Natural Gas Price Risk: An Anomaly of Last Winter or a Warning for Wisconsin?

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This conference is being held to evaluate if last winter's natural gas volatile price movements were the sole result of bitter cold temperatures or if there are some underlying issues impacting natural gas deliveries into Wisconsin that require additional attention. And, if so, are there lessons learned from other regions to assist Wisconsin in solving those underlying issues to insure a future of competitively-priced, reliable natural gas supplies to residential, commercial, and industrial customers, as well as the electric power sector.

This document provides background information, as well as some points of interest, for this discussion.

How cold was last winter? The winter of 2013-2014 ranked in the top ten coldest winters ever for the state of Wisconsin. In fact, fourteen Wisconsin cities in the north-central and northeast observed the coldest winter on record. Nationwide, last winter was one of the two coldest winters recorded in the last quarter century, and U.S. consumption of natural gas reached its highest level ever on January 7, 2014, topping 137 Bcf/day for the first time in history. That level of consumption is the equivalent of supplying the entire U.S. twice-over on an average day.

How was supply impacted? With shale production growth in the Appalachians, natural gas production levels in the Lower-48 states reached a record high in January 2014, exceeding January 2013 production levels by 3.86 Bcf/day. Record production levels helped to offset well freeze-offs[1]. The duration of freeze-offs were generally short, usually lasting less than one day. Even so, freeze-offs totaled 132 Bcf or on average 1 Bcf/day from December 1, 2013, through late-March 2014, whereas during a normal winter, freeze-offs impact 30-40 Bcf of natural gas supplies[2]. A freeze-off is not necessarily considered a force majeure, and therefore, suppliers impacted by well freeze-offs may need to secure natural gas supplies elsewhere to cover their contractual obligations. With more natural gas production moving onshore, it is possible that freeze-offs may become more common.

How did the cold weather impact natural gas prices? Natural gas prices at the Henry Hub[3] were trading at around $3.50 per MMBtu in November 2013. With the colder weather, natural gas prices at the Henry Hub increased to a five-year high in February 2014, but still reached just one-half of where prices reached in prior cold winters. In February 2014, natural gas prices at the Henry Hub fluctuated between $4.50 -$6.50 per MMBtu with the exception of reaching a peak of $8.15 per MMBtu on February 10, 2014. By comparison, during a one-week cold spell in February 2003, which was not even as cold as this past winter, natural gas prices at the Henry Hub fluctuated between $8.42 and $18.48 per MMBtu.

[1] A well freeze-off occurs when the small amount of water produced alongside the natural gas crystallizes inside the pipeline at or near the production wells, completely blocking off the flow of natural gas, and thus shutting down the well. There are several ways to remedy this situation: wait for the weather to get milder, add insulation, pump methanol through the pipes, or apply external heat. Historically, freeze-offs occur when regions with typically mild weather experience unusually cold conditions.

[2] Data on well freeze-offs sourced from *Bentek/Platts Gas Daily*, March 31, 2014.

[3] The Henry Hub is a physical location in southern Louisiana, which connects to more than a dozen interstate pipelines. The Henry Hub is widely used as a national benchmark for the price of natural gas supply because it is also the pricing point for the natural gas futures contract traded on the New York Mercantile Exchange (NYMEX).

How did the cold weather impact delivered natural gas prices? If a company contracted in advance for its delivered natural gas at a pre-determined price, the cold weather did not likely influence the delivered natural gas price for that contracted volume. Conversely, if a company did not contract in advance for its delivered natural gas, they were likely subject to spot market prices.[4] Delivered spot market prices will vary depending on the city gate[5] delivery point. For example, spot market, city gate delivered prices to Wisconsin were around $3.75/MMBtu in early November 2013. In February 2014, spot market, city gate delivered prices to Wisconsin ranged from $7.00/MMBtu to $40.00/MMBtu. Similarly, parts of New York and New England saw spot market, city gate prices skyrocket to over $100/MMBtu at times this past winter.

What was all the talk about a "basis" blowout? In the natural gas industry, basis is defined as the difference between the Henry Hub price and the value of natural gas delivered to another location. On November 1, 2013, the price at the Henry Hub was $3.57/MMBtu, and the spot market, city gate price delivered to Wisconsin was $3.72/MMBtu, making the basis $0.15/MMBtu. However, on February 27, 2014, the price at the Henry Hub was $4.84/MMBtu, and the spot market, city gate price delivered to Wisconsin was $22.75/MMBtu, making the basis $17.91/MMBtu.

What caused the basis price volatility? Basis prices incorporate regional current market conditions. For the Northeast, the Energy Information Administration (EIA) issues *Energy Market Alerts* for both natural gas and electricity during times of rising spot market, city gate prices to that region. The EIA issued *Energy Market Alerts*[6] for the Northeast in January 2013 and January 2014, as well as July 2013. In its review of winter conditions, the EIA stated that high basis differentials in the Northeast both this past winter and the winter of 2012-2013 suggest "a delivery system that is stretched significantly."[7] Record heating demand was driven by bitter cold weather, but demand from the power generation sector also played a significant role in the Northeast. According to the EIA, in 2001, natural gas-fired power generation in New England accounted for 30% of the region's electricity production. That percentage climbed to 52% this past winter, even though there has been virtually no change in the region's natural gas pipeline infrastructure.[8] The EIA does not offer *Energy Market Alerts* for the Midwest, although it is likely that the Midwest encountered similar market conditions relative to high heating demand and high demand from the electric power sector.

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[4] Spot market prices reflect a price for delivering natural gas on the next day. A spot market price will reflect the perceived value of natural gas at a specific location.

[5] A city gate is a physical location where the natural gas is transferred from an interstate pipeline to a natural gas local distribution company (LDC). At this location, pipeline pressures are often reduced to allow for redelivery of the natural gas to a home or business. The price at the city gate includes the wellhead price of natural gas (the cost of the natural gas at the point of extraction), as well as the cost of transporting it via interstate pipeline to the city gate. City gate prices reflect local weather trends, usage patterns, and delivery capabilities by the pipelines serving that region.

[6] See EIA Energy Market Alerts. http://www.eia.gov/special/alert/east_coast/

[7] See EIA Market Digest: Natural Gas (2013-2014). http://www.eia.gov/naturalgas/review/deliverysystem/2013/

[8] There were virtually no new major pipeline expansions in New England between 2001 and 2013 despite climbing demand from the electric power sector. There are, however, several new pipeline projects underway as a result of prolific production from the Appalachian-based Marcellus and Utica shale basins.

How much did delivered natural gas prices influence electricity prices and vice versa? The majority of natural gas-fired electric power plants secure their natural gas on a "need-to-have-it" basis in the spot market, counting on the fact that there will be enough natural gas supply and interstate pipeline capacity available. Because there are no commercially-viable ways to store electricity, natural gas-fired electric power plant operators do not want to contract for more natural gas than is needed, especially since they lack certainty about when their plant will be dispatched by the regional grid operator. This means during times of constraint, natural gas-fired power plant operators may be very active buyers of in the spot market if called upon to run by the regional grid operator. As with any competitive market, when there are more buyers than sellers, prices tend to move higher. This was evident on the Pennsylvania-New Jersey-Maryland (PJM) Interconnection, the Regional Transmission Organization (RTO) serving the Northeast. During the coldest two days in January, PJM dispatched "all available generation" for a certain number of hours. This meant that all natural gas-fired generation operators were "required" to schedule gas deliveries at whatever the spot market prices dictated, even if less expensive units or more efficient units were available. PJM says natural gas scheduling issues caused most of the $597 million in out-of-market make-whole (uplift) charges[9] in January 2014. In its January 7, 2014, *Energy Market Alert,* the EIA points out that spot market day-ahead electricity prices in both New York and New England climbed to over $200 per megawatt-hour (MWh), roughly five to six times the average day-ahead price in the fourth quarter of 2013. Platts even reported a day-ahead electric price of $548.83/MWh in one of the PJM easternmost markets.

How did the Midwest fare in comparison to PJM? According to a report by the Midwest Independent System Operator (MISO)[10], MISO markets performed well despite the historic cold temperatures. Similar to PJM, MISO hit a new peak of 109.3 gigawatts on January 6, 2014, a level that was 9% higher than the prior winter peak.[11] According to MISO's report, they continued to rely on coal-fired generating resources for the majority of the time. Meanwhile, spot market, day-ahead electric prices in January 2014 averaged $56.55/MWh, about double the level in September 2013, but rose to $400/MWh on January 28[12]. MISO's analysis concludes that the rising cost of spot market, delivered natural gas prices contributed to the rising cost of spot market, day-ahead electricity prices.

When there are constraints, who is first in line to receive the natural gas? The answer to this question is directly related to the contracted level of reliability, and customers with the highest level of contracted reliability receive top priority when constraints occur. Conversely, those customers with the lowest level of contract reliability are at a greater risk of being curtailed or interrupted.

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[9] Out-of-market make-whole (uplift) charges are payments made to market participants under certain market conditions to ensure they do not operate at a loss.

[10] MISO 2013-2014 Winter Assessment Report, Information Delivery and Market Analysis, June 2014. https://www.misoenergy.org/Library/Repository/Report/Seasonal%20Market%20Assessments/2014%20Winter%20Assessment%20Report.pdf

[11] MISO also *January 2014 Extreme Weather Event – MISO Preliminary Review* discussing actions taken. https://www.misoenergy.org/Library/Repository/Communication%20Material/Key%20Presentations%20and%20Whitepapers/January2014ExtremeWeatherEvent_PreliminaryReview_MISO.pdf

[12] *IMM Monthly Market Metrics Report*, January 2014. https://www.misoenergy.org/Library/Repository/Report/Seasonal%20Market%20Assessments/2014%20Winter%20Assessment%20Report.pdf

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