

Recent Electricity Price Increases and Reliability Issues Due to Coal Plant Retirements

Key Points

- The month of January 2014 saw two historic cold snaps in the Eastern U.S. The first, the polar vortex, brought the lowest temperatures in decades across the East and Southeast on January 3-8.ⁱ The second event during the last week of the month brought more record-cold temperatures to the Northeast and Midwest, along with paralyzing snow and ice to the Southeast.ⁱⁱ
- Both cold snaps resulted in:
 - Spikes in natural gas prices (as high as \$140/MMBtu);
 - Wholesale electricity price increases (as high as \$2,000/MWh); and
 - Measures to avoid electricity shortages (customers asked to reduce their use of electricity).
- The increasing use of natural gas to generate electricity is contributing to these wholesale electricity price increases.
- Over 20,000 MW of coal capacity may have retired already. Another 42,000 MW are slated for retirement in the next decade.ⁱⁱⁱ
- As these coal plants retire, the probability of electricity price increases and potential supply disruptions during periods of high natural gas prices is likely to increase.

Background. Interstate natural gas pipelines were originally constructed for natural gas local distribution companies (LDCs) to serve winter heating demand. Power plants were able to use underutilized capacity in the summer and shoulder months.^{iv} However, the electric power sector has gone from being

the smallest user of natural gas to the largest.^v Despite this trend, in many areas of the country, electric power generation is still “second in line” for natural gas, purchasing interruptible supplies that are available when pipelines are not fully utilized by customers with firm contracts (i.e., LDCs that supply home heating).^{vi} This can cause problems when high natural gas demand for space heating coincides with high electricity demand, primarily on very cold days.

Concerns from regulators and those responsible for the reliability of the electric system.

Both the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) have expressed concerns about the increasing reliance of the power sector on natural gas. In late 2011, FERC held a technical conference in Washington on electric system reliability related to compliance with EPA regulations. In early 2012, FERC Commissioner Phillip Moeller requested comments be inserted into a special docket on questions related to the impact of coal retirements and increased natural gas use for electric power generation. This was followed in 2012 by a series of workshops around the country on coordination between natural gas and electricity markets. In February, 2013, the Commission held a special technical conference entitled *Coordination between Natural Gas and Electricity Markets*. Additionally, FERC staff have produced four reports entitled *Gas-Electric Coordination: Quarterly Report to the Commission*, most recently on December 19, 2013.^{vii}

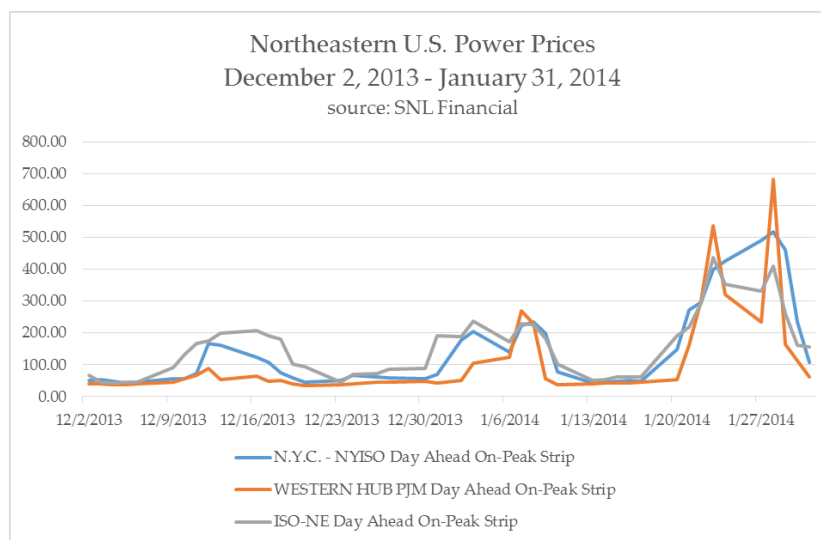
NERC has conducted two special reliability assessments in the past few years (2011 and 2013) focusing on the increased use of natural gas by the electric sector. In 2011, NERC stated that “increased dependence on natural gas for generating capacity can amplify the bulk power system’s exposure to interruptions in natural gas fuel supply and delivery.”^{viii} In 2013, NERC noted that differences between the two systems can result in a “mismatch between the availability of gas delivery services and gas demand for electricity generation.”^{ix}

In its winter 2013-2014 reliability assessment, NERC concluded that, “... the concerns are high priority in areas where (1) power generators rely on interruptible gas pipeline transportation, (2) natural gas interstate pipelines are

constrained to meet demand beyond what has been contracted and committed, and (3) gas use for power generation is growing the fastest.” Further, NERC warned that the previous winter had strained the system in New England: “The 2012-2013 winter period demonstrated that New England’s natural gas dependency risk continues to escalate and existing fuel arrangements of many generators will lead to continued challenging and complex operating conditions when the power system and fuel supply deliveries are stressed.”^x

Projected increases in electricity prices. This past fall, the Brattle Group published a report projecting increases in electricity prices due to coal plant retirements using the PJM Interconnection (the power pool that serves the mid-Atlantic (including Washington, DC, Philadelphia, and New Jersey) and the eastern Midwest (Ohio)) as a case study. Brattle stated that two factors can lead to higher electricity prices as coal plants retire: first, the reduction in the available supply of electricity pushes power prices higher as more expensive resources are dispatched; and, second, power prices increase as natural gas prices increase due to greater gas demand from the electric sector. In its case study, Brattle found that without retirements, on-peak eastern PJM prices are projected to average \$40-50/MWh between now and 2020, and off-peak prices are projected to average \$30-40/MWh. With coal retirements, Brattle states that on-peak prices could increase by \$9-11/MWh, and off-peak prices could increase by \$5-6/MWh. In other words, Brattle found that, in eastern PJM, coal retirements may cause wholesale peak electricity prices to increase by 22-28 percent and that off-peak prices could increase by 16-20 percent.^{xi}

Predictions are borne out: January 2014. These concerns and predictions became a reality during January 2014. Two historical cold snaps resulted in greatly increased wholesale electricity prices and calls for electricity conservation in the East. The chart below illustrates day-ahead peak prices for early December 2013 – January 31, 2014 at the PJM Western Hub, the New York ISO New York City hub, and at ISO New England. It shows prices in early and mid-December around the averages for these areas (\$45-\$60/MWh)^{xii} and peaks during the first and last weeks in January up to or exceeding *ten times* these averages.



In fact, on January 23, 2013, PJM had to seek FERC approval to exceed its electricity price cap of \$1,000/MWh.^{xiii} Despite lifting the price cap, power supplies remained dangerously low. During both events, on January 6-8 and again on January 23 and 27, PJM issued special calls for consumers to conserve electricity “to ensure adequate power supplies.”^{xiv}

Analysts have found that coal retirements and increased reliance by the power sector on natural gas were linked to price spikes and reliability issues. ICF International, in a January 21 report examining the early January event, observed that, during the polar vortex event, many independent system operators “were forced to issue emergency alerts and call reserves or reduce voltage. This raises the question as to whether the system operated reasonably well under extreme circumstances, or alternatively, whether changes in the resource mix with coal retirements, increased reliance on natural gas ... may be inadvertently compromising grid reliability and/or resulting in very high prices that might be avoided.”^{xv}

ICF went on, in an addendum to this report, to state, with respect to projected coal plant retirements in PJM that “There is little doubt that if these retirements had all already occurred without other offsetting changes such as lower forced outage rates at oil and natural gas and other plants, and the construction of alternative resources, the results would have been more dire. Rather than PJM instituting voltage reductions, **there would likely have been rolling blackouts**

threatening space heating, and hence, public health and safety.”^{xvi} (Emphasis added.)

ICF found that, during the polar vortex event, a significant number of gas unit outages (up to one-third of the outages in PJM) were due to a lack of natural gas, because it was being used by firm (home heating) customers. ICF stated that many of the power plant outages during the polar vortex event “... were due to lack of natural gas delivery capability to generators that rely on interruptible capacity.”^{xvii}

The Energy Information Administration (EIA) reached the same conclusions, emphasizing unprecedented natural gas prices as the major factor in electricity price spikes. “Day-ahead, on-peak power prices at the Massachusetts Hub went ... up to \$237.75/MWh during the early January freeze ... In PJM, [r]eal-time, hourly prices during January 7-8 reached as high as the \$800/MWh range with 15-minute periods of more than \$2,000/MWh. These prices were mainly driven by corresponding movements in natural gas prices as the demand for natural gas for both power and heating led to full use of natural gas pipelines in the region and a scarcity of supply.” As to natural gas prices: “Prices at the Algonquin Citygate trading point in Massachusetts, which normally remain around \$3-\$6/MMBtu during unconstrained periods, reached slightly over \$30/MMBtu in mid-December 2013 and were up to \$38.09 in early January.”^{xviii}

Natural gas prices were even higher for PJM during mid-January, prompting the power pool’s appeal to FERC to loosen electricity price caps (see above). PJM stated in its filing to FERC that “[p]ublished natural gas prices to two key citygates in the PJM Region, for trades on January 21 and delivery on January 22, *averaged* over \$120/MMbtu, and included high prices for the day of up to \$140/MMbtu.”^{xix} (Emphasis added.)

Electricity price spikes and shortages could continue in the future as more coal plants retire. These high wholesale electricity prices and potential shortages could continue into the future. Nick Akins, Chairman, President, and CEO of AEP, stated on the company’s fourth quarter 2013 earnings call: “Looking at the physical side, when 89% of our coal capacity slated for retirement in mid-2015 is called upon and running, natural gas

delivery is challenged, and voltage and load reductions are occurring, it is another reminder that we should carefully plan and design this social safety net we call the electric grid to meet extreme requirements.’” He went on to say that “AEP management expected power prices to rise around 2015, corresponding roughly with the planned retirement of many of its coal plants, but the recent weather-caused rise in power prices, and the degree they have risen, is surprising.”^{xx} (emphasis added)

February 6, 2014

ⁱ The Weather Channel, “Deep Freeze Recap: Coldest Temperatures of the Century for Some,” January 10, 2014, <http://www.weather.com/news/weather-winter/coldest-arctic-outbreak-1990s-midwest-south-east-20140103>, accessed January 30, 2014.

ⁱⁱ The Weather Channel, “January Closes Out with Another Arctic Blast,” January 29, 2014, <http://www.weather.com/news/weather-forecast/arctic-cold-finish-january-20140117>, accessed January 30, 2014; CNN, “Georgia, Alabama Clear Vehicle-Littered Streets as Deep Freeze Sets In,” January 30, 2014, <http://www.cnn.com/2014/01/29/us/winter-weather/>, accessed January 30, 2014.

ⁱⁱⁱ ACCCE, *Coal Unit Shutdowns*, January 26, 2014.

^{iv} North American Electric Reliability Corporation, *2013 Special Reliability Assessment: Accommodating an Increased Dependence on Natural Gas for Electric Power: Phase II: Vulnerability and Scenario Assessment*, May 2013.

^v North American Electric Reliability Corporation, *2011 Special Reliability Assessment: A Primer of the Natural Gas and Electric Power Interdependency in the United States*, December 2011.

^{vi} North American Electric Reliability Corporation, *2013 Special Reliability Assessment: Accommodating an Increased Dependence on Natural Gas for Electric Power: Phase II: Vulnerability and Scenario Assessment*, May 2013.

^{vii} See FERC web page on Electric-Natural Gas Coordination, <http://www.ferc.gov/industries/electric/indus-act/electric-coord.asp>, accessed February 2, 2014.

^{viii} North American Electric Reliability Corporation, *2011 Special Reliability Assessment: A Primer of the Natural Gas and Electric Power Interdependency in the United States*, December 2011.

^{ix} North American Electric Reliability Corporation, *2013 Special Reliability Assessment: Accommodating an Increased Dependence on Natural Gas for Electric Power Phase II: A Vulnerability and Scenario Assessment for the North American Bulk Power System*, May 2013.

^x North American Electric Reliability Corporation, *2013-2014 Winter Reliability Assessment*, November 2013.

^{xi} The Brattle Group, *Coal Plant Retirements: Feedback Effects on Wholesale Electricity Prices*, November 2013.

^{xii} 2013 average day-ahead on-peak prices for NEPool were \$59.90, and those for PJM Pennsylvania were \$45.74. EIA, *Wholesale Market Data, Day Ahead Wholesale Prices at Selected Hubs*, 2013.

^{xiii} “FERC eases price cap in PJM amid unprecedented gas price spikes,” *Greenwire*, January 27, 2014.

^{xiv} See: PJM Interconnection, LLC, “Announcements and News Releases,” <http://www.pjm.com/about-pjm/newsroom/announcements-and-news-releases.aspx>, accessed February 2, 2014.

^{xv} ICF International, *Polar Vortex Energy Pricing Implications – Commercial Opportunities and System Reliability*, January 2014.

^{xvi} ICF International, *Addendum to Polar Vortex Energy Pricing Implications – Commercial Opportunities and System Reliability*, January, 2014.

^{xvii} *Ibid.*

^{xviii} EIA, *Today in Energy*, “Northeast and Mid-Atlantic power prices react to winter freeze and natural gas constraints,” January 21, 2014, <http://www.eia.gov/todayinenergy/detail.cfm?id=14671>, accessed January 30, 2014.

^{xix} Before the Federal Energy Regulatory Commission, “REQUEST OF PJM INTERCONNECTION, L.L.C. FOR WAIVER AND FOR COMMISSION ACTION BY JANUARY 24, 2014, Docket ER 14-____-00, January 23, 2014.

^{xx} SNL Financial, “As PJM leans on coal plants in the cold, AEP questions market rules,” January 27, 2014.