The capacity is expressed in ICAP term.

[8] PMN, 2015/2016 RPM Base Residual Auction Results, PJM DOC#699093, pages 2-3.

[9] Corina Rivera-Linares, "PJM CEO: "Generation changes likely to spur 'badly needed' transmission upgrades," Generation Hub, May 17, 2012.

[10] Joshua Phillips, SPP, "SPP EPA Impact Assessment For SPC & MOPC," presentation to the SPP Strategic Planning Committee Meeting, ("SPP Strategic Planning Committee Presentation") April 9, 2012.

[11] SPP Strategic Planning Committee Presentation.

[12] "SPP reserve margin OK with EPA rules," Platt's, April 10, 2012.

[13] SPP's study from December 2011, by SPP's Economic Studies Working Group, reported that the EPA air rules might cause the overall generating capacity in SPP to drop by 2,000 MW to 5,000 MW, which equals about 9 percent of SPP's 54,949 MW peak load record hit on August 2, 2011. "SPP reserve margin OK with EPA rules," Platt's, April 10, 2012.

[14] Patricio Silva, Senior Analyst from ISO-NE, presentation of an "Environmental Regulatory Update," to the Inter-Area Planning Stakeholder Advisory Committee composed of ISO-NE, NYISO, and PJM, March 30, 2012.

[15] NYISO, 2011 Load & Capacity Date (Gold Book), page 25.

[16] In 2011, available demand response amounted to 1,897 MW, up from 712 MW in 2001. NYISO, Power Trends 2012, page 11.

[17] ISO-New England press release, "FERC Filing Confirms New England's Sixth Capacity Auction Procured Resources Needed for 2015–2016," April 30, 2012.

[18] The approved delist requests included the 604-MW Vermont Yankee nuclear facility's request.

[19] Patricio Silva, ISO-NE, presentation to the ISO-NE Environmental Advisory Committee, April 30, 2012.

[20] Patricio Silva, ISO-NE, providing an "Environmental Regulatory Update," to the Inter-Area Planning Stakeholder Advisory Committee composed of ISO-NE, NYISO, and PJM, March 30, 2012.

[21] NERC, "Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations," October 2010; NERC, Long-Term Reliability Assessment, November 2011.

[22] Brantley Hargrove, "ERCOT Says There Should Be *Just Enough* Juice To Keep Lights On This Summer, As Long As It Isn't Hot, Hot, Hotter Than Hell," Dallas Observer, March 1, 2012; Letter from Public Utility Commission of Texas Chairman Donna Nelson to Trip Doggett, ERCOT, August 12, 2011.

[23] ERCOT is one of the parties that sought to delay the implementation of the EPA CSAPR rule, which is currently under review by the federal court. In the meantime, the CAIR rule is in effect.

[24] I have elsewhere described the full range of tools as the "Champ" Swiss army knife, with a wide range of implements to deal with a wide array of contingencies. These tools have helped grid operators in a variety of circumstances to assure reliable supply of electricity, both on a region-wide and location-specific basis. Susan Tierney, "Responding to EPA's Regulations Affecting Coal Plants: Using a 21st Century Toolkit (or, upgrading to the "Champ" from the "Classic")," presentation to NARUC's Roundtable on the EPA Regulations, NARUC Winter Meeting, February 14, 2011.

[25] Letter from PUCT Chairman Donna Nelson to Trip Doggett, ERCOT, August 12, 2011.

[26] Laylan Copelin, "ERCOT: Summer Blackouts not likely, but concerns still linger," American Statesman Staff, May 1, 2012

[27] Barry Cassell, "Luminant delays plan to shut Monticello coal units," Generation Hub, January 23, 2012. Luminant made this decision after the federal court stayed CSAPR.

[28] ERCOT News Release, "ERCOT Board moves to improve future generation outlook," April 18, 2012. Also, UBS Investment Research, "US IPP Power Shock," May 24, 2012.

[29]ERCOT News Release, "Generation reserves remain tight for summer; ERCOT expects calls for energy conservation: *More power plants return to service, and weather forecast less extreme than 2011," May 1, 2012*

[30] PUCT proposal (an amendment to 25.505 and a new rule 25.508), published in the Texas Register, April 27, 2012. The current price cap has a $3,001 ceiling for a violation of 50 MW or more; the original proposal was to raise it to $4,500. PUCT Commissioner Anderson has recently recommended that that price apply at a level of 200 MW or more, with gradual increases in prices up to it. UBS Investment Research, "US IPP Power Shock," May 24, 2012.

[31] PUCT Commissioner Christine Wright, "Overview of Smart Meters in ERCOT," April 17, 2012, http://www.puc.state.tx.us/agency/topic_files/101/PUC_Smart_Meter_Review_Christine_Wright.pdf

[32] SNL data.

[33] MISO, 2012 Summer Resource Assessment, May 2012.

[34] These comments are from of the "Electric Utility Trade Associations" (Edison Electric Institute, the American Public Power Association, the Large Public Power Council, and the National Rural Electric Cooperative Association), filed in FERC Docket No. AD12-1-000, Commission Role Regarding Environmental Protection Agency's Mercury and Air Toxics Standards, February 29, 2012.

[35] Metin Celebi, Kathleen Spees, Quincy Liao, Steve Eisenhart of the Brattle Group, "Supply Chain and Outage Analysis of MISO Coal Retrofits for MATS," May 2012.

[36] In my opinion, the combination of these "high risk" events, any one or more of which may not transpire, includes: longer lead times for adding new generating units than was expected earlier when significant quantities of gas-fired generating capacity was added in the U.S.; high-side estimate of base-case coal-plant retirements driven by the MATS rule (with that estimate based on a prior MISO study prepared before the MATS rule was finalized and that did not reflect its flexibility with respect to controls or compliance periods); a high-side estimate of coal-plant retirements based on a study prepared by EEI nearly a year before the MATS rule was finalized; an assumption that all power plants would have only one year of additional time beyond April 2015 to comply with MATS (i.e., to April 2016), even though EPA guidance has indicated the process through which generators may seek an additional year to comply with MATS (i.e., until April 2017); longer-

than-expected outages to tie in plants where upgrades have been undertaken at the facility in parallel with operations at the plant; and craft labor shortages that may constrain efforts to add pollution-control equipment.

[37] For example, the Brattle study surveyed vertically integrated utility companies to ask about the time required to develop, permit, and construct new power plants. Based on my own extensive experience in and study of power plant permitting and siting, the respondents' time frames are much longer than past experience of competitive electric generators when faced with market opportunities and with reliability issues that led permitting agencies to accelerate permitting time frames. See, for example, "Siting Power Plants in the New Electric Industry Structure: Lessons California and Best Practices for Other States" (with Paul J. Hibbard), *The Electricity Journal*, June 2002.

[38] Amy Harder, "War Over Natural Gas About to Escalate," National Journal, May 3, 2012.

[39] Southern Company indicates that low gas prices with high coal prices in the 2020 time frame could lead to 57-percent reliance on gas and 22 percent on coal, with 21 percent based on nuclear and other; with high gas prices and low coal prices, the shares are projected to be 34 percent for gas and 45 percent for coal. Southern Company, First Quarter 2012 Earnings Report conference call, April 25, 2012.

[40] SNL Financial, as of Mary 15, 2012. Note that since November 11, 2011, total announced capacity has grown by 10 GW and total capacity under construction has increased by 3 GW. See the Appendix for more detail.

[41] Amounts under construction by electric reliability region are:

- the Western states (the "WECC" region): 12.8 GW
- the Southeast states (the "SERC" region): 15.5 GW
- Florida (the "FRCC" region): 2.2 GW
- the Midwest/MidAtlantic region (the "RFC" region, roughly equivalent to PJM): 4.6 GW
- ERCOT part of Texas: 2.0 GW
- The Upper Midwest/Northern Plains states (the "MRO" region, similar to MISO): 0.8 GW
- The south-central states (the "SPP" region): 1.5 GW
- New York and New England (the "NPCC" region"): 1.2 GW.

[42] NERC, Long-Term Reliability Assessment 2011, Table 4. Total existing circuit miles of transmission amount to 395,000 as of 2011.

[43] Dallas Burtraw, Karen Palmer, Anthony Paul, Blair Beasley, and Matt Woerman, "Reliability in the Electricity Industry under New Environmental Regulations," May 2012 ("RFF Study"), page 1.

[44] RFF Study.

[45] EIA, 826 data.

[46] Southern Company, 1st Quarter 2012 Earnings Report conference call, April 25, 2012.

[47] Kathleen Hart, "Progress Energy CEO sees uncertain future for new nukes given 'dash to gas'," SNL Energy, May 25, 2012.

[48] See, for example, MJ Bradley Associates and Analysis Group, "Ensuring a Clean, Modern Electric Generating Fleet While Maintaining Electric System Reliability," August 2010.

[49] Susan Tierney, "Upcoming Power Sector Environmental Regulations: Framing the issues about potential reliability/cost impacts," October 22, 2010, presentation to the National Commission on Energy Policy's Workshop on Power Sector Environmental Regulations.

[50] Testimony of Susan F. Tierney, Ph.D. Managing Principal, Analysis Group, Boston, Before the U.S. Senate Environment and Public Works Committee, Subcommittee on Clean Air and Nuclear Safety, June 30, 2011, at its Oversight Hearing: Review of EPA Regulations Replacing the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR).

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

The Positive Outlook for Cleaner Air and Reliable Electric Service

Appendix

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Analysis Group, Inc.

June 11, 2012

The Positive Outlook for Cleaner Air and Reliable Electric Service: Appendix

How Things Looked in 2010:

Two years ago in the Spring of 2010, several conditions helped to shape the outlook for the electric industry. Several were well understood; others cast a shadow of uncertainty about trends in the future:

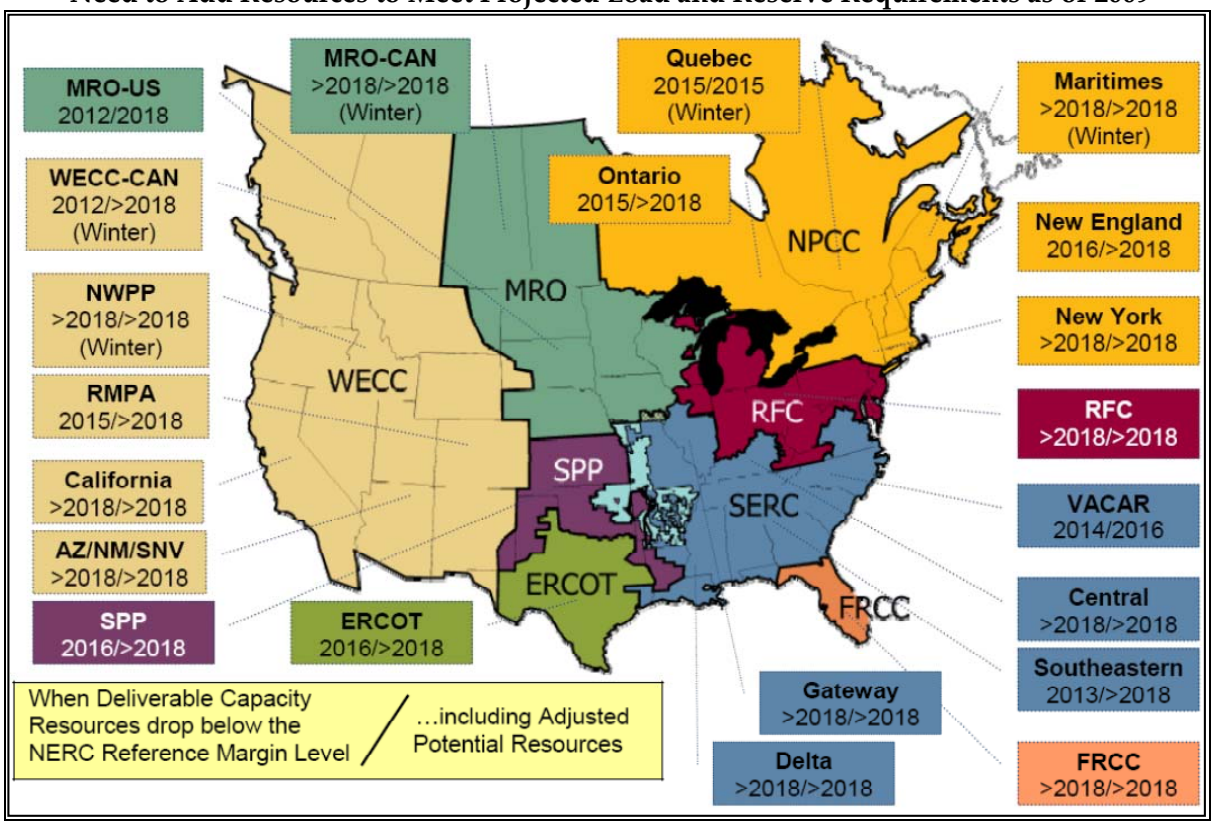
- The economy and electricity demand: Following the collapse of the economy in the second half of 2008, electric demand had dropped substantially – something that rarely occurs except as a reflection of the normal effects of weather variation on demand. U.S. electricity sales in 2009 were lower than they were in 2005. Industrial electricity consumption had dropped 9 percent in one year.[1] Some regions were harder hit than others,[2] but in all regions, generating capacity was well above reserve requirements.[3] As shown below in Figure A-1, in 2009 all regions of the U.S. were estimated to have adequate generating capacity above the reference reserve margin for many years, with only the "MRO" region (Midwest Reliability Organization) region needing to add capacity by 2012 (i.e., three years later) and the Southeastern U.S. (part of the "SERC" region) needing to add new capacity by 2013 (i.e., four years later). In 2010, it remained highly uncertain how fast the economic recovery would occur, and in turn, how soon electricity demand growth would eat into surplus generating capacity.

[1] Energy Information Administration ("EIA") data for the retail sales of electricity in the U.S.

[2] Electricity sales in some regions (i.e., in the MidAtlantic states and East North Central states) in 2009 were lower than they had been in 2002. In other regions, 2009 demand was lower than in 2003 (New England, East South Central) or in 2004 (West North Central and South Atlantic). Some regions were hit less hard (Mountain and Pacific contiguous states were lower than 2006 levels, and West South Central was back to 2005 levels). EIA 826 data for the retail sales o f electricity in the U.S.

[3] North American Electric Reliability Corporation ("NERC"), "Long-Term Reliability Assessment 2009-2018," October 2009, Figure Summary 1.

Table A-1
Summary of the Time Frame in Which U.S. and Canadian Regions
Need to Add Resources to Meet Projected Load and Reserve Requirements as of 2009



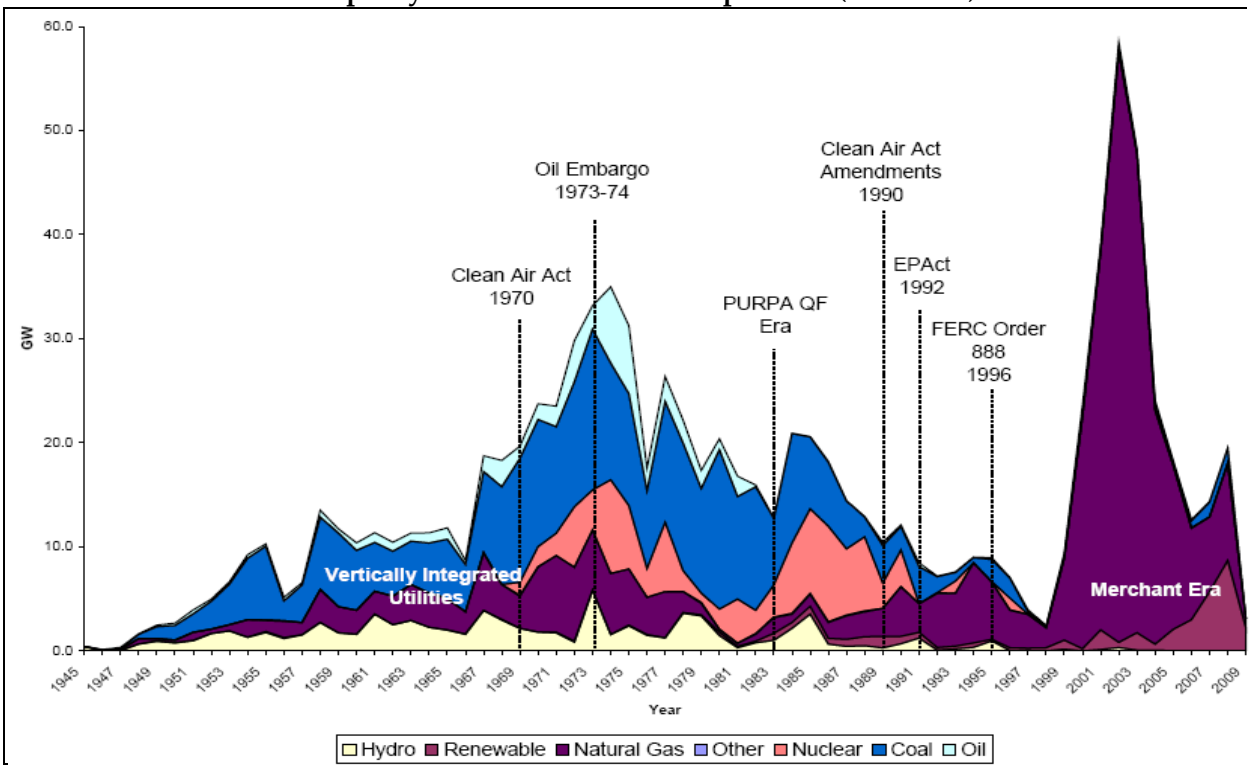
Source: NERC, Long-Term Reliability Assessment, 2009, Figure Summary 1.

- Changes in the Fuel and Power Plant Technology Mix: The prior decade witnessed significant additions of power generation capacity, which contributed to the surplus capacity situation described above. Total U.S. generating capacity at the end of 2009 was 1,027 gigawatts ("GW"), of which approximately a third (314 GW) was at coal-fired power plants, about 40 percent (404 GW) was at natural-gas-fired power plants, 10 percent (101 GW) was at nuclear stations, and 20 percent (203 GW) was at hydroelectric and other renewable energy plants. While natural gas-fired and wind generation capacity dominated the additions in the first part of the decade (as shown below in Figure A-2),[4] new coal-fired power plants were also entering service. Eight new coal-fired power plants totaling 3.2 GW of capacity entered operation in 2009, the largest increase since 2001. Another 22 coal-fired power plants (13.8 GW) were under construction with an additional 4.9 GW newly proposed in 2009, although another 14.9

[4] ICF, "Investment Decisions for Baseload Power Plants," report prepared for the National Energy Technology Laboratory ("NETL") of the U.S. Department of Energy ("DOE"), January 29, 2010.

GW of previously announced coal-fired power plants were cancelled.[5] The reasons given for cancellations and delays were policy uncertainty (especially regarding carbon legislation), strained project economics (as significant increases in construction inputs occurred before the end of the decade), and anti-coal campaigns that fought regulatory approvals of many proposed coal plants.[6]

Figure A-2
Generating Capacity Additions by Fuel and by Year
the Capacity Entered Commercial Operation (1945-2009)



Source: ICF, "Investment Decisions for Baseload Power Plants, Volume 1," prepared for NETL, January 2010, Exhibit 1-1.

- Aging Power Plant Fleet: As of Spring 2010,[7] much of the nation's electric generating infrastructure was old and getting older. Nearly two-thirds of coal-plant capacity, 44 percent of nuclear capacity, and one-fourth of gas-plant capacity was already over 30

[5] NETL, Tracking Power Plants, January 8, 2010.

[6] EIA, Form 860 data; NETL, "Tracking New Coal-Fired Power Plants," January 8, 2010.

[7] EIA, Form EIA-860 data (Annual Electric Generator Report), data available through 2008. Cited in Susan Tierney, "The Prospects for Natural Gas, Coal, and Nuclear Power in America's Energy Future," paper presented to the Aspen Institute Congressional Program on Energy Security and Climate Change: Policy Challenges for the Congress, April 7, 2010.

years old. Fourteen percent of coal-fired capacity – mainly at over 500 relatively small and inefficient generating units – was already 50 years old or older.[8]

- Coal Prices, Natural Gas Prices and Fuel Consumption for Power Generation: Across the country, states vary significantly with respect to their reliance on these fuels for power production. Many states[9] rely on coal for over 80 percent of their power supply, and others states rely much-more heavily on natural gas.[10] In 2009, after a number of years of prices at high levels, natural gas prices dropped to their lowest level in 7 years.[11] This resulted from a combination of increased production of shale gas, economic slowdown that affected demand, and other factors. Meanwhile, coal prices were rising (with an 84 percent increase from 2000 to 2009).[12] Many studies heralding the prospects of continued low natural gas prices showed up in the public domain.[13] EIA observed that, by 2010, the "increase in delivered coal prices and the decrease in delivered natural gas prices, combined with surplus capacity at highly-efficient gas-fired combined-cycle plants resulted in coal-to-gas fuel switching. This occurred particularly in the Southeast (Alabama, Arkansas, Florida, Georgia, Mississippi, and South Carolina) and also Pennsylvania. Nationwide, coal-fired electric power generation declined 11.6 percent from 2008 to 2009, bringing coal's share of the electricity power output to 44.5 percent, the lowest level since 1978."[14] Looking ahead

[8] EIA, Form EIA-860 data (Annual Electric Generator Report), data available through 2008.

[9] The most heavily reliant on coal were: West Virginia (98% coal); Wyoming (94%); Indiana (94%); Kentucky (94%); North Dakota (91%); Ohio (85%); and Missouri (81%). Several other states used coal for more than half of their electric generation: Kansas (75%); Iowa (75%); New Mexico (73%); Delaware (70%); Nebraska (66%); Wisconsin (66%); Colorado (65%); Tennessee (63%); Georgia (63%); Montana (62%); North Carolina (61%); Michigan (61%); Minnesota (58%); Maryland (57%); Pennsylvania (53%); South Dakota (52%); and Alabama (51%). (Illinois, Oklahoma and Arkansas each had 48% power generation from coal, as well.) EIA, Form EIA-906 and EIA-920 Databases, 2008 data. http://www.eia.doe.gov/cneaf/electricity/epm/epm_ex_bkis.html.

[10] States relying heavily on power produced by natural gas: Rhode Island (97%): Nevada (68%); Alaska (59%); California (58%); Massachusetts (51%); Louisiana (49%); Texas (48%); and Florida (47%). EIA, Form EIA-906 and EIA-920 Databases, http://www.eia.doe.gov/cneaf/electricity/epm/epm_ex_bkis.html.

[11] EIA data (reported at year's end in EIA's Electric Power Annual, November 2010).

[12] EIA data (reported at year's end in EIA's Electric Power Annual, November 2010).

[13] For example, MIT's major report, "The Future of Natural Gas," reported its overarching conclusions such as: "Abundant global natural gas resources imply greatly expanded natural gas use, with especially large growth in electricity generation. Natural gas will assume an increasing share of the US energy mix over the next several decades, with the large unconventional resource playing a key role." MIT, MIT Study on the Future of Natural Gas, July 2010, page xi. Other examples include: "Special report: gas shale 1: seven plays dominate North America activity," Oil & Gas Journal, September 28, 2009; Clifford Krauss, Drilling Boom Revives Hopes for Natural Gas, The New York Times, August 24, 2008; ICF, "Availability, Economics and production of North American Unconventional Natural Gas Supplies," prepared for INGAA, November 21, 2008; "Estimated recoverable natural gas in US put at 1,525 Tcf," Platts, September 13, 2007.

[14] EIA, Electric Power Annual, November 2010, page 1.

from early 2010, EIA was estimating continued pressure from low natural gas prices on coal use.[15]

- New EPA air regulations: In early 2010, it was well known that EPA was working to finalize proposed regulations affecting air emissions at existing power plants. Two regulations adopted previously by the Bush Administration's EPA – the Clean Air Interstate Rule ("CAIR") and the Clean Air Mercury Rule ("CAMR") – had been vacated by the courts, and sent back to EPA for revision. In March of 2010, the Obama Administration's EPA's Air Administrator, Gina McCarthy, testified before Congress that the agency was nearing issuance of the revised CAIR proposal and that the proposed CAMR revisions would be out by March 2011.[16] Final rules on each were expected to occur within 6-12 months following the proposed regulations, with the first phase of the air transport rule (CAIR) to go into effect shortly after issuance and with the second phase timed more closely to implementation of the mercury and air toxics rules in 2014-2015.

- Push-Back on EPA Regulations: Also in Spring of 2010, the Edison Electric Institute ("EEI") and some companies began to raise concerns about the cumulative effects and inflexibility of EPA's upcoming regulations affecting power plants (including air emission regulations, coal-ash and cooling-water intake regulations) on coal use and electric system reliability.[17] In February 2010, EEI had prepared a now-infamous chart calling the EPA regulations a "train wreck," allowing insufficient time for power plant owners to comply with the regulatory deadlines.[18] Owners of coal plants began to raise concerns in various forums.[19]

- Reports on Electric System Reliability Impacts of EPA Regulations: In 2010, a series of reports were published on the effects of the regulations on power plant retirements.[20]

[15] EIA, Short Term Energy Outlook, April 2010.

[16] Statement of Regina A. McCarthy, Assistant Administrator, Office of Air and Radiation, U.S. EPA, before the U.S. Senate Committee on Environment and Public Works, March 4, 2010.

[17] Statement of the EEI, "Economic Impacts of Coal," Submitted to the Congressional Caucus on Coal, May 25, 2010.

[18] Statement of the EEI, "Economic Impacts of Coal," Submitted to the Congressional Caucus on Coal, May 25, 2010.

[19] See, for example, Bruce Braine, American Electric Power ("AEP"), "Planning under Climate Change/ Environmental Uncertainty," presentation to the MACRUC Conference, June 30, 2010.

[20] These reports include: North American Environmental Markets Service, "EPA's Upcoming MACT: Strict Non-Hg Regs Can Have Far-Reaching Market Impacts," (April 2010); ICF study prepared for INGAA, "Coal-Fired Electric Generation Unit Retirement Analysis;" (May 2010); ICF study prepared for EEEI, "Preliminary Reference Case and Scenario Results," (July 2010); Credit Suisse, "A Thought… CATR is First Step in Changing the Coal Fleet," (July 2010); MJ Bradley Associates and Analysis Group (prepared for the Clean Energy Group), "Ensuring a Clean, Modern Electric Generating Fleet While Maintaining Electric System Reliability," August

These studies showed a wide range of retirement outcomes for coal plants, ranging from 6 GW to 65 GW.[21] The lower estimates focused specifically on the impacts of the air regulations which would affect the industry in the nearer term, and the higher estimates examined the cumulative effects of all of the various regulations and assuming more stringent rules would be issued by the EPA.

As described further below, reports such as these prompted significant attention among public officials, investor groups and reliability organizations. The Bipartisan Policy Center and the National Association of Regulatory Utility Commissioners ("NARUC"), for example, began to hold series of workshops and sessions on the EPA regulations' impacts on the electric sector starting in late 2010. Other dialogues among air regulators, utility regulators and energy officials got underway soon afterwards. These have been followed by significant congressional interest, investor analyst assessments, regional transmission organization ("RTO") analyses, and power plant owners' actions, among other things. The Federal Energy Regulatory Commission ("FERC") has been sponsoring conferences on reliability issues, with EPA and the U.S. DOE, state utility regulators, NARUC, NERC, power companies, RTOs, and others. U.S. House and Senate committees have held hearings to examine reliability implications of the EPA air rules. Heads of companies that own affected power plants have informed investors about their readiness to respond to the EPA rules. Power plant-retirement announcements have begun, along with proposals to replace capacity and to take other actions to mitigate reliability impacts on the electric systems.

Importantly, of course, the EPA has issued final rules and taken other actions on various environmental regulations affecting existing coal, oil and natural gas power plants. As of June 2012, the electric industry knows much more about the outlook for air regulations and is in a very different and much better-prepared position, than it was two years ago.

2010; Bernstein Research, "U.S. Utilities: Coal-Fired Generation Is Squeezed in the Vice of EPA Regulation; Who Wins and Who Loses?" October 2010; Steven Fine (ICF), "Clean Air, Ash and Water Regulations: Potential Impact of EPA Proposed Rules," October 2010; NERC, "2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulation," October 2010; Deutsche Bank Group Climate Change Advisors, "Natural Gas and Renewables: A Secure Low Carbon Future Energy Plan for the United States," November 2010; Stan Kaplan, EIA, "Potential for Displacing Coal With Generation from Existing Natural Gas Plants," presentation to the National Capitol Area Chapter, U.S. Association for Energy Economics, November 2010; Metin Celebi, et al., (Brattle Group), "Potential Coal Plant Retirements Under Emerging Environmental Regulations," (December 2010); Ira Shavel and Barclay Gibbs (Charles River Associates), "A Reliability Assessment of EPA's Proposed Transport Rule and Forthcoming Utility MACT," December 2010.

[21] See Susan Tierney, Electric Reliability under New EPA Power Plant Regulations: A Field Guide," January 18, 2011, http://www.wri.org/stories/2011/01/electric-reliability-under-new-epa-power-plant-regulations-field-guide.

What We Know About EPA's Air Regulations (2010 to 2012)

Although EPA finalized the air transport regulations, the Cross-State Air Pollution Rule ("CSAPR"), ahead of the mercury and air toxics standard ("MATS"), the latter is currently the centerpiece of much attention from a compliance point of view.

CSAPR: Consistent with EPA's anticipated schedule in early 2010, the agency published its proposed revisions to the remanded CAIR rule in July, 2010, calling the new regulation the "cross state air pollution rule."[22] The purpose of the rule was to address pollutants that were transported from their emission source in one state to another state where they adversely affected air quality. This proposed rule would affect emissions of sulfur dioxide ("SO_2") and nitrogen oxides ("NO_x") from existing fossil-fueled power plants in certain states in the eastern half of the U.S. After receiving hundreds of comments from states, environmental and public health groups, industry, and other stakeholders, EPA then issued the final rule on July 6, 2011, along with a supplemental rule that would add five additional states to the program. Technical revisions to the July rule were published on October 6, 2011. The supplemental rule was finalized on December 15, 2011.

Although CSAPR was scheduled to begin its Phase 1 compliance program to replace CAIR starting January 1, 2012, its implementation was delayed on December 30, 2011, pending a decision by the federal appeals court. In response to various petitions opposing aspects of CSAPR, the U.S. Court of Appeals for the D.C. Circuit issued a ruling to stay the CSAPR pending judicial review, and left CAIR in place while the court considers the merits of the challenges to the CSAPR. Opponents and proponents of the rule, including EPA itself, filed briefs with the court in February and March 2012. Pending this court review, EPA has issued minor technical adjustments to the rule to provide flexibility to states by increasing budgets in 17 states and easing limits on market-based compliance options, so that the rule can be implemented expeditiously in the future.

MATS: Issued on a slightly slower time line than the CSAPR regulations, EPA published the mercury and air toxics standard as a proposed regulation on March 16, 2011. The proposal addressed new standards for emissions of mercury, acid gases and other toxic pollution from certain coal- and oil-fired power plants. After holding public hearings and receiving comments on the proposed rule, EPA issued publicly the final MATS regulation on December 21, 2011. EPA has indicated that MATS would affect the approximately 1,400 coal- and oil-fired generating units that are over 25 MW in size, at about 600 power plants nationwide.[23]

As part of its final rule, EPA included several provisions to help ensure timely and effective compliance in ways that would not jeopardize electric system reliability. To provide transparency about the implementation flexibility built into the rule and the Clean Air Act

[22]The time line here is taken from the EPA website for CSAPR, http://www.epa.gov/airtransport/.

[23] http://www.epa.gov/airquality/powerplanttoxics/pdfs/20111216MATSpresentation.pdf

itself,[24] EPA also issued guidance on how it planned to enforce MATS as part of the regulatory package. EPA stated its intentions regarding how it would apply MATS in cases where generating units are critical for reliability purposes.[25] EPA also identified the steps that a power plant owner/operator should take to qualify for an administrative order for such plants.[26] The process would generally give existing power plants up to four years to comply with MATS (i.e., up until April 2016),[27] and would allow for additional time on a case-by-case basis (e.g., a fifth year until April 2017 when need could be demonstrated at a particular site).

On December 21, 2011, President Obama issued a companion memorandum on the MATS rule.[28] This presidential memo explicitly recognized that the electric "system as a whole is critical infrastructure that plays a key role in the functioning of all facets of the U.S. economy, and maintaining its stability and reliability is of critical importance. It is therefore crucial that

[24] Sources of flexibility in the final rule include: establishing different emissions standards for different categories of power plants (e.g., coal-fired power plants, oil-fired unit); station-wide averaging of emissions from units on a single site; adopting work-practice standards for demonstrating compliance with certain hazardous air pollutants; ability to comply using either input- or output based emissions limits; and others.

[25] In its regulatory package for MATS, EPA included a letter describing how EPA would "exercise its authorities to ensure compliance with environmental standards while addressing genuine risks to reliability." December 16, 2011 Letter from Cynthia Giles. Assistant Administrator for the Office of Enforcement and Compliance Assurance, to EPA Regional Administrators and others, "Enforcement Response Policy for Use of Clean Air Act Section 113(a) Administrative Orders in Relation to Electric Reliability and the Mercury and Air Toxics Standards." ("MATS Compliance Enforcement Letter.") In issuing this letter, EPA took an unusual step to provide information to assist the industry in addressing mechanisms so that environmental regulations would not lead to reliability considerations in the field. "The EPA generally does not speak publicly to the intended scope of its enforcement efforts, particularly years in advance of the date when a violation may occur. The Agency is doing so now with respect to the MATS to provide confidence with respect to electric reliability. EGUs [electric generating units] may be needed to operate to maintain the reliability of the electric grid when they would prefer, or could be required, to halt operations temporarily (until controls can be installed) or indefinitely (through deactivation of a unit). The policy is informed, as are our enforcements actions in general, by the need to find an appropriate balance between critical public interests, bearing in mind the resources and process time required for any enforcement response." MATS Compliance Enforcement Letter.

[26] These steps would include: providing early notice of compliance plans to transmission planning authorities for the area where the affected plant is located; making a timely request for an administrative order for a unit that may affect reliability due to deactivation or due to installation of control; submitting a complete request for an administrative order

[27] This timeline includes the normal three years provided to all sources by the Clean Air Act, as well as a fourth-year extension that EPA expect state permitting authorities will make broadly available to the industry where an additional year is needed for technology installation. http://www.epa.gov/airquality/powerplanttoxics/pdfs/20111216MATSpresentation.pdf. This would mean that owners of affected units could expect to have four years (i.e., through April 2016) to comply with MATS. Additionally, EPA identified a clear pathway for plants needed for reliability to receive up to one further year (i.e., to April 2017) to comply, with such authorizations issued on a case-by-case basis.

[28] Presidential Memorandum for the Administrator of the Environmental Protection Agency, "Subject: Flexible Implementation of the Mercury and Air Toxics Standards Rule," December 21, 2011.

implementation of the MATS Rule proceed in a cost-effective manner that ensures electric reliability." The memo identifies flexibilities in the Clean Air Act that would assist the industry in complying with the stricter air pollution standards while also ensuring electric reliability.

Even though such regulatory mechanisms had been identified much earlier[29] as available and as a reason why the industry would be able to comply with the EPA regulations in a timely and reliable way, the specificity with which EPA laid out a plan in December 2011 for how to navigate timely compliance to assure reliability, provided an even clearer path than was previously known. Many Regional Transmission Operators have embraced the best practice of having power plant owners provide information to EPA and to transmission system operators within one year of EPA issuance of MATS as a final rule.[30]

Notably, none of the parties that filed court complaints to contest various aspects of the MATS rule requested that its implementation dates be stayed. (This differs from the complaints filed with respect to the CSAPR rule, many of which requested stays of the rule during the court's consideration of the CSAPR regulation.)

What's Happened with Market Dynamics (2010 to 2012)

As noted previously, the industry's actions to respond to the EPA air regulations have taken place in the context of significant changes in the fundamental economics of power generation in the U.S. By 2012, the signs of natural gas' attractiveness as a fuel to generate electricity have become much brighter than they were two years ago. This, combined with slow growth in demand for electricity, has placed even more economic pressure on the least-efficient coal-fired power plants, on the status of proposals to build new coal-fired generating units, and on the pace of announcements of coal-plant retirements.

While indications were already apparent in 2009 and 2010, by mid-2012, there have been countless reports[31] issued on the relatively attractive outlook for unconventional gas reserves,

[29] See for example, the report I co-authored with Paul Hibbard, Michael Bradley, Chris Van Atten and others: MJ Bradley Associates and Analysis Group, "Ensuring a Clean, Modern Electric Generating Fleet While Maintaining Electric System Reliability," August 2010.; MJ Bradley and Associates and Analysis Group, "Ensuring a Clean, Modern Electric Generating Fleet While Maintaining Electric System Reliability: Summer 2011 Update," June 2011.

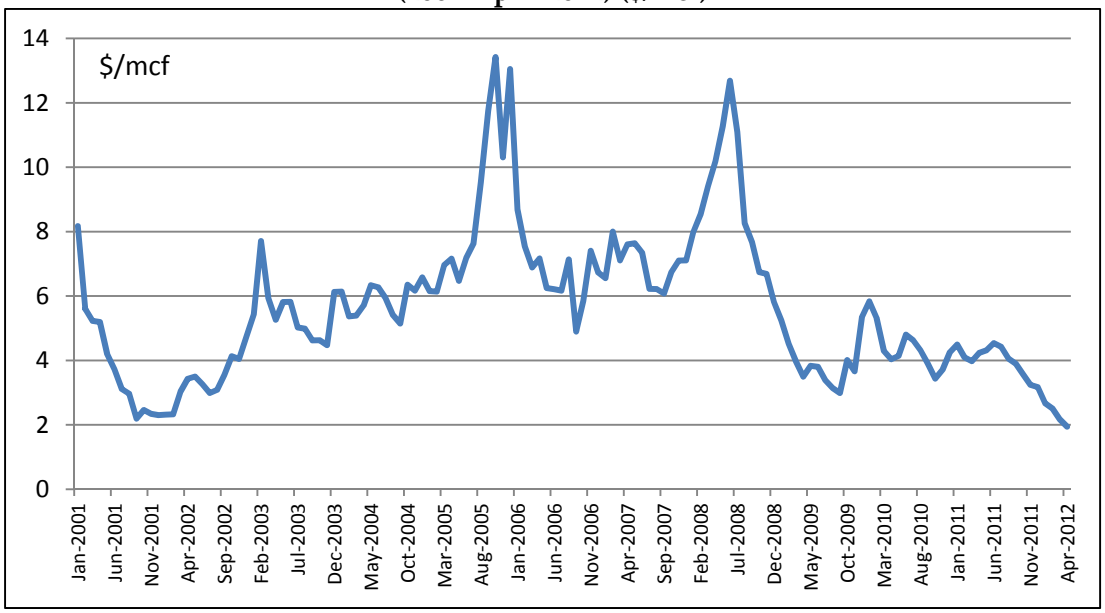
[30] Joint Comments of the Electric Reliability Council of Texas, the Midwest Independent Transmission System Operator, the New York Independent System Operator, PJM Interconnection, L.L.C., and the Southwest Power Pool, filed in EPA's rulemaking proceeding leading to the adoption of the MATS rule (National Emission Standards for Hazardous Air Pollutants From Coal and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units), EPA-HQ-OAR-2009-0234, EPA-HQ-OAR-2011-0044, FRL-9286-1.

[31] EIA, "Annual Energy Outlook 2011;" EIA, "Annual Energy Outlook 2012" (Early Release); EIA, "U.S. Shale Gas and Shale Oil Plays: Review of Emerging Resources," July 2011; National Petroleum Council, "Prudent

for domestic production levels for natural gas, and for natural gas prices at present and in the future.

Current spot-market prices for natural gas are the lowest they have been in a decade, and the prices of forward gas contracts remain low for many years in the future, as shown in Figures A-3 through A-5, below. EIA's Early Release 2012 Annual Energy Outlook estimates that average annual wellhead prices for natural gas will remain below $5 per mcf (2010 dollars) through 2023.[32] Note that in its 2010 Annual Energy Outlook, EIA had estimated the 2023 price would approximately 30 percent higher ($6.46/mcf in 2023 (2010$)).[33]

Figure A-3
Henry Hub Natural Gas Prices
(2001-April 2012) ($/mcf)



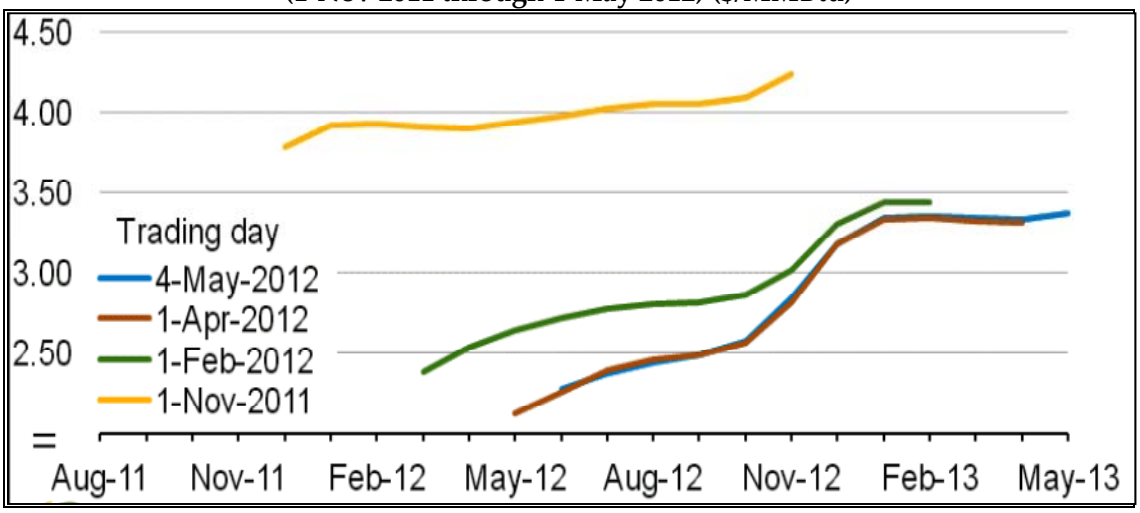
Source: EIA

Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources," September 15, 2011; Bipartisan Policy Center, "Report of the Task Force on Ensuring Stable Natural Gas Markets," March 22, 2011.

[32] In January 2012 and February 2012, wellhead prices averaged $2.89 and $2.46 per mcf, respectively. EIA data.

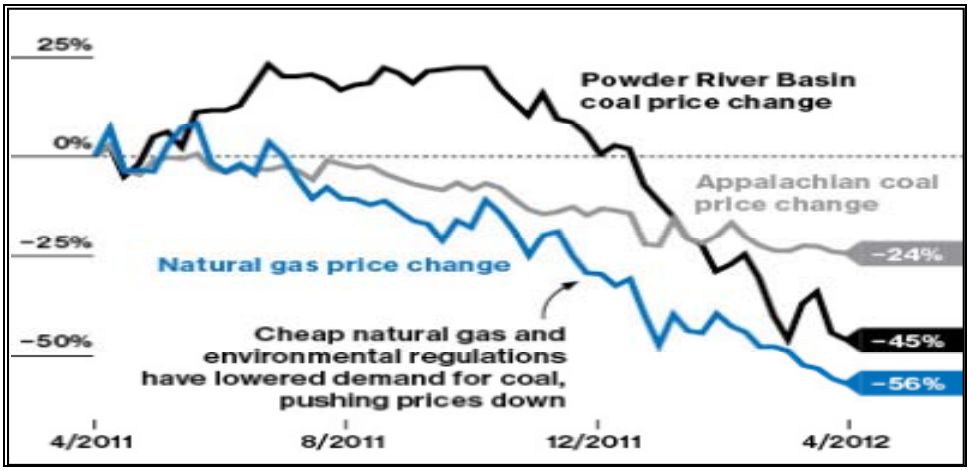
[33] AEO 2010 (table: aeo2010r.d111809a ($6.32 in 2023 (2008$)); AEO 2012 early release, page 5 inflation adjustments to convert 2008$ to 2010$ (GDP Chain-type Price Index).

Figure A-4
Henry Hub Natural Gas Futures Curves
(1-Nov 2011 through 4-May 2012) ($/MMBtu)



Source: EIA, Short Term Energy Outlook, Market Prices and Uncertainty Report, May 2012, Figure 14.

Figure A-5
Gas-to-Coal Price Differential



Source: Bloomberg Business Week, http://www.businessweek.com/articles/2012-04-26/coals-future-is-rocky-at-best; data from the New York Mercantile Exchange and the Intercontinental Exchange.

The tightening gas-to-coal fuel-price differential has greatly affected the profitability of coal plants and put pressure on many of the least-efficient power plants to retire: "In competitive power markets like those in the Midwest, MidAtlantic and Northeast states, and even in more traditional power regions such as the Southeast, falling natural gas prices lead to lower

revenues for coal plants by causing wholesale electricity prices to decline. Rising coal prices can further narrow the margins of coal plant operators. In the past year, coal plants have been facing a perfect storm of falling natural gas prices, a continued trend of high coal prices, and weak demand for electricity."[34]

As the beginning of June 2012, the spot market price of natural gas (Henry Hub) traded at $2.39/mmBtu.[35] Low natural gas prices have resulted in a significant drop in wholesale power prices as well. Average wholesale electricity prices have dropped more than 50 percent since 2008, and in the first quarter of 2012, they were 10 percent lower than in the fourth quarter of 2011.[36] These record-low natural gas prices have been attributed to strong domestic production, robust storage levels, and new pipeline projects that have allowed additional supplies to get natural gas to markets.[37] Even if prices are expected to rise somewhat above these short-term seasonal levels, natural gas prices are broadly viewed as remaining relatively attractive for years to come.

Across the course of a year (e.g., in 2010 and in 2011), the much-tighter gas-coal price differentials put significant price pressure on the operations (and economics) of the least-efficient coal plants. Compared to five years ago, net revenues at such plants located in competitive markets (e.g., PJM, MISO, New York, Texas, ISO-NE, as shown in the map of RTOs in the accompanying report) were down in the hours they operated. And in many cases, system operators were dispatching more gas-fired power plants ahead of these less-efficient coal plants.

The squeeze of profitability can be seen in Figure A-6, which compares the "supply curve" in PJM for 2007 and 2010. Using variable costs as a proxy for wholesale spot prices, this chart shows that coal plants' operating costs (fuel and variable operations and maintenance ("O&M")) tended to increase from 2007 to 2010, while the wholesale electricity clearing prices in the hours where gas units set the price are much lower in 2010 compared to 2007. This would mean that the net revenues (driven by clearing price less fuel and variable O&M) for coal plants were squeezed in 2010.

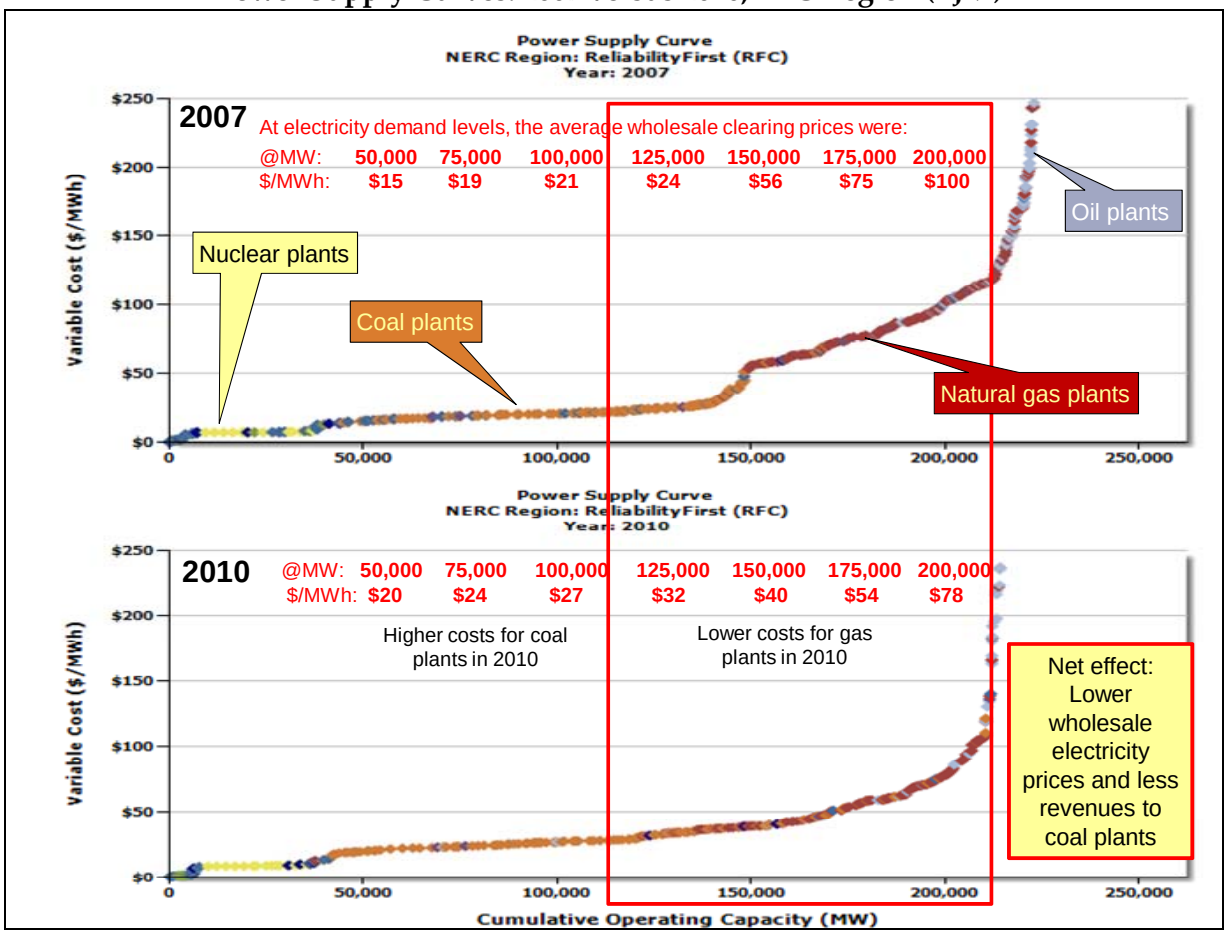
[34] Susan Tierney, "Why Coal Plants Retire: Power Market Fundamentals as of 2012," February 16, 2012.

[35] http://www.eia.gov/dnav/ng/hist/rngwhhdd.htm. In the last week of May, prices were between $2.50/mcf and 2.66/mcf, with the June 1, 2012 price at $2.39/mcf.

[36] "Electricity Declines 50% as Shale Spurs Natural Gas Glut: Energy," *Bloomberg*, January 17, 2012.

[37] FERC, "Winter 2011-12 Energy Market Assessment," October 20, 2011.

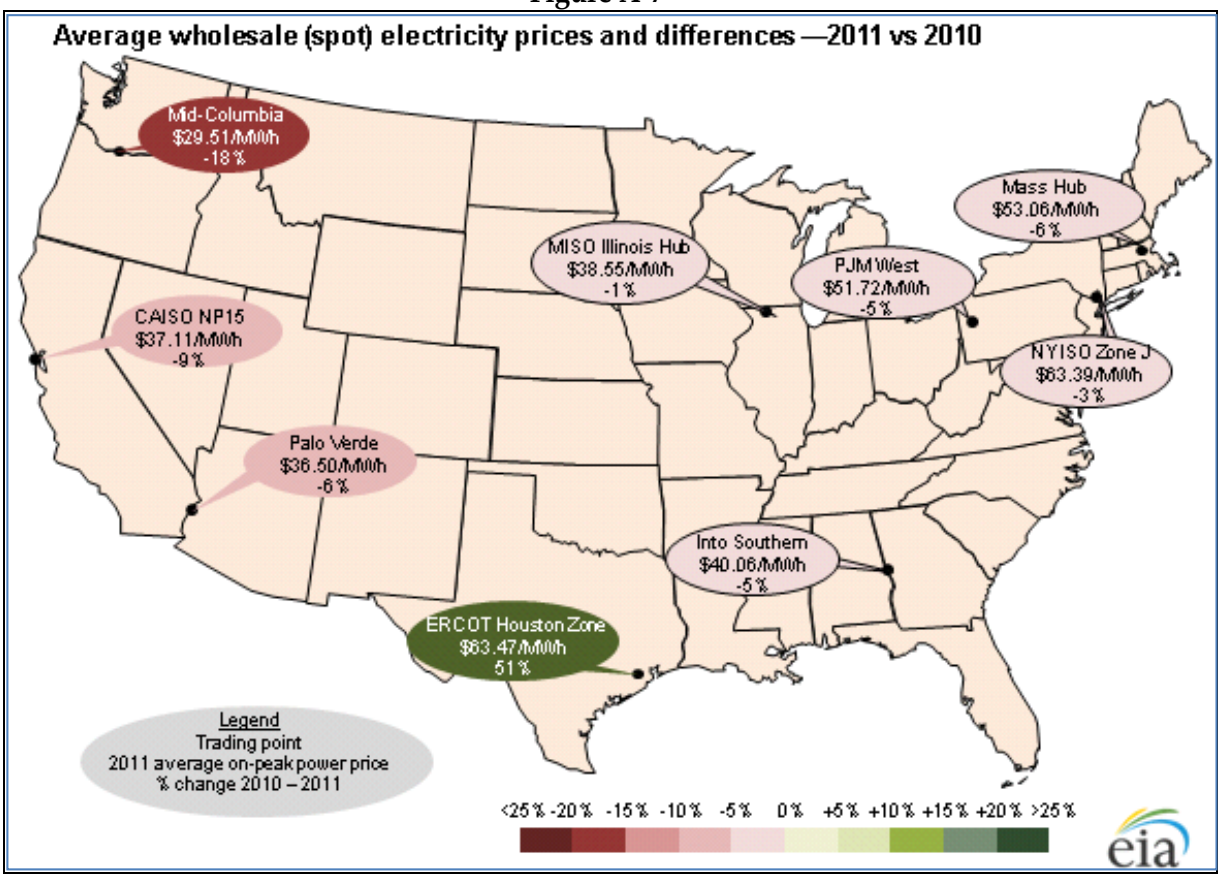
Figure A-6
Power Supply Curves: 2007 versus 2010, RFC Region (PJM)



Data from SNL Financial for 2007 and 2010 for the Reliability First Corporation region. More recent SNL data for RFC in 2011 incorporated changes in the region's boundaries relative to the Midwest Reliability Organization.

Unrelated to EPA air regulations, the revenue pressure from the decreases in natural gas prices in 2011 and early 2012, would cause the least-efficient coal plants to operate even less than previously and to earn lower net revenues when they would run. Figure A-7 shows that, with the exception of the ERCOT Texas market, average wholesale electricity prices were lower in 2011 versus 2010.

Figure A-7



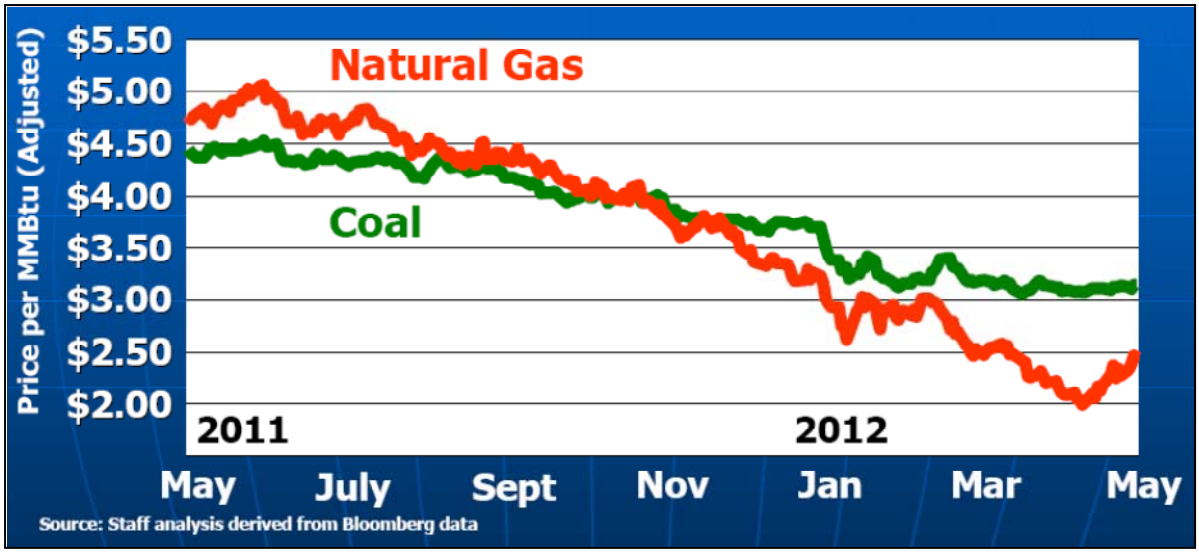
Source: EIA, 2011 Brief, "Wholesale electricity prices mostly lower in 2011." January 11, 2012.
http://www.eia.gov/todayinenergy/detail.cfm?id=4530

New information compiled by FERC staff in May 2012 indicates that "market participants expect lower prices than a year ago [see Table A-1, below]….[P]rices for the forward summer strip this year are $7 to $22/MWh less than similar forwards a year ago…. We expect the ongoing substitution of natural gas-fired generation for coal-fired generation to continue as a result of these low gas prices. When the cost of natural gas dropped below $4 per MMBtu, combined cycle units started competing on price with coal-fired steam units using Central Appalachian coal….The switch-over from coal to natural gas [Figure A-8, below] can be expected to lower coal plant revenues. In addition, some coal plant owners may reduce their offers in order to keep running because they need to manage their coal piles. This is because many coal-fired plant owners entered into contracts determining price and delivery schedules when conditions were different."[38]

[38] FERC Staff, Summer 2012 Energy Market and Reliability Assessment, Item No: A-3, May 17, 2012.

Table A-1 Electricity Prices 2011 and 2012 Forward Price Comparison ($/MWh)			
	2011	2012	Percent Change
PJM Western Hub (Midwest)	$63.25	$26.55	-26%
Mass Hub	$60.95	$38.50	-37%
Cinergy/Indiana	$47.50	$37.25	-22%
Mid C (Mid Continent)	$31.62	$25.00	-21%
SP-15 (California)	$47.00	$38.50	-18%
Palo Verde (Arizona)	$42.50	$34.75	-18%
FERC Staff, "Summer 2012 Energy Market and Reliability Assessment," Item No: A-3 May 17, 2012.			

Figure A-8
Coal-Fired to Natural Gas-Fired Generation Shift



FERC Staff, "Summer 2012 Energy Market and Reliability Assessment," Item No: A-3

Several companies that have traditionally relied on coal for a substantial portion of their generation are using more natural gas. In its Q1 earnings call, AEP's executives reported that the company's natural gas consumption had increased 62 percent year over year, and that with the exception of one plant, its gas-fired combined cycles in the eastern part of its system were operating at an 85-percent capacity factor.[39] In an interview, AEP's CEO said that the company

[39] AEP, "1Q12 Earnings Release Presentation," April 20, 2012, page 7. AEP reported that from Q12011 to Q12012, its net capacity factor in AEP East for coal went down 61.2 percent to 47 percent, and for gas increased from 21.7 percent to 47.3 percent. In AEP's SPP region during the same period, the capacity factors for its coal

increased its overall "natural-gas capacity by 24 percent last year, and it expects to increase that by another 14 percent this year….At the peak of 2007 and 2008, we were taking [and burning] about 80 million tons of coal a year. That's what we were burning…Today, that's probably down to the order of 55 million tons of coal a year. You can see the coal dropping and the natural gas picking up."[40]

During its last earnings call, Southern Company executives reported that in 2007, the company's electricity production was 16 percent natural gas and 70 percent coal. They now expect that the mix for 2012 will be 47 percent natural gas and only 35 percent coal. Its natural gas combined-cycle plants have been operating at a 70-percent capacity factor, and the company estimates that its purchases of natural gas make up 2 percent of total gas consumption in the U.S.[41]

Conditions like these around the country have caused coal to drop from 52 percent of total generation output to 42 percent, with most of the decade in absolute levels occurring since 2008.[42] Gas-fired generation has increased in absolute levels over the decade (as did non-hydro renewable energy), and has gradually taken market share from coal. (See Figure A-9.)

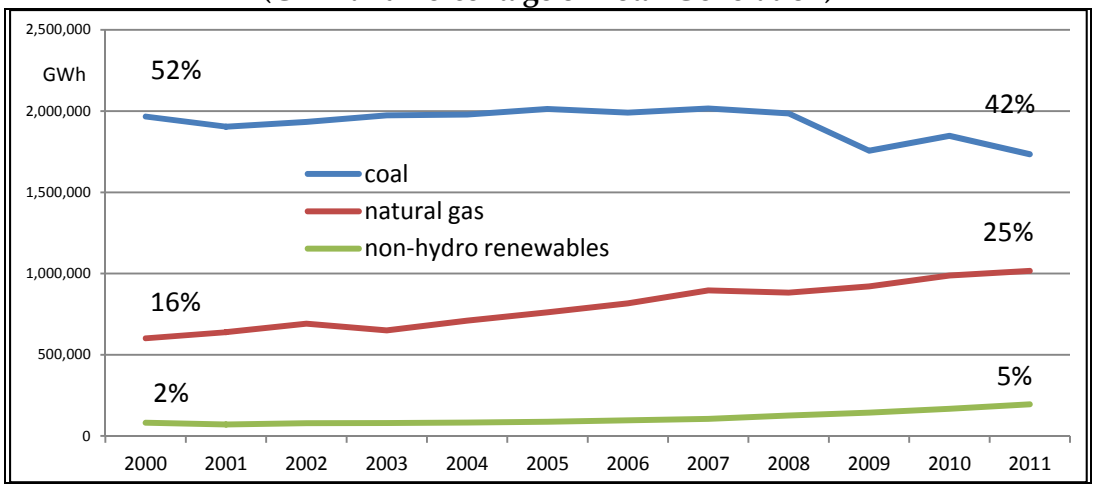
units decreased less (from 78.8 percent to 75.7 percent) and also increased less for its natural gas units (from 17.2 percent to 21.9 percent).

[40] Amy Harder, "War Over Natural Gas About to Escalate," National Journal, May 3, 2012. http://www.nationaljournal.com/energy-report/war-over-natural-gas-about-to-escalate-20120503.

[41] Southern Company, First Quarter 2012 Earnings Report conference call, April 25, 2012.

[42] Coal-fired electricity generation dropped by 13 percent from 2007 through 2011, while gas-fired power production increased by 13 percent in the same period. EIA, Short-Term Energy Outlook, February 2012, data for Figure 25 (U.S. electricity generation by fuel, all sectors).

Figure A-9
U.S. Generation by Fuel (2000-2011)
(GWh and Percentage of Total Generation)



Source: EIA.

These trends have also been influenced by recent changes in the overall generating mix. Approximately 10.7 GW of new gas-fired generating capacity came on line in 2010 and 2011. As of the beginning of 2012, another 11.5 GW is under construction and expected to be completed in 2012 and 2013.[43]

Some of the new coal plants that began construction a few years ago have entered operation. Since the beginning of 2010, approximately 8.6 GW of new coal-fired generating capacity has entered service, with another 5 GW still under construction and expected to be in operations during 2012.[44]

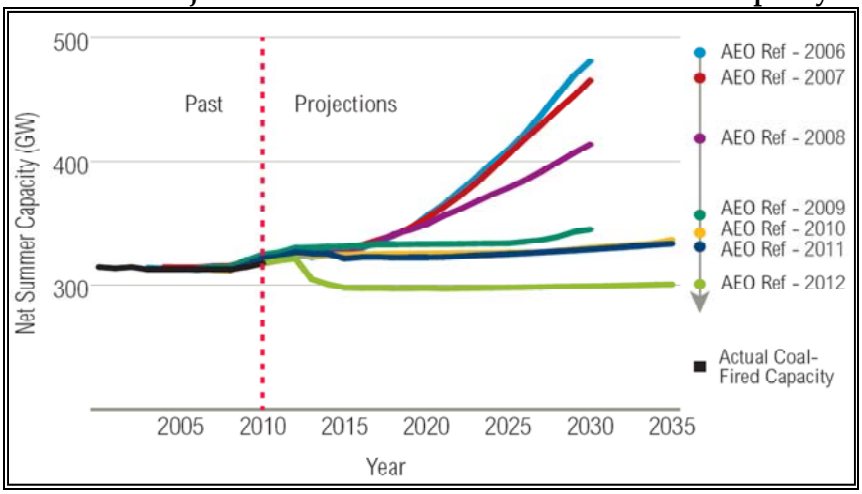
Significant amounts of proposed or announced new coal-fired capacity has been cancelled in recent years, however, largely a product of worsening coal-plant investment economics. The outlook for total net coal-fired generating capacity has declined over the past few years, as indicated in the following EIA projections (shown in Table A-10). EIA's current forecasts suggest a continuing fleet of just under 300 GW of coal-fired capacity, with an approximate net decrease of around 6 percent since 2009.[45]

[43] 7.5 GW in 2012, plus 4.0 GW in 2013. NETL, "Tracking New Coal-Fired Power Plants," January 2012.

[44] Approximately 6.6 GW was added in 2010, and another 1.4 came into operation in 2011. As of early 2012, another 0.6 GW had entered service, with another 5 GW expected to be completed by the end of 2012. Additionally, 1.2 GW was under construction on a schedule to enter service by the end of 2014. NETL, "Tracking New Coal-Fired Power Plants," January 2012.

[45] EIA data: 306 GW of coal-fired capacity (summer rating) in 2009, versus the AEO 2012 outlook for projected capacity in 2015 (289 GW) and 2020 (286 (GW) (which would be a 7 percent reduction from 2009 to 2020).

Figure A-10
Past and Projected Total U.S. Coal-Fired Net Summer Capacity



Source: James Bradbury, "US Electricity Markets Increasingly Favor Alternatives to Coal," WRI, 2012, based on EIA Annual Energy ("AEO") Outlooks from recent years.

What's Happened with Coal Plant Retirement Announcements and Projections (2010 to 2012)

As of June 2011, company announcements indicated that there would be 3.4 GW of coal-fired capacity retired in 2011. This was expected to be followed by 2.8 GW more in 2012, another 2.3 GW in 2013, plus 8.5 GW in 2014, for a cumulative amount of 17.2 GW from 2011 through 2015. This was on top of prior retirements occurring in 2009 and 2010.

From 2009 through the end of 2011, 10.5 GW of coal units actually retired. One third (3.3 GW) was located in ISO-NE and NYISO, approximately one-fifth (2.3 GW) was in the RFC region (roughly equivalent to PJM), almost one-fifth (1.9 GW) was in the West (the WECC region), one-sixth (1.5 GW) was in the SERC area of the South, and 7 percent (0.7 GW) was in MISO.

As of March 2012 (as shown in Table A-2, below, comparing the estimates as of June 2011), the numbers shifted: in fact, 4.0 GW retired in 2011. More retirements are expected in the years leading up to 2015 than was indicated last year. For example, last year's expectation of retirements from 2011 through 2013 was a total of 8.7 GW; this year, 10.9 GW is expected between 2011 through the end of the current year (2012), with a total of 12.8 GW by the end of 2013. As a result, retirements are shifting forward in time, largely in response to the pressure that natural gas prices are placing on coal-fired generation. In fact, such retirements would not need to occur prior to 2014 (or 2015 or beyond, for plants needed for reliability purposes) if there were attributable solely to the MATS Rule, which goes into effect in that period.

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http://www.eia.gov/oiaf/aeo/tablebrowser/#release=EARLY2012&subject=6-EARLY2012&table=9-EARLY2012&region=0-0&cases=full2011-d020911a,early2012-d121011b

Retirements will likely increase above these levels as the deadlines for compliance with the EPA air regulations approaches.

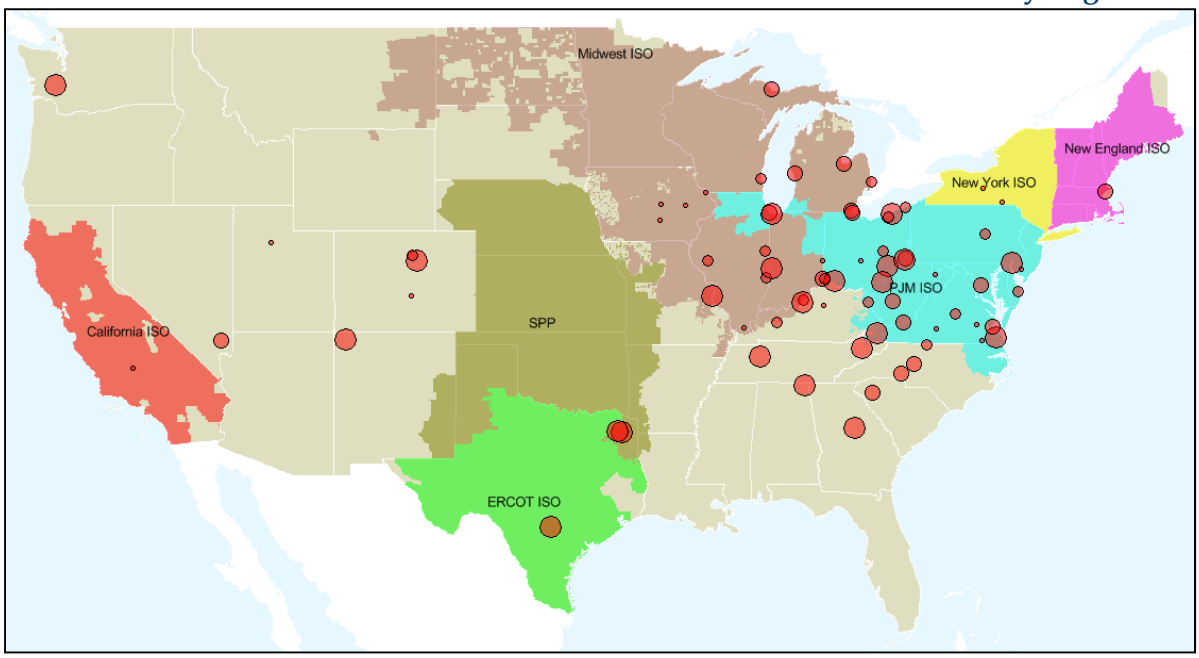
Table A-2
Coal Unit Retirements Expected to Occur in the Following Time Period (GW)

Date of Announced Retirements	2011	2011-2012 cumulative	2011-2013 cumulative	2011-2014 cumulative	2011-2015 cumulative
As of June 2011	3.4 (estimated)	6.1	8.7	17.2	20.0
As of March 2012	4.0 (actual)	10.9	12.8	17.4	25.0

Source: SNL Financial database of coal unit retirements.

According to an analysis by MJ Bradley Associates, the cumulative announced retirements since 2010 (shown on the map in Figure A-11) have an average unit age of 53 years and an average unit size of 153 MW.

Figure A-11
Location of Announced Coal-Fired Power Plant Retirements Since 2010 by Region



Source: Chris Van Atten, MJBradley Associates, presentation to the ICAC Conference, April 26, 2012, based on MJB&A tracking, EPA NEEDs 4.10, and Ventyx Velocity data.

What We Know About Reliability Outlook Today

In the past year, numerous new, expert assessments have been published on the implications of the CSAPR and MATS rules on electric system reliability. They tend to show that earlier assessments that projected a high level of retirements[46] had been based on assumptions about EPA regulatory requirements that were more stringent than actually adopted by EPA, and that therefore over-estimated the likely incremental effects of these regulations. For example:

[46] Recall that those assessment published in 2010 showed a wide range of projected retirements for coal plants (6 GW to 65 GW). Susan Tierney, Electric Reliability under New EPA Power Plant Regulations: A Field Guide," January 18, 2011, http://www.wri.org/stories/2011/01/electric-reliability-under-new-epa-power-plant-regulations-field-guide.

Bipartisan Policy Center ("BPC") : When the BPC published in August 2011 the results of its year-long assessment of the impacts of EPA regulations on electric system,[47] it was one of the first assessments published after the issuance of the drafts of EPA air (and cooling water intake[48]) regulations. Thus it had the benefit of knowing about the flexibility that EPA had included in its proposals. Among other things, BPC concluded that the:

> scenarios in which electric system reliability is broadly affected are unlikely to occur. Previous national assessments of the combined effects of EPA regulations reach different conclusions, in part because they make quite different assumptions about the stringency and timing of new requirements and about the availability and difficulty of implementing control technologies. In some cases these assumptions deviate from the specifics of EPA's recent proposals in meaningful ways. Moreover, market factors, such as low natural gas prices, are as relevant as EPA regulations in driving coal plant retirements.[49]

The BPC analysis noted that several things happened to allow for lower retirement estimates, including: the MATS rule's provisions allowing for some commercially available, lower-cost technologies (e.g., dry sorbent injection) that had not previously been assumed; the availability of under-utilized gas capacity; the fact that smaller units are already operating infrequently; and the insight that most assessments do not take into account the fact that the market will bring forward new resources.[50]

BPC identified a number of diverse tools available to address reliability concerns, including: technological readiness for pollution control systems; transmission entities' ability to conduct reliability studies for and coordinated management of localized effects of outages and retirements; early compliance planning by plant owners with support by local regulators and RTOs; ability for EPA and local air permitting authorities to issue compliance-time extensions and consent decrees where needed for local reliability issues; state utility regulators support in non-restructured states for long-term natural gas supply contracts and development of conventional and non-conventional capacity resources (including demand-side resources); market mechanisms in competitively structured wholesale power regions; and streamlining of states' permitting of new infrastructure (including generation and transmission facilities).[51]

Congressional Research Service: Also in August 2011, CRS analysts reached a similar conclusion: many prior studies had predated EPA's actual proposals and reflected

[47] Staff of the Bipartisan Policy Center, "Environmental Regulation and Electric System Reliability," August 2011 ("BCP 2011 Report").

[48] Footnote describing 316(b) draft regulations issued in December 2010.

[49] BCP 2011 Report. Page 3.

[50] BCP 2011 Report, page 3.

[51] BCP 2011 Report, pages 3-5.

"assumptions about stringency and timing (especially for implementation) that differ significantly from what EPA actually may propose or has promulgated."[52] CRS commented that the "primary impacts of many of the rules will largely be on coal-fired plants more than 40 years old that have not, until now, installed state-of-the-art pollution controls. Many of these plants are inefficient and are being replaced by more efficient combined cycle natural gas plants, a development likely to be encouraged if the price of competing fuel—natural gas—continues to be low, almost regardless of EPA rules."[53]

Shortly after EPA published the final MATS rule in December 2011, CRS issued another report focusing on reliability issues associated with MATS. CRS found that "although the rule may lead to the retirement or derating of some facilities, almost all of the capacity reductions will occur in areas that have substantial reserve margins…. [T]o address the reliability concerns expressed by industry, the final rule includes provisions aimed at providing additional time for compliance if it is needed to install pollution controls or add new capacity to ensure reliability in specific areas. As a result, it is unlikely that electric reliability will be harmed by the rule."

Commenting on the cost of compliance, CRS's December 2011 study commented "that the average price of electricity nationally will increase by 3.1% by 2015, as a result of the rule. Electricity prices have declined more than 20% in real terms since 1980. The impact of price changes would be relatively small compared to this downward trend, and well within the normal range of historical price fluctuations."[54]

North American Electric Reliability Corporation: In a special assessment published in November 2011, NERC estimated that by 2015, the incremental effect of EPA air regulations on unit retirements and capacity deratings would be between 0.05 GW and 4.3 GW from CSAPR, and between 8.6 GW and 12.0 GW from MATS.[55] The implications of these retirements on regional reserve requirements as of 2015 are shown in Figure A-12, with two regions (ERCOT (Texas) and NPCC (New England)) showing need to add resources by 2015 above those already in development. These estimates had dropped considerably from the retirement impacts estimated by NERC in October 2010, prior to EPA's issuance of the draft MATS regulations and final CSAPR regulations in 2011.[56]

[52] James E. McCarthy and Claudia Copeland, "EPA's Regulation of Coal-Fired Power: Is a "Train Wreck" Coming?" CRS, August 8, 2011.

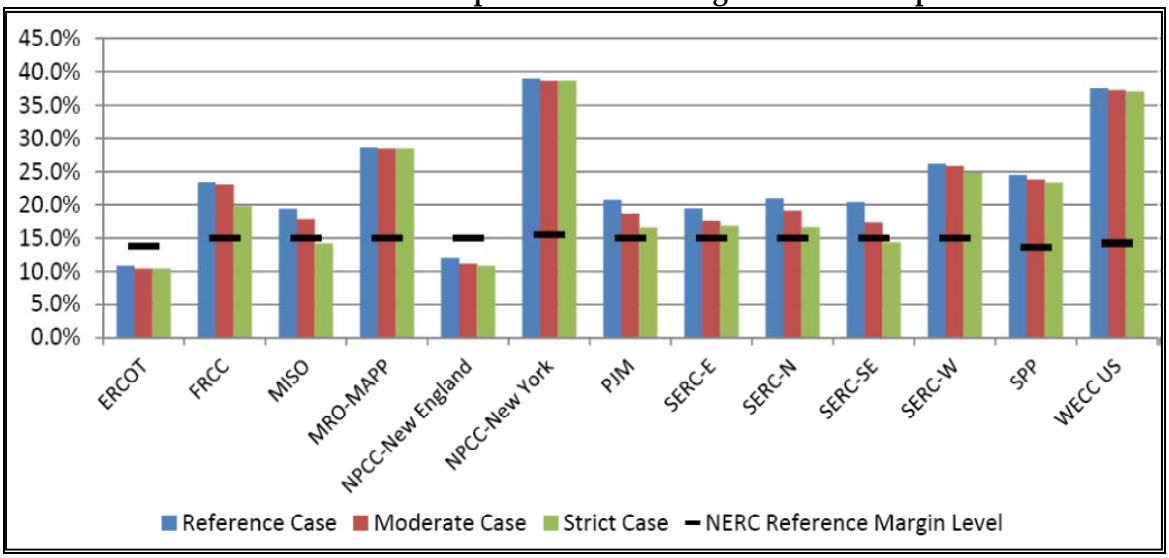
[53] DOE, "Resource Adequacy Implications of Forthcoming EPA Air Quality Regulations," December 2011 ("DOE 2011 Assessment").

[54] James McCarthy, "EPA's Utility MACT: Will the Lights Go Out?" CRS, January 9, 2012.

[55] NERC, "Potential Impacts of Future Environmental Regulations" (Extracted from the 2011 Long-Term Reliability Assessment), November 2011, Tables 48-49.

[56] NERC, "2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations," October 2010.

Figure A-12
2015 Peak Anticipated Reserve Margin Scenario Impacts



Source: NERC, Potential Impacts of Future Environmental Regulations" (Extracted from the 2011 Long-Term Reliability Assessment, November 2011), Figure 69, showing cumulative impacts of all EPA regulations (i.e., air pollution regulations, cooling-water intake rule, and coal-ash regulations) affecting existing power plants (but with coal-ash requirements not having any effect during this period).

Department of Energy: In December 2011, DOE published its independent assessment of the implications of EPA air regulations on electric reliability. In its analysis, DOE "stress tested" the impacts of compliance costs on coal-plant economics and estimated retirements using deliberately stringent assumptions about the impacts of CSAPR and MATS. Although noting that compliance with these regulations could be achieved through a variety of mechanisms,[57] the DOE assessment assumed that every coal plant without sufficient air pollution controls would have to add them.[58] DOE concluded that:

[57] DOE noted that "In some cases, compliance with the new rules, particularly CSAPR, may be achieved through the use of existing controls, shifts in dispatch, purchase of allowances, and fuel switching. In other cases, compliance with new rules will require installation of new pollution controls and may motivate the construction of replacement generation, which can sometimes take multiple years to complete. Assuming prompt action by regulators and generators, the timelines associated with new construction and retrofit installations are generally comparable to EPA's regulatory compliance timelines. If delays occur and if it is necessary to address localized reliability concerns, the Clean Air Act provides multiple mechanisms to extend these deadlines or bring sources into compliance over time on a plant-specific basis." DOE 2011 Assessment, page v.

[58] "This report examines a Stringent Test Case, where, in addition to CSAPR requirements, each uncontrolled electric generator is required to install both a wet flue gas desulfurization (FGD) system and a fabric filter to reduce air toxics emissions. If such installations are not economically justified, this scenario assumes that the plant must retire by 2015. In reality, power plant owners will have multiple other technology options to comply

> In the Stringent Test Case, a total of 29 GW of coal capacity would be retired by 2015 (21 GW over the Reference Case) …[and] … target reserve margins can be met in all regions, even under these stringent assumptions. Moreover, in every region but one (TRE [Texas]), no additional new capacity is needed to ensure resource adequacy in the Stringent Test Case beyond what is projected in the Reference Case. In TRE, the analysis finds that less than 1 GW of new natural gas capacity would be needed by 2015 beyond the additions already projected to occur in the Reference Case. This analysis also finds that the total amount of new capacity that would be added by 2015 is less than the amount that is already under development, only some of which is reflected in the Reference Case. DOE's analysis also considered impacts on available generation capacity of plant outages due to pollution control retrofit activity. … In the Stringent Test Case, taking into account projected capacity additions, DOE found that resources would be sufficient in all regions even when outages to tie-in pollution control retrofits were incorporated.
>
> In summary, this report concludes:
>
> - Assuming prompt action by regulators and generators, the timelines associated with the construction of new generation capacity and installation of pollution control retrofits would generally be comparable to EPA's regulatory compliance timelines.
> - A Stringent Test Case more conservative than the anticipated implementation of CSAPR and the proposed MATS rule showed the overall supply-demand balance for electric power in each region examined would be adequate; however, further iterative analysis will be warranted to assess local reliability considerations as the rules are implemented.
> - Mechanisms exist to address such reliability concerns or other extenuating circumstances on a plant-specific or more local basis, and the Department of Energy is willing to provide technical assistance throughout this process.[59]

NERA Economic Consulting: In March 2012, NERA estimated that the MATS and CSAPR rules would lead to 38 GW of incremental retirements of coal-plants, and that most of these retirements would occur in the eastern half of the U.S. NERA estimated that market economics

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with the regulations – options that typically cost less than installations of FGDs and fabric filters. *Therefore, this scenario should not be viewed as an estimate of the expected impacts of CSAPR and MATS, but rather as a stress test used to bound resource adequacy implications of these rules under conservative assumptions.* Specifically, this report focuses on whether, under the Stringent Test Case, there would be sufficient generation capacity to meet electricity demand in each NERC region, before constraints on deliverability are considered." DOE 2011 Assessment, page v.

[59] DOE 2011 Assessment, pages v-vii.

would lead to 15 GW of retirements, even without the air rules.[60] NERA estimates that the cost of compliance (including the cost of investing in replacement generation) would be $10 billion in 2015. (For total electric revenues in the U.S. in 2012 were $372 billion.[61])

Resources for the Future ("RFF"): In May 2012, RFF published its analysis, focusing on the air rules rather than the fuller but less-certain suite of environmental regulations (i.e., as had been done by NERC). Using its own dynamic equilibrium model, RFF concludes that "these regulations are unlikely to create the shock to the system as some worry. They lead to little change in generation capacity."[62] RFF concluded that reliability issues would not result from MATS compliance.

Taking into account all cost impacts,[63] EPA's schedule for implementing MATS that allows compliance to go into 2016, and regional differences with regard to regulation versus competition,[64] RFF estimates that the air regulations will lead to total incremental annual costs for the entire electric industry of between $6.6 billion and $7.1 billion, and that consumers pay approximately 70 percent of total costs.[65] (Considering that electricity consumers in the U.S. paid electric bills totaling $372 billion in 2012,[66] and that 70-percent of the total cost would be

[60] Anne E. Smith, Paul M. Bernstein, Scott J. Bloomberg, Sebastian M. Mankowski, Sugandha D. Tuladhar, NERA Economic Consulting, "An Economic Impact Analysis of EPA's Mercury and Air Toxics Standards Rule, March 1, 2012.

[61] EIA, 826 data.

[62] Dallas Burtraw, Karen Palmer, Anthony Paul, Blair Beasley, and Matt Woerman, "Reliability in the Electricity Industry under New Environmental Regulations," May 2012 ("RFF Study"), page 1. "Neither the MATS scenario nor the CSPAR & MATS scenario leads to substantial changes in existing capacity by 2020 compared to the baseline. This includes coal capacity, which falls about 1.2–1.5 percent under the policy scenarios. Natural gas capacity remains virtually unchanged under MATS and under CSAPR & MATS from baseline. There are, however, reductions in new capacity in 2020, mostly due to lower investment in new natural gas plants. In the long run, the policies still will have little impact on national capacity. In 2035, total existing capacity remains virtually the same under the two policies compared to baseline. There are small decreases in coal capacity of about 1.5 percent and small increases in natural gas capacity, ranging from about 1 percent under MATS to about 2 percent under CSAPR & MATS. Total new capacity is 1.2 percent lower under CSAPR & MATS than under the baseline." RFF Study, page 16.

[63] These various costs include investment in new generating capacity additions, costs to improve efficiency in existing power plants, investment in new pollution controls based on the technologies that minimize cost of compliance, avoidance of the costs of emission allowances.

[64] For different parts of the country, the study assumes as appropriate the differences between regions of the country where utilities are regulated under traditional cost-of-service regulation or where there are organized competitive markets that establish cost recovery by generators.

[65] RFF Study, pages 2 and 31. In addition, "the cost of pollution control investments should not impose a big impact on the availability of capital to the electricity industry. The approximate annual capital costs for incremental investments in pollution control in the neighborhood of $5.1–$5.4 billion by 2020, although substantial, do not appear especially large for the industry." RFF Study, page 29.

[66] EIA, 826 data.

paid by consumers, this would roughly equate to a 1-percent increase in electricity rates to accomplish the air quality improvements from CSAPR and MATS.) "The authors find that the difference between the 2009 and the 2011 forecasts of secular changes in natural gas prices and electricity demand have a larger impact on future electricity prices and fuel mix than does the introduction of CSAPR and MATS regulations."[67]

Electric Power Research Institute ("EPRI"): On May 31, EPRI published its analyses of the cumulative effects of all EPA regulations (i.e., CSAPR, MATS, coal ash, cooling-water intake rules and updated National Ambient Air Quality Standards ("NAAQS") on SO2 and NOx by 2018). As such, it does not provide an apples-to-apples comparison with the other recent studies, in terms of either reliability impacts or cost impacts.

The analysis does point out that under different assumptions about the flexibility of these rules, the effect on the current 316 GW of coal plants would vary – again in response to the full suite of EPA regulations (not just air regulations):

> On the "current course" approximately 202 GW of existing coal-fired capacity would remain financially viable with costs for required environmental investment being recouped in less than 5 years. Another 61 GW of coal capacity – primarily older, smaller, and less efficient units – could not be profitably retrofitted and would be retired. The remaining 54 GW would either be retired or retrofitted depending on market-specific factors, such as: whether regulatory frameworks provide for cost recovery, cost and performance of competing generation, changes in power prices, trends in demand, and natural gas prices.
>
> In the alternative "flexible path" case, approximately 288 GW would remain financially viable, only 25 GW would be retired, and only 4 GW would either be retired or retrofitted depending on market-specific factors.[68]

EPRI estimates that a more flexible path would reduce costs by $100 billion. Among the assumed elements of EPRI's 'more flexible path' is the extra compliance period for the MATS rule. EPRI also states that "[a]nother critical factor is the price of natural gas. With a projected price in 2020 of $4/million Btu slightly more than 100 GW of coal-fired generation (one-third of the existing fleet) could be retired. A flexible path for compliance strategies, with lower fixed costs, would still reduce this impact."[69]

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[67] RFF Study, page 19.

[68] EPRI, "Analysis of Current and Pending EPA Regulations on the U.S. Electric Sector," May 31, 2012; EPRI press release, "EPRI Assesses Implementation Options of EPA's Environmental Rules on Electric Industry and the Economy: *Results Show Technology and Innovation Could Dramatically Reduce Costs*," May 31, 2012.

[69] EPRI press release, "EPRI Assesses Implementation Options of EPA's Environmental Rules on Electric Industry and the Economy," May 31, 2012.

What's Happening with New Power Projects

As anticipated by many observers starting two years ago, the market has responded creatively to the need to assure reliability and efficient power supplies, taking into account both fuel-price fundamentals, power-market designs, assumptions about the character of regulatory requirements, and other factors.

New Generating Capacity in the Pipeline: Approximately 390 GW of new generating capacity has been announced for the lower 48 states. Over 40 GW of the total announcement capacity is under construction, and over two-thirds of that is in the parts of the U.S. that are affected by both the MATS and CSAPR rules (i.e., all by the WECC, in the second figure below).

Table A-3
All Power Plants (Lower 48) - Proposed
(MW by Development Status and Projected In-Service Date)

Planned In-Service Year	Total Announced Capacity (MW)	Total Under Construction Capacity (MW)
2012	25,371	18,974
2013	25,054	10,936
2014	27,162	3,528
2015	27,275	1,802
>2015	284,967	5,372
Total	**389,829**	**40,612**

Source: SNL Financial, as of Mary 15, 2012. Note: Since November 11, 2011, total announced capacity has grown by 10 GW and total capacity under construction has increased by 3 GW.

Table A-4 New Capacity Additions by Region (Lower 48)		
NERC Region	**Total Announced Capacity (MW)**	**Total Under Construction Capacity (MW)**
WECC	147,577	12,763
SERC	45,176	15,532
RFC	53,828	4,584
ERCOT	43,545	1,977
MRO	39,209	831
SPP	32,078	1,528
NPCC	15,048	1,231
FRCC	13,368	2,165
Total	**389,829**	**40,611**
Source: SNL Financial, as of Mary 15, 2012. Note: Since November 11, 2011, total announced capacity has grown by 10 GW and total capacity under construction has increased by 3 GW.		

Significant quantities of gas-fired generation are in the pipeline. (See Table A-5.) These types of projects, especially peaking units needed for reliability, are relatively fast to permit and construct: in recent history, including during periods of intense development activity in the last decade when many competitive generation developers added significant quantities of gas-fired generating capacity), gas-fired combined-cycle projects have had a four-year development cycle (including permitting and construction) and peaking units have taken from one-to-three years for total development time, with the shorter periods in cases where reliability required expedited permitting.[70]

[70] See, for example, "Siting Power Plants in the New Electric Industry Structure: Lessons California and Best Practices for Other States" (with Paul J. Hibbard), *The Electricity Journal*, June 2002.

Table A-5
Natural Gas- Fired Power Plants (Lower 48): Proposed
(MW by Development Status and Projected In-Service Date)

	In-Service Date of New Capacity	Capacity Under Construction	Capacity in Advanced Development	Capacity in Early Development	Other Announced Capacity	Total	Cumu-lative
Natural Gas Combined Cycle Projects	2012	3,194	219	-	630	4,043	4,043
	2013	5,059	600	2,727	1,217	9,602	13,645
	2014	2,038	3,431	1,784	2,064	9,317	22,963
	2015	-	3,912	4,846	4,265	13,023	35,986
	>2015 or unknown	624	1,785	13,439	14,454	30,302	66,287
	Total	10,915	9,947	22,796	22,629	66,287	66,287
Gas Turbine and other Gas-Fired Peakers	2012	2,026	-	1,426	16	3,468	3,468
	2013	2,322	-	411	430	3,162	6,630
	2014	-	45	1,399	1,922	3,366	9,996
	2015	-	100	1,728	1,420	3,248	13,244
	>2015 or unknown	45	994	485	1,214	2,738	15,983
	Total	4,393	1,139	5,449	5,002	15,983	15,983
Total New Natural Gas-Fired Generating Capacity	2012	5,220	219	1,426	646	7,511	7,511
	2013	7,381	600	3,137	1,647	12,765	20,275
	2014	2,038	3,476	3,183	3,986	12,683	32,959
	2015	-	4,012	6,574	5,685	16,271	49,230
	>2015 or unknown	669	2,779	13,924	15,668	33,040	82,270
	Total	15,308	11,086	28,245	27,631	82,270	82,270

Source: SNL Financial, as of Mary 15, 2012.

Other regions that have previously identified some unit retirements are now expecting to delay some of them closures until transmission reinforcements can be completed to assure reliable electric supply. For example, recently, PJM has determined that new transmission upgrades will be needed to be put in place before some of FirstEnergy's previously announced retirements of four old plants can occur.[71]

[71] Ashtabula, Lakeshore and three of the five boilers at Eastlake will remain open through early 2015 but operate only when PJM determines they are needed, typically during peak electrical usage. In 2015, when

What We Know About Power Companies' Readiness Today

In the last two years, many owners of power plants affected by EPA air regulations have told investors that they are well-positioned to comply because of prior investments or early planning to meet anticipated EPA rules. Last November, the MJ Bradley Associates and Analysis Group report, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability," reported on 30 such companies: AES, Ameren , Buckeye Power Cooperative, Calpine, CMS Energy, Constellation, Dominion, Duke, Dynergy, Edison International, Exelon, FirstEnergy, GenOn, Great Plains Energy, Lower Colorado River Authroity, NextEra, Northeast Utilities, NRG, PowerSouth Electric Cooperative, PPL, Progress, PSEG, Santee Cooper, SCANA, Seminole Electric Cooperative, TECO Energy, TVA, Vectren, Wisconsin Energy, Xcel. Together, these companies represent about half of the nation's coal-fired generating capacity and eleven out of the top 15 largest coal fleet owners in the U.S.[72]

More recently, Southern reported in its April 2012 earnings call that the provisions in the final MATS rule are likely to allow the company to incur a lower capital budget for compliance. The original estimate was that the company would need to spend up to $2.7 billion over a three-year period; the current estimate is now "somewhere between $0.5 billion to $1 billion less, depending on the number of bag houses, the extent to which we'll have to expand transmission system, gas pipelines and a variety of other issues."[73]

Progress Energy's CEO stated that, with regard to Duke and Progress – which intend to merge if approved by regulators – "Both companies got an early start on retiring old coal units….Duke did some of that by replacing it with a modern supercritical coal plant. We did it by building gas combined-cycle, and Duke is also building gas combined-cycle. So you'll see in the new company a greater concentration of gas than either of us had before simply because we're both

upgrades to the company's transmission system are done, the power plants will be shut down. Eastlake's two larger boilers will be shut down in September as originally planned, but their generators will be equipped with large electric motors and converted to become voltage regulators to stabilize the high voltage transmission lines in the region. The smaller Eastlake generators and the Lakeshore generator will get the same retrofit in 2015. Also at Eastlake, FirstEnergy will install four very large combustion turbines that will be used to generate power during times of peak demand. The company cannot pass on the cost of the turbines to rate payers because of deregulation. John Funk, "FirstEnergy will keep older power plants open until 2015, launch nearly $1 billion in transmission upgrades," Cleveland Plain Dealer, May 1, 2012. This article describes the plans described by FirstEnergy's CEO Anthony Alexander on the company's recent earnings call.

[72] MJ Bradley Associates and Analysis Group, "Ensuring a Clean, Modern Electric Generating Fleet While Maintaining Electric System Reliability: November 2011 Update," November 2011, Appendix.

[73] Southern Company, Q1 Earnings Report conference call, April 25, 2012.

in the throes of building new gas."[74] Progress Energy added roughly 600 MW of gas in June 2011 and expects to add an additional 1,500 MW by the end of 2013 in the Carolinas.

In Kentucky, utility regulators have recently approved plans of Kentucky Utilities/Louisville Gas & Electric (owned by PPL Corporation) to construct a new, 640-MW, gas-fired generating facility. The plan is part of the companies' efforts to comply with MATS, and accompanies plans to retire six coal-fired generating units (totaling 797 MW of capacity by the end of 2015.[75]

American Electric Power: AEP has recently announced changes in its plans, including a decision to withdraw its request to retrofit the 49-year-old Big Sandy power plant in Kentucky, because it would cost more than alternatives. Just last month in April 2012, in a letter to AEP shareholders in April 2012,[76] AEP's chief executive officer wrote that the company has a strategy to "reposition our generation assets for a more sustainable fuel mix." He explained that several factors were pushing the company, "including new environmental regulations; the economics of coal versus natural gas; the operating cost, age and efficiency of some coal units; increased competition; and grid reliability. We will retire more than 5,100 megawatts (MW) of coal-fired generation and retrofit nearly 11,000 MW with new, advanced pollution controls or upgrade existing control equipment. Additional coal-fired generation may be refueled with natural gas….Our shift to natural gas and other resources reflects a market change. A key factor is the recent development of massive shale gas formations throughout the United States, which places downward pressure on natural gas prices. In fact, natural gas prices have been consistently low for the past two years. Another significant factor is the prospect of major environmental compliance investments in coal units, driving up the cost of coal-fired electricity. By 2020, we estimate natural gas will account for 27 percent of AEP's generating capacity, compared with 24 percent today. At the same time, we expect our coal capacity to decrease to about 50 percent of our total capacity by 2020, compared with 67 percent in 2011."[77]

[74] Kathleen Hart, Progress Energy CEO sees uncertain future for new nukes given 'dash to gas'," SNL Energy, May 25, 2012.

[75] Matthew Mandyk, "State regulators approve Kentucky Utilities, LG&E plan for gas-fired generation," May 3, 2012, SNL.

[76] Nicholas Akins, President & Chief Executive Officer, AEP, "A Message from the President & CEO," 2012 AEP Corporate Accountability Report, April http://www.aepsustainability.com/docs/2012_AEP_CAReport.pdf.

[77] Nicholas Akins, President & Chief Executive Officer, AEP, "A Message from the President & CEO," 2012 AEP Corporate Accountability Report, April http://www.aepsustainability.com/docs/2012_AEP_CAReport.pdf.