ABA Section of Litigation, 2013 ABA Annual Meeting, August 8-12, 2013:
"Hot Topics in Energy and Environmental Law"

Coal Plant Retirements and Electric System Reliability

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ABA Annual Meeting – Hot Topics In Energy and Environmental Law

August 10, 2013, 8:30 a.m.

Coal Plant Retirements and Electric System Reliability

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I. Introduction

Coal-fired electric generating units are being retired from the United States power fleet at an accelerating rate. The combined effect of new clean air and water regulations developed by the Environmental Protection Agency ("EPA") coupled with the abundant supply and low price of natural gas has made some coal-fired generation, once the backbone of power production in the United States, uneconomic compared to other power sources. Given the historic importance of coal in power production, many industry participants and observers have expressed concern that coal plant retirements could threaten the adequacy of electricity capacity (*i.e.*, reliability of supply) across the country.

However, although the projected plant retirements have the potential to decrease our power supply, recent reports by independent analysts and the entities charged with ensuring system reliability suggest that the situation is manageable. The ability of regulatory agencies to exercise flexibility in implementing their rules, new construction of generation, decreased demand for electricity due to conservation measures, and compensation schemes for generators needed to run uneconomic units for reliability purposes, all provide methods to avoid capacity shortages.

This paper summarizes the role of coal-fired generating units as power reserve resources for system reliability, gives an overview of completed and forecasted coal plant retirements, briefly discusses the potentially-conflicting regulatory regimes and compliance frameworks

under which owners of electric generation must operate, and describes one compensation scheme that has been used to ensure electric system reliability in the short term.

II. Background – Coal-fired Generation as Reserve Power

Owners of coal-fired utilities and other industry insiders have expressed concern that coal plant retirements may lead to a dangerous decrease in the overall reliability of the bulk power system. Historically, the majority of our power system's "base load," the portion of electrical power that runs 24 hours a day, has been provided by coal-fired generation. Although the power mix has diversified over time, coal-fired generation still plays an important role in power system reliability.

Power generation and the electrical load (demand) must be very close to equal every second to keep alternating-current electricity in balance across the grid and avoid overloading network components, leading to current fluctuations or cascading failures of larger sections of the power network.[1] When demand for electricity exceeds available power generation, system failures like brownouts[2] and blackouts may result. Protective relays and fuses are used to automatically detect overloads and to disconnect circuits at risk of damage, but an adequate supply of generation is needed at all times.

One of the main ways to guard against power failures involves maintaining power reserves – generation that goes unused under normal operating conditions, but can be made available if it is needed. Today, many of the oldest coal-fired plants are too inefficient and expensive to provide base load, but they are used as reserve resources to guard against shortages. Without adequate reserve power, operators of the power system cannot ensure system reliability. As coal plants are retired to comply with EPA regulations, or for other economic reasons, they

must be replaced with new generating units to provide adequate electricity capacity, assuming demand remains the same. With the accelerating pace of coal plant retirements, some industry participants are concerned that new plant construction and decreased electricity demand resulting from conservation measures will not be able to keep pace with the retirements, leading to a shortage in supply of reserve, and perhaps even base load power.

III. Retirement of Coal-fired Electric Generation Stations

Although the United States power supply has diversified in recent years, coal still plays a major role in power production. The United States currently has approximately 322 gigawatts ("GW"), and 1,264 units of coal-fired generating capacity in its power production fleet.[3] In 2012, the Energy Information Administration ("EIA") estimated that 175 coal-fired generators (or 8.5 percent of the fleet) would be retired in the next decade.[4] Based on more recent announcements of retirement plans, it is likely that by 2015, over 52 GW (or over 16 percent of the existing coal-fired generating capacity in this country will be retired.[5] Retirement announcements began ramping up in 2006 and accelerated in 2010 when natural gas prices decreased by approximately 80 percent from two years before.[6]

To put the pace of the coal plant retirements in perspective, The Brattle Group estimates that 49-57 GW of replacement capacity will be needed by 2016.[7] Between 2007 and 2011, approximately 97 GW of new generation capacity came on line, so the need is significant, but not impossible to achieve.[8]

Most of the coal plants slated for retirement share some common characteristics. Generally, the plants are smaller in size, lack any environmental controls, and are over 50 years old.[9] They are also geographically concentrated. Currently, forecasted coal plant retirements are

centered in the Midwestern and Southeastern regions, primarily in Ohio, Pennsylvania, Georgia, West Virginia, Virginia, North Carolina, Kentucky, and Indiana.[10] In October 2012, The Brattle Group included the below table in its Discussion Paper providing an update on projected coal plant retirements, showing the projected retirements by Independent System Operator ("ISO") and Regional Transmission Organization ("RTO") region.[11]

Table 2 Projected Retirements by ISO/RTO region

ISO/RTO Region	Coal Retirement (GW)	% of Coal Capacity	% of Total Capacity
PJM	14-21	18-27%	8-11%
MISO	11-16	17-24%	9-13%
SPP	3-4	12-16%	4-6%
ISO-NE	0.8	33%	3%
NYISO	0.5 - 0.6	20-24%	1-2%
ERCOT	0.4	2%	0%
CAISO	0.1 - 0.2	5-10%	0-0%

As shown in this table, the Midwest and Southeast account for approximately 38 GW of announced plant retirements.[12]

IV. The Regulatory Landscape

Owners of electric generation must comply with rules and regulations promulgated by various regulatory entities, and the regulations are not always compatible. For example, public utilities are, in some instances, subject to regulation by state regulatory authorities and by the Federal Energy Regulatory Commission ("FERC"). They are also subject to EPA regulations directed at reducing emissions from power plants.

In addition, public utilities must comply with regulations promulgated by entities formed specifically to monitor and ensure reliability of the interconnected bulk power system. The North American Electric Reliability Corporation ("NERC") develops and enforces electric reliability standards; assesses seasonal and long-term reliability annually; monitors the bulk power system; investigates causes of power outages and potential violations of reliability standards; and educates, trains and certifies industry personnel.[13] NERC defines a reliable electric system as one with both adequate supply and system security:

> **Adequacy:** Adequacy means having sufficient resources to provide customers with a continuous supply of electricity at the proper voltage and frequency, virtually all of the time. Resources refer to a combination of electricity generating and transmission facilities that produce and deliver electricity, and demand-response programs that reduce customer demand for electricity. Maintaining adequacy requires system operators and planners to take into account scheduled and reasonably expected unscheduled outages of equipment, while maintaining a constant balance between supply and demand.
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> **Security*:*** For decades, NERC and the bulk power industry defined system security as the ability of the bulk power system to withstand sudden, unexpected disturbances, such as short circuits or unanticipated loss of system elements due to natural causes. In today's world, the security focus of NERC and the industry has expanded to include withstanding disturbances caused by man-made physical or cyber attacks. The bulk power system must be planned, designed, built and operated in a manner that takes into account these modern threats, as well as more traditional risks to security.[14]

The ISOs and RTOs also provide reliability assessments for their regions, as directed by NERC, and include tariff provisions to ensure system reliability on a regional basis.

One of the main concerns regarding coal plant retirements necessitated by the implementation of EPA regulations is that generation owners may be caught between conflicting regulatory schemes aimed at environmental protection and electric system reliability. So what happens when generating unit is needed for reliability, but operating that unit would be in violation of EPA regulations?

FERC does not have the statutory authority to just excuse an entity's obligation to comply with applicable EPA regulations. FERC is a "creature of statute," and has "no constitutional or common law existence or authority, but only those authorities conferred upon it by Congress."[15] Unless specifically required by statute, FERC's authority created by its enabling statute does not supersede or supplant the other federal laws applicable to a regulated entity like.[16] Moreover, in fulfilling its statutory duties, FERC itself is required to comply with other federal statutes.[17] Similarly, the EPA cannot override FERC's authority. The two agencies' regulations apply with equal force to regulated entities, and they (the agencies) have to find a way to implement their regulations in a manner that does cause electric system failure.

V. Are Reliability Impacts Unavoidable?

Recent reports by analysts offer hope that new construction of generation and regulatory flexibility in the implementation of environmental regulations will avoid significant impacts on system reliability.

In 2010, NERC, motivated by increased announcements of coal plant retirements, began assessing the potential reliability impacts of such retirements on the bulk power system.[18] NERC's most recent System Reliability Assessment does not anticipate that retirements and retrofits to meet future environmental regulations are not anticipated to cause reliability concerns this summer.[19] The Congressional Research Service has also concluded that it is unlikely that EPA regulations will cause major national reliability problems.[20] However, NERC points out the potential for reliability problems certain regional markets.[21]

Of particular concern are the areas of Texas served by the Electric Reliability Council of Texas ("ERCOT"), the grid operator for most of the state. Both NERC and the EIA have found that, in Texas, electric supply additions are falling behind the increased peak-hour demand.[22] In

its 2013 Summer Reliability Assessment, NERC noted that, while the reserve target for ERCOT is 13.75 percent, the Anticipated Reserve Margin for ERCOT is 12.88 percent for summer 2013. EIA attributes the narrowing of electric reserve margins and potential electric supply shortfall to Texas' robust economy and recent population growth, combined with current regulatory and market uncertainty, making investors reluctant to fund new projects within ERCOT.[23] EIA also points out that ERCOT is the only RTO that does not have a mechanism for paying for reserve supply, contrasted with the practice in most other RTOs of recovering, through retail electricity rates, the cost incurred by utilities to either build or contract for reserve generating capacity.

However, NERC notes that ERCOT is taking measures to mitigate the potential supply shortfall, including working with the Public Utility Commission of Texas and market participants to consider the possible recall of currently-mothballed units and the implementation of demand response (electricity conservation) programs.[24]

VI. Interim Solutions

To ensure system reliability during any interim period between coal plant retirements and construction of replacement generation, many generating units slated for closure will be identified as necessary for system reliability, delaying their decommissioning. Although this could be onerous for generation owners of coal plants that are uneconomic, ISOs and RTOs, charged with overseeing and maintaining electric system reliability within their footprint, have developed methods to ensure reliability while addressing the financial needs of the owners of generating units that have become prohibitively expensive to keep on line.

One temporary solution for generation owners is compensation under "reliability-must-run" arrangements. ISOs and RTOs perform regular reliability assessments and know which power plants support base load and are needed for system reliability. Occasionally, an ISO or

RTO will receive notice that a generation owner plans to permanently retire, or temporarily "mothball" a plant for various reasons, including retirements due to the high cost of retrofitting to comply with EPA regulations. To address those situations, the ISO and RTO tariffs often contain provisions to compensate a generation owner required to run an uneconomic unit to maintain electric system reliability, known variously as reliability-must-run resources, system support resources, and by other designations.

For example, the MidContinent Independent System Operator's ("MISO") Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff")[25] includes a System Support Resource program ("SSR").[26] The SSR program allows MISO to designate as units needed for system reliability, generation resources that would otherwise be retired for economic, environmental, or other reasons. Other ISOs/RTOs have similar provisions in their tariffs.

The MISO Tariff requires market participants to notify MISO when they are planning to temporarily shut down or retire any unit by submitting a form (Attachment Y to the MISO Tariff). MISO then performs a system reliability assessment to determine whether the unit is needed for system reliability.

If MISO determines that the unit is needed for reliability purposes, MISO then enters into a contractual arrangement with the market participant. The contracts typically contain detailed provisions as to how MISO will dispatch the unit and how the generation owner will be compensated. MISO considers, among other things, the following factors when negotiating compensation under the SSR program: fixed operating and maintenance costs; applicable state, federal or property taxes; and costs of repairs or upgrades needed to meet applicable environmental regulations or local operating permit requirements.[27]

Compensation for running an uneconomic unit may not solve the problem for all generation owners. As the EPA regulations are finalized and implemented, some coal plants will be required to retrofit or close. At this point, it is not entirely clear what would happen if a plant required to retrofit or close under EPA regulations was also needed for reliability.

Although the MISO Tariff does not specifically state that penalties incurred for operating a unit in violation of EPA regulations may be considered as a compensation factor; notably, compensation to the generation owner is a negotiable part of the agreement. However, although the generation owner could seek to be reimbursed for future EPA penalties during the negotiation phase, it is somewhat unlikely that MISO or other ISOs/RTOs would contract to reimburse a generation owner for knowingly violating a federal law. Moreover, at least in MISO, the contractual arrangement itself may protect a generation owner from having to operate a unit, even one designated as needed for reliability, in violation of EPA regulations. Section 13.J of SSR Standard Form Agreement, Attachment Y to the Tariff states:

> In the event of a conflict between this Agreement and an applicable federal, state, and local law, ordinance, rule, regulation, order of any Governmental Authority or tariff, the applicable federal, state, and local law, ordinance, rule, regulation, order of any Governmental Authority or tariff shall prevail, provided that Participant shall give notice to Midwest ISO of any such conflict affecting Participant.[28]

Based on the language in the Standard Form Agreement above, it is unlikely that MISO would seek to force a generation owner to operate units in violation of other federal laws and regulations. However, there is potential for conflict between the mandates of the EPA, FERC, NERC, and the entities charged with ensuring regional reliability.

These tariff provisions have been successful at maintaining regional reliability in response to *ad hoc* notifications of plant retirements. However, as some commenters have noted, must-run contractual arrangements are not designed to support multi-year, high-capital retrofit

investments.[29] Rather, they are temporary *status quo* operations to address reliability concerns. If EPA regulations are finalized and implemented, coal plants that fail to retrofit or retire by the deadlines specified in the rules could incur civil and criminal penalties. FERC and the EPA will have to resolve that conflict if a plant is required to stay on line as a must-run unit to support system reliability in violation of EPA regulations.

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1 *See*, *e.g.*, Steven Warren Blume, *Electric power system basics: for the nonelectrical professional*. John Wiley & Sons, 2007, ISBN 0470129875, at p. 199; Alan Wyatt, *Electric Power Challenges and Choices*, The Book Press Limited, Toronto, 1986 ISBN 0-920650-00-7, at p. 63.

2 Brownouts, so named because of the light dimming experienced during an intentional or unintentional drop in voltage, can be caused by a disruption of the electrical grid, or may occasionally be imposed in an effort to reduce load and prevent a blackout.

3 *Review of Coal Retirements*, M.J. Bradley & Assoc., LLC (Apr. 12, 2013), at p. 3, *available at* http://www.mjbradley.com/sites/default/files/Coal_Plant_Retirement_Review_Apr2013_0.pdf ("Bradley & Assoc. Report").

4 Annual Energy Outlook 2012, with Projections to 2035, U.S. Energy Information Administration (June 2012), *available at* http://www.eia.gov/forecasts/archive/aeo12/pdf/0383(2012).pdf.

5 Bradley & Assoc. Report at p. 2.

6 *Id.*

7 Metin Celebi, Frank Graves, & Charles Russell, *Potential Coal Plant Retirements: 2012 Update (Discussion Paper)*, The Brattle Group (Oct. 2012), at p. 10, *available at* http://www.brattle.com/_documents/UploadLibrary/Upload1082.pdf ("Brattle Group Paper").

8 *Id.*

9 Bradley & Assoc. Report at p. 2.

10 *Id.*

11 Brattle Group Paper at p. 7.

12 *Id.*

[13] *See* http://www.nerc.com/Pages/default.aspx.

[14] *Frequently Asked Questions,* North American Electric Reliability Corp. (Nov. 2012), at p. 1, *available at* www.nerc.com/AboutNERC/Documents/FAQs_DEC12.pdf.

[15] *Michigan v. EPA,* 268 F.3d 1075, 1081 (D.C. Cir. 2001)); *see also Atlantic City Elec. Co. v. FERC,* 295 F.3d 1, 8 (D.C. Cir. 2002); *Cal. Indep. Sys. Operator Corp. v. FERC*, 372 F.3d 395, 398 (D.C. Cir. 2004).

[16] *See*, *e.g.*, *Regulations Implementing the Energy Policy Act of 2005; Coordinating the Processing of Federal Authorizations for Applications under Sections 3 and 7 of the Natural Gas Act and Maintaining a Complete Consolidated Record*, Order No. 687, 117 FERC ¶ 61,076, at P19 (2006) ("the Commission has no ability to contract or expand a schedule established by federal law.").

[17] *See, e.g.*, *Duke Power Co.*, 112 FERC ¶ 62,168 (2005) (Commission is required to comply with provisions of the National Historic Preservation Act); *Nebraska Pub. Power Dist.*, 85 FERC ¶ 61,078, at 61,328 (1998) (noting the Commission's obligation under the Endangered Species Act); *Tennessee Gas Pipeline Co.*, 117 FERC ¶ 61,034, at P8 (2006) ("Congress has given the Commission additional duties under the National Environmental Policy Act of 1969. . . and other related statutes.").

[18] *Potential Impacts of Future Environmental Regulations*, North American Electric Reliability Corp. (Nov. 2011), *available at* http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/EPA%20Section.pdf ("NERC 2011 Report").

[19] *2013 Summer Reliability Assessment*, North American Electric Reliability Corp. (May 2013), at pp. 1, 5-6, *available at* http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/2013SRA_Final.pdf ("NERC 2013 Summer Reliability Assessment").

[20] James E. McCarthy & Claudia Copeland, *EPA's Regulation of Coal-Fired Power: Is a "Train Wreck" Coming?*, Congressional Research Service (July 11, 2011), *available at* http://www.fas.org/sgp/crs/misc/R41914.pdf ("CRS Report").

[21] *See* NERC 2013 Summer Reliability Assessment at pp. 1-2.

[22] *Id.*; *Electric supply additions are not keeping pace with increased peak-hour demand in Texas*, U.S. Energy Information Administration (June 24, 2013), *available at* http://www.eia.gov/todayinenergy/detail.cfm?id=11811 ("EIA Report").

[23] EIA Report.

[24] NERC 2013 Summer Reliability Assessment at p. 6.

[25] The entire MISO Tariff is *available at* https://www.midwestiso.org/Library/Tariff/Pages/Tariff.aspx.

[26] *See* MISO Tariff, Attachment Y.

[27] MISO Tariff, Section 38.2.7(i).

[28] MISO Tariff, Attachment Y, Section 13.J of the SSR Standard Form Agreement.

[29] Judah Rose, Kenneth Collison & Himali Parmar, *Retiring Coal Plants While Protecting System Reliability (White Paper),* ICF International, Inc. (July 26, 2011), at p. 24, *available at* http://www.icfi.com/insights/white-papers/2011/retiring-coal-plants-while-protecting-system-reliability ("ICF White Paper").