A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability

Updated April 3, 2012

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Table of Contents

Executive Summary i
I. Background on Issues 1
II. Overview of USEPA Rulemakings 2
A. Clean Air Act Rules 3
1. Cross-State Air Pollution Rule 3
2. Mercury and Air Toxics Standards 4
3. Greenhouse Gas Tailoring Rule 5
4. Greenhouse Gas New Source Performance Standards 7
5. National Ambient Air Quality Standards 8
B. Other Rules 9
1. Coal Combustion Residuals Rule 9
2. Thermal Power Plant Cooling Water Intake Structures Rule 9
C. Ranking of Potential Rule Impacts and Regulatory Timelines 10
III. Summaries of USEPA Analyses on Rule Benefits and Costs 12
A. Cross-State Air Pollution Rule 12
B. Mercury and Air Toxics Standards 12
C. Greenhouse Gas Tailoring Rule 13
D. Greenhouse Gas New Source Performance Standards 13
E. National Ambient Air Quality Standards 14
F. Thermal Power Plant Cooling Water Intake Structures Rule (proposed) 14
G. Coal Combustion Residuals Rule (proposed) 15
IV. Compilation of Recent Capacity Retirement/Electric System Reliability Studies and Available Planning Options 16
A. Compilation of Capacity Retirement/Electric System Reliability Studies 16
B. Available Planning Options 20
V. Summary 21

* The Northeast States for Coordinated Air Use Management (NESCAUM) is the regional association of air pollution control agencies representing Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Any views or opinions expressed in this paper are the author's, and do not necessarily reflect those of NESCAUM as an organization or of its member state air agencies.

A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability

Executive Summary

The purpose of this primer is to provide a basic background on recent and pending U.S. Environmental Protection Agency (USEPA) rules affecting the electric power generation sector (with coal power plants being a major focus). Several studies are briefly summarized that have assessed the environmental regulations' possible collective impact on power plant retirements and electric system reliability. Where available, USEPA analyses of the costs and benefits of proposed and final rules are presented. Also presented are planning options identified in several of the scenario studies that can help mitigate potential reliability issues.

These environmental rules reflect long standing requirements contained within national environmental laws that Congress adopted and charged the USEPA with the responsibility for implementing. In a number of cases, the USEPA is now under court order to promulgate rules that have been deferred for years, or were deemed legally deficient in their original form. These rules will impose costs upon the electric generation sector, but they also have public health and environmental benefits that in some cases far exceed their projected costs.

Power plant owners will have to decide how to cost-effectively respond to these public health and environmental requirements. One outcome could be that a significant number of older un- or under-controlled coal-fired plants will be retired, rather than fit with new add-on technologies. Concerns have been raised that closing these plants for economic reasons could have a significant impact on the reliability of the electric grid due to lost generation capacity. Others contend that grid reliability concerns are overstated in light of the industry's historical track record in retrofitting and replacing comparable amounts of generation under past rules, current reserve margins throughout the country, the under-utilized capacity of natural gas generators, growing energy efficiency efforts, demand-side management opportunities, rapidly expanding renewable supplies, and other planning options.

A number of studies have been performed that suggest a range of outcomes under different assumptions regarding environmental rule stringency. Taken together, the studies give a range of 25 – 76 GW in possible electric generation capacity retirements by 2020 as a result of pending environmental rules. Greater rule stringency regarding compliance time and degree of required technology coincides with higher amounts of projected capacity retirements. Cumulatively, the studies generally indicate a likelihood of locally confined reliability impacts, to the extent they may occur.

Historically, the electric power sector has been able to build new generation capacity over the span of a relatively few years well in excess of the upper end of projected generation capacity reductions. For example, between 2001 and 2003, over 160 GW of new generation capacity was built in the U.S. In addition, current peak electricity demand

reserve margins in most areas of the U.S. are well above target reserve margins set by the North American Electric Reliability Corporation. This excess generation capacity can act as a further cushion in maintaining system reliability in many areas.

While the full scope and application of some of the USEPA's forthcoming rules are not yet known, the agency has indicated its intent to provide compliance flexibility for power plants. When final rules are promulgated, a range of control technology options, where needed, should be available for compliance purposes. As the rules take effect, there are a number of options available to address supply and demand needs while shoring up system reliability, such as transmission upgrades, distributed generation sources, and energy efficiency programs. Where threats to electric system reliability legitimately arise, regulatory tools exist, and have previously been used, to mitigate potential problems on a location-specific basis.

A Primer on Pending Environmental Regulations and their Potential Impacts on Electric System Reliability

I. Background on Issues

The U.S. Environmental Protection Agency (USEPA) has recently adopted, proposed, or soon will propose, a series of air, water, and waste regulations for the electric power sector with the potential to promote significant changes in this industry. Power plant owners will have to decide how to cost-effectively respond to these requirements. One outcome could be that a significant number of older un- or under-controlled coal-fired plants will be retired, rather than fit with scrubbers or other emission control devices. Concerns have been raised that closing these plants for economic reasons could have a significant impact on the reliability of the electric grid due to lost generation capacity. Others contend that grid reliability concerns are overstated in light of the industry's historical track record in retrofitting and replacing comparable amounts of generation under past rules, current reserve margins throughout the country, the under-utilized capacity of natural gas generators, growing energy efficiency efforts, demand-side management opportunities, rapidly expanding renewable supplies, and other planning options.

A number of studies have been performed that indicate a range of outcomes under different assumptions regarding environmental rule stringency. Cumulatively, these generally indicate a likelihood of locally confined reliability impacts, to the extent they may occur.

Under the Clean Air Act ("CAA" or "the Act"),[1] the rules of interest include:

- the "Cross-State Air Pollution Rule" addressing the interstate flow of air pollution,
- the "Mercury and Air Toxics Standards" for hazardous air pollutants (HAPs),[2]
- the "Tailoring Rule" for large sources of greenhouse gases, and
- New Source Performance Standards (NSPS) for greenhouse gases from fossil fuel power plants.

In addition to pending and potential new Clean Air Act rules, other non-air environmental rules must also be considered in assessing electric system reliability concerns. Under section 316(b) of the Clean Water Act (CWA), the USEPA has proposed a rule that will target the environmental impacts of cooling water use at thermal power plants. The USEPA has also proposed a rule under the Resource Conservation and Recovery Act (RCRA) to govern the disposal of coal combustion residuals (i.e., coal ash).

[1] A number of acronyms are associated with Clean Air Act provisions. These acronyms, as well as chemical formulas, are indicated at the first appearance of the wording they are associated with, but for ease of reading, these shorthand terms are generally not repeated throughout the text.

[2] This rule has also been called the "Utility HAPs" or the "Utility MACT" rule. "MACT" is taken from language in the Clean Air Act referring to "maximum achievable control technology" (MACT) for limiting emissions of hazardous air pollutants (Clean Air Act section 112).

II. Overview of USEPA Rulemakings

In reviewing the USEPA's regulatory agenda, it must be kept in mind that many of the rules under development or now coming into place are not by the USEPA's own initiative, but rather are due to court decisions or settlement agreements compelling the USEPA to either replace previously adopted rules deemed illegal, or establish schedules to develop new rules where the USEPA has previously failed to act. For these rules, the USEPA's discretion is legally constrained with regard to the agency's schedule for issuing proposed or final rules. The final rules themselves, however, can have varying levels of discretion in timing and breadth of application in keeping with the statutory provisions under which they are promulgated.

The rules briefly described in the following sections are tabulated in Table 1 along with the dates they were or will be proposed and finalized, and the environmental statutes under which Congress authorized the USEPA to act. Not all the pending rules immediately affect the electric power sector. For example, establishing new national ambient air quality standards starts a process for the states to develop plans that will achieve the standards within a set period of time. The state plans developed to meet the standards may require some level of pollution control from power plants, but this would be determined through the state planning process and not directly from the establishment of an air quality standard.

Table 1: Summary table of current or pending USEPA rulemakings.

Rule/Standard	Proposal Date	Final Rule Date	Statutory Authority
Cross-State Air Pollution Rule	Aug 2010	Jul 2011 (currently stayed)	Clean Air Act
Mercury and Air Toxics Standards	May 2011	Dec 2011	Clean Air Act
Tailoring Rule	Sep 2009	May 2010	Clean Air Act
Greenhouse Gas NSPS	Mar 2012	May 2012	Clean Air Act
$PM_{2.5}$ NAAQS	2012?	2012?	Clean Air Act
Ozone NAAQS	2013?	2014?	Clean Air Act
NO_2 NAAQS	Jul 2009	Jan 2010	Clean Air Act
Secondary NAAQS NOx/SOx	Jul 2011	Mar 2012	Clean Air Act
Coal Combustion Residuals Rule	Jun 2010	---	Resource Conservation and Recovery Act
316(b) Cooling Water	Mar 2011	Jul 2012	Clean Water Act

Note: Future dates are current as of April 2012. Some dates are uncertain and all are subject to change (including implementation of final rules) due to litigation, slippage in USEPA schedules, presidential decisions, or other factors.

A. Clean Air Act Rules

1. Cross-State Air Pollution Rule

Overview: The Cross-State Air Pollution Rule addresses emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx) from fossil fuel power plants in the eastern United States that contribute to downwind formation of fine particulate matter and ground-level ozone.[3] The rule comes under Clean Air Act section 110(a)(2)(D) prohibiting air pollutants from being emitted in an upwind state that "contribute significantly" to poor air quality in a downwind state.

Status: The USEPA announced the final Cross-State Air Pollution Rule on July 6, 2011. The rule is the replacement for the earlier Clean Air Interstate Rule (CAIR), which was remanded back to the USEPA by the D.C. Circuit Court of Appeals in 2008. While the D.C. Circuit remanded the earlier rule back to the USEPA, it did not vacate it, hence power plants have had to comply with the Clean Air Interstate Rule's requirements in the interim as the USEPA developed the replacement rule.

On December 30, 2011, the D.C. Circuit Court of Appeals stayed implementation of the Cross-State Air Pollution Rule, which was to have gone into effect on January 1, 2012. As a result, the USEPA has re-instated the reduction requirements of the Clean Air Interstate Rule as litigation continues. The court has ordered a briefing schedule to be completed by March 16, 2012. Under this schedule, the court could issue a final decision on the merits of the Cross-State Air Pollution Rule in the summer or early fall of 2012.

The Cross-State Air Pollution Rule did not significantly change the overall reduction requirements from the earlier Clean Air Interstate Rule for the electric power sector in the aggregate, although it constrained the ability of individual power plants to meet their reduction requirements through interstate trading of pollution allowances. While the D.C. Circuit rejected the original interstate trading approach of the Clean Air Interstate Rule, the later Cross-State rule did retain some reduced ability for interstate trading. As of the end of 2010, preliminary data from the covered power plants indicated their collective annual emissions were already approaching the Cross-State Air Pollution Rule's national 2012 emissions targets for sulfur dioxide and nitrogen oxides (Table 2). This rule, however, allocates emissions by state, such that with reduced trading, meeting state-level reduction targets under the rule, if ultimately implemented, could have greater local reliability impacts in some areas than suggested by looking at collective emissions from all affected power plants.

[3] Power plants located in 27 states are subject to reduction requirements under the Cross-State Air Pollution Rule for NOx and/or SO_2 emissions. A 28th state, Oklahoma, was added under a supplemental rulemaking [76 Fed. Reg. 80760 (December 27, 2011)] to address ozone-season NOx emissions. The supplemental rulemaking also covered the states of Iowa, Michigan, Missouri, and Wisconsin for NOx emissions during the ozone season. These states are already included in the final Cross-State Air Pollution Rule for annual fine particulate matter ($PM_{2.5}$) contributions.

Table 2: Comparison of actual power plant emissions (2005-2010) and Cross-State Air Pollution Rule (CSAPR) annual emissions (million tons).[4]

	2005	2008	2009	2010	2011*	2012	2014
	Actual Emissions					CSAPR**	
Sulfur dioxide	8.8	6.5	4.8	4.2	3.7	3.0	2.4
Nitrogen oxides	2.6	2.1	1.3	1.4	1.3	1.3	1.2

* Based on 2011 data received by the USEPA as of February 17, 2012 (see footnote).
** Does not account for allowed year-to-year variability in emissions in final rule.

2. Mercury and Air Toxics Standards

Overview: Pursuant to section 112 of the Clean Air Act, the Mercury and Air Toxics Standards requires coal- and oil-fueled power plants to reduce their emissions of certain hazardous air pollutants, including mercury, non-mercury toxic metals, acid gases, and organic air toxics. For mercury, non-mercury toxic metals, and acid gases, the rule requires installing "maximum achievable control technology" (MACT) to meet numerical emission limits. For organic air toxics, such as dioxins and furans, the rule requires that work practice standards be followed to minimize emissions by optimizing combustion conditions, rather than specifying numerical emission limits to be achieved through pollution controls.[5]

The final rule affects in particular the coal-fired power plant fleet as coal combustion is the dominant source of mercury emissions among the fossil fuels used in the electric power sector. The rule is considered "technology-based" in that its requirements typically are met through emission controls installed at affected power plants rather than achieved through emissions trading.

Status: The USEPA announced its final rule on December 21, 2011 in accordance with a court-ordered schedule requiring the USEPA to issue a replacement rule for the Clean Air Mercury Rule (CAMR) vacated in 2008. The D.C. Circuit vacated the earlier rule in its entirety, rather than keeping it in place while the USEPA revised it (unlike the previously mentioned Clean Air Interstate Rule), so no portion of it had been implemented at the national level. A number of states, however, adopted their own power plant mercury

[4] The annual SO_2 and NOx emissions in the table are from power plants in the 23 states covered by the Cross-State Air Pollution Rule for $PM_{2.5}$ (Alabama, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, and Wisconsin). The 2005 emissions and projected 2012 and 2014 emissions are from "Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone in 27 States; Correction of SIP Approvals for 21 States," prepublication version (July 6, 2011); at 34, Table III-3. The 2008-2011 emissions are from U.S. EPA Clean Air Markets Division, Data and Maps, Quick Reports (2008-2010) & Preliminary Quick Reports (2011), http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard (accessed February 17, 2012).

[5] "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," 77 Fed. Reg. 9304 (February 16, 2012). (As previously noted, this rule has often been referred to as the Utility MACT rule or Utility HAPs rule.)

rules that require greater mercury reductions on a quicker timeline than would have been required under the vacated Clean Air Mercury Rule. While the vacated rule was specific to mercury, the USEPA's final replacement rule covers additional hazardous air pollutants, such as arsenic, chromium, nickel, acid gases, dioxins, and furans.

Of the air rules currently underway, the Mercury and Air Toxics Standards have drawn the greatest concern from the electric power sector due to the perceived stringency of power plant-specific control technology requirements and, therefore, the cost of controls. Emissions trading is not a compliance option due to the source-specific control requirements under section 112 of the Clean Air Act. There is also a statutorily constrained compliance deadline of three years, with a possible extension of an additional year issued through the relevant permitting authority (e.g., state or local air agency) that the USEPA expects to be broadly available when needed for technology installation. The USEPA also is making available the possibility of an additional fifth year to achieve compliance using administrative orders granted by USEPA under section 113(a) of the Clean Air Act. The USEPA expects these orders to be rarely needed, and issued on a case-specific basis upon a showing that a power plant's operation is critical for reliability.[6]

Power plant owners have been on notice of a pending rule since late 2000 when the USEPA determined as part of a study required by the Clean Air Act that regulating mercury and other toxic air emissions from power plants was "appropriate and necessary."[7] Furthermore, a number of states have already adopted state mercury rules for power plants, with controls in place at a growing number of units.[8] Therefore, power plant owners, if not already subject to regulatory requirements, have been aware of existing or pending regulatory programs for the past decade.

3. Greenhouse Gas Tailoring Rule

Overview: This rule governs the emissions of greenhouse gases from any large source that will be built or modified after January 2, 2011. It applies to power plants (and other large stationary sources) emitting 75,000 tons or more of carbon dioxide-equivalent (CO_2e)[9] annually. The Tailoring Rule comes under the Clean Air Act's Prevention of Significant Deterioration (PSD) program, which establishes pre-construction permit

[6] U.S. EPA Memorandum, "The Environmental Protection Agency's 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 Standard," U.S. EPA Office of Enforcement and Compliance Assurance, December 16, 2011, available at http://www.epa.gov/airquality/powerplanttoxics/pdfs/EnforcementResponsePolicyforCAA113.pdf.

[7] "Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units," 65 Fed. Reg. 79825 (December 20, 2000).

[8] National Association of Clean Air Agencies (NACAA), "State/Local Mercury/Toxics Programs for Utilities," April 6, 2010, available at http://www.4cleanair.org/Documents/StateTableupdatedApril2010.doc (accessed January 18, 2011).

[9] "Carbon dioxide-equivalent" (CO_2e) is an internationally accepted method of comparing the global warming potential (GWP) of a given mass of a greenhouse gas over a defined period of time expressed relative to a reference gas, CO_2, which is assigned a GWP = 1. For a non-CO_2 greenhouse gas, its CO_2e for a given mass is expressed as its mass multiplied by its GWP (e.g., methane's GWP = 21 over a 100 year period).

requirements for new and modified sources. The Tailoring Rule also applies under Title V of the Clean Air Act, which requires major sources to obtain operating permits from a state or other issuing authority that incorporate all applicable air pollution requirements. Unlike a pre-construction permit, operating permits do not impose pollution reduction requirements on sources, but rather are a compilation of all applicable requirements from other provisions of the Clean Air Act.

Status: The Tailoring Rule went into effect January 2, 2011. Affected sources need to analyze and adopt "best available control technology" (BACT) for greenhouse gases to obtain a pre-construction permit under the Clean Air Act. They must also incorporate these measures into their operating permits at the time the permits are first issued or are renewed. With the exception of Texas, all state and local permitting authorities are planning to implement the rule's requirements.[10]

Due to the relatively high emissions threshold for affected sources (≥75,000 tons CO_2e), the Tailoring Rule does not greatly expand the universe of affected sources already subject to Clean Air Act permitting requirements. Title V operating permits do not impose pollution control requirements, and are essentially a record-keeping tool for compiling all Clean Air Act requirements in one location for enforcement and public information purposes. As such, it is more a record keeping requirement than a control requirement. In the case of power plants, it will apply to sources that already are required to have operating permits, hence does not represent a major change in circumstances.

For pre-construction permits, the Tailoring Rule has greater implications after January 2, 2011. Affected sources will have to perform an analysis of best available control technologies for greenhouse gases. In late 2010, the USEPA issued guidance on what it considers an appropriate approach in analyzing greenhouse gas control technologies.[11] The approach is the same "top down" analysis that fossil fuel power plants and air agency permitting authorities are already familiar with in doing control technology determinations of other previously covered air pollutants under the Clean Air Act, such as sulfur dioxide and nitrogen oxides. Under this approach, technical feasibility and cost can be considered in determining a "best available" control option for a source. The USEPA also indicates that the best available options, at least in the early years, will likely be tied to efficiency measures that sources would consider in any event, rather than still emerging options, like carbon capture and sequestration, which the USEPA indicates could be discarded on technical feasibility or cost considerations during the review process.

In light of the USEPA guidance, it appears that the Tailoring Rule does not incorporate significant new requirements for greenhouse gases, at least in the early years, beyond

[10] National Association of Clean Air Agencies (NACAA), "GHG Permitting Programs Ready to Go by January 2nd," October 28, 2010. Available at http://www.4cleanair.org/Documents/NACAAGHGSIPCalllletterssummaryfinal.pdf (accessed January 24, 2011).

[11] "PSD and Title V Permitting Guidance for Greenhouse Gases," 75 Fed. Reg. 70254 (November 17, 2010).

what the affected sources would likely already consider with regards to efficiency improvements. For example, even prior to the USEPA guidance, a proposed new 612 MW natural gas combined cycle power plant in California voluntarily requested, and was granted, enforceable greenhouse gas emission limits that incorporated energy efficiency measures, such as heat recovery, in its pre-construction permit.[12]

The Tailoring Rule is currently being challenged in the U.S. Court of Appeals for the D.C. Circuit. The USEPA argues that the Tailoring Rule is required under the statutory language of the Clean Air Act, and the agency is compelled to act as a result of the U.S. Supreme Court decision in *Massachusetts v. EPA*, 549 U.S. 497 (2007), which held that greenhouse gases are air pollutants as defined under the Clean Air Act.[13]

4. Greenhouse Gas New Source Performance Standards

Overview: For new or modified industrial sources, the USEPA is required to set new source performance standards (NSPS) that reflect the best achievable pollution limitation based on costs, any non-air quality health and environmental impacts, and energy requirements. When new source performance standards are issued for new or modified sources within a source category, the Clean Air Act requires that the USEPA establish guidelines for state standards of performance to control emissions from existing sources in the same category. The guidelines are to provide targets based on demonstrated controls, emission reductions, costs, and expected timeframes for installation and compliance. These guidelines for existing sources can be less stringent than new source requirements. States have discretion to require less stringent requirements if they can demonstrate the USEPA guidelines are unreasonably cost-prohibitive, physically impossible, or that there are other factors that prevent reasonably meeting the guidelines.

Status: As a result of legal petitions filed by a number of states and environmental groups challenging the USEPA's failure to establish greenhouse gas new source performance standards for fossil fuel power plants, the agency entered into a settlement agreement in December 2010 establishing a schedule for rulemaking, which was later modified in June 2011.[14] After several postponements, the USEPA announced a proposed standard on March 27, 2012.[15] The proposed standard would only apply to new

[12] Bay Area Air Quality Management District, "Prevention of Significant Deterioration Permit Issued Pursuant to the Requirements of 40 CFR § 52.21," Russell Center Energy Center, Hayward, CA, PSD Permit Application No. 15487 (February 3, 2010).

[13] The USEPA had originally declined to regulate greenhouse gas emissions under the Clean Air Act, but its decision was successfully challenged in *Massachusetts v. EPA*. As a result, the USEPA reversed its earlier denial, and issued a rule setting greenhouse gas emission limits for new motor vehicles under Clean Air Act section 202(a). The motor vehicle regulation in turn triggered the Clean Air Act stationary source permitting program that requires assessments of best available control technologies for pollutants "subject to regulation" under the Act (in this case, greenhouse gases from motor vehicles). The greenhouse gas measures resulting from the control technology assessment must then be incorporated into the facility's Clean Air Act Title V operating permit.

[14] "Proposed Settlement Agreement, Clean Air Act Citizen Suit," 75 Fed. Reg. 82392 (December 30, 2010) (modified June 13, 2011).

[15] U.S. EPA, *Regulatory Actions: Proposed Carbon Pollution Standard for Future Power Plants*, U.S. EPA, available at http://www.epa.gov/carbonpollutionstandard/actions.html (accessed April 2, 2012).

generating units. The USEPA did not propose standards for existing fossil fuel power plants, nor did it indicate a timeline for proposing these in the future.

The proposed output-based standard for new units is 1,000 pounds of carbon dioxide per megawatt-hour (MWh), which the USEPA believes can be met by new natural gas combined cycle units without add-on controls. It applies to new fossil fuel power plants larger than 25 MW, but excludes new fossil fuel power plants that have permits and start construction within 12 months of the USEPA's proposal. The rule would also not apply to existing power plants that undergo modifications needed to meet other air pollution standards. The proposed rule includes a 30 year compliance period such that a new coal unit could be built without add-on controls initially. The unit could later add CO_2 reduction technology, such as carbon capture and storage, so that it would meet the standard when its emissions are averaged over a 30 year period.

5. National Ambient Air Quality Standards

Overview: Under the Clean Air Act, the USEPA is required to review and revise, if needed, national ambient air quality standards (NAAQS) at least every five years. There are two types of national standards – a "primary" standard whose level is set with an adequate margin of safety to protect public health, and a "secondary" standard whose level is set to protect public welfare values.[16] New and existing national ambient air quality standards in and of themselves do not directly impose pollution control requirements on the electric power sector. State planning authorities develop control measures that can include power plant control requirements as part of their state implementation plans (SIPs) required under the Clean Air Act to meet or maintain compliance with a national ambient air quality standard. In addition, the USEPA can and has issued "SIP calls" requiring upwind states to revise their state implementation plans in order to reduce emissions of particular pollutants from in-state sources that the USEPA finds are significantly contributing to downwind nonattainment or interfering with maintenance of a national ambient air quality standard in another state. While the USEPA cannot directly require control requirements on specific sources in a SIP call, it can and has proposed model rules encompassing reductions from power plants that, if adopted by a state, would be deemed as complying with Clean Air Act requirements. In the absence of a state addressing its downwind contribution in a timely manner, the USEPA can issue a federal implementation plan (FIP) that would require specific measures on sources within a state. SIP calls have been EPA's approach for ozone and fine particulate matter ($PM_{2.5}$ – fine particulate matter having a diameter of 2.5 microns or less), and states subject to the calls have generally followed the USEPA's proposed model rule approach to target power plants.

Status: The USEPA is under court order to reconsider its recently revised fine particulate matter annual primary and secondary national ambient air quality standards. The schedule for proposing revised particulate standards is uncertain at this time. The USEPA also was reconsidering the recently revised ozone primary and secondary national ambient air quality standards in light of similar legal challenges as with the fine

[16] The CAA § 302(h) definition of "effects on welfare" includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate.

particulate matter standards. The administration, however, abandoned the process in September 2011, and the USEPA will not revise the ozone standards prior to 2013.

The USEPA also recently revised the nitrogen dioxide (NO_2) primary national ambient air quality standard. The revised nitrogen dioxide standard may have implications for power plants because it is a component of a fossil fuel power plant's emissions of nitrogen oxides (nitrogen oxides collectively include nitric oxide and nitrogen dioxide).

As part of a court-ordered consent decree, the USEPA issued secondary national ambient air quality standards for nitrogen oxides and sulfur oxides (NOx/SOx) to protect sensitive aquatic ecosystems from continuing acidic deposition. The USEPA announced a final rule on March 20, 2012 in which it retained the currently existing secondary NOx/SOx standards without change, and established a new set of secondary standards that are identical to the currently existing health-based hourly standards for sulfur dioxide and nitrogen dioxide.[17] Therefore, the new secondary standards have little practical effect on sources already subject to the pre-existing standards.

B. Other Rules

1. Coal Combustion Residuals Rule

Overview: The Coal Combustion Residuals (CCR) Rule would establish for the first time requirements under the Resource Conservation and Recovery Act (RCRA) for the proper disposal of coal ash generated by coal combustion at electric power plants. The USEPA has proposed two options for coal ash disposal:[18] 1) regulating coal ash as a "special waste" under RCRA subtitle C, or 2) regulating coal ash as non-hazardous waste under RCRA subtitle D. If coal ash were regulated as a special waste, existing surface ash impoundments would be phased-out. If regulated as non-hazardous waste, existing impoundment ponds would need to install liners.

Status: The USEPA proposed its options for regulating coal ash on June 21, 2010, but has not set a date for a final rule, stating it would need to fully evaluate all of the information and comments it receives on the proposed rule before finalizing. The USEPA indicated that neither proposed option would alter the current regulatory status of coal ash that is beneficially used (e.g., in concrete and wallboard), nor was it seeking to alter the regulatory status of coal ash beneficial uses at the present time.

2. Thermal Power Plant Cooling Water Intake Structures Rule

Overview: The purpose of the thermal power plant cooling water intake structures rule under section 316(b) of the Clean Water Act (CWA) is to reduce environmental harm from existing power plant cooling systems. The types of harms identified by the USEPA are trapping ("impingement") of large fish and other aquatic life against screens at

[17] U.S. EPA, *Nitrogen Dioxide (NO_2) and Sulfur Dioxide (SO_2) Secondary Standards*, U.S. EPA Technology Transfer Network National Ambient Air Quality Standards (NAAQS), available at http://www.epa.gov/ttnnaaqs/standards/no2so2sec/index.html (accessed April 2, 2012).

[18] "Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals from Electric Utilities; Proposed Rule," 75 Fed. Reg. 35128 (June 21, 2010).

cooling water intakes and "entrainment" of smaller aquatic life (e.g., eggs and larvae) in water sucked into the intakes, leading to death. In addition, for "once-through" cooling systems where water passes through a power plant heat exchanger only once before discharging back to a water body, thermal heating of natural water bodies may also cause environmental harm.

Prior to proposing the cooling water structures intake rule, the USEPA indicated that it did not favor a "one size fits all approach" that would require the same type of cooling system (e.g., "closed-cycle") on every power plant.[19] When it proposed its rule, the USEPA indicated a preferred option ("Option 1") that reflects this. In its preferred option, the USEPA would apply the rule in three ways depending on the facility (in addition to power plants, the proposed rule would also cover some types of manufacturers, such as aluminum, iron, steel, petroleum, paper, chemicals, and food processing). The first part would set uniform impingement controls (e.g., fish screens) at existing power plants and manufacturing facilities getting at least 25% of their cooling water from a nearby water body, and having a design intake flow greater than 2 million gallons per day. The second part would require existing facilities that withdraw at least 125 million gallons per day to conduct studies to assist their permitting authority in determining what, if any, site-specific entrainment controls should be required. The third part would require new electric generating units installed at existing facilities to add "closed-cycle" cooling systems or equivalent technology. Affected facilities would have up to eight years to comply after the effective rule date.[20]

The USEPA estimates that the proposed rule would apply to about 1,260 facilities, of which about 670 are power plants. Of the roughly 1,260 covered facilities, the USEPA estimates about 740 of these are already compliant with the technology requirements of its preferred option in the rule proposal.[21]

Status: The USEPA proposed the cooling water intake structures rule on March 28, 2011, with the final rule due by July 2012. Leading up to its latest rule proposal, the USEPA had been under court order since 1995 to develop a cooling water rule, and under another court order since 2007 to reconsider parts of the original rule it promulgated in 2004.

C. Ranking of Potential Rule Impacts and Regulatory Timelines

An analysis by the North American Reliability Corporation (NERC) looked at four potential USEPA rules and, under the assumptions of the study, predicted that the rules having the greatest projected impacts on power plant retirements and electric system reliability are, in order of projected greatest to least impact, 1) CWA section 316(b) cooling water rule, 2) Mercury and Air Toxics Standards, 3) Cross-State Air Pollution

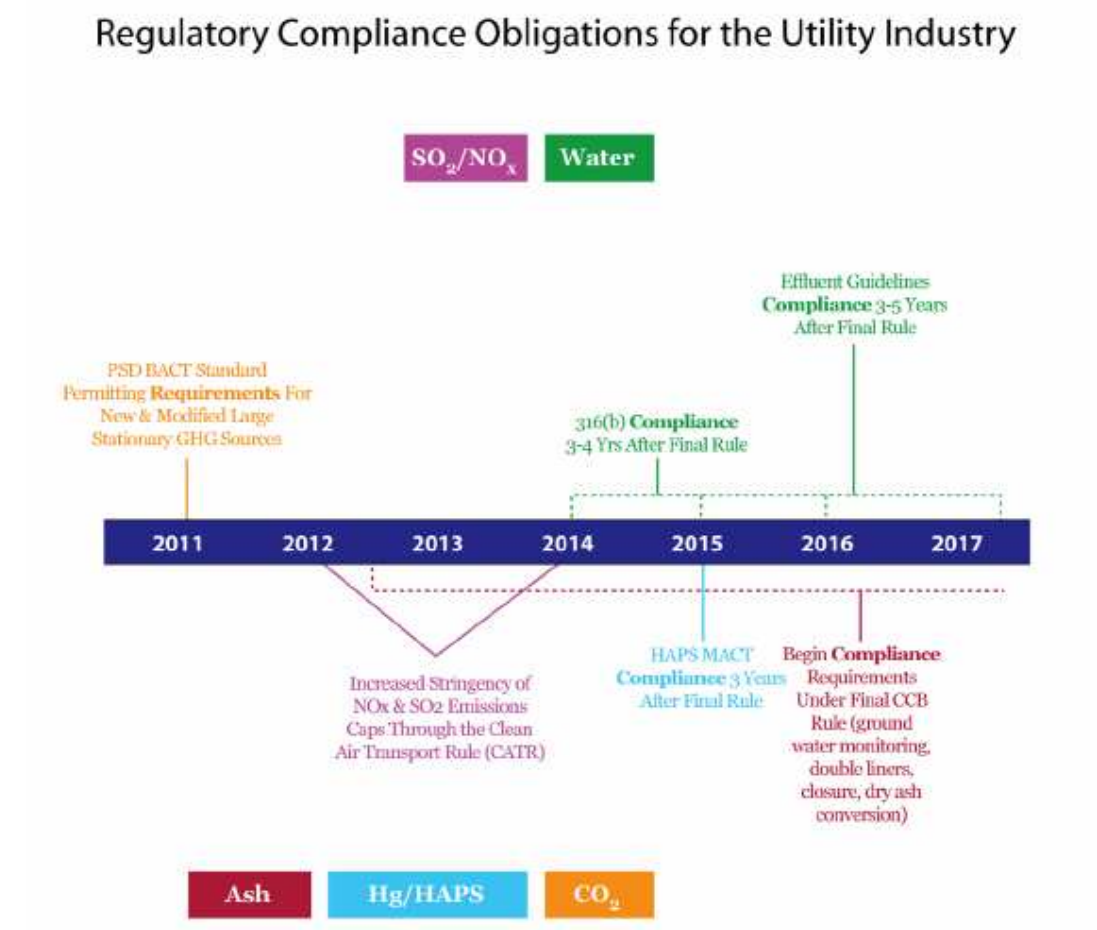
[19] U.S. EPA, Letter to Rep. Fred Upton, U.S. House of Representatives, from USEPA Administrator Lisa Jackson (December 16, 2010).

[20] "National Pollutant Discharge Elimination System—Cooling Water Intake Structures at Existing Facilities and Phase I Facilities," 76 Fed. Reg. 22174 (April 20, 2011).

[21] U.S. EPA, *Clean Water Act Section 316(b) Existing Facilities Proposed Rule Qs and As*, March 28, 2011. Available at http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/index.cfm (accessed March 29, 2011).

Rule, and 4) Coal Combustion Residuals rule.[22] Figure 1 displays the current timing for these and other pending rules.

Figure 1: Timeline of regulatory compliance and control requirements affecting fossil fuel power plants.[23]



[22] North American Electric Reliability Corporation (NERC), "2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations," NERC, Princeton, NJ (October 2010) (*hereinafter* "NERC Report"). Available at http://www.nerc.com/files/EPA_Scenario_Final_v2.pdf (accessed January 24, 2011).

[23] Larsen, J., "Response to EEI's Timeline of Environmental Regulations for the Utility Industry," World Resources Institute (December 3, 2010). Available at http://www.wri.org/stories/2010/12/response-eeis-timeline-environmental-regulations-utility-industry (accessed January 24, 2011).

For clarity, the timeline of Figure 1 does not include actions or milestones that 1) do not establish requirements on power plants, e.g., court remands or vacaturs of rules deemed illegal, 2) are rules already in place, thus not new requirements, 3) are procedural steps only, such as public notice and comment requirements, or 4) establish a national ambient air quality standard, which affect state air quality planning but are not direct control requirements on pollution sources. The Edison Electric Institute has developed a timeline incorporating these additional items, which can be found at: Edison Electric Institute (EEI), "Environmental Regulatory Timeline for Coal Units," EEI (2010). Available at http://www.eei.org/meetings/Meeting%20Documents/EPA-CAAUtilityRegTimelineTrainWreckChart.ppt (accessed January 24, 2011).

III. Summaries of USEPA Analyses on Rule Benefits and Costs

For the USEPA's proposed and final rules and standards, the agency has estimated the rules' benefits and costs as part of required regulatory impact analyses, and these are summarized in this section.

A. Cross-State Air Pollution Rule

The USEPA has estimated the benefits and costs of its final Cross-State Air Pollution Rule, and presented its estimates in the Regulatory Impact Analysis that is part of the rulemaking docket.[24] The USEPA estimates that the combined health and welfare benefits of the rule are much larger than the rule's estimated costs (Table 3).

Table 3: Estimated benefits and costs of the USEPA Cross-State Air Pollution Rule.

Category	Monetized benefits or costs (2007$)
Estimated public health benefits	$110 - $280 billion in 2014
Estimated public welfare benefits	$4.1 billion in 2014
Estimated costs for electricity-generating industry	$1.4 billion in 2012; $0.8 billion in 2014

Public health benefits include avoiding approximately 13,000 – 34,000 premature deaths, 15,000 nonfatal heart attacks, 8,700 hospital admissions, and 400,000 cases of aggravated asthma.

The USEPA limited its public welfare benefits analysis to visibility improvements in U.S. national parks. The USEPA identifies additional welfare benefits, but does not monetize these (e.g., reduced nitrogen and acidic deposition, reduced mercury deposition, increased agricultural crop and commercial forest yields).

Costs are largely incurred by the power plant sector, with the USEPA allowing limited interstate trading to provide some flexibility for covered sources. The USEPA projected retail electricity prices to increase nationally by an average of 1.3% in 2012 and 0.8% in 2014.

B. Mercury and Air Toxics Standards

In the regulatory impact analysis for the final Mercury and Air Toxics Standards, the USEPA estimated benefits and costs associated with reductions in mercury and particulate matter (used as the surrogate for non-mercury toxic metals).[25] Co-benefits from avoided premature mortality due to reductions in particulate matter accounted for over 90% of the monetized benefits. The USEPA did not quantify benefits for a number of health and welfare end points, such as those associated with reductions in non-mercury

[24] U.S. EPA, *Regulatory Impact Analysis for the Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone in 27 States; Correction of SIP Approvals for 22 States*, Docket ID No. EPA-HQ-OAR-2009-0491, U.S. EPA Office of Air and Radiation, June 2011. Available at http://www.epa.gov/airtransport/pdfs/FinalRIA.pdf (accessed July 12, 2011).

[25] U.S. EPA, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards*, U.S. EPA, EPA-452/R-11-011, December 2011. Available at http://www.epa.gov/ttn/ecas/regdata/RIAs/matsriafinal.pdf (accessed December 22, 2011).

hazardous air pollutants. As a result, the monetized benefits are a lower bound of the potential benefits resulting from reductions of the full suite of air toxics under the final rule. The USEPA also made an effort to separate the particulate matter reductions due to the implementation of the Cross-State Air Pollution Rule (originally proposed as the "Transport Rule") from the additional particulate matter reductions expected from the air toxics rule to avoid double counting of benefits. Table 4 presents the summarized benefits and costs given in the USEPA's regulatory impact analysis of the final Mercury and Air Toxics Standards.

Table 4. Estimated benefits and costs of USEPA Mercury and Air Toxics Standards.

Category	Monetized benefits or costs in 2016 (2007$)	
	3% Discount Rate	*7% Discount Rate*
Social benefits*	$37-$90 billion	$33-$81 billion
Social costs	$9.6 billion	$9.6 billion
Net benefits (benefits – costs)	$27-$80 billion	$24-$71 billion

* The USEPA indicates unquantified benefits also exist for non-mercury hazardous air pollutants not included in the regulatory impact analysis.

C. Greenhouse Gas Tailoring Rule

The USEPA's regulatory impact analysis attributed over $77 billion (2007$) in annual benefits from the initial phase of the Tailoring Rule as a result of regulatory relief in removing the need for small greenhouse gas sources to obtain permits, and reducing the number of permit applications to be processed by permitting authorities. The USEPA did not attribute any direct costs from the Tailoring Rule to the large greenhouse gas emission sources that would be subject to it on the basis that the permit requirements were already mandated by the Clean Air Act and existing rules, and were not the result of the USEPA's rulemaking.[26]

D. Greenhouse Gas New Source Performance Standards

The USEPA believes that current and projected market conditions in the U.S. are already leading electricity generators to install technologies that meet the proposed standard (natural gas combined cycle) or are not subject to it (e.g., renewables). In light of these conditions, the USEPA projects that the greenhouse gas new performance standard for fossil fuel electric generating units will result in negligible carbon dioxide emission changes, energy impacts, quantified benefits, costs, and economic impacts by 2020. As a result, the agency concludes that the rule will not have impacts on the price of electricity, employment or labor markets, or the U.S. economy.[27]

[26] U.S. EPA, *Regulatory Impact Analysis for the Final Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule*, EPA 452/R-10-003, U.S. EPA Office of Air Quality Planning and Standards, May 2010. Available at http://www.epa.gov/ttn/ecas/ria.html (accessed January 24, 2011).

[27] U.S. EPA, *Regulatory Impact Analysis for the Proposed Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units*, EPA-452/R-12-001, March 2012. Available at http://www.epa.gov/carbonpollutionstandard/actions.html (accessed April 2, 2012).

E. National Ambient Air Quality Standards

The Clean Air Act does not allow the USEPA to consider costs in setting the level of a revised ambient air quality standard, but the agency is required under Executive Order 12866 to develop a regulatory impact analysis (RIA) summarizing estimated benefits and costs from changing a standard. While the USEPA provides estimates of costs in achieving a national ambient air quality standard, the extent of pollution reductions required and sources affected are ultimately determined by individual state and local air quality planning authorities, and not directly by the USEPA. Therefore, cost estimates represent hypothetical strategies to achieve a standard, but the specific strategies eventually implemented will vary according to state or local planning decisions. Table 5 shows benefit and cost estimates from the USEPA's 2010 supplementary RIA[28] for its ozone air quality standard reconsideration (which was subsequently abandoned by the White House in September 2011) and the agency's RIA for the 2006 fine particulate air quality standard revision.[29]

Table 5: USEPA benefit and cost estimates of revised ozone and $PM_{2.5}$ air quality standards.

NAAQS levels	Estimated Benefits (annual in 2020)	Estimated Costs (annual in 2020)
If ozone NAAQS = 0.070 ppm	$13-$17 billion	$19-25 billion
If ozone NAAQS = 0.060 ppm	$35-$100 billion	$52-$90 billion
2006 $PM_{2.5}$* NAAQS	$9-$76 billion	$5.4 billion

*2006 $PM_{2.5}$ national ambient air quality standards = 15 $\mu g/m^3$ annual; 35 $\mu g/m^3$ 24-hour

F. Thermal Power Plant Cooling Water Intake Structures Rule (proposed)

In its March 28 proposal, the USEPA estimated benefits and costs for four potential cooling water rule options. The USEPA's preferred Option 1 was previously described above. Options 2 and 3 would require closed-cycle or equivalent technologies on more facilities than Option 1, with Option 3 extending the requirements to lower intake flow facilities than Option 2. Option 4 would set a higher intake flow rate threshold than Option 1 in establishing uniform impingement requirements at existing facilities, with smaller intake flow facilities subject to site-specific determinations.

The USEPA's analysis of benefits considered reductions in deaths of fish and other aquatic life under each option that in turn will increase "use benefits," such as recreational and commercial fishing, as well as "nonuse" benefits, such as improved ecosystem function and greater protection of endangered species. The USEPA believes its estimated monetized benefits do not completely account for the full benefits of the proposed options, thus are likely a low (conservative) estimate of benefits. Table 6 shows the USEPA's cost and benefit estimates for the four options in the proposed cooling water rule.

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[28] U.S. EPA, *Summary of the Updated Regulatory Impact Analysis (RIA) for the Reconsideration of the 2008 Ozone National Ambient Air Quality Standard (NAAQS)*, U.S. EPA, January 2010. Available at http://www.epa.gov/ttn/ecas/regdata/RIAs/s1-supplemental_analysis_full.pdf (accessed January 24, 2011).

[29] U.S. EPA, *Regulatory Impact Analysis for the Review of the Particulate Matter National Ambient Air Quality Standards*, Docket ID No. EPA–HQ–OAR–2006–0834, U.S. EPA Office of Air and Radiation October 6, 2006. Available at http://www.epa.gov/ttn/ecas/ria.html (accessed January 24, 2011).

Table 6: USEPA annualized cost and benefit estimates (in millions, 2009$) for cooling water rule options.

	Option 1[a]	Option 2	Option 3	Option 4
3% Discount Rate				
Electric generators direct compliance cost	$318.77	$4,319.59	$4,457.79	$289.77
Total Social Cost[b]	$383.80	$4,462.90	$4,631.62	$326.55
Monetized Benefits	*$17.63*	*$120.79*	*$125.65*	*$17.33*
7% Discount Rate				
Electric generators direct compliance cost	$385.68	$4,564.02	$4,703.65	$340.80
Total Social Cost[b]	$458.81	$4,699.35	$4,862.05	$383.10
Monetized Benefits	*$16.04*	*$92.20*	*$95.71*	*$15.76*

[a] Option 1 is USEPA's preferred option.
[b] Total Social Cost includes manufacturers direct compliance cost and state and federal administrative cost (not shown in table).

G. Coal Combustion Residuals Rule (proposed)

The USEPA developed three cost and benefit scenarios for the proposed Coal Combustion Residuals rule that assumed it would 1) induce an increase in beneficial uses of coal ash, 2) induce a decrease in beneficial uses of coal ash, and 3) have no impact on beneficial uses of coal ash. "Beneficial uses" in this context refer to the use of coal ash in cement production and other construction applications. Table 7 displays the USEPA's cost and benefit estimates for the three scenarios.[30]

Table 7: USEPA proposed CCR rule annualized cost and benefit estimates ($million) under three scenarios for coal ash beneficial uses.

USEPA scenario		**Subtitle C Special Waste**	**Subtitle D Non-hazardous Waste**
1. Induced increase in beneficial uses of coal ash	Cost	$1,474	$587
	Benefit	$6,320 to $7,405	$2,533 to $3,026
2. Induced decrease in beneficial uses of coal ash	Cost	$1,474	$587
	Benefit	($16,725) to ($15,640)*	$85 to $577
3. No impact on beneficial uses of coal ash	Cost	$1,474	$587
	Benefit	$198 to $1,283	$85 to $577

*Parentheses indicate negative value.

As seen in Table 7, assumed changes in beneficial uses of coal ash result in large differences in the estimated net benefits of the rule.

[30] U.S. EPA, *Regulatory Impact Analysis for EPA's Proposed RCRA Regulation Of Coal Combustion Residues (CCR) Generated by the Electric Utility Industry*, U.S. EPA Office of Resource Conservation & Recovery (ORCR), April 30, 2010.

IV. Compilation of Recent Capacity Retirement/Electric System Reliability Studies and Available Planning Options

A. Compilation of Capacity Retirement/Electric System Reliability Studies

A summary comparison of recent studies examining potential capacity reductions and reliability impacts from USEPA rules affecting the electric power industry suggest a range of 25 – 76 GW in possible capacity reductions by 2020 (Table 8).

In general, the studies find that the two rules having the greatest potential impact on capacity retirement decisions are the CWA section 316(b) cooling water rule (in studies that include this rule) and the Mercury and Air Toxics Standards. The coal ash rule (CCR) and Cross-State Air Pollution Rule (originally proposed as the "Transport Rule") are generally predicted to have lesser impacts as individual rules, but have some additive effect to the other pending rules, and may have relatively greater impacts in some local situations.

It is important to recognize that at the time the retirement/reliability studies were done, neither the section 316(b) cooling water rule nor the Mercury and Air Toxics Standards had yet been proposed, so their full scope was unknown. The studies generally assumed the most stringent possible rules would be adopted as a "worst case" sensitivity scenario to test possible electric system reliability impacts under the strictest conditions. For the section 316(b) cooling water rule, this assumed construction of closed-cycle cooling water towers at every U.S. thermal power plant. For the Mercury and Air Toxics Standards, the studies typically assumed installation of scrubbers, selective catalytic reduction, and activated carbon injection at all U.S. coal plants where any of these control technologies are not already installed.

While the studies have provided useful information as sensitivity tests for potential electric system reliability impacts, the assumed stringencies and timing of the future USEPA rules are not likely to occur in actual practice.[31] In its proposed section 316(b) cooling water rule, the USEPA's preferred option would not uniformly require closed-cycle or equivalent technology for existing thermal plants, and instead make such requirements subject to site-specific determinations. In regard to the Mercury and Air Toxics Standards, the Institute of Clean Air Companies, a national association of air pollution control system providers, has indicated that there is a range of control technology options available to reduce emissions of hazardous air pollutants. These options provide flexibility in installation timing and cost for meeting the rule's requirements.[32]

[31] Congressional Research Service (CRS), "EPA's Regulation of Coal-Fired Power: Is a 'Train Wreck' Coming?," CRS Report for Congress (August 8, 2011).

[32] Institute of Clean Air Companies (ICAC), Letter to Sen. Thomas Carper, U.S. Senate, from ICAC Executive Director David C. Foerter (November 3, 2010). Available at http://www.icac.com/files/public/ICAC_Carper_Response_110310.pdf (accessed February 3, 2011).

Table 8: Comparison of studies projecting amount of coal capacity at risk for retirement in response to future USEPA regulations.[33]

Study	Projected coal capacity to retire or at risk	Criteria to identify coal capacity at risk	Rules considered (proposed or potential)
The Brattle Group, Dec. 2010	50 – 65 GW by 2020	Regulated units: 15-year present value of cost > replacement power cost from a gas combined cycle or combustion turbine; Merchant units: 15-year present value of cost > revenues from energy and capacity markets	Transport Rule (final rule is the Cross-State Air Pollution Rule) Mercury and Air Toxics Standards 316(b) Cooling Water Coal Ash
Charles River Assoc., Dec. 2010	39 GW by 2015	In-house model (NEEM) optimizing costs of existing capacity and costs of potential new capacity	Transport Rule (final rule is the Cross-State Air Pollution Rule) Mercury and Air Toxics Standards
NERC, Oct. 2010[34]	46 – 76 GW by 2018 (total fossil fuel capacity, including oil and gas)	Levelized costs (@ 2008 CF) after retrofitting each unit for the environmental regulations compared to the cost of a new gas-fired unit	Transport Rule (final rule is the Cross-State Air Pollution Rule) Mercury and Air Toxics Standards 316(b) Cooling Water Coal Ash
ICF, Oct. 2010	75 GW by 2018	Unknown	Unknown
Credit Suisse, Sept. 2010	60 GW	Size and existing controls	Transport Rule (final rule is the Cross-State Air Pollution Rule) Mercury and Air Toxics Standards
ICF/INGAAA, May 2010	50 GW	Age, efficiency, and existing controls	Unknown
ICF/IEE, May 2010	25 – 60 GW by 2015	Cost of retrofitting coal plant compared to cost of new gas combined cycle	Unknown

Even under the "worst case" sensitivity scenarios assuming the most stringent possible final rules, the amount of potential capacity retirements is less than new capacity additions that have occurred over similar time periods in the recent past. For example, a 177 GW net increase in U.S. generating capacity occurred over the five year period between 1999 and 2004,[35] with the three-year period over 2001-2003 seeing over 160 GW newly built (Figure 2).[36] This is over twice as large as the high end of the

[33] Table based in part on: The Brattle Group, "Potential Coal Plant Retirements under Emerging Environmental Regulations," The Brattle Group, Cambridge, MA (December 8, 2010) p. 11. Available at http://www.brattle.com/_documents/uploadlibrary/upload898.pdf (accessed January 24, 2011).

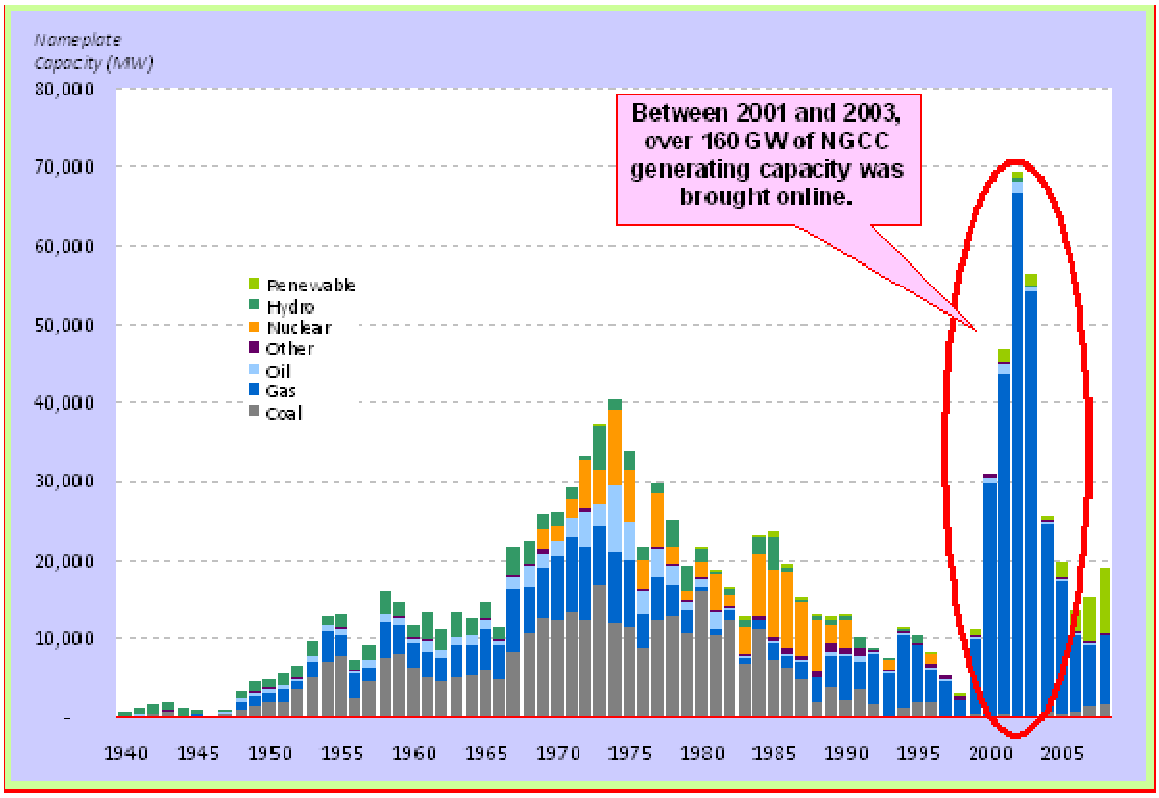
[34] NERC released a revised assessment in November 2011 with a projected capacity reduction due to retirements or deratings in the 36 – 59 GW range as a result of the combined USEPA rulemaking impacts. NERC, "2011 Long-Term Reliability Assessment," Princeton, NJ (November 2011).

[35] Charles River Associates, "A Reliability Assessment of EPA's Proposed Transport Rule and Forthcoming Utility MACT," Charles River Associates, Washington, DC (December, 16, 2010) p. 5. Available at http://crai.com/uploadedFiles/Publications/CRA-Reliability-Assessment-of-EPA's-Proposed-Transport-Rule.pdf (accessed January 24, 2011).

[36] M.J. Bradley & Associates and Analysis Group, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability," M.J. Bradley & Associates, Concord, MA, and Analysis Group, Boston, MA (August 2010). Available at http://www.mjbradley.com/documents/MJBAandAnalysisGroupReliabilityReportAugust2010.pdf (accessed January 24, 2011).

capacity retirements projected under the most stringent rule scenario in the above tabulated studies (76 GW in the NERC study).

Figure 2: U.S. power plant capacity added by in-year service.[37]



In addition to the electric generation sector's historical ability to add significant amounts of new capacity, over 100 GW nationwide of excess capacity currently exist, with each NERC reliability region above minimum peak demand reserve margins (Figure 3 and Table 9). The current situation is due in part to new power plant additions in most regions, reduced demand during the economic downturn, and increasing rigor of load management programs. An analysis of industry data by the Congressional Research Service in the context of the final Mercury and Air Toxics Standards found that regional reserve margins were substantial in those areas most likely to experience power plant retirements or deratings from the rule.[38]

[37] From S. Tierney, Analysis Group, "Upcoming Power Sector Environmental Regulations: Framing the Issues about Potential Reliability/Cost Impacts," presented at Workshop on Power Sector Environmental Regulations, Bipartisan Policy Center, Washington, DC (October 22, 2010) (citing: Ceres, *et al.*, Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States, June 2010). Available at http://www.bipartisanpolicy.org/sites/default/files/Sue%20Tierney.ppt (accessed January 27, 2011).

[38] Congressional Research Service (CRS), "EPA's Utility MACT: Will the Lights Go Out?," CRS Report for Congress (January 9, 2012).

Figure 3: Map of NERC electric reliability regions (continental U.S. only).

Table 9: Estimated reserve margins in all NERC electric reliability regions.[39]

NERC Electric Reliability Region	Projected Reserve Margin[a] in 2013	Cushion Above NERC Target Reserve Margin[b] in 2013
TRE	23.9%	7.8 GW
FRCC	28.6%	6.1 GW
MRO	22.1%	3.2 GW
NPCC	24.4%	5.9 GW
RFC	24.3%	17.1 GW
SERC	26.3%	23.9 GW
SPP	30.3%	7.7 GW
WECC	42.6%	35.6 GW
Total		**107. 3 GW**

[a] Includes capacity defined by NERC as Adjusted Potential Reserve Margin, which is the sum of deliverable capacity resources, existing resources, confidence factor adjusted future resources and conceptual resources, and net provisional transactions minus all derates and net internal demand expressed as a percent of net internal demand. Source: NERC, *2009 Long-Term Reliability Assessment: 2009-2018*, October 2009, p. 396 (Summer Demand).

[b] Capacity in excess of what is required to maintain NERC Reference Margin or the regional target reserve levels.

In summary, recent studies suggest a range of 25 – 76 GW in possible electric generation capacity retirements by 2020 as a result of pending USEPA air, water, and waste rules. Greater rule stringency regarding compliance time and degree of required technology coincides with higher amounts of projected capacity retirements. There are indications, however, that there will be flexibility in rule breadth and timing as well as a number of

[39] *From* M.J. Bradley & Associates and Analysis Group, Table 2, p. 9.

technology options to achieve compliance. Historically, the electric power sector has been able to build new generation capacity over the span of a relatively few years well in excess of the upper end of projected generation capacity reductions. For example, between 2001 and 2003, over 160 GW of new generation capacity was built in the U.S. In addition, current peak electricity demand reserve margins in most areas of the U.S. are well above target reserve margins set by the North American Electric Reliability Corporation. This excess generation capacity can act as a further cushion in many areas.

B. Available Planning Options

The NERC analysis, while projecting the highest potential capacity retirements among the studies to date, also identifies a number of options available to the electricity sector that provide further flexibility in addressing potential reliability issues (Table 10).[40]

Table 10: Electricity sector options available to address environmental goals and electric system reliability.

Generation	Advance in-service dates of generation resources and accelerate new generation construction when possible
	Add smaller generation units at point of need and expand distributed generation to maintain local reliability
	Expand use of natural gas generation from existing units during off-peak hours
	Repower some coal-fired generation with combined-cycle gas turbines
Planning	Use existing marketing tools, such a forward capacity markets and reserve sharing mechanisms, to assist in signaling resource needs
	Immediately plan and construct early pollution control retrofits to avoid future construction delays and manage retrofit timing on a unit basis to keep regional capacity supply stable
Demand-side	Increase energy efficiency measures to offset demand growth
	Implement greater demand response resources to increase flexibility during peak demand
Transmission	Increase transfers from regions with larger generation pools
	Add or upgrade transmission capacity to enhance transfer capabilities
Pollution controls	Develop or explore new pollution control technologies in lieu of installing scrubbers to meet clean air standards

In addition to the measures listed above that the electricity sector has to increase planning flexibility, there are also regulatory mechanisms available to address reliability concerns in specific areas where they may arise (Table 11). These allow regulatory authorities to postpone or suspend application of environmental rules, typically on a case-specific basis, in order to preserve local system reliability.

[40] NERC Report, p. 40. *See also,* ClimateWire, "Enviro regulations poised to close 20% of coal plants – study," January 12, 2011, *quoting* John Moura, a NERC technical analyst in reliability assessments and performance analysis, "Everyone has indicated there is an issue here [with coal retirement]. ... The next step is to say how can we get through this. We don't think there will be any real reliability issues with these regulations coming in because there are safeguards."

Table 11: Regulatory mechanisms available to address electric system reliability needs.

Clean Air Act	USEPA can grant time extensions for power plants to install air pollution controls on a case-by-case basis.
	U.S. Dept. of Energy can override Clean Air Act requirements under section 202(c) of the Federal Power Act in limited emergency circumstances.
	The President & USEPA have the authority to extend deadlines for the Mercury and Air Toxics Standards as necessary to preserve electric system reliability.
	USEPA can establish administrative consent orders with power plants that allow them to run under specific and limited circumstances to maintain reliability while avoiding violations of national air quality standards.
Clean Water Act	USEPA has flexibility in the timing of implementing the section 316(b) cooling water rule as well as discretion in determining the type of cooling water technology required (including exemptions) based on plant location, physical layout, and technology costs.

There is a recent example of the use of two of these mechanisms involving the Potomac River Generating Station in the Washington, DC metropolitan area. After the power plant shut down in 2005 due to Clean Air Act requirements, the U.S. Department of Energy used its authority under section 202(c) of the Federal Power Act to order it to re-start for system reliability purposes.[41] The USEPA subsequently developed an administrative consent order with the power plant owner establishing the conditions under which the plant would operate while maintaining compliance with air quality standards.[42]

V. Summary

The USEPA is issuing or plans to issue a number of environmental rules concerning air, water, and waste that will affect the electric power sector with implications for electric system reliability. The rules reflect long standing requirements contained within national environmental laws that Congress adopted and charged the USEPA with the responsibility for implementing. In a number of cases, the USEPA is now under court order to promulgate rules that have been deferred for years, or were deemed legally deficient in their original form. These rules will impose costs upon the electric generation sector, but they also have public health and environmental benefits that in some cases far exceed their projected costs.

In light of legislative requirements and the court orders enforcing them, the issue is not whether the USEPA should act, but how to plan for the coming actions. To accomplish this in an efficient manner will require cooperation among the electric power sector, electric system operators, and energy and environmental regulators at the local, state, and federal levels.

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[41] U.S. Department of Energy (DOE), "DOE Orders Mirant Power Plant to Operate under Limited Circumstances," U.S. DOE Press Release (December 20, 2005). Available at http://www.energy.gov/2817.htm (accessed January 27, 2011).

[42] U.S. EPA, "EPA Issues Administrative Order to Mirant Potomac River - Order Sets Schedule for Mirant to Comply with Clean Air Standards," USEPA News Release (June 2, 2006). Available at http://yosemite.epa.gov/opa/admpress.nsf/93216b1c8fd122ca85257018004cb2dc/2e1916f8aef739048525718100417b12 (accessed January 27, 2011).

The power sector has a recent history of adding significant new generation capacity in a timely manner that exceeds the upper end of generation capacity reductions projected in several electric system scenario analyses. There also are existing excess capacity reserve margins in every reliability region of the U.S. that provide an additional cushion to mitigate potential generation capacity reductions.

While the full scope and application of some of the USEPA's forthcoming rules are not yet known, the agency has indicated its intent to provide compliance flexibility for power plants. When final rules are promulgated, a range of control technology options, where needed, should be available for compliance purposes. As the rules take effect, there are a number of options available to address supply and demand needs while shoring up system reliability, such as transmission upgrades, distributed generation sources, and energy efficiency programs. Where threats to electric system reliability legitimately arise, regulatory tools exist, and have previously been used, to mitigate potential problems on a location-specific basis.