

SUMMER 2011 UPDATE

Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability

June 2011



M.J. BRADLEY & ASSOCIATES LLC



ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Acknowledgements

The following report was prepared on behalf of the Clean Energy Group's Clean Air Policy Initiative, a coalition of electric companies dedicated to responsible energy and environmental stewardship. The participating companies (listed below) are some of the nation's largest generators of electricity, with over 146,000 megawatts of electric generating capacity (including 93,000 megawatts of fossil generating capacity) throughout the U.S.

Calpine Corporation
Constellation Energy
Exelon Corporation
NextEra Energy
National Grid
PG&E Corporation
Public Service Enterprise Group

REPORT AUTHORS

Michael J. Bradley, M.J. Bradley & Associates LLC
Susan F. Tierney, Analysis Group
Christopher E. Van Atten, M.J. Bradley & Associates LLC
Amlan Saha, M.J. Bradley & Associates LLC

For questions or comments about this report, please contact:

Christopher Van Atten
M.J. Bradley & Associates LLC
47 Junction Square Drive
Concord, MA 01742
Telephone: 978 369 5533
E-mail: vanatten@mjbradley.com

Executive Summary

In August 2010, M.J Bradley & Associates and Susan Tierney of the Analysis Group were commissioned to prepare a study on the impact of two major U.S. Environmental Protection Agency (“EPA”) air regulations affecting the electric power sector: (1) the Clean Air Transport Rule (“Transport Rule”) and (2) the national emission standards for hazardous air pollutants from coal- and oil-fired electric utility steam generating units (“Utility Toxics Rule”). The study concluded that the electric industry is well-positioned to comply with EPA’s proposed air regulations without threatening electric system reliability.

This “Summer 2011 Update” supplements the original analysis in light of new information and reaffirms the major conclusion of the prior report that the electric industry can comply with EPA’s air pollution rules without threatening electric system reliability provided that EPA, the industry and other agencies take practical steps to plan for the implementation of these rules and adopt appropriate regulatory approaches. Proper planning and implementation can secure important public health benefits, reliable electric service, and efficient market outcomes.

Since our analysis was released in August 2010, EPA has published its proposed Utility Toxics Rule and should be close to issuing the final Transport Rule.

1. EPA has proposed achievable standards for coal-fired power plants for mercury, acid gases, and other hazardous air pollutants. The proposed emission limits are well within the capability of existing pollution control technology, and allow options for cost-effective compliance strategies.

- The Utility Toxics Rule proposes emissions standards for existing coal-fired power plants for mercury, particulate matter (“PM”), and hydrochloric acid (“HCl”). Companies can choose any combination of control systems or operational changes that enable them to achieve the proposed limits.
- Nearly 60 percent of all coal-fired boilers that submitted stack test data to EPA are currently achieving the Utility Toxics Rule’s proposed mercury emissions standard.¹ This translates to more than 100 boilers (out of a total of 178). These power plants are meeting the proposed standard with a wide variety of pollution control systems and configurations (e.g., wet scrubbers, dry scrubbers, baghouses, and carbon injection systems).
- Many states already impose more stringent mercury emissions limits on coal-fired power plants than have been proposed by EPA; these states, where plants are already in compliance with those stricter standards, include Illinois, Massachusetts, New Jersey, Connecticut, Delaware, and New York.
- About 70 percent of all coal-fired boilers that submitted stack test data to EPA are currently achieving the proposed standards for PM and HCl. Close to 160 coal-fired generating units report emissions below the level of the proposed HCl standard (out of 217), and close to 120 units report emissions below the proposed PM standard (out of 172). All of the proposed standards (mercury, PM, and HCl) allow companies to average their emissions across multiple boilers at a single facility. Smaller boilers, which may only operate a limited number of hours each year, may comply without any major capital upgrades if co-located with a better-controlled boiler. Almost 20 percent of existing coal capacity that currently lacks “scrubbers” is co-located at plants with existing scrubbers. These units can potentially

¹ Based on EPA’s revised standard of 1.2 pounds per trillion British thermal units (lb/TBtu).

benefit from the averaging provisions of the rule, reducing the costs and potential retirements from the Utility Toxics Rule, as well as avoiding any related reliability issues.

- EPA has proposed a "work practice standard" to control emissions of dioxins and furans, rather than setting a numeric emissions limit. The work practice standard requires "good combustion practices" to limit the formation of organic HAPs.
- Several studies, published before EPA issued its Utility Toxics Rule, have projected widespread coal plant retirements in the U.S. The higher end projections are likely overstating future levels of retirements given what we now know about EPA's proposed approach and the market response to date.

2. Recent corporate financial statements and other recent announcements confirm that at least some of the nation's largest coal-fired generating companies are well positioned to comply with EPA's proposed air quality rules.

- Benjamin G.S. Fowke, III, President and Chief Operating Officer of Xcel Energy, said: "Like many of our peers, we are in the process of evaluating what if any impact [EPA's Utility Toxics Rule] may have on our operations. Based on our preliminary review we do not anticipate that the rule will require extensive changes to our plans at [Northern States Power] and [Public Service Company of Colorado]...Our proactive steps to reduce emissions through the MERP project in Minnesota and our plans for the Clean Air-Clean Jobs Act in Colorado put us in good position to comply with these rules." *April 28, 2011, Xcel Energy Inc. 1st Quarter 2011 Earnings Call*
- Jim Rogers, President and CEO of Duke Energy, said: "[T]he anticipation of more stringent environmental rules has long been part of our business plan. Over the past 10 years, we have spent \$5 billion retrofitting existing units with updated emissions controls...Today, approximately 75% of our current coal generation capacity has scrubbers in operation. This will increase to approximately 90%, once our fleet modernization program and related retirements are completed...We have really mitigated a lot of the risk and the cost associated with this program by the early steps that we took." *May 3, 2011, Duke Energy 1st Quarter 2011 Earnings Call*
- According to Gale Klappa, Chairman, President and CEO of Wisconsin Energy: "We really see very little impact on customer electric rates or our capital plan between now and 2015 as a result of all the new EPA regulations that have been proposed...We might see 1% to 2% increase our best guess [sic]. So that gives you an example of how well we are positioned from the environmental standpoint in terms of complying with even the new proposed rule." *May 3, 2011, Wisconsin Energy Corporation 1st Quarter 2011 Earnings Call*
- Reacting to EPA's proposed Utility Toxics Rule, Theodore Craver, chairman, president and CEO of Edison International said: "We installed the necessary equipment back in 2009 and are already achieving these [mercury] limits. U.S. EPA's rule contained other draft provisions covering acid gases and non-mercury metals, which we can meet by installing the pollution control equipment we have been planning to use at Midwest Gen to meet our SO₂ emissions commitments to the Illinois EPA." *May 2, 2011, Edison International 1st Quarter 2011 Earnings Call*
- William Spence, Chief Operating Officer, Executive Vice President and President of PPL Generation, said: "Our proactive approach to environmental compliance positions the PPL fleet favorably for future EPA regulation. Ninety-six percent of the competitive coal generation is scrubbed, 88 percent has NO_x controls already installed." *February 4, 2011, PPL 4th Quarter 2010 Earnings Call*

- Mauricio Gutierrez, Executive Vice President and Chief Operating Officer of NRG reports that: "The proposed [Utility Toxics Rule] provides flexibility in that compliance can be achieved through facility averaging and company selected control technology. It also recognizes the inherent differences in mercury emissions from lignite coal...[t]he key takeaway is that we do not expect at this time any additional environmental CapEx beyond what we have previously announced." *May 5, 2011, NRG Energy 1st Quarter 2011 Earnings Call*
- The Tennessee Valley Authority ("TVA"), which owns 17,000 megawatts ("MW") of coal-fired generating capacity, announced plans in April 2011 to retire 18 older coal-fired generation units at three power plants (2,700 MW) as part of the utility's vision of being one of the nation's leading providers of low-cost and cleaner energy by 2020. The utility will replace "older and less-economical generation with cleaner sources." Tom Kilgore, TVA's President and CEO, said that a "variety of electricity sources, rather than heavy reliance on any single source, reduces long-term risks and helps keep costs steady and predictable....In the longer term, these actions reinforce our vision to keep bills low, keep our service reliability high and further improve air quality as we modernize the TVA power system." *TVA Press Release, April 14, 2011.*

3. The results of PJM's most recent Reliability Pricing Model ("RPM") forward capacity auction clearly indicate the industry can meet future electricity demand while maintaining electric system reliability in one of the most coal-dependent regions of the country.

- On May 13, 2011, PJM announced the results of its RPM forward capacity auction for the period from May 31, 2014 through June 1, 2015. Both the Transport Rule and the Utility Toxics Rule will be in effect by the beginning of 2015. These results provide up-to-date information about how the region's reliability organization will ensure sufficient capacity to meet peak demand conditions after the proposed EPA air regulations go into effect.
- PJM operates the nation's largest integrated power market, serving 54 million customers in 13 mid-Atlantic and Midwestern states, including all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.
- To ensure future electric system reliability, PJM's forward capacity auction requires power plant operators and other participating companies to offer (i.e., commit) resources, including both generating capacity and demand-side resources, three years in advance of when they are needed.²
- The results of the most recent auction confirm that the 13-state PJM region will have ample electricity supply after EPA's Transport and Utility Toxics Rules take effect. The market response represents a 20.6 percent reserve margin for the region. The energy resources selected to serve the region included new generating resources, capacity upgrades to existing power plants, new demand response resources, and new commitments to energy efficiency.
- The resources that bid into but fail to "clear the auction" (i.e., to be selected as the lowest-cost capacity resources) are not needed for reliability purposes. Generating units that did not clear have the option to retire. In the most recent auction, existing fossil generating units that failed to clear were offset by new generating resources, energy efficiency, and demand response that offered their capacity at lower prices.
- Numerous analyst reports have attempted to predict future levels of coal plant retirements with estimates ranging from 10 to 70 GW. The PJM forward capacity auction is where the "rubber-meets-

² There are exceptions to this requirement (e.g., when a company relies on its own generating resources to satisfy its load requirements). See *infra* n.21.

the-road," reflecting actual market investment behavior, signaling that sufficient power will be available after EPA's air rules take effect.

4. EPA has the statutory authority under the Clean Air Act to grant, on a case-by-case basis, extensions of time to complete the installation of pollution control systems.

- EPA emphasizes in its proposed Utility Toxics Rule that it has the discretion to grant, on a case-by-case basis, extensions of time to complete the installation of pollution control systems where appropriate.
- This provision provides companies with the flexibility to schedule the installation of controls across multiple outage periods—maintaining electric system reliability while facilitating the expeditious installation of modern pollution control systems.
- Permitting authorities have used this provision in the past under previous MACT rules.
- If four years is still not enough time to install the necessary controls, EPA and the Department of Energy have the authority to enter into administrative orders of consent or consent decrees with power plants, allowing them to run under specific and limited circumstances to maintain reliability. This approach ensures that reliability standards are maintained without an across-the-board delay in the implementation of the rules.

I. EPA'S PROPOSED UTILITY TOXICS RULE

A. EPA has proposed achievable standards for coal-fired generating units for mercury, acid gases, and other hazardous air pollutants

In December, 2000, the U.S. Environmental Protection Agency (“EPA”) issued a formal notice concluding that it was “appropriate and necessary” to regulate hazardous air pollutants (“HAPs”) from the electric power sector under Section 112 of the Clean Air Act. The finding specifically referenced concerns associated with mercury, arsenic, chromium, nickel, cadmium, dioxin, hydrogen chloride, and hydrogen fluoride. Almost 11 years later, EPA has issued its proposed rule.³

The proposed standards for existing coal-fired generating units are summarized in Table 1 below.

Table 1 – Proposed Standards for Existing Coal-Fired Generating Units

HAP or HAP Surrogate	Proposed Standard
Particulate matter	0.030 lb/MMBtu
Hydrogen chloride	0.0020 lb/MMBtu
Mercury (units designed for coal \geq 8,300 Btu/lb)	1.2 lb/TBtu ⁴
Mercury (units designed for coal $<$ 8,300 Btu/lb)	4.0 lb/TBtu

Note: The Utility Toxics Rule also proposes “output-based” emissions standards for coal-fired generating units (i.e., standards expressed in pounds per megawatt-hour “MWh”). Companies can demonstrate compliance based on either the “input-based” standards listed above (in million Btu “MMBtu” of heat input) or the output-based limits.

Coal-fired generating units emit over 100 chemicals on EPA’s list of HAPs—pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive problems or birth defects, and that adversely affect the environment.⁵ Rather than requiring companies to comply with standards for each individual HAP emitted from coal-fired generating units, however, EPA has proposed the use of “surrogates,” simplifying the monitoring and compliance requirements of the rule. For example, particulate matter (“PM”) has been proposed as a surrogate for all non-mercury metal HAPs, including arsenic, cadmium, chromium, and lead. Hydrogen chloride (“HCl”) is being used as a surrogate for all acid gas HAPs. No surrogate was used for mercury.

EPA’s proposed standards were calculated based on an extensive data collection effort, involving hundreds of stack tests at coal-fired generating units throughout the country. The Clean Air Act requires that EPA’s standards reflect the performance of the “best performing” facilities within the category or subcategory.

Figure 1 compares the proposed standard for mercury⁶ with the stack test results from 178 coal units that conducted stack emissions testing in 2010 as part of EPA’s Information Collection Requests (“ICR”) emissions testing program. The results show that nearly 60 percent of all coal-fired generating units that submitted stack test data to EPA are currently achieving the proposed mercury emissions standard. This translates to more than 100 units (out of a total of 178).

³ U.S. Environmental Protection Agency (“EPA”), *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*, Federal Register / Vol. 76, No. 85 / Tuesday, May 3, 2011.

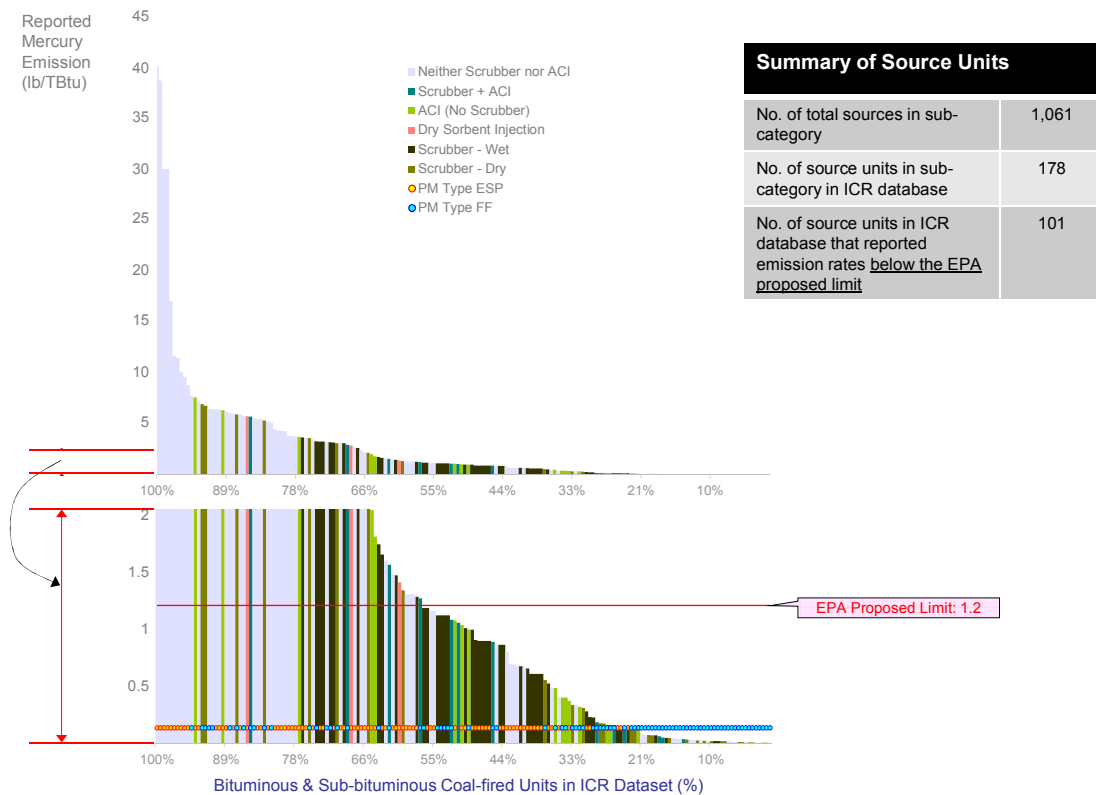
⁴ EPA’s proposed mercury emissions standard for existing electric generating units designed for coal \geq 8,300 Btu/lb was revised on May 18, 2011. The standard was adjusted from 1.0 lb/TBtu to 1.2 lb/TBtu.

⁵ EPA, *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units—Final Report to Congress*, EPA-453/R-98-004a, February 1998.

⁶ Only about 30 coal-fired generating units in the U.S. would be subject to the mercury standard for units designed for coal with a heat content of less than 8,300 British thermal units per pound (Btu/lb); therefore, we focus our analysis on the mercury standard for units designed for coal \geq 8,300 Btu/lb.

Figure 1 also shows that the power plants meeting the proposed standard have a wide variety of pollution control systems and configurations that are reducing their mercury emissions. Many of the units that are below the level of the standard have been retrofit with a scrubber (wet or dry) or activated carbon injection (“ACI”). Virtually all of the units with a “baghouse” or fabric filter (“FF”) report emissions well below the level of the proposed mercury standard. In many cases, these mercury reductions are being achieved as a co-benefit of existing state and federal pollution control programs aimed at reducing SO₂ and other air pollutants. In some cases, states have adopted mercury control requirements because of the slow pace of the federal rulemaking process. Appendix A provides details on the existing state mercury control requirements. Several states already impose more stringent mercury emissions limits on coal-fired power plants than what has been proposed by EPA, including: Illinois, Massachusetts, New Jersey, Connecticut, Delaware, and New York.

Figure 1 – Proposed Mercury Emissions Standard and ICR Stack Test Results



Note: In order to better reflect the detail of the graph, the lower portion of the figure highlights a narrow band of the upper bar graph (i.e., the area below 2 lb/TBtu).

Figure 2 compares the proposed standard for PM with the stack test results from 172 coal-fired generating units that conducted stack emissions testing in 2010. The results show that nearly 70 percent of all coal-fired generating units that submitted stack test data are currently achieving the proposed PM emissions standard. This translates to more than 119 units (out of a total of 172).

Figure 3 compares the proposed standard for HCl with the stack test results from 217 coal-fired generating units that conducted stack emissions testing in 2010. The results show that 73 percent of all coal-fired generating units that submitted stack test data are currently achieving the proposed HCl emissions standard. This translates to 158 units (out of a total of 217).

Figure 2 – Proposed PM Emissions Standard and ICR Stack Test Results

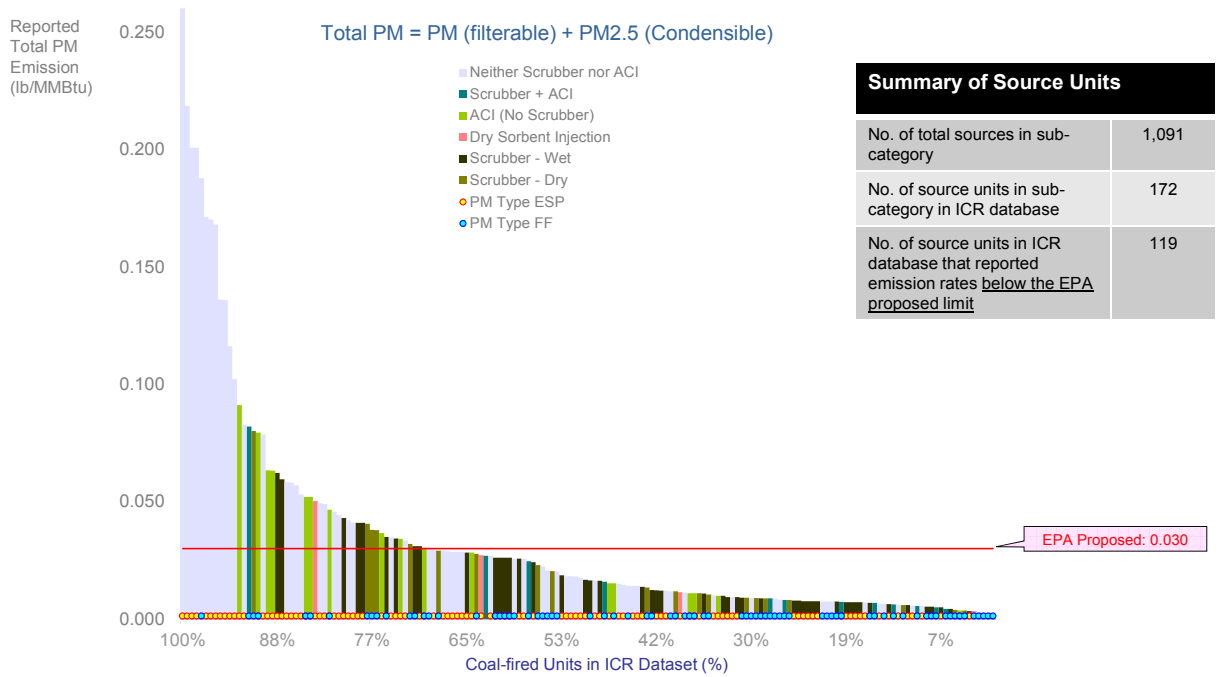
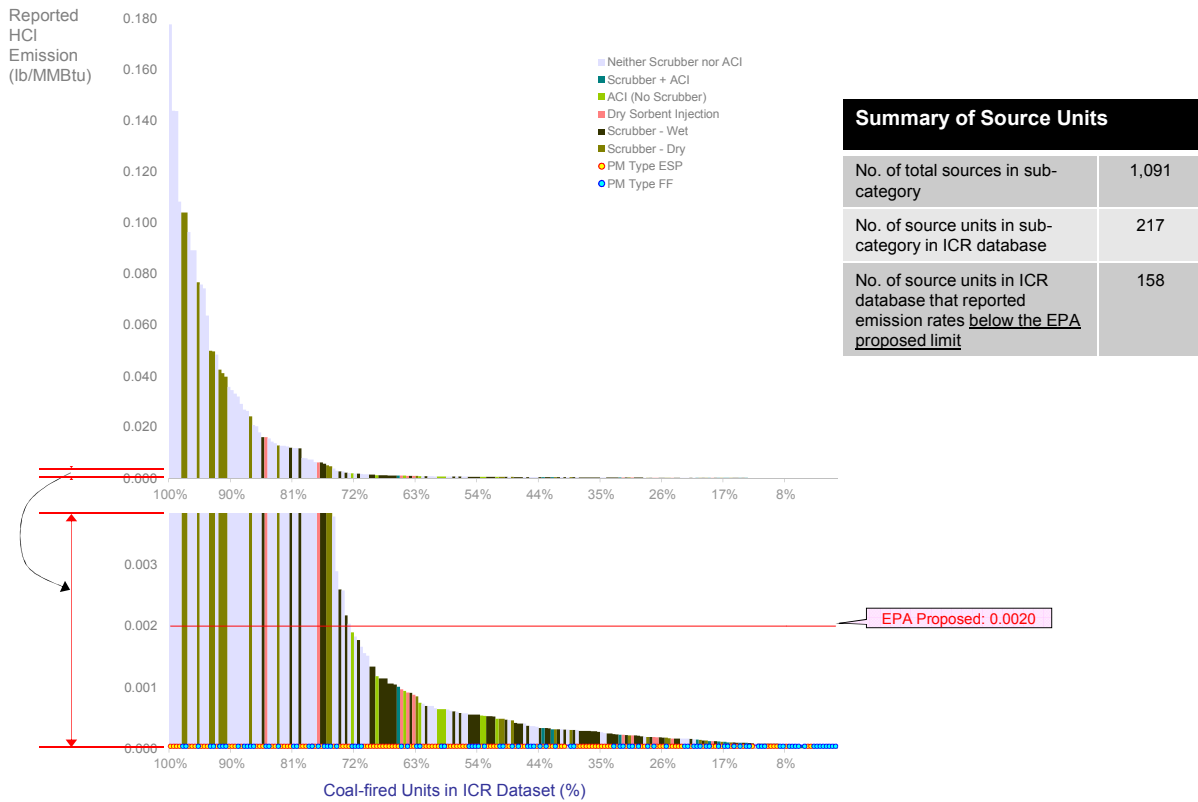


Figure 3 – Proposed HCl Emissions Standard and ICR Stack Test Results



Note: In order to better reflect the detail of the graph, the lower portion of the figure highlights a narrow band of the upper bar graph (i.e., the area below 0.004 lb/MMBtu).

B. The averaging provisions of the Utility Toxics Rule, and work practice standards for dioxins and furans, reduce the costs and potential retirements from the rule

Most coal-fired power plants have multiple boilers and electric generating units at a single plant location. The Utility Toxics Rule would allow companies to demonstrate compliance by averaging their emissions across multiple units at an affected source. This flexible compliance option is particularly helpful to smaller generating units that are co-located with larger generating units, but may not be economic to retrofit with pollution control systems.

Smaller boilers, which may only operate a limited number of hours each year, may comply without any major capital upgrades if co-located with a better-controlled boiler. Almost 20 percent of existing coal capacity that currently lacks “scrubbers” is co-located at plants with existing scrubbers. These units can potentially benefit from the averaging provisions of the rule, reducing the costs and potential retirements from the Utility Toxics Rule, as well as avoiding any related reliability issues.

EPA has proposed a “work practice standard” to control emissions of dioxins and furans, rather than setting a numeric emissions limit. The work practice standard requires “good combustion practices” to limit the formation of organic HAPs. Companies would perform an annual performance test to ensure efficient fuel combustion.

C. The majority of U.S. coal plants have already installed air pollution controls

As highlighted in our August 2010 report, many coal plants have already installed pollution control technologies to dramatically reduce their air pollution emissions, including NO_x, SO₂, mercury, and other HAPs.

- About 60 percent of the U.S. coal fleet (192 GW) has scrubbers installed or under construction. Scrubbers capture sulfur dioxide (“SO₂”), mercury, HCl, and PM emissions.⁷ Among large coal-fired generating units—units greater than 400 megawatts (“MW”)—more than 70 percent have scrubbers installed. Scrubbers are the most capital intensive technology that a company would potentially need to install to comply with the Utility Toxics Rule.
- About 35 percent of the U.S. coal fleet (112 GW) has fabric filters installed. Fabric filters (or baghouses) can dramatically reduce PM and mercury emissions.⁸
- About 50 percent of the U.S. coal fleet (158 GW) has advanced post-combustion NO_x controls installed—selective catalytic reduction (“SCR”) or selective non-catalytic reduction (“SNCR”).⁹
- More than 70 percent of the U.S. coal fleet has electrostatic precipitators (“ESPs”) installed for PM control, although many are older systems designed for lower levels of performance.¹⁰ Companies may need to upgrade their ESPs or replace them with baghouses to comply with the PM limits proposed in the Utility Toxics Rule.

Additionally, new technologies are available that companies will be using to comply with EPA’s new air rules. In particular, dry sorbent injection (“DSI”) has emerged as a low-capital-cost alternative to installing a scrubber. DSI can be used to control SO₂ and other acid gases through the injection of a chemical reagent, including sodium bicarbonate, hydrated lime, and a natural occurring mixture of sodium carbonate and

⁷ Northeast States for Coordinated Air Use Management (“NESCAUM”), *Control Technologies to Reduce Conventional and Hazardous Air Pollutants from Coal-Fired Power Plants*, March 31, 2011.

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

sodium bicarbonate called *Trona*. Relative to a scrubber, DSI not only has low capital costs but can also generally be installed within 12 months. DSI costs have been estimated at \$55 per kilowatt (“kW”).¹¹ Midwest Generation estimates that it can retrofit its entire coal fleet with DSI and fabric filters within 12 to 24 months (of decision) at a cost of \$232/kW.¹² By contrast, a scrubber alone can cost over \$400/kW.¹³

Generally, DSI will be considered for coal units burning low sulfur Powder River Basin (“PRB”) coal. Other factors that will drive the deployment of DSI include unit size, percentage reduction of emissions required, plant economics, and site specific characteristics. DSI has been deployed at several coal-fired generating units in the U.S., including:

- In 2010, NRG’s Dunkirk and Huntley power plants installed DSI systems that simultaneously inject Trona and powder-activated carbon (“PAC”). Performance tests indicate that emissions of SO₂ have been reduced by over 55 percent, mercury levels have been reduced by over 90 percent, and particulate levels have been reduced to less than 0.010 lb/MMBtu. NRG considers these installations sufficient and expects no additional environmental capex requirements to comply with the Utility Toxics and Transport rule.¹⁴
- Duke Energy installed DSI systems in 2010 at its Gallagher generating station. According to the company, the estimated total cost of the DSI system, installed at Units 2 and 4, was \$11.6 million or about \$41/kW. The system will reduce SO₂ emissions by 50 percent. Duke Energy expects the DSI system to help the company comply with the requirements of the Utility Toxics Rule and Transport Rule.¹⁵
- GenOn operates a DSI system at its Potomac River Generating Station in Alexandria, Virginia. According to the company, the Potomac River plant has seen up to 80 percent reduction in SO₂ emissions since introducing the trona-based system.¹⁶
- Midwest Generation is seeking to retrofit its coal fleet (12 coal-fired units in the Midwest with total capacity of about 5 GW) with DSI technology and upgrade its particulate control systems at a total estimated cost of \$1.2 billion.¹⁷ In November 2010 and February 2011, Midwest Generation obtained construction permits from the Illinois Environmental Protection Agency to install DSI systems at its Waukegan and Powerton generating stations.¹⁸
- Conectiv Energy installed a Trona based DSI system at its Edge Moor plant (Units 3 and 4) and operated it from 2009 to mid-2010 on bituminous coal. The plant has since been converted to run on natural gas obviating the need for the DSI system.¹⁹

¹¹ EPA, *Documentation Supplement for EPA Base Case v4.10_PTox- Updates for Proposed Toxics Rule*, March 2011.

¹² Bernstein Research, *U.S. Utilities: The EPA’s Mercury and Air Toxics Standards Are Tougher Than They Appear*, March 2011.

¹³ NESCAUM, *supra* n.7.

¹⁴ NRG Energy, *Q1 2011 Earnings Conference Call*, May 5, 2011.

¹⁵ Duke Energy Indiana, Inc., *Petition for issuance of a Clean Coal Technology Certificate of Public Convenience and Necessity (“CPCN”) pursuant to Ind. Code § 8-1-8.7 for the use of a Dry Sorbent Injection System at its Gallagher Generating Station Units 2 and 4*, No. 43873 (Indiana Utility Regulatory Commission, Sep 8, 2010).

¹⁶ GenOn, <http://www.genon.com/company/company-environmental-technology.aspx> (accessed June 3, 2010)

¹⁷ Edison International, *Q2 2010 Earnings Call Transcript*, <http://www.morningstar.com/earnings/16355020-edison-international-eix-q2-2010.aspx> (accessed June 4, 2011)

¹⁸ Midwest Generation LLC, *Form 10-K*, February 2011.

¹⁹ NESCAUM, *supra* n.7.

II. COMPANY REACTIONS TO EPA RULES

A. Financial statements confirm that at least some of the nation's largest coal-fired generating companies are well positioned to comply, reflecting the progress throughout the U.S. coal fleet in adding modern pollution control systems

A survey of recent corporate earnings statements shows that several of the companies that own significant quantities of coal-fired generating capacity are well positioned to comply with EPA's proposed air quality rules because of earlier investments in their fleets. The following quotes, from a sampling of electric company executives, highlight several important themes: (1) companies have long anticipated these rules; (2) early investments have positioned these companies well for compliance; and (3) the impact on electricity rates can be managed.

- Benjamin G.S. Fowke, III, President and Chief Operating Officer of Xcel Energy, said: "Like many of our peers, we are in the process of evaluating what if any impact [EPA's Utility Toxics Rule] may have on our operations. Based on our preliminary review we do not anticipate that the rule will require extensive changes to our plans at [Northern States Power] and [Public Service Company of Colorado]...Our proactive steps to reduce emissions through the MERP project in Minnesota and our plans for the Clean Air-Clean Jobs Act in Colorado put us in good position to comply with these rules." *April 28, 2011, Xcel Energy Inc. 1st Quarter 2011 Earnings Call*
- Jim Rogers, President and CEO of Duke Energy, said: "[T]he anticipation of more stringent environmental rules has long been part of our business plan. Over the past 10 years, we have spent \$5 billion retrofitting existing units with updated emissions controls...Today, approximately 75% of our current coal generation capacity has scrubbers in operation. This will increase to approximately 90%, once our fleet modernization program and related retirements are completed...We have really mitigated a lot of the risk and the cost associated with this program by the early steps that we took." *May 3, 2011, Duke Energy 1st Quarter 2011 Earnings Call*
- According to Gale Klappa, Chairman, President and CEO of Wisconsin Energy: "We really see very little impact on customer electric rates or our capital plan between now and 2015 as a result of all the new EPA regulations that have been proposed...We might see 1% to 2% increase our best guess [sic]. So that gives you an example of how well we are positioned from the environmental standpoint in terms of complying with even the new proposed rule." *May 3, 2011, Wisconsin Energy Corporation 1st Quarter 2011 Earnings Call*
- Reacting to EPA's proposed Utility Toxics Rule, Theodore Craver, chairman, president and CEO of Edison International said: "We installed the necessary equipment back in 2009 and are already achieving these [mercury] limits. U.S. EPA's rule contained other draft provisions covering acid gases and non-mercury metals, which we can meet by installing the pollution control equipment we have been planning to use at Midwest Gen to meet our SO₂ emissions commitments to the Illinois EPA." *May 2, 2011, Edison International 1st Quarter 2011 Earnings Call*
- William Spence, Chief Operating Officer, Executive Vice President and President of PPL Generation, said: "Our proactive approach to environmental compliance positions the PPL fleet favorably for future EPA regulation. Ninety-six percent of the competitive coal generation is scrubbed, 88 percent has NO_x controls already installed." *February 4, 2011, PPL 4th Quarter 2010 Earnings Call*
- Mauricio Gutierrez, Executive Vice President and Chief Operating Officer of NRG reports that: "The proposed [Utility Toxics Rule] provides flexibility in that compliance can be achieved through facility

averaging and company selected control technology. It also recognizes the inherent differences in mercury emissions from lignite coal...[t]he key takeaway is that we do not expect at this time any additional environmental CapEx beyond what we have previously announced.” *May 5, 2011, NRG Energy 1st Quarter 2011 Earnings Call*

- The Tennessee Valley Authority (“TVA”), which owns 17,000 MW of coal-fired generating capacity, announced plans in April 2011 to retire 18 older coal-fired generation units at three power plants (2,700 MW) as part of the utility’s vision of being one of the nation’s leading providers of low-cost and cleaner energy by 2020. The utility will replace “older and less-economical generation with cleaner sources.” Tom Kilgore, TVA’s President and CEO, said that a “variety of electricity sources, rather than heavy reliance on any single source, reduces long-term risks and helps keep costs steady and predictable....In the longer term, these actions reinforce our vision to keep bills low, keep our service reliability high and further improve air quality as we modernize the TVA power system.” *TVA Press Release, April 14, 2011*

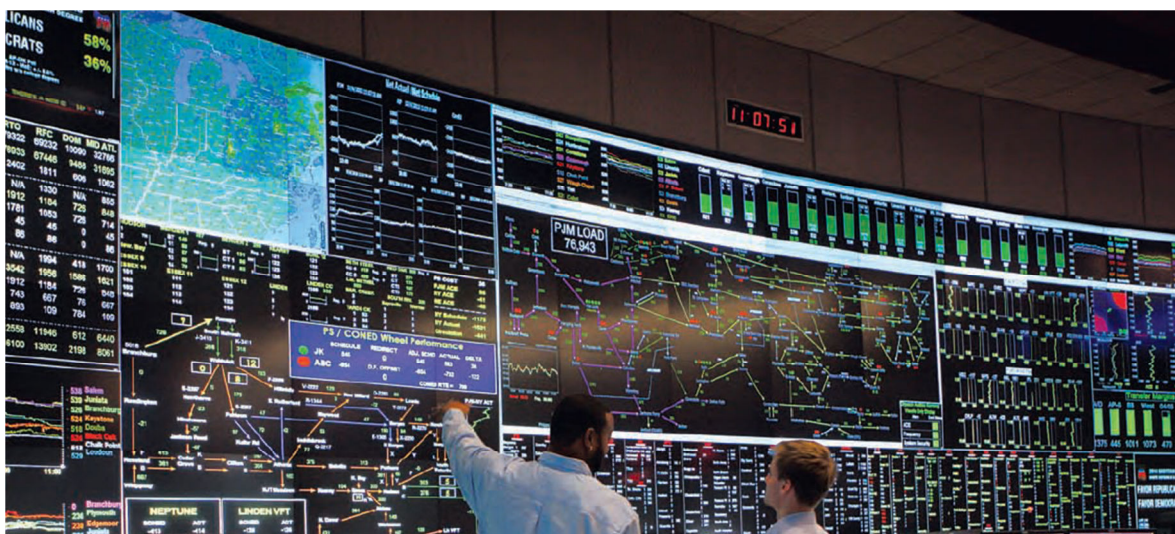
III. PJM FORWARD CAPACITY AUCTION

A. Results from PJM's RPM forward capacity auction show that the industry is able to meet future electricity demand while maintaining electric system reliability

Recent market information from one region of the country with a large concentration of coal-fired power plants provides up-to-date information and insights about how various players in the industry plan to respond to the EPA's future air pollution regulations. Market participants not only include owners of power plants affected by the EPA air pollution regulations, but also owners of other power plants and providers of demand-side resources, all of whom are critical to ensure regions have access to diverse, reliable, efficient, and environmentally compliant electric resources.

PJM provides reliability and wholesale power market functions for the nation's largest integrated power market, serving 54 million customers in 13 Mid-Atlantic and Midwestern states including all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. In addition to operating a centrally dispatched, competitive wholesale electric power market, PJM coordinates and directs the operation of the transmission grid and plans transmission expansion improvements to maintain grid reliability in the region. Much of the generating capacity in PJM's footprint is at coal-fired power plants, some of which are old and relatively inefficient. At the end of 2010, coal units comprised 41 percent of capacity in PJM.²⁰

Keeping the Lights On at the PJM Control Room



Source: PJM. PJM 2010 Annual Report.

To secure adequate capacity to meet future projected power demand, PJM recently conducted its latest round of market-based bidding through its Reliability Pricing Model ("RPM") forward capacity auction. On May 13, 2011, PJM announced the results of that auction, which covers the period from May 31, 2014 through June 1, 2015 – a time when the Utility Toxics Rule and the Transport Rule will both be in effect. PJM's forward capacity auction requires owners of power plants and other participating companies²¹ to offer (i.e., commit) resources including both power plants and demand-side resources, three years in

²⁰ Monitoring Analytics, *State of the Market Report for PJM*, March 10, 2011.

²¹ There are exceptions to this requirement for companies that provide their own generating resources to meet their own loads. Power companies in PJM that do not participate in the capacity auction, like AEP and Duke-Ohio, are required to certify that they have adequate capacity to ensure reliable service. These companies have confirmed that they have sufficient electric capacity to meet their needs through June 1, 2015 – more than five months after the EPA rules are expected to take effect.

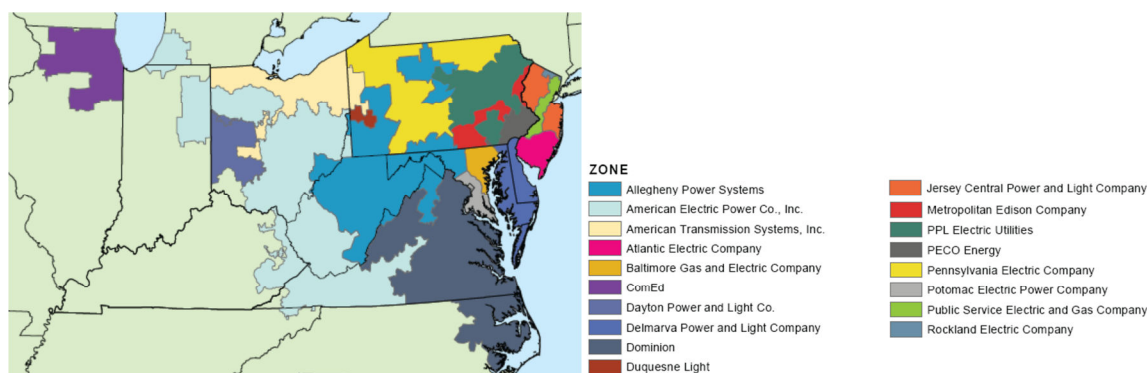
advance so as to maintain electric system reliability. Resources that “clear” the auction receive capacity payments; those that do not clear receive no compensation for their capacity.

The results of the May 13th 2011 auction show that while some coal plants²² were unable to clear the auction and may choose to retire, the region was still able to secure an ample supply of energy resources to maintain reliability. In fact, the market secured resources sufficient to maintain a 20 percent reserve margin for the region.

Out of a total of nearly 150,000 MW of capacity selected in the recent PJM auction,²³ nearly 4,200 MW of new capacity plans to enter the market by 2014/2015, including the addition of new generation capacity resources, capacity upgrades to existing generation capacity resources, new demand resources, upgrades to existing demand resources, and new energy efficiency resources.

The PJM Service Territory

“MAAC” is the Mid-Atlantic Area Council Region which is the eastern part of PJM. Within MAAC are the Eastern (“EMAAC”) area which includes parts of New Jersey, Eastern Pennsylvania, Delaware and Eastern Maryland – in the areas served by PSE&G, JCP&L, PECO, AE, DPL & RECO); the Southwestern MAAC (parts of Maryland and the District of Columbia, served by PEPCO and BG&E); and the Western MAAC (parts of Pennsylvania served by Penelec, MetEd, PPL). There is also “Western PJM” – in parts of Illinois, Indiana, Ohio, Kentucky and other states (ComEd, AEP, Dayton, APS, Duquesne, ATSI, Duke).



Source: PJM, <http://pjm.com/documents/~media/about-pjm/pjm-zones.ashx> (accessed June 3, 2011)

The price of capacity, which accounted for less than 20 percent of PJM wholesale power prices in 2010 when prices were at historic highs, increased and decreased in different parts of the region.²⁴ As summarized in the chart below, in the Eastern part of PJM (the subregions called “MAAC” and “EMAAC”), prices fell more in line with past price levels. The “RTO” price—representing the price in the portions of the PJM region not constrained by transmission (which effectively is the western portion of the PJM system)—increased to levels that were still below prices in 2010/2011 although slightly above prices in 2009/2010 and 2011/2012.

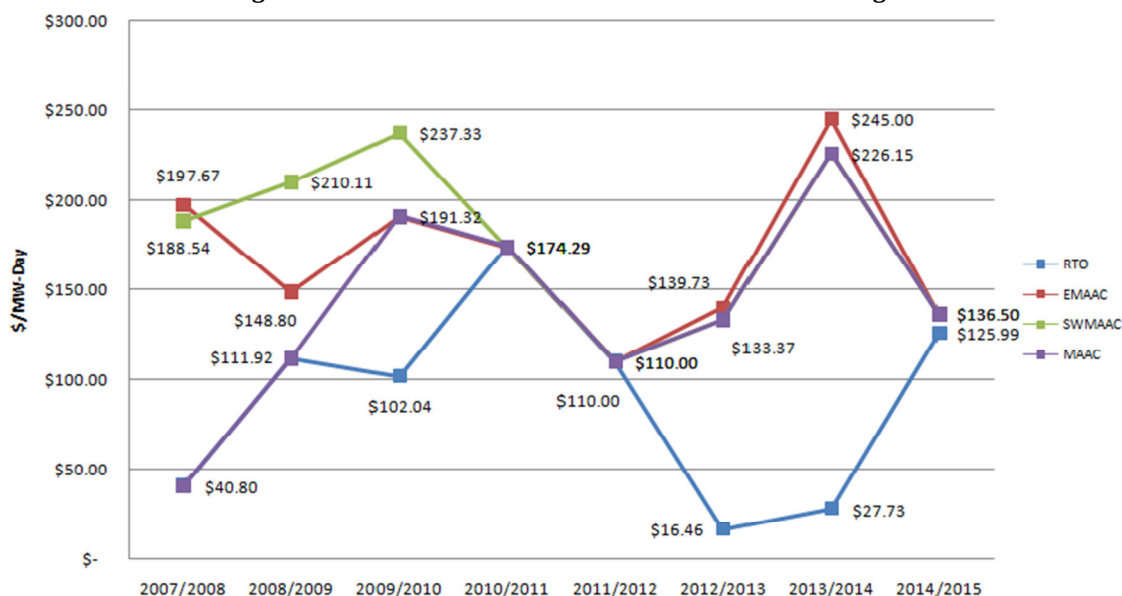
²² Note that PJM’s market monitor had provided guidance to participants in the auction that they should develop their bids assuming compliance with the EPA Utility Toxic Rule: “Question 1: If a participant determines that the costs to meet the proposed MACT rules will be prohibitive, do they need to submit a request for deactivation so that they would not have to offer a unit into the 2014/2015 Base Residual Auction (BRA)? Answer 1: The MMU expects participants to offer units based on their calculated costs of compliance and based on their own economic decisions. If the units do not clear, participants have the option to retire the units.” See Monitoring Analytics, *Clarification on ACR Data and Pending EPA Regulations*, April 28, 2011.

²³ This amount is lower than PJM’s 2010 generating capacity of 167,362 MW (See PJM, *Annual Report*, 2010), or its projected capacity requirements for 2014/2015, because some distribution companies are permitted to satisfy their capacity requirements through their own generating resources, as noted previously.

²⁴ Monitoring Analytics, *State of the Market Report for PJM*, March 10, 2011.

The generating units that failed to clear the auction—including fossil generating units that may eventually be slated for retirement—were largely offset by these new generating, energy efficiency, and demand response resources. In its auction results, PJM reported a reduction in committed coal capacity in 2014/2015 equal to 6,900 MW, and suggested that the decrease is likely related to some coal capacity reflecting the costs of environmental retrofits in their offer prices.²⁵ These costs would make some coal units uneconomic relative to lower cost resources. In contrast to the reduction in committed coal capacity, however, demand response resources increased by 4,836 MW.²⁶ Commitments to conserve energy through energy efficiency increased by 142.7 MW.²⁷ The auction also procured 695 MW of wind power and 45.6 MW of solar power.²⁸

Figure 4 – PJM Base Residual Auction Resource Clearing Prices



Source: PJM, 2014/2015 RPM Base Residual Auction Results, PJM DOCS #645284 (May 2011).

Notes:

RPM – Reliability Pricing Model, with the “Base Residual Auction” being the initial auction each year to select basic resources for a future period.

“RTO” – Regional Transmission Organization—effectively these are the capacity prices in the western portion of PJM.

“MAAC” – Mid-Atlantic Area Council

“EMAAC” – Eastern Mid-Atlantic Area Council region

“SWMAAC” – Southwest Mid-Atlantic Area Council region

As indicated by the results of PJM’s most recent forward capacity auction, the region will have more than enough capacity to meet federal reliability standards set by NERC when the Utility Toxics Rule and the Transport Rule will both be in effect. Notably, more than 5 GW of new capacity came into the market with this auction, including new generation and new demand side resources such as energy efficiency and demand response. This outcome illustrates the diversity of ways that market participants can provide reliable power supplies while meeting future environmental requirements.

B. The results of the PJM forward capacity auction suggest that some projections of future coal plant retirements may be overstated

Numerous analyst reports have been issued since the beginning of 2010, predicting varying levels of coal plant retirements in the U.S. Some of the factors contributing to these retirement projections include lower

²⁵ PJM, 2014/2015 RPM Base Residual Auction Results: Addendum, PJM DOCS #648604 (May 2011).

²⁶ *Id.*

²⁷ PJM, 2014/2015 RPM Base Residual Auction Planning Period Parameters, PJM DOCS #631095 (May 2011)

²⁸ PJM, Demand Resources and Energy Efficiency Continue to Grow in PJM’s RPM Auction, May 13, 2011.

electricity demand, lower natural gas prices, the advanced age of many coal-fired generating units, and the increased costs associated with EPA’s environmental rules. Many of these reports included impacts from EPA’s air regulations as well as other rules (e.g., 316(b) cooling water standards, coal ash rules, and some of the studies have modeled a price on greenhouse gas emissions). Most of these studies were developed prior to the issuance of the Utility Toxics Rule in March 2011. Examples of some of these analyst reports are summarized below, including projected coal capacity retirements.

The results of the recent PJM forward capacity auction, which reflect actual market investment decisions rather than modeled predictions, suggest that the level of coal plant retirements will be more modest than some have predicted and that the 13-state PJM region will have ample electricity supply after EPA’s air regulations go into effect in the middle of the decade. As EPA’s proposed air pollution regulations are more flexible than had been anticipated by some of those studies’ “worst-case” scenarios and given the industry can supply needed capacity through a variety of resources, the recent PJM auction results suggest that coal plant retirements will likely fall at the lower range of prior estimates.²⁹

Study by	Release Date	Nationwide Projected Capacity Retirement (denotes coal capacity only)	Incremental Retirements (excludes 13 GW of already announced retirements/idlings)	Report Title
CERA	March 2011	35 GW (by 2020)	22 GW	<i>Staying Power Can US Coal Plants Dodge Retirement for Another Decade?</i> (Private Report)
Bernstein Research	March 2011	54 GW (by 2014/15)	41 GW	<i>U.S. Utilities: The EPA’s Mercury and Air Toxics Standards Are Tougher Than They Appear</i>
FBR Capital	December 2010	45 GW (by 2018)	32 GW	<i>Coal Retirements in Perspective: Quantifying the Upcoming EPA Rules</i>
The Brattle Group	December 2010	40-55 GW (by 2020)	34 GW	<i>Potential Coal Plant Retirements Under Emerging Environmental Regulations</i>
NERC	October 2010	15-35 GW (by 2018)	12 GW	<i>2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations</i>
Credit Suisse	September 2010	60 GW (by 2017)	47 GW	<i>Growth from Subtraction: Impact of EPA Rules on Power Markets</i>
PIRA Energy Group	April 2010	30-40 GW (by 2015)	22 GW	<i>EPA’s Upcoming MACT: Strict Non-Hg Regs Can Have Far-Reaching Market Impacts</i>

²⁹ See also S. Tierney and C. Cicchetti, *The Results in Context: A Peer Review of EEI’s “Potential Impacts of Environmental Regulation on the U.S. Generation Fleet,”* May 2011; and S. 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>

IV. EPA AUTHORITY TO GRANT ADDITIONAL TIME FOR THE INSTALLATION OF CONTROLS

A. EPA has the statutory authority under the Clean Air Act to grant, on a case-by-case basis, extensions of time to complete the installation of pollution control systems

In general, under the Clean Air Act, Congress requires existing, affected sources to comply with standards for hazardous air pollutants “as expeditiously as practicable, but in no event later than 3 years after the effective date of such standard.” As a result, affected coal-fired power plants will need to comply with the emissions limits of the Utility Toxics Rule by the beginning of 2015. However, there are exceptions under the law, which allow additional time for the installation of controls, and, in fact, EPA emphasizes in its proposed Utility Toxics Rule that the Agency and state regulatory authorities have the discretion to grant, on a case-by-case basis, an additional 12 months for the installation of pollution control systems where appropriate. Permitting authorities have used this provision in the past under previous air toxics rules.

This provision provides companies with the flexibility to schedule the installation of controls across multiple outage periods—maintaining electric system reliability while facilitating the expeditious installation of pollution control systems. Companies will typically construct pollution control systems while a power plant continues to operate. The equipment is then connected or “tied-in” to the plant during a scheduled outage period, coordinated with other generating facilities to ensure reliability. This will typically occur during a month or month(s) when the demand for electricity is relatively low—avoiding the hottest summer months and the coldest winter months. A 12-month extension would provide plant operators with an additional two shoulder periods to schedule outages and stagger the installation of controls.

If four years is still not enough time to install the necessary controls, EPA and the Department of Energy have the authority to enter into administrative orders of consent or consent decrees with power plants, allowing them to run under specific and limited circumstances to maintain reliability. This approach ensures that reliability standards are maintained without an across-the-board delay in the implementation of the rules.

V. CONCLUSION

These new findings support the conclusion that we reached in our August 2010 study on EPA's air regulations and their implications for electric system reliability. The flexible nature of EPA's regulations, the readiness reported by leaders of many of the companies owning affected coal plants, the recent results of the forward capacity auction in PJM, and the various authorities of EPA and other federal agencies all indicate we can modernize and clean the nation's electric fleet to enhance public health while maintaining electric system reliability.

APPENDIX A

State Mercury Regulations

State	Year Enacted	Policy/Rule
New Hampshire	2002	Requires 75% reduction in annual mercury emissions from coal plants compared to 1996/97 emissions.
Connecticut	2003	Requires coal-fired power plants to achieve either an emissions standard of 0.6 lb/tBtu or a 90% efficiency in technology installed to control mercury emissions.
New Jersey	2004	Requires a 90% reduction of mercury emissions from coal-fired power plants by the end of 2007. Plants have the option of meeting the standards in 2012 if they also make major reductions in their emissions of sulfur dioxide, nitrogen oxides, and fine particulates.
Delaware	2006	Requires power plants to capture at least 80% of mercury beginning in 2009 and 90% beginning in 2013.
Maryland	2006	Requires power plants to capture at least 80% of mercury beginning in 2010 and 90% beginning in 2013.
Illinois	2006	Requires power plants to reduce mercury emission by 90% starting in July of 2009.
North Carolina	2006	Requires power plants submit by January 1, 2013 detailed plans and timetables for achieving maximum technically and economically possible mercury reductions at each unit. Units that are not controlled by 2017 must be shut down.
Montana	2006	Requires mercury emitting EGUs to achieve an emission rate lower than 0.9 lb/TBtu by January 1, 2010. EGUs unable to meet this limit after installing an approved control strategy may apply for an alternative limit by July 1, 2011.
Minnesota	2006	Requires MN's largest coal-fired power plants to cut mercury emissions by 90% by 2015.
Massachusetts	2007	Requires power plants to capture at least 85% of mercury (or achieve a rate of 0.0075 lb/GWh) by 2008 and 95% of mercury (or achieve a rate of 0.0025 lb/GWh) by 2012.
New York	2007	Phase I (2010): Power plants must reduce mercury emissions by 50%. Phase II (2015): Implementation of unit-based limits for each facility to reduce mercury emissions by 90% using Maximum Available Control Technologies
Colorado	2007	Requires new or reconstructed units to achieve a minimum mercury capture rate of 90% and implement BACT.
Georgia	2007	<i>Multi-pollutant Control for EGUs (steam)</i> requires four specific power plants to carry out feasibility studies for mercury controls by 2018. <i>Mercury emissions from new EGUs</i> require the use of BACT to control mercury emissions.
Wisconsin	2008	Requires large (>150 MW) coal-fired power plants to either – a) achieve a 90 percent reduction in mercury emissions from coal by the year 2015; or b) reduce multiple pollutants, including nitrogen oxides (NOx) and sulfur dioxide (SO ₂), and achieve 90 percent reduction in mercury emissions six years later Requires small (> 25 MW and < 150 MW) coal-fired power plants reduce their mercury emissions to BACT level.
South Carolina	2008	Requires power plants to install mercury emission monitoring equipment by June 2009.
Michigan	2009	Requires EGUs to reduce mercury emissions by 90%, or achieve 75% mercury emission reductions along with nitrogen oxides (NOx) and sulfur dioxide (SO ₂) reductions.
Oregon	2010	Caps mercury emissions from new EGUs and requires installation of mercury controls at existing ones. Total statewide mercury emissions limited to 60 lb/year after 2018. New coal plants cannot emit more than 25 lb/year.

Source: Environmental Defense Fund, Mercury Alert: Cleaning up Coal Plants for Healthier Lives, March 2011.