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

August 2010

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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 170,000 megawatts of electric generating capacity (including 110,000 megawatts of fossil generating capacity) throughout the U.S., and serve nearly a fifth of all U.S. electric customers.

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Executive Summary

In the 20 years since the Clean Air Act ("CAA") Amendments of 1990, electric power companies throughout the United States have deployed a wide range of pollution-control technologies, new power plants with relatively low emissions, and demand-side measures to reduce air emissions from electricity production. The Environmental Protection Agency ("EPA") has found, however, that despite this significant progress in reducing emissions, in 2008 about 127 million Americans still lived in counties with unhealthy air—many of which are located along the Ohio River Valley, in the Middle Atlantic, and in the Southeast.[1,2]

To begin to address these issues, on August 2, 2010, EPA published its draft Clean Air Transport Rule (the "Transport Rule"), regulating emissions in 31 Eastern states and the District of Columbia where controlling emissions will produce the greatest public health benefit.[3] EPA plans to implement the Transport Rule on January 1, 2012. Additional rulemakings are also underway to regulate hazardous air pollutants ("HAPs"), with EPA under court order to promulgate its final "Utility MACT" rule by November 2011. According to EPA, compliance would be required by early 2015.[4]

These new rules regulating air emissions from fossil fuel-fired power plants will require certain uncontrolled plants to install pollution control equipment. Third-party analysts have concluded that some coal plant owners may choose to retire units in lieu of such installations. For example, two recent studies suggested that between now and 2015, the combination of low energy prices and EPA air regulations could result in the retirements of between 25 to 40 gigawatts ("GW")[5,6] of the nation's 1,030 GW of electric generating capacity.[7]

Although some of the nation's less efficient power plants may be retired, many existing coal plants will be retrofit with new pollution controls. Approximately half of the nation's coal-fired generating capacity (150 GW) has already installed SO_2 scrubbers, another 55 GW plan to install scrubbers, and a significant number of coal units have already announced plans to retire,[8] leaving approximately one-fourth of the nation's coal-fired generation to add pollution controls, switch to a cleaner fuel, or retire. Companies may also have the option to purchase allowances or adjust dispatch to comply with certain rules.

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[1] U.S. EPA, *Draft FY 2011-2015 EPA Strategic Plan*, at p. 7. Collectively, power plants are responsible for 66 percent of SO_2 emissions, 19 percent of NOx emissions, and 39 percent of CO_2 emissions in the U.S. Also, in 2002, the EPA cataloged emissions in the United States and concluded that fossil-fuel-fired power plants were responsible for the following percentages of nationwide emissions for the following HAPs (all figures are approximate): hydrochloric acid (60%); mercury compounds (45%); arsenic compounds (35%); and nickel compounds (25%). U.S. EPA, *2002 National Emissions Inventory Booklet.*

[2] According to the recent National Academy of Sciences, *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use* (2010), "after ranking all the [power] plants according to their damages, we found that the most damaging 10% of plants produced 43% of aggregate air-pollution damages from all plants, and the least damaging 50% of the plants produce less than 12% of aggregate damages" …(and) the most damaging 10%...account for approximately one quarter of electricity generated at the 406 plants." (at p. 88).

[3] Office of Air and Radiation, U.S. EPA, *Air Transport Rule Factsheet*, at p. 1.

[4] U.S. EPA, *Proposed Rule: Federal Implementation Plans To Reduce Interstate Transport of Fine Particulate Matter and Ozone.* August 2, 2010.

[5] PIRA Energy Group ("PIRA"), *EPA's upcoming MACT; Strict Non-Hg Can Have Far-Reaching Market Impacts*, April 8, 2010.

[6] ICF International, *EEI Preliminary Reference Case and Scenario Results.* May 21, 2010.

[7] Energy Information Administration ("EIA"), *Electric Power Monthly*, July 2010. (Based on preliminary 2009 capacity, capacity additions and retirements up through April 2010.)

[8] PIRA, *supra* n.5.

Some in the industry have raised concerns about the combined effects over the next five years of anticipated power plant retirements and outages required to install new pollution control equipment. Clearly, the nation must carefully consider how to maintain electric system reliability, while also improving our nation's health and environmental quality.

In this paper, we highlight the impact of EPA's upcoming air regulations, with a focus on the issue of possible power plant retirements on electric reliability. We conclude that, without threatening electric reliability, the industry is well-positioned to respond to EPA's proposed road map to "help millions of Americans breathe easier, live healthier,"[9] provided that EPA, the industry and other agencies take practical steps to plan for the implementation of these regulations and adopt appropriate regulatory approaches. In particular, we conclude the following:

1. **Even though some units likely will retire in lieu of complying with the new regulations, electric system reliability will not be compromised if the industry and its regulators proactively manage the transition to a cleaner, more efficient generation fleet.**

    - Power system reliability relates not only to generation capacity and availability, but also to consumption levels and patterns, and transmission capacity and use. As such, all these factors must be considered when assessing reliability impacts. Existing power system capacity well in excess of minimum reserve levels, relatively modest projections of load growth over the next several years, a large amount of proposed generating resources, and the availability of load management practices indicate the system can handle the level of projected retirements.

    - Each North American Electric Reliability Corporation ("NERC") reliability region has excess capacity, totaling over 100 GW of excess capacity nationwide. Therefore, considering only the projected level of coal unit attrition relative to existing capacity resources, it appears there will be no capacity shortages even if projected retirement scenarios prove accurate.

    - Further, economic conditions have reduced the demand for electricity in recent years providing an additional capacity cushion to assist in managing any power plant outages required to install pollution controls.

    - The industry has a proven track record of adding new generating capacity and transmission solutions when and where needed and of coordinating effectively to address reliability concerns. In the three years between 2001 and 2003, the electric industry built over 160 GW of new generation—about four times what analysts project will retire over the next five years.

    - Notably, many of the regions of the country with organized wholesale markets, including many parts of the Midwest, Mid-Atlantic, and Northeast, have developed effective tools such as capacity markets and reserve sharing mechanisms enabling electric generators to access other companies' available resources to assure regional reliability.

    - Additionally, the industry is deploying enhanced demand response actions, expanded energy efficiency programs, and new "smart grid" advances to manage consumption during the transition to cleaner, more efficient generation.

[9] U.S. EPA, *supra* n.1, at p. 2.

2. **Industry data counter concerns that it will cost the industry too much to comply with EPA's proposed air regulations, that pollution controls cannot be installed soon enough, or that the EPA regulations will lead to the closure of otherwise economically healthy power plants.**

    - The proven technologies for controlling air pollution emissions, such as NO_x, SO_2, mercury and acid gases, are commercially available and have already been, or soon will be, installed on the majority of the nation's coal plants (65 percent with scrubbers; 50 percent with advanced NO_x controls), demonstrating that the costs can be managed.

    - The industry has a demonstrated ability to schedule and sequence unit outages in an efficient and reliable manner and is capable of installing additional pollution control systems to comply with the Transport Rule and Utility MACT Rule.

    - Many of the coal units that are the most likely candidates to shut down are smaller, 40 to 60 year old units, which are nearing the end of their design life expectancy and are already economically challenged.

    - Additionally, the retirement of some existing generating capacity will create room on the transmission grid to accommodate additional power flows, or new generating capacity, without requiring attendant upgrades in transmission, thus mitigating reliability concerns while reducing the cost of transitioning to a cleaner, more efficient generation fleet.

3. **EPA, the Federal Energy Regulatory Commission ("FERC"), the Department of Energy ("DOE") and State utility regulators, both together and separately, have an array of tools to moderate impacts on the electric industry.**

    - EPA may, and if needed, should exercise its statutory authority under the CAA to grant, on a case-by-case basis, extensions of time to complete pollution control installations where appropriate.

    - To the extent that its legal authority allows, EPA should adopt regulatory approaches that allow for cost-effective compliance, such as the emissions trading mechanism proposed in the Transport Rule.

    - In circumstances in which power plant retirements trigger localized reliability concerns, EPA and DOE should follow established precedent, including use of consent decrees, to permit continued operation for reliability purposes only, pending necessary upgrades or generation additions. Additionally, the various federal agencies and offices with responsibility for assuring reliability for the nation's electricity capability should work together to help support the industry and states in complying with EPA's new air regulations.

    - Transparent, well-established market rules approved by FERC and overseen by independent market monitors, particularly the forward capacity markets relied on by some Regional Transmission Operators ("RTOs"), as well as state regulatory agency oversight, provide additional safety nets to help ensure adequate capacity.

- Although EPA is under court order to promulgate its air regulations, the Agency can and should coordinate the implementation of anticipated water regulations under Section 316(b) of the Clean Water Act ("CWA") and new waste regulations to avoid possible reliability concerns.[10]

[10] EPA should also consider the possible greenhouse gas emissions implications of its 316(b) regulations. In 2007, the U.S. Supreme Court found the EPA has clear statutory authority to regulate greenhouse gases under the CAA. Transitioning to a cleaner generating fleet will help EPA fulfill this obligation.

I. MANAGING ELECTRIC SYSTEM RELIABILITY WHILE IMPLEMENTING NEEDED ENVIRONMENTAL IMPROVEMENTS WITH SIGNIFICANT PUBLIC HEALTH BENEFITS

A. The Electric System Has Substantial Excess Generating Capacity and Appropriate Processes in Place to Assure Reliable Electricity Supply to Consumers

Currently, there are more than 17,000 electric generation units in the United States with a combined nameplate capacity of over 1,030 GW.[11] In 2009, coal-fired generation produced 45 percent of the nation's electricity, followed by natural gas (23 percent) and nuclear (20 percent), with the remaining amount produced through a combination of hydroelectric power, oil, wind and other miscellaneous fuel types.[12]

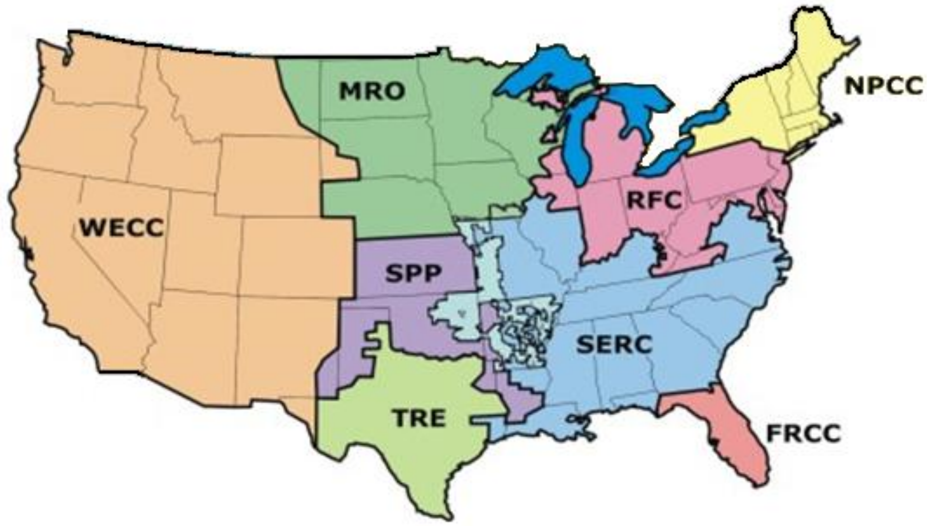
Power plant owners, transmission system owners, and power system operators plan and operate their systems according to numerous federal, state and local regulations, policies and protocols, applying planning requirements designed to ensure electricity suppliers have adequate resources to meet current and future demand, and operational standards to ensure power is available when consumers turn on the lights.

Power system reliability is tied to many things: generation plant capacity and availability, consumption levels and patterns, and transmission capacity and use. As such, electric system planners must consider all of these relevant system infrastructure and demand factors in assessing whether sufficient capacity will be available to maintain reliability. Existing power system capacity well in excess of minimum reserve levels, relatively modest projections of load growth over the next several years, a large amount of proposed generating resources throughout the country, and the availability of load management practices indicate the electric system should be able to handle the transition to a cleaner, more efficient generation fleet.

Under FERC's oversight, NERC sets standards to ensure the reliability of the nation's electric system. NERC comprises eight regional reliability organizations (or "regions," as shown below), whose members include grid operators, utilities, generating companies and others in the electric industry.

[11] EIA, *supra* n.7.
[12] EIA, *Net Generation by Energy Source*, http://www.eia.doe.gov/cneaf/electricity/epm/table1_1.html (accessed July 31, 2010).

Figure/Table 1 - NERC Electric Reliability Regions



FRCC – Florida Reliability Coordinating Council	**SERC** – Southeast Reliability Corporation
MRO – Midwest Reliability Organization	**SPP** – Southwest Power Pool, RE
NPCC – Northeast Power Coordinating Council	**TRE** – Texas Regional Entity
RFC – Reliability First Corporation	**WECC** – Western Electricity Coordinating Council
Note: NERC regional results shown in this presentation include the continental US only	

Most of the nation's regional reliability organizations cover multiple states and each manages and monitors compliance with NERC's reliability standards, including maintenance of minimum target reserve margins, a key indicator of resource adequacy. Actual or expected reserve margins measure the extent to which generating capacity exceeds (or falls short of) peak electricity demand. All regions must have capacity above expected demand to accommodate power plant outages, transmission failures, unexpectedly high demand, or other contingencies. Most regions have a minimum target reserve margin at or below 15 percent.[13] In recent years, actual reserve margins around the country have been well above the minimum target levels, due not only to new power plant additions in most regions, but also to reduced demand attributable to the economic recession and increasingly robust load management programs.[14]

Table 2, below, illustrates that, in 2013, all NERC regions expect to have actual capacity levels well in excess of minimum reserve requirements. Although this provides only one metric of reliability, and each region will undertake more granular analysis in the months ahead, these capacity "cushions" indicate there should not be a capacity shortage even if projected retirement scenarios prove accurate. As the table further highlights, on an aggregate basis across all NERC regions, the electric sector is expected to have over 100 GW of surplus generating capacity in 2013, about three times the 30 to 40 GW of retirements projected by PIRA Energy Group.[15,16] Reliability First Corporation ("RFC") and the Southeast Reliability Corporation ("SERC") regions, for example, where most of the uncontrolled coal plants are located, are

[13] Some regions are below 15%, such as TRE (12.5%), SPP (13.6%), WECC (14.7%). Regions that don't establish a formal target are assigned one for planning purposes by NERC, with 15% for regions like the Midwest and 10% for regions with substantial hydroelectric power. NERC, *2010 Summer Reliability Assessment*, May 2010.
[14] *Id*.
[15] NERC, *2009 Long-Term Reliability Assessment: 2009-2018,* October 2009.
[16] PIRA, *supra* n.5.

expected to have high reserve margins at 24.3 percent and 26.3 percent, respectively.[17] These regions could retire 17.1 GW (RFC) and 23.9 GW (SERC) of capacity and still maintain the 15 percent NERC reserve margin target.

Table 2 - Estimated Reserve Margins in All NERC Regions: Adequate Generating Capacity

NERC Electric Reliability Region	Projected Reserve Margin (1) in 2013	Cushion Above NERC Target Reserve Margin (2) 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**

1. 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).
2. Capacity in excess of what is required to maintain NERC Reference Margin or the regional target reserve levels.

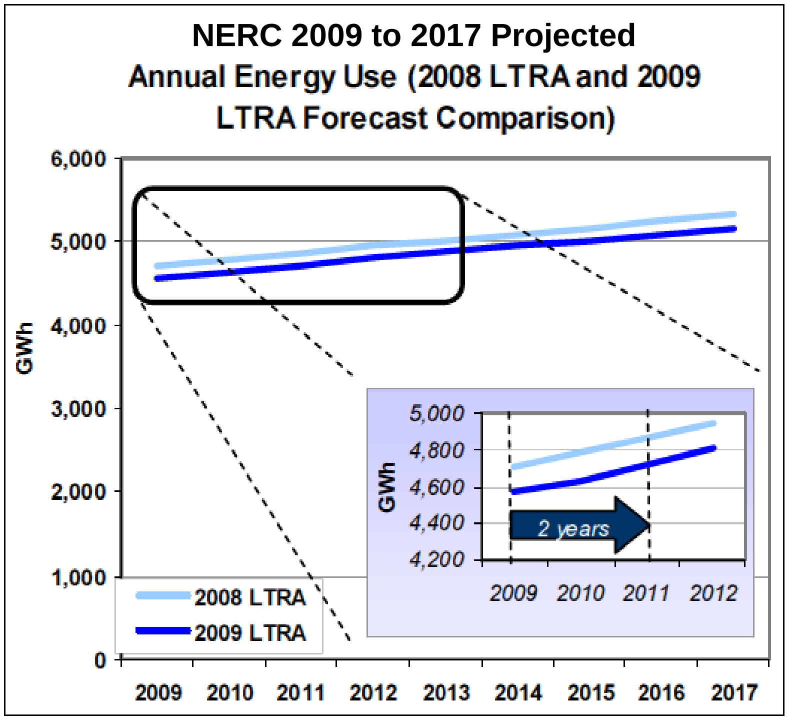
Source: NERC, *2009 Long-Term Reliability Assessment: 2009-2018,* October 2009.

Experience in the RFC region, which encompasses thirteen states in the Midwest and Mid-Atlantic regions, is illustrative of the electric system's ability to tolerate retirements without jeopardizing reliability. Generators in the PJM Interconnection ("PJM") retired about 6,000 MW of capacity between 2004 and 2007, and over 3,000 additional MW of capacity have been announced for retirement in PJM by 2012.[18] Despite almost 10,000 MW of retirements over this seven year period, the RFC region is still forecast to have a reserve margin of over 24 percent in 2013, or an excess of 17,000 MW of generation above the 15 percent NERC target reserve margin target.

Moreover, as a result of the economic recession, NERC projects "significant reductions in projected long-term energy use in North America" [19], which provide an additional capacity cushion. While total demand is still projected to increase in most regions, it will do so at a slower pace and from a lower starting point. See, for example, Figure 2 which shows the decrease in forecast energy use from NERC's 2009 long-term reliability assessment as compared to its 2008 forecast. Additionally, summer peak demand has decreased over 10 GW per year for two consecutive years.[20] Furthermore, in all regions of the country, well-established tools exist to analyze potential regional power system impacts, and to facilitate planning, managing and operating the system to ensure ongoing reliability.

[17] NERC, *supra* n.15.
[18] PJM, *Generation Retirement Summaries*, http://www.pjm.com/planning/generation-retirements/gr-summaries.aspx (accessed July 31, 2010).
[19] NERC, *supra* n.15, at p. 13.
[20] NERC, *supra* n.13, at p. 1.

Figure 2



Source: NERC, *2009 Long-Term Reliability Assessment: 2009-2018,* October 2009, p. 13.

B. The Electric Industry Has Proven Its Ability to Avoid Capacity Problems in the Past—Through Power Plant Capacity Additions, Fuel Conversions, Transmission Solutions, and Load Management Techniques

1. New Capacity is Already in the Pipeline

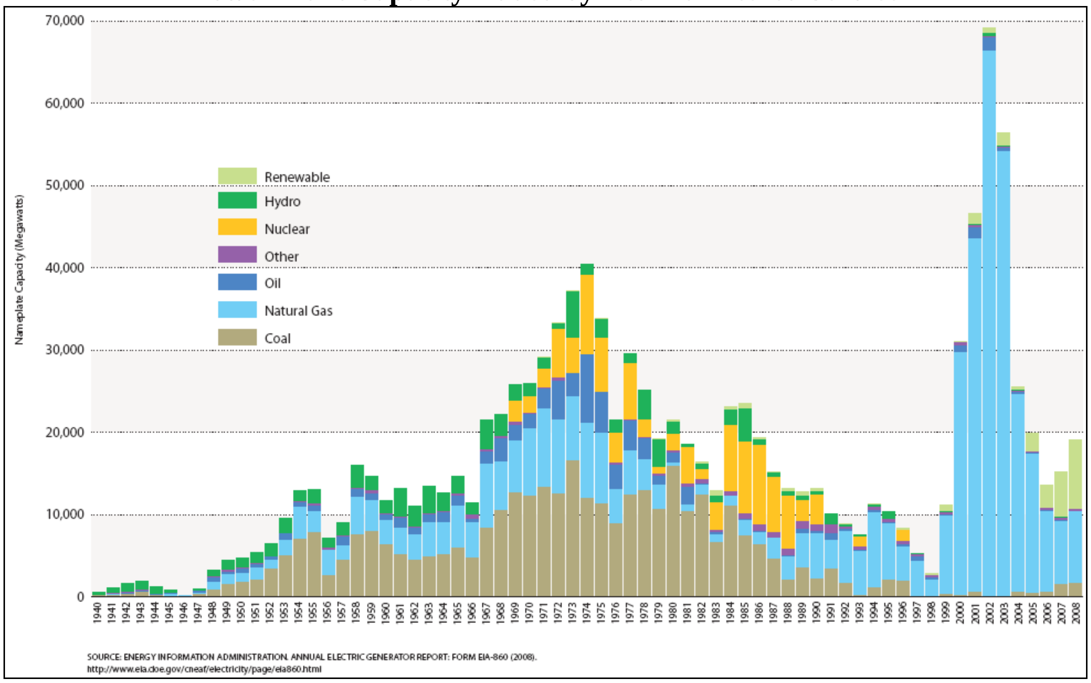
Even with the robust reserve margins in all NERC regions, industry participants are pursuing various measures to safely and reliably transition to cleaner, more efficient electric supply resources. Plans are underway for a variety of new plants, even as less efficient ones are retired. While economics remains the major consideration in deciding whether to develop or expand generating capacity or to mothball older plants, other major drivers, including reliability and environmental improvements, are in play. For example, the implementation of forward capacity markets in certain Independent System Operators (ISOs) has provided more price transparency, enabling the industry to see the value of various generation resources.

Moreover, the industry has shown previously that it can efficiently add capacity or respond adequately to potential reliability issues. Between 1999 and 2008, for example, in response to a variety of market, regulatory and economic signals, the electric sector added almost 270 GW of natural gas-fired generating capacity, the equivalent of more than 80 percent of the entire existing U.S. coal fleet.[21] (See Figure 3 below, which shows the significant investment in new gas plants during the past decade.) Indeed, in just three years between 2001 and 2003, the electric industry built over 160 GW of new generation,[22] about four times what analysts project will retire over the next five years. Although conditions a decade ago

[21] EIA, *Annual Electric Generator Report: Form EIA-860*, 2008.
[22] *Id.*

differ in several respects, this robust construction cycle suggests that developers and investors will respond to strong signals if new capacity is needed.

Figure 3
Power Plant Capacity Added by Year It Entered Service



Source: Ceres, et al., *Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States*, June 2010.

There are also examples in which the industry responded quickly and effectively to resolve looming reliability problems. In the mid-1990s, for example, three large nuclear generating units in Connecticut, totaling almost 3,000 MW, were unexpectedly and simultaneously unavailable during lengthy outages[23], transforming Connecticut from a power exporter to a net importer. To avert any reliability problems over the extended outages, the regional grid operator, along with the region's utilities and public officials, instituted a variety of measures including adjusting unit maintenance schedules, executing additional interruptible contracts with large commercial customers, installing new generation and transmission equipment, and coordinating closely with neighboring power systems to maximize out-of-state power purchases.[24] If necessary, the industry could employ similar strategies in response to future coal plant retirements.

Further, as indicated in Table 3 below, substantial new capacity build has been announced, planned or is seeking grid interconnection studies. Across the NERC regions, a recent report identified over 55 GW of proposed generation in advanced stages of development in the queue for 2013. Although, not all of these plants will be built, strong market incentives and signals from regulators that new capacity will be needed will promote generation development proposals beyond those announced to date.

[23] Western Massachusetts Electric Company, *Form 8K*, November 25, 1996, "Other Events."
[24] PRNewswire, *NEPOOL: Power Supplies May be Tight in New England This Summer*, June 11, 1996.

Table 3 - Proposed New Build – 2013[25]

NERC Region	New Generation Proposed to Be Built (in Transmission Queues for 2013)
TRE	4.3 GW
FRCC	2.0 GW
MRO	3.6 GW
NPCC	7.5 GW
RFC	8.7 GW
SERC	10.3 GW
SPP	2.8 GW
WECC	16.3 GW
Total	**55.5 GW**

Note: There are substantial additional generating facilities in the queue in each region.

Numerous electric companies have already announced substantial new capacity additions, many at the sites of existing coal units that will be retired. Georgia Power, which recently demolished a coal plant in Georgia and stated its intention to retire another, announced it plans to build three 840 MW combined cycle gas turbines ("CCGTs") in Georgia.[26] Oglethorpe Power Corporation has proposed a 605 MW CCGT[27] and a 100 MW biomass facility in Georgia.[28] Also in the Southeast, Progress Energy plans to build a 950 MW CCGT at the site of three coal units, which will retire when the gas plant comes online.[29] In Tennessee, TVA is building an 878 MW CCGT at the site of its John Sevier coal plant, and the City of Vineland New Jersey plans to replace its 25 MW coal plant with a 60 MW gas plant.[30,31]

Also, although they do not operate in the same base load mode as do nuclear or many coal plants, low emission energy facilities have expanded rapidly over the past several years.[32] For example, the total wind power capacity now operating in the U.S. is over 35,600 MW. In 2009 alone, the U.S. wind industry broke all previous records by installing nearly 10,000 MW of new generating capacity, enough to serve over 2.4 million homes. Additionally, over 400 MW of solar was installed throughout the nation in 2009. Solar installations are poised to grow about 50 percent annually in the next three years, reaching 1.5 GW to 2 GW of new installations in 2012.[33]

The retirement of inefficient coal units may spur further development of cleaner generating capacity. Regional transmission studies include capacity even if it runs infrequently. Freeing room for new capacity through retirements means some low emission generation resources, including gas plants, can be accommodated without having to invest in new transmission.

[25] ICF International, *supra* n.6.
[26] Georgia Power, *From Coal to Natural Gas,* http://www.georgiapower.com/generation/home.asp (accessed July 31, 2010).
[27] Oglethorpe Power, *Oglethorpe Power to Build Gas-Fired Generating Plant,* March 10, 2010.
[28] Power-Gen Worldwide, *Oglethorpe plans a biomass plant,* June 29, 2010.
[29] Energy Business Review, *Progress Energy Wins Approval To Build 950MW Gas-fired Plant,* October 2, 2009.
[30] Marketwire, *TVA Prepares to Begin Construction on 880-Megawatt Combined-Cycle Unit,* March 16, 2010.
[31] NJ Spotlight, *NJ Coal Plants Face Cleanups and Closures,* July 10, 2010.
[32] Wind and solar are intermittent resources; therefore, only part of their output is credited for reliability purposes.
[33] GTM Research, *The United States PV Market Through 2013: Project Economics, Policy, Demand and Strategy*, December 2009.

2. Existing Gas Units Have Untapped Power Production Potential

Given the significant addition of gas-fired capacity in the past decade, as detailed earlier in Figure 3, and the relative price advantage of coal versus natural gas in the period from 2007 to 2008, gas plants were not operated at their full design capability in many parts of the country. As detailed in Table 4 below, gas-fired CCGT power plants in 2008 had an average utilization rate of only 33 percent, as compared to coal's 56 percent. Despite declines in natural gas prices, existing gas units have significant untapped power production potential, which can be expanded during off peak periods without constructing new generation. This excess capacity can assist in managing power plant outages required to install pollution control systems.

Table 4 – Estimated Utilization of U.S. Coal and Gas Plants (CCGT) by Region (2008)

		Coal		Gas	
Region	*Plant Size (MW)*	*Total Installed Capacity (MW)*	*% Utilization*	*Total Installed Capacity (MW)*	*% Utilization*
FRCC	> 500	7,981	67%	17,678	46%
	200 - 500	1,628	64%	2,410	26%
	< 200	199	53%	1,389	20%
MRO	> 500	18,113	73%	3,033	15%
	200 - 500	4,915	59%	1,246	15%
	< 200	3,111	42%	506	10%
NPCC	> 500	2,407	79%	13,791	44%
	200 - 500	2,548	70%	4,326	36%
	< 200	1,079	47%	2,843	21%
RFC	> 500	99,474	61%	28,087	19%
	200 - 500	11,479	54%	2,709	13%
	< 200	4,664	48%	1,794	34%
SERC	> 500	91,188	66%	40,529	24%
	200 - 500	10,699	57%	4,995	29%
	< 200	4,109	36%	1,229	33%
SPP	> 500	17,970	71%	12,051	32%
	200 - 500	2,361	72%	2,116	37%
	< 200	647	44%	465	22%
TRE	> 500	15,193	80%	28,869	44%
	200 - 500	1,213	82%	5,025	36%
	< 200			1,020	24%
WECC	> 500	30,081	73%	37,435	47%
	200 - 500	2,992	78%	6,835	40%
	< 200	2,465	60%	5,042	49%
All US Plants	**> 500**	**282,407**	**67%**	**181,473**	**35%**
	200 - 500	**38,277**	**60%**	**30,136**	**32%**
	< 200	**16,616**	**45%**	**15,966**	**30%**

Source: MJB&A analysis based on U.S. Energy Information Administration's Form EIA-860 (2008) and EIA-923 (2008)

Additionally, many coal plants have the potential to repower their units, by replacing conventional coal-fired steam electric generating units with CCGTs, thus increasing the units' efficiency *and* reducing air emissions—an approach already being used today by the industry. For example, Xcel Energy has replaced a 270 MW coal plant in Saint Paul, Minnesota with a 515 MW CCGT, reducing SO_2 emissions by 99.7 percent, NOx emissions by 96.9 percent, and eliminating mercury emissions.[34] It also repowered

[34] Utility Engineering, *Twin Cities to breathe easier thanks to UE*, Value Connection, Issue 2, 2007.

two coal units in Minneapolis.[35] In New Jersey, Calpine has announced its intent to convert an 83 MW coal unit to a 158 MW gas unit.[36]

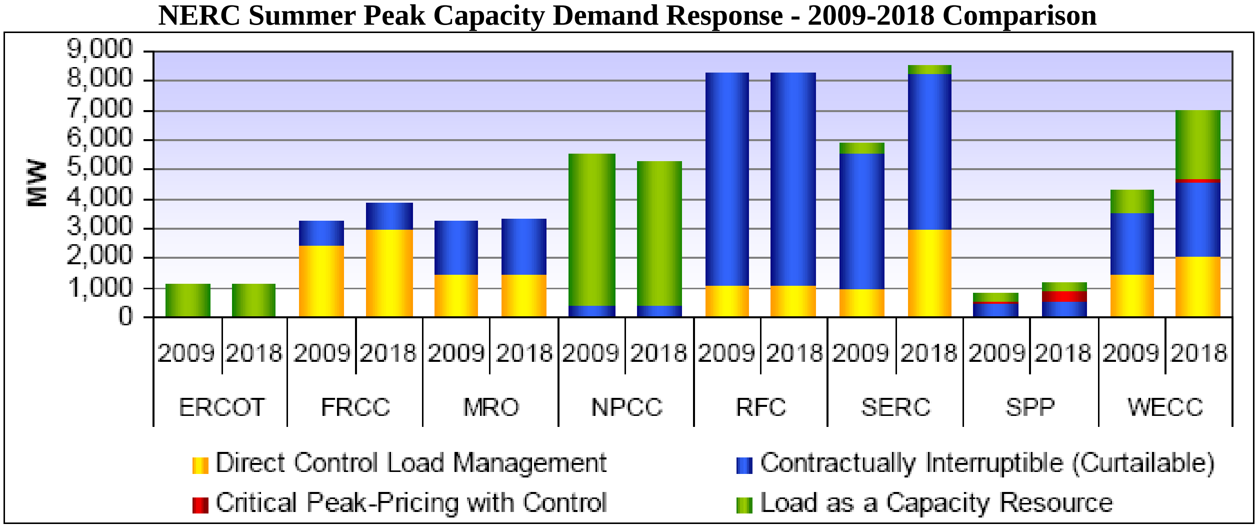
3. Enhanced Load Management Programs Can Be Deployed to Meet System Reliability Needs Economically

Historically, grid operators have dispatched plants to meet customers' electricity requirements. Over the years, the industry has recognized that decreasing load requirements can be more efficient and economical than increasing supply by dispatching generation. As a result, load management tools, such as demand response ("DR") and energy efficiency ("EE") programs have been widely implemented across the nation.

DR programs manage load by temporarily reducing or shifting electricity use by homes or businesses during critical times like hot summer days. EE programs, on the other hand, primarily seek to reduce consumers' energy use on a permanent basis through the installation of energy efficient technologies and conservation measures. Both means of load management provide an additional tool for system operators to manage electric reliability.

DR programs operate in all of the NERC Regions, as shown in Figure 4 below. In some regions, such as RFC, SERC, WECC, and MRO, a substantial fraction of the DR resources are available in the form of "contractually interruptible" or curtailable loads. These typically entail contracts between a utility and an industrial customer, in which the customer agrees to curtail part of its usage when requested for a specified number of times during a certain period, in exchange for electric rate discounts. The other forms of DR—direct control load management, critical peak pricing with control, and load as a capacity resource—are more dynamic forms of supply, in which the grid operator, in effect, dispatches the load to respond with a reduction or shift in load, much like a generating facility.

Figure 4
NERC Summer Peak Capacity Demand Response - 2009-2018 Comparison



Source: NERC, Long-Term Reliability Assessment, 2009, Figure 7 (page 18).

In particular, these other forms of DR have increased steadily in organized wholesale competitive markets. In PJM, for example, DR has increased five-fold in the past five years and continues to grow.[37]

[35] North Dakota Home Town Times, *Xcel Energy Switches Minneapolis Coal Plant to Natural Gas*, October 13, 2009.
[36] NJ Spotlight, *supra* n.31.

In the most recent PJM capacity auction, DR offers increased 32 percent over last year and over 9,000 MW cleared, which represents about six percent of total available capacity resources.[38] DR is expected to reduce the peak electricity use this summer in PJM by 8,525 MW, the equivalent output of ten large power plants.[39]

DR is not just increasing in PJM. According to the ISO/RTO Council, competitive markets are "shattering barriers" in terms of attracting DR resources.[40] In FERC's recently released *National Action Plan on Demand Response*, it highlighted that DR has tripled in recent years in the New England region[41] and identified strategies to further enhance DR. Already, about half of electric utilities across the nation have some type of DR program. With continued support from regulatory agencies like FERC and the advancement of "smart grid" technologies, DR is expected to continue to grow as a viable supply alternative to traditional generation.

As with DR, EE programs have increased dramatically in the past several years. According to information compiled by the Consortium for Energy Efficiency, and as highlighted in Figure 5, the total budget for all US ratepayer-funded EE and DR programs has increased 80 percent since 2006 to $4.4 billion in 2009.[42] These programs resulted in savings of almost 105,000 gigawatt hours ("GWh") of electricity in 2008—the equivalent of the total electricity consumption in Tennessee in the same year.[43] By 2018, new EE programs alone are expected to reduce summer peak demands by almost 20,000 MW (a full year's growth).[44]

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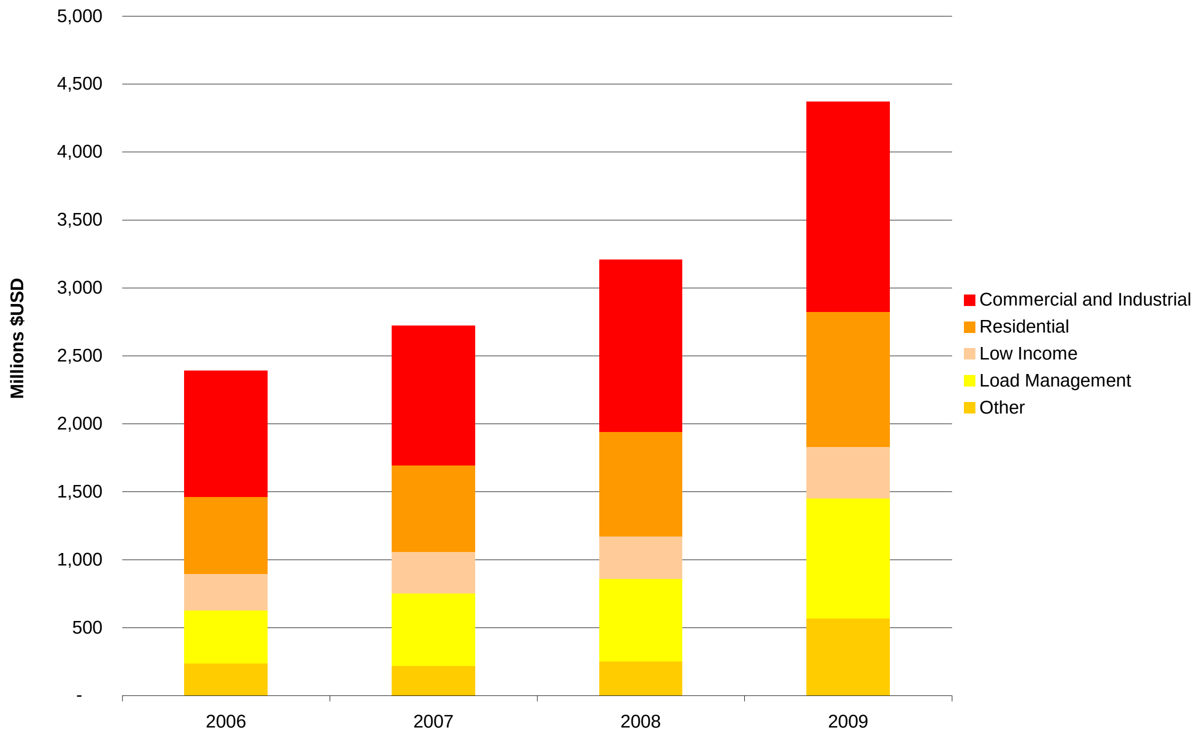
[37] PJM, *Demand Response To Play Significant Role In Meeting PJM's Higher Summer Peak Electricity Use*, http://pjm.com/~/media/about-pjm/newsroom/2010-releases/20100505-summer-2010-outlook.ashx (accessed August 6, 2010)
[38] PJM, *2013/2014 RPM Base Residual Auction Results*, at p. 1.
[39] PJM, *supra* n.37.
[40] ISO/RTO Council, *2009 State of the Markets Report*, September 22, 2009.
[41] The Federal Energy Regulatory Commission Staff, *National Action Plan on Demand Response*, June 17, 2010, at p. 7.
[42] Consortium for Energy Efficiency ("CEE"), *The State of the Efficiency Program Industry: Budgets, Expenditures, and Impacts*, 2009, at p. 7.
[43] *Id.*
[44] NERC, *supra* n.15, at p. 12.

Figure 5
Energy Efficiency and Demand Response Program Budgets, 2006-2009



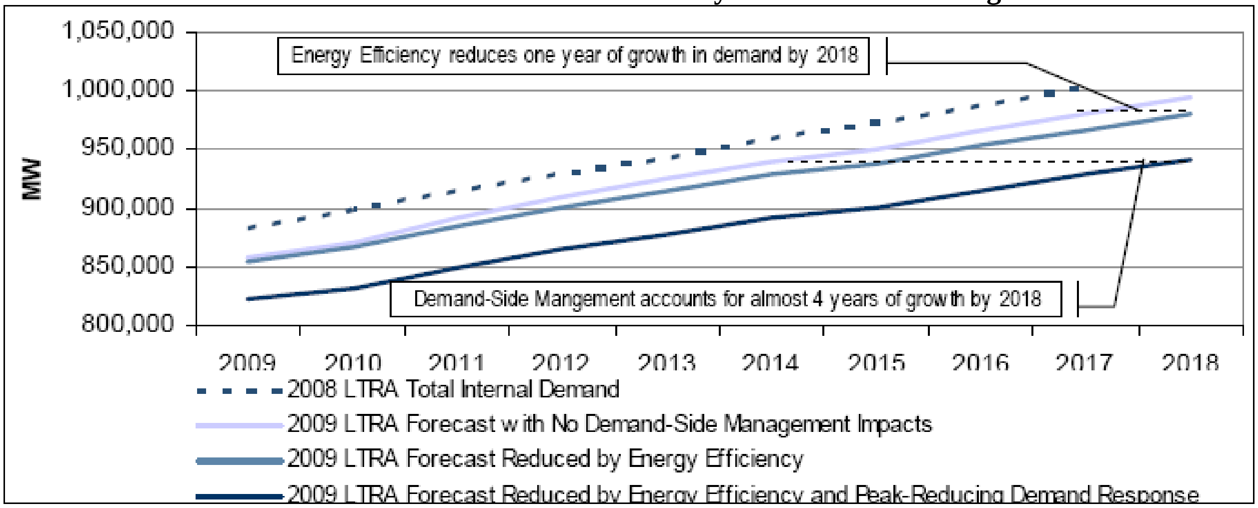
Source: Consortium for Energy Efficiency, *The State of the Efficiency Program Industry: Budgets, Expenditures, and Impacts*, 2009

Although California and the Northeast account for over half of the total, budgets for ratepayer-funded EE programs are expanding in all regions of the country. In 2009, EE budgets for Illinois, Wisconsin, and Iowa increased in 2009, year-on-year, by 60 percent, 40 percent, and 36 percent, respectively.[45] In the Southeast, Alabama, Mississippi, North Carolina, and Louisiana reported ratepayer-funded EE budgets for the first time in 2009.[46] EE's use as a capacity resource is increasing in organized wholesale markets as well. For example, EE resources accounted for 757 MW of the resources offered into the most recent PJM RPM auction, an increase of 33 percent over the prior year. Of those resources, 90 percent, or 680 MW cleared the auction to serve as a firm capacity resource.[47]

NERC estimates that current levels of EE and DR will shave off certain portions of expected growth in demand, as shown in Figure 6, below, underscoring growing acceptance of these load-management tools.

[45] CEE, *supra* n.42, at p. 15.
[46] *Id.* at p. 16.
[47] PJM, *supra* n.38.

Figure 6
Summer Peak Demand Growth Reduced by Demand-Side Management



Source: NERC, Long-Term Reliability Assessment, 2009, at p. 18.

Based on the experience of states and organized competitive wholesale markets that have implemented EE and DR, it is clear these programs provide yet another cost-effective tool to help maintain reliability in the face of generation retirements.

II. THE INDUSTRY HAS THE CAPACITY TO TIMELY RESPOND TO EPA'S FUTURE AIR REGULATIONS

A. The Majority Of Coal Plants Have Already Installed Air Pollution Controls

Proven pollution control technologies are widely available to dramatically reduce emissions of NO_x, SO_2, mercury, and other HAPs from coal plants, which account for 98 percent of the electric sector's SO_2 emissions, 86 percent of its NOx emissions, and 98 percent of its mercury emissions.[48,49]

Over the last 20 years, the industry has deployed a number of different technologies to comply with federal and state SO_2 and NOx regulations. The three basic options for reducing SO_2 emissions from coal plants include: (1) switching from higher to lower sulfur coal; (2) blending higher sulfur coal with lower sulfur coal; or (3) installing flue gas desulfurization ("FGD") control systems, commonly referred to as scrubbers. Wet scrubbers, which use a sorbent to capture SO_2, can typically achieve at least 95 percent SO_2 removal. Widely available NOx control technologies for coal generation can be grouped into two broad categories: combustion modifications and post-combustion controls. Post-combustion controls can reduce NOx emissions by 90 percent or more by removing the NOx after it has been formed in the boiler. The most common post-combustion control is selective catalytic reduction ("SCR") technology, in which ammonia (NH_3) is injected, combining with the NOx in the flue gas to form nitrogen and water.

The majority of coal plants have already installed such controls. Of the 310 GW of coal capacity in the United States, 150 GW have installed FGD systems and another 55 GW have FGD controls planned,[50] representing 65 percent of the existing coal fleet. As detailed in Attachment A, numerous scrubber installations have been recently completed or soon will be completed. Additionally, about 50 percent of coal capacity in the U.S. has installed or soon will be retrofit with advanced NOx controls (SCR and selective non-catalytic reduction ("SNCR") technologies).[51]

To date, most studies put a heavy emphasis on deploying scrubbers to comply with the new EPA air regulations. Retirements occur where the costs of installing scrubbers does not make economic sense based upon the unit's characteristics. However, a number of companies have announced that they will use other less costly technologies in lieu of scrubbers. For example, on August 5, 2010, Edison Mission International, one of the nation's largest merchant coal generators, announced it could achieve compliance without installing scrubbers by using trona injection technology.[52]

B. With Proper Planning, the Industry Can Install the Necessary Pollution Controls on a Timely Basis

EPA projects that about 14 GW of additional coal-fired generating capacity will need to be retrofit with scrubbers and less than 1 GW with SCR controls by 2014 to comply with the recently proposed Transport Rule.[53] This number of retrofits is significantly less than the industry has added in past construction

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[48] EIA, *U.S. Electric Power Industry Estimated Emissions by State (EIA-767 and EIA-906)*, Electric Power Annual 2008, http://www.eia.doe.gov/cneaf/electricity/epa/emission_state.xls (accessed July 30, 2010)
[49] U.S. EPA Office of Air Quality Planning and Standards, *National Emissions Inventory for Hazardous Air Pollutants*, 1999.
[50] PIRA, *supra* n5, at p. 7.
[51] U.S. EPA, *National Electric Energy Data System ("NEEDS")*, version 3.02.
[52] Trona is a naturally occurring sorbent that can be injected directly into boilers to remove harmful air toxics without the use of FGD scrubbers. Given that the PIRA and EEI analyses did not consider trona and other less costly compliance options, the predicted retirement scenarios are very likely overstated. Nonetheless, this report uses the predicted retirements as a conservative input to test all of the reliability considerations.
[53] U.S. EPA, *Proposed Rule: Federal Implementation Plans To Reduce Interstate Transport of Fine Particulate Matter and Ozone*, August 2, 2010.

cycles. For example, during the peak of scrubber construction, between 2008 and 2010, approximately 60 GW of coal capacity was retrofit with scrubber controls,[54] highlighting the industry's ability to complete a substantial number of retrofits over a short period of time. In 2009 and 2010, the industry completed between 50 and 60 scrubber retrofits each year.[55]

Moreover, the industry's past successful installation of pollution controls on numerous units underscores its ability to schedule and sequence any required unit outages in an efficient and reliable manner. To help ensure reliability, generators and transmission owners provide reasonable advance notice of any planned outages to the respective transmission authorities. In turn, the transmission authorities develop a coordinated outage schedule to prevent any deliverability problems. This illustrates a key benefit of a fully integrated national transmission system.

Further, the CAA allows three years for existing sources to comply with the Utility MACT rule with the possibility of a one-year extension. EPA is under a court-imposed deadline to complete its regulations by November 2011, with compliance required by late 2014. As numerous states have adopted regulations limiting mercury emissions from coal-fired power plants, many companies have already begun to install mercury control technologies. Also, the scrubber and particulate control systems installed to comply with the Transport Rule and other EPA regulations will help companies to comply with future air toxics regulations.

In the event, however, that any required retrofit construction schedules could not be completed within the pre-compliance period, EPA may, and should, exercise its authority under Section 112(i)(3)(B) of the CAA to provide up to one-year extensions to complete pollution control installations. In addition, to protect the national security interest of maintaining adequate electrical grid reliability, the President has the authority under Section 112(i)(4) of the CAA to grant one or more compliance extensions of up to two years each. Any such extensions would be unit-specific and based on clear demonstration that the technology to implement such standards is not available.

These federal tools combined with market rules and signals, industry reliability standards and enforcement mechanisms, and utility regulatory requirements and incentives, provide a robust portfolio of techniques to assure compliance with health-based air regulations while maintaining reliable electricity supply.

C. The Coal Plants Most Likely To Retire Are Nearing The End Of Their Design Life Expectancies And Are Already Economically Challenged

As indicated by Table 5 below, many of the uncontrolled coal units, which are the most likely to retire, are smaller (250 MW and below) and are 40 to 60 years old. Thus, the coal plants most likely to retire are already nearing the end of their design life expectancies, as confirmed in recent coal plant retirement announcements, detailed in Attachment B.

[54] M. J. Bradley & Associates analysis based on U.S. EPA NEEDS Database v. 3.02.
[55] *Id.*

Table 5 - Characteristics of U.S. Coal Plants

Unit Age	Units		Capacity		Avg. Unit Size	Pollution Control Installed (% of units)			
	Count	%	MW	%	(MW)	SNCR	SCR	Scrubber	Uncontrolled
> 60 years	46	5%	1,762	1%	38	2%	4%	11%	87%
51 - 60 years	313	31%	39,787	13%	127	21%	9%	19%	64%
41 - 50 years	233	23%	58,078	20%	249	15%	19%	33%	53%
31 - 40 years	229	23%	114,090	38%	498	4%	43%	65%	27%
11 - 30 years	163	16%	80,165	27%	492	6%	29%	66%	31%
10 years or younger	7	1%	2,444	1%	349	43%	29%	57%	29%
Total	1,004		297,639			13%	23%	41%	48%

Data Sources: 2007/2008 EPA IPM, ARP, NBP Databases & Commercial Sources, MJB&A Analysis

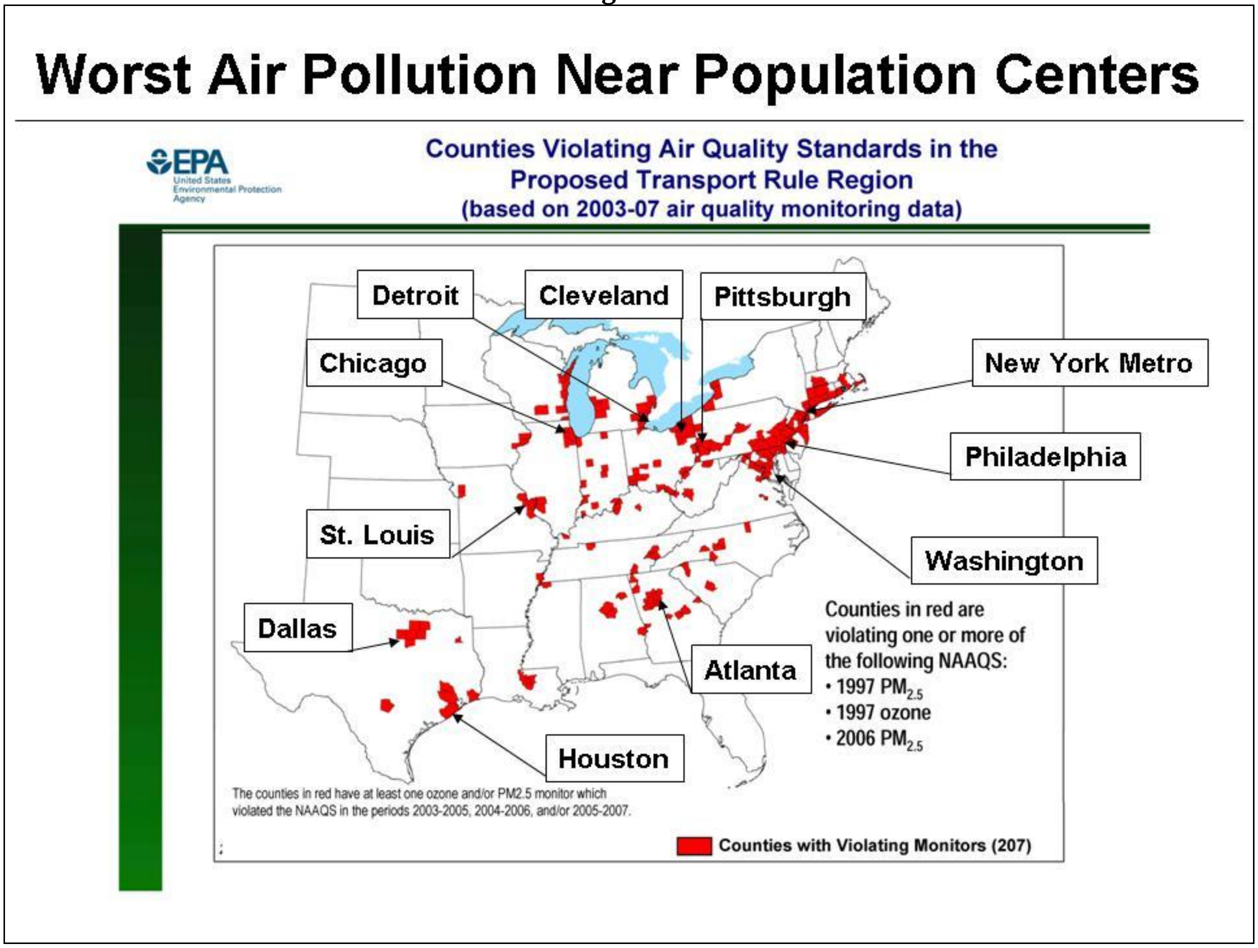
Information included in the most recent annual *State of the Market Report* prepared by PJM's Independent Market Monitor ("IMM") suggests that fundamental economics, not the EPA regulations, are already challenging those units most likely to retire. In that report, the IMM identified over 11 GW of coal units at risk for retirement, since they "did not recover avoidable costs even with capacity revenues."[56] Of the 11 GW identified in the report, most operated less than 1,000 of the 8,760 hours in 2009 and tended to be significantly smaller with an average installed capacity of only 73 MW.[57] Of the 122 coal units in PJM with capacity less than or equal to 200 MW, 35 failed to recover their avoidable costs and another 52 were close to not recovering those costs. Therefore, in PJM, a region covering 13 states and DC, in addition to approximately 10 GW of coal generation that has or will be retired during the seven years from 2004 to 2011, another 11 GW faces a troubling economic outlook. As such, the units' economics already place them at risk of shutdown, regardless of EPA's future air regulations.

In reducing the air pollution emissions from some of the nation's most inefficient uncontrolled units, EPA will facilitate the development of cleaner, more efficient generation while improving air quality and reducing greenhouse gas emissions. The current levels of air pollution in certain regions of the country require industrial facilities and power plants to obtain emission offsets to expand their operations. This requirement discourages economic development due to the increased permitting and financial obligations compared to areas that meet federal and state air quality standards. Significantly as well, as shown in Figure 7, because these non-attainment areas are concentrated in highly populated areas, reducing emissions there will facilitate the development of cleaner, more efficient generation near electric load centers where it is needed most.

Additionally, the retirement of generating capacity that has been previously supported by transmission investment could create room on the transmission grid to handle power flows both within and outside the regions, or the addition of new generating capacity, without requiring attendant transmission upgrades. These considerations, too, will help mitigate reliability concerns and reduce the cost of upgrading the nation's power system infrastructure.

[56] PJM, *State of the Market Report*, Vol. 1, March 11, 2010, p. 21.
[57] *Id.* Vol. 2 at p. 176.

Figure 7



Source: U.S. EPA (with city locations added by M.J. Bradley & Associates)

III. EPA, DOE, FERC AND STATE UTILITY REGULATORS HAVE THE TOOLS TO MODERATE IMPACTS ON THE ELECTRIC INDUSTRY AND MANAGE ELECTRIC SYSTEM RELIABILITY.

A. Statutory, Regulatory and Market Safeguards Exist To Mitigate Risks of Retirement On Reliability

Assorted risk management procedures under the CAA, the Federal Power Act ("FPA") and other statutes provide EPA, DOE, FERC, and the President tools to moderate potential impacts on electric system reliability. The procedures serve as a bridge, if necessary, to a permanent solution, helping ensure reliability while minimizing exposure to harmful air pollutants. EPA also has the authority to develop cost-effective regulatory approaches, such as the emissions trading mechanism proposed in the Transport Rule, that will enable greater compliance flexibility and flexibility in managing potential reliability issues.

In addition to the EPA's and President's authority to extend deadlines for installation of pollution controls described in Section II B, where necessary to maintain electric system reliability, DOE has the power under Section 202(c) of the FPA to override CAA-derived control requirements in limited emergency circumstances. In such emergency situations, including extended periods of insufficient power supply as a result of shortage of electric facilities, DOE has the discretion to issue unit-specific orders designed to maximize CAA compliance and minimize health risks.

Two examples of DOE's exercise of this authority illustrate the point. In 2003, the Secretary of Energy ordered energizing a new underwater cable connecting New Haven, Connecticut to Long Island, which had previously been constructed but remained inoperable due to legal actions appealing permits. Citing August 2003's massive electric service outage, the Secretary invoked his authority to alleviate the reliability emergency.[58]

DOE's actions related to the Potomac River plant serving Washington, DC provide another example. In 2005, the plant's owner, Mirant, had decided to shut down all five generating units at its Potomac River plant located outside Washington, DC. The DC Public Service Commission requested that DOE issue an emergency order directing Mirant to continue to operate the units, as their shutdown would have "immediate" and "drastic" effects on DC's electric system reliability. In conjunction with the EPA, which required Mirant to enter into a consent decree, DOE issued an Order[59] requiring Mirant to operate the plants under specific and limited circumstances tailored to relieve the risk of a DC area blackout, while avoiding to the full extent possible exceedances of federal air quality standards.

The well-established consent decree template, as used to address the Potomac River situation, provides EPA yet another tool to synthesize reliability and environmental concerns. By restricting a unit to operate for reliability purposes only, pending completion of any required transmission upgrades or replacement

[58] DOE, *Order No. 202-03-2*, August 28, 2003. "I hereby determine that an emergency continues to exist in the Northeast United States due to a shortage of electric energy, a shortage of facilities for […] the transmission of electric energy and other causes. […] On August 14, 2003, the Northeast and Upper Midwest areas in the United States, as well as portions of Canada, experienced the largest electric transmission grid failure and electric service outage ever to occur in North America. Tens of millions of people were affected by this outage, and it presented profound risks to the public health and safety throughout the affected areas. […] Only hours after the outage occurred, and after considering the unanimous recommendation of the North American Electric Reliability Council, the New York Independent System Operator (NYISO), ISO New England, Inc. (ISO-NE), and electric utilities in both New York and Connecticut in support of the issuance of an emergency order, I issued an order directing the NYISO and ISO-NE to require the Cross-Sound Cable Company, LLC (CSC) to operate the Cross-Sound Cable and related facilities as necessary to alleviate the disruptions in electric transmission service. The Cable was energized a short time thereafter."

[59] DOE, *Order No. 202-05-03*, December 20, 2005.

generation, such consent decrees can maintain reliability while minimizing adverse environmental impacts to the fullest extent possible.

Many regional wholesale competitive markets also have well-established forward capacity markets such as PJM's Reliability Pricing Model and New England's Forward Capacity Market, which are approved by FERC and overseen by independent market monitors, to facilitate and provide advanced notice of the retirement of inefficient units while maintaining reliability. Reliability impact studies are conducted for units that have announced retirement or fail to clear the forward capacity auctions, and those identified as being needed for reliability may continue to operate past their planned retirement date pursuant to "reliability must run" ("RMR") agreements. To help ensure reliability while minimizing adverse environmental impacts, the RMR agreements can provide the units operate only to maintain reliability. For example, Exelon Generation recently coordinated with PJM and the Pennsylvania Department of Environmental Protection ("PA DEP") to negotiate a consent decree and operating procedures related to an RMR agreement for its two retiring coal units, which require the units operate for reliability purposes only.[60]

In addition to these established ISO/RTO procedures, advance analysis in the long range reliability planning processes should lead to rational and timely investments in new transmission that will mitigate any service reliability issues associated with future generation retirements. The local transmission owners currently play an important supplemental role in accomplishing this objective. For example, Commonwealth Edison ("ComEd"), the local transmission owner in Chicago, proactively filed an application with the Illinois Commerce Commission[61] seeking permission to enhance its transmission system. In its application, ComEd noted the identified upgrades would be required to maintain system reliability in the event that two of Midwest Generation's at-risk coal units, Fisk and Crawford, were to retire.[62]

Procedures also exist to protect electric system reliability in regions where coal plants are not part of an organized wholesale competitive market, but are owned by vertically-integrated utilities in traditionally regulated monopoly regimes. Generators regulated by state regulatory commissions have a legal obligation to reliably serve their customers, and to conduct long range resource planning. Typically, generators will have many options to meet their statutory obligation to serve including, but not limited to: (1) investing in existing plants; (2) building new plants; (3) decreasing load through DR and EE programs; (4) building transmission; or (5) a prudent combination of all those tools. Too, state regulators may adopt ratemaking policies to encourage such actions, including ones that address utilities' financial disincentives where aggressive EE and DR programs would otherwise produce lower revenues.

As such, FERC and other relevant agencies have a number of tools available to moderate the impacts of air emission regulations, while maintaining reliability and minimizing adverse environmental impacts. Moreover, EPA is also developing new water regulations under Section 316(b) of the Clean Water Act ("CWA"), new waste regulations, and greenhouse gas regulations affecting the electric power sector. EPA should consider efficiently coordinating these rules as it moves forward with its rulemakings to avoid possible reliability concerns.

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[60] *Commonwealth of Pennsylvania Department of Environmental Protection v. Exelon Generation Company, LLC.,* No. 382 MD 2010 (Pa. Cmmw. April 16, 2010) included in *Operating Procedures for Cromby Generating Station Unit No. 2 and Eddystone Generating Station Unit No. 2 as Required for Reliability Purposes* at Appendix 1, http://pjm.com/planning/generation-retirements/~/media/planning/gen-retire/must-run-operating-procedures.ashx (accessed August 6, 2010).

[61] Commonwealth Edison Company, *Application for authorization under Section 4-101 of the Illinois Public Utilities Act ("Act"), 220 ILCS § 5/4-101, or alternatively, for a Certificate of Public Convenience and Necessity, pursuant to Section 8-406 of the Act, to install, operate and maintain two new 345,000 volt electric transmission lines in Cook County, Illinois,* No. 10-0385 (Ill. Cir. June 11, 2010).

[62] Direct Testimony of Thomas W. Leeming, p. 2, Lines 25-35.

IV. CONCLUSION

Current industry practice and a review of applicable system data indicate the industry is well-positioned to respond to EPA's mission to "help millions of Americans breathe easier and live healthier" without threatening electric reliability. Generation plant capacity and availability, consumption levels and patterns, and transmission capacity and use must all be considered when judging the reliability impacts of environmental regulatory action.

The existing substantial excess capacity, the industry's proven track record to timely construct new generation and to efficiently coordinate the scheduling of planned outages, together with capacity upgrades, transmission enhancements, "smart grid" investments, fuel conversions, DR, and EE, should mitigate reliability concerns.

The industry has already successfully employed these various strategies to reliably meet customers' energy needs while reducing environmental impacts, and it will continue to do so in response to EPA's new regulations. As a final backstop, existing statutory, market and regulatory safeguards will facilitate the retirement of inefficient units, and an orderly transition to cleaner, more efficient generation.

ATTACHMENT A

Sampling of Recent Announcements of Scrubber Installations

Plant	Unit	State	Size (MW)	Highlights
Brandon Shores	1	MD	643	This significant environmental upgrade supports Constellation Energy's environmental stewardship efforts by: Reducing Maryland's coal-fired power plant's SO_2 emissions by an estimated 95 percent; Reducing existing mercury emissions by 90 percent; and Significantly reducing acid gases. http://www.constellation.com/portal/site/constellation/menuitem.38d5d085b395c0cb2adedd10d66166a0/
Brandon Shores	2	MD	643	
Kingston	1	TN	135	The two scrubbers added at Kingston will control sulfur dioxide from all nine boilers at the fossil plant, which can generate 10 billion kilowatt-hours of electricity per year. "We now have state-of-the-art control equipment on all of our units at Kingston, allowing us to generate the electricity needed by our customers," Kingston Plant Manager Leslie Nale said. "This translates into cleaner air in the Great Smoky Mountains and across the region." http://www.tva.gov/news/releases/aprjun10/kingston_scrubbers.html
Kingston	2	TN	135	
Kingston	3	TN	135	
Kingston	4	TN	135	
Kingston	5	TN	177	
Kingston	6	TN	177	
Kingston	7	TN	177	
Kingston	8	TN	177	
Kingston	9	TN	178	
Miller	3	AL	750	During peak construction, Alabama Power's $1.7 billion scrubber initiative was responsible for creating more than 2,300 jobs. "This investment is not only good for the environment, it's also good for Alabama's economy," Charles McCrary, Alabama Power president and CEO, said. http://southerncompany.mediaroom.com/index.php?s=43&item=2074
Miller	4	AL	750	
Gaston	5	AL	861	
Barry	5	AL	750	
Coffeen	1	IL	340	"Our investment in these technologies reflects our commitment to environmental stewardship and our support for the communities we serve," says Chuck Naslund, AER chairman, president and chief executive officer. "Through these projects, we have not only offered continued permanent employment to hundreds of Illinoisans, but we have also provided jobs to contract employees who call Illinois home. Clearly these projects have had a positive impact on the economies of central and southern Illinois – areas hard-hit by tough economic conditions." http://www.bloomberg.com/apps/news?pid=conewsstory&tkr=AEM:SP&sid=a.W8.1491R8g
Coffeen	2	IL	560	
Cardinal	1	OH	600	According to Buckeye Power, one of the owners of the Cardinal Plant, "the addition of these scrubbers means the Cardinal plant is able to reduce emissions while using Ohio coal, meaning jobs and economic benefits for eastern Ohio and the region." The unit 3 scrubber is still under construction. http://www.buckeyepower.com/pages/buckeye-power-2
Cardinal	2	OH	600	
Cardinal	3	OH	630	
Monroe	4	MI	775	DTE Energy will also be installing two additional FGD systems at Monroe units 1 and 2. According to DTE, "the $600 million project will create 900 jobs and be one of the largest construction projects in Michigan over the next few years." http://www.prnewswire.com/news-releases/dte-energy-environmental-project-will-create-900-jobs-78770632.html
Monroe	3	MI	795	
Cliffside	5	NC	550	According to Duke, the scrubber control installation at Cliffside Unit 5 will be completed by the Fall of 2010. Duke already has emission-control scrubbers on all its large Carolinas coal plants—Allen, Marshall and Belews Creek. According to Duke spokesman Andy Thompson, Duke has reduced its NOx emissions by 80% since 1997 and SO2 emissions have fallen 70% since 2005. http://www.bizjournals.com/charlotte/blog/power_city/2010/07/duke_energy_assessing_new_epa_rules.html
Bowen	1	GA	713	Scheduled for completion in early 2010, according to Georgia Power. http://www.georgiapower.com/pluggedin/construction_2009_08.asp
Crist	6	FL	302	According to Gulf Power, since 1992, the company has reduced regulated emissions by more than 70 percent despite increased electricity demand from 120,000 new customers. With the scrubber system fully operational, Gulf Power will have reduced overall regulated emissions by more than 85 percent since 1992. http://www.renewablesbiz.com/article/09/12/gulf-power-begins-scrubber-startup
Crist	7	FL	477	
Clifty Creek	1	IN	217	"The addition of these FGD systems represents a major commitment to environmental quality in southeastern Ohio and southeastern Indiana," said David L. Hart, vice president and assistant to the president of OVEC-IKEC. "The projects will also produce an economic boost to the two regions." The scrubber installations at Clifty Creek and Kyger Creek are scheduled for completion in 2010. http://www.prnewswire.com/news-releases/ovec-ikec-to-invest-820-million-for-environmental-controls-at-kyger-creek-and-clifty-creek-power-plants-56325052.html
Clifty Creek	2	IN	217	
Clifty Creek	3	IN	217	
Clifty Creek	4	IN	217	
Clifty Creek	5	IN	217	
Clifty Creek	6	IN	217	
Kyger Creek	1	OH	217	

Plant	Unit	State	Size (MW)	Highlights
Kyger Creek	2	OH	217	
Kyger Creek	3	OH	217	
Kyger Creek	4	OH	217	
Kyger Creek	5	OH	217	
Chalk Point	1	MD	342	"We are making a major investment in emission reduction technologies," said Edward R. Muller, Mirant chairman and CEO. "This equipment offers an excellent solution for substantially improving air quality while maintaining system reliability and efficient power generation for consumers and businesses." http://investors.mirant.com/releasedetail.cfm?releaseid=351567
Chalk Point	2	MD	341	
Morgantown	1	MD	624	
Morgantown	2	MD	620	
Dickerson	1	MD	182	
Dickerson	2	MD	182	
Dickerson	3	MD	182	
Brunner Island	1	PA	344	According to PPL's website, "[t]he unit's scrubber is now operating as designed, thanks to plant employees who safely made the final connections between the plant and the scrubber during a recent maintenance outage." http://www.pplweb.com/ppl+generation/ppl+brunner+island.htm
Brunner Island	2	PA	397	
Brunner Island	3	PA	754	
Hatfields Ferry	1	PA	530	According to an Allegheny Energy fact sheet, "[t]he 'scrubbers' will remove approximately 95 percent of the sulfur dioxide (SO_2) emissions and significantly reduce mercury emissions from the station…In addition to improving the environment, the scrubber system will enable Hatfield's Ferry to purchase more local coal, which will preserve regional coal mining and related coal mining support jobs. The project will bring approximately 350 construction jobs to the region for a period of about three years. Additional full-time positions will be added to operate and maintain the scrubbers." http://www.alleghenyenergy.com/Newsroom/Scrubber.Hat.2page.pdf
Hatfields Ferry	2	PA	530	
Hatfields Ferry	3	PA	530	
Hudson	2	NJ	583	According to PSEG Power, advanced emissions controls would be installed at Hudson by 2010. Scrubbers at its Mercer plant are scheduled for completion in late 2010, http://www.reuters.com/article/idUSN1450072120080514
Mercer	1	NJ	315	
Mercer	2	NJ	310	

Source: MJB&A analysis.

ATTACHMENT B

Recent Coal Plant Retirement Announcements

Name	Owner	State	Installed Capacity (MW)	Age (years)	Advanced SO_2/NOx Controls
Weatherspoon	Progress Energy	NC	48	60	None
Weatherspoon	Progress Energy	NC	49	59	None
Weatherspoon	Progress Energy	NC	76	57	None
L V Sutton	Progress Energy	NC	93	55	None
L V Sutton	Progress Energy	NC	102	54	None
L V Sutton	Progress Energy	NC	403	37	None
H F Lee	Progress Energy	NC	74	57	None
H F Lee	Progress Energy	NC	77	58	None
H F Lee	Progress Energy	NC	248	47	None
Cape Fear	Progress Energy	NC	172	51	SNCR
Cape Fear	Progress Energy	NC	144	53	SNCR
Cameo	Xcel Energy	CO	54	49	None
Arapahoe	Xcel Energy	CO	47	58	None
Arapahoe	Xcel Energy	CO	121	54	None
Wabash River	Duke Energy	IN	95	53	None
Wabash River	Duke Energy	IN	85	55	None
Wabash River	Duke Energy	IN	85	56	None
Wabash River	Duke Energy	IN	85	54	None
Wabash River	Duke Energy	IN	318	41	None
John Sevier	TVA	TN	176	53	SNCR
John Sevier	TVA	TN	176	52	SNCR
John Sevier	TVA	TN	176	54	SNCR
John Sevier	TVA	TN	176	54	SNCR
Cromby	Exelon	PA	144	55	SNCR + Scrubber
Eddystone	Exelon	PA	309	49	SNCR + Scrubber
Eddystone	Exelon	PA	279	50	SNCR + Scrubber
Richard Gorsuch	American Municipal Power	OH	50	59	None
Richard Gorsuch	American Municipal Power	OH	50	59	None
Richard Gorsuch	American Municipal Power	OH	50	59	None
Richard Gorsuch	American Municipal Power	OH	50	59	None
Indian River	NRG Energy	DE	82	53	None
Indian River	NRG Energy	DE	177	40	None
Jack McDonough	Southern Co	GA	258	46	None
Jack McDonough	Southern Co	GA	259	45	None
Hunlock	UGI	PA	50	51	None
Will County	Midwest Generation	IL	188	55	None
Will County	Midwest Generation	IL	184	55	None
Boardman	Portland General Electric, Others	OR	585	29	None
Howard Down	Vineland Municipal Electric Utility	NJ	25	40	None
TOTAL	-	-	4,939	-	-

Source: MJB&A analysis based on U.S. EPA Acid Rain Program database and U.S. EIA File 860.