



Monitoring
Analytics

PJM Energy Market Offer Caps: January 1 through 8, 2018

The Independent Market Monitor for PJM
January 19, 2018

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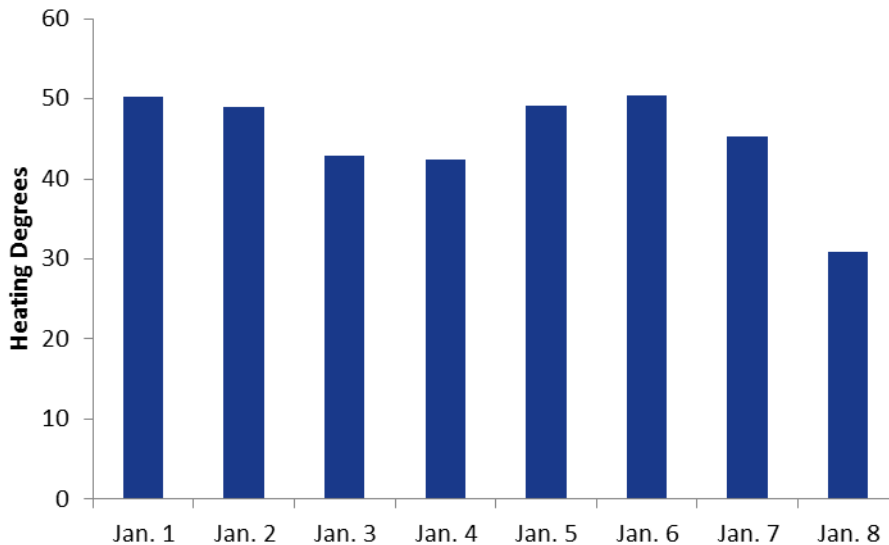
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Market Conditions

During the first week of January 2018, the PJM market footprint experienced extremely low temperatures. The average PJM wide temperature did not exceed 20 degrees Fahrenheit from December 28, 2017, to January 7, 2018. Figure 1 shows the heating degrees for January 1 through 8, 2018. The average for the first week of January was 47 heating degrees, compared to daily averages of 23.4 heating degrees in January 2017 and 29.4 heating degrees in January 2016.

Figure 1 Daily Heating Degrees, January 1 through 8, 2018¹



Both electricity and natural gas demand rose to high levels. Daily peak electricity demand exceeded 130,000 MW on each day from January 2 through January 6, 2018, peaking on January 5 at 138,465 MW.² Natural gas prices reached levels that caused the short run marginal costs of natural gas fired generators to exceed \$1,000 per MWh on January 4 through 8, 2018.

¹ A heating degree day is defined as the number of degrees that a day's average temperature is below 65 degrees F (the temperature below which buildings need to be heated). A cooling degree day is the number of degrees that a day's average temperature is above 65 degrees F (the temperature when people will start to use air conditioning to cool buildings). PJM uses 60 degrees F for a heating degree day as stated in Manual 19.

² "Cold Weather Summary: December 27, 2017 – January 7, 2018," PJM Presentation to the Operating Committee, January 9, 2018. <<http://pjm.com/-/media/committees-groups/committees/oc/20180109/20180109-item-04-cold-weather-summary.ashx>>.

The PJM region natural gas pricing hubs most affected were TETCO M-3, Transco Zone 5, Transco Zone 6 Non-New York, and Transco Zone 6 New York. Table 1 describes the geographic areas in the PJM region where each natural gas trading hub determines the replacement cost of fuel. Natural gas prices ranged from \$20 per MMBtu to \$150 per MMBtu for these hubs during the first week of January. Natural gas prices in the Appalachian region remained below \$10 per MMBtu. Natural gas prices in the Chicago area peaked on January 3, 2018, also remaining below \$10 per MMBtu despite pipeline restrictions.

Table 1 Natural Gas Trading Hub Geography

Natural Gas Trading Hub	Approximate Pricing Area in PJM
TETCO M-3	Central and Eastern Pennsylvania
Transco Zone 5	Virginia, Washington DC, Baltimore
Transco Zone 6 Non-New York	Eastern Pennsylvania, Northern Maryland, Delaware, Southern New Jersey
Transco Zone 6 New York	Northern New Jersey

For gas day January 4, 2018, prices in these areas rose high enough to cause energy offers to exceed \$1,000 per MWh for natural gas fired generators with high heat rates.³ For gas day Friday, January 5, 2018, most natural gas fired generators in the eastern part of the PJM footprint experienced short run marginal costs exceeding \$1,000 per MWh. For the weekend through the morning of Monday, January 8, a small subset of higher heat rate units had short run marginal costs exceeding \$1,000 per MWh. Table 2 provides example calculations of natural gas fired generator fuel costs over the relevant range of heat rates and gas prices to demonstrate which levels result in short run marginal costs exceeding \$1,000 per MWh.

Table 2 Example Calculations of Generator Fuel Costs (\$ per MWh)

Gas Price (\$ per MMBtu)	Heat Rate (MMBtu per MWh)		
	6	10	20
\$20	\$120	\$200	\$400
\$50	\$300	\$500	\$1,000
\$80	\$480	\$800	\$1,600
\$100	\$600	\$1,000	\$2,000

³ The gas flow day begins at 10:00 AM Eastern Prevailing Time and continues until 10:00 AM on the following day.

Summary of Offers Above \$1,000 per MWh

In the first week of January, 83 units had cost-based incremental offers above \$1,000 per MWh and 69 units had price-based incremental offers above \$1,000 per MWh. These units are owned by 18 parent companies.⁴ Not all resources with cost-based offers above \$1,000 per MWh were natural gas fired. In these cases, cost-based offers above \$1,000 per MWh were caused by high VOM adders.

In the Day-Ahead Energy Market, no units set the LMP with an offer segment above \$1,000 per MWh. No units were made whole to a total offer above \$1,000 per MWh via day-ahead operating reserve credits (DAOR).⁵

In the Real-Time Energy Market, no units set the LMP with an offer segment above \$1,000 per MWh. Thirteen units were made whole to a total offer above \$1,000 per MWh via balancing operating reserve credits (BOR). None of the 13 units were made whole to an incremental offer above \$1,000 per MWh. The resulting total offers above \$1,000 per MWh were due to the no load and start cost.

DAOR and BOR credits are preliminary. The Market Monitor is investigating the cause of BOR credits above \$1,000 per MWh.

Offer Verification

The Market Monitor and PJM requested documentation regarding cost-based incremental offers above \$1,000 per MWh. Market Sellers are responsible for providing documentation supporting the high natural gas prices that led to incremental offers above \$1,000 per MWh. The Market Monitor will verify the offers based on the approved Fuel Cost Policy and natural gas market data available. The Market Monitor will recommend that PJM impose penalties according to Schedule 2 of the Operating Agreement for noncompliant cost-based offers.

Offer Cap Violations

In the first week of January, the Market Monitor observed incremental energy offers in violation of the offer cap provisions in the PJM tariff (“OATT”) and Operating Agreement. The PJM OATT and Operating Agreement require that all incremental

⁴ Effective January 8, 2017, PJM had 1,334 units, 476 use natural gas as their primary fuel source. Units are the market resource modeled by PJM. A unit can be a group of generators (e.g. combined cycles) or separate shares of a generator (e.g. generators owned and marketed by multiple companies).

⁵ The total offer was calculated as the area under the incremental offer curve, plus the no load cost, plus the applicable start cost divided by the total MWh made whole.

energy offers exceeding \$1,000 per MWh be cost based.⁶ An incremental energy offer on the price offer schedule that exceeds \$1,000 per MWh cannot exceed the incremental energy offer on the cost offer schedule for the corresponding MW level. If the price offer does exceed the cost offer for a corresponding MW level, the cost offer schedule must be used. A price offer over \$1,000 per MWh that exceeds the cost offer at any MW level constitutes a tariff violation.

From the OA, Section 1.10.1A (d) (viii), offers:

Shall not exceed an energy offer price of \$1,000/megawatt-hour for all generation resources, except (1) when a Market Seller's cost-based offer is above \$1,000/megawatt-hour and less than or equal to \$2,000/megawatt-hour, then its market-based offer must be less than or equal to the cost-based offer; and (2) when a Market Seller's cost-based offer is greater than \$2,000/megawatt-hour, then its market-based offer must be less than or equal to \$2,000/megawatt-hour;

The Market Monitor and PJM reminded violating Market Sellers of the rules during the week. Market Sellers corrected many of their noncompliant price offers, addressing inappropriately high price offers and uplift payments. No violating offers set prices above \$1,000 per MWh. No units received uplift based on violating offers. Some units may have been economically withheld based on the violating offers, particularly dual fuel resources offered based on gas in the price based offer and less expensive oil in the cost offer.

In its 2015 filing supporting the current offer cap rule, PJM describes why it accepts price offers exceeding \$1,000 per MWh. PJM states:

This proposed revision accounts for the fact that when Market Sellers submit their cost-based and market-based offers, PJM's systems automatically select the lower of the two offers. If a Market Seller's market-based offer were not allowed to rise along with a cost-based offer that exceeds \$1,000/MWh, PJM's systems would automatically select the lower, market-based offer, which would still be capped at \$1,000/MWh. To be clear, this proposed revision will not allow other Market Sellers that do not have legitimate cost-

⁶ See "Energy Price Offers in Excess of \$1,000 per MWh," IMM Market Message (January 6, 2018) <http://www.monitoringanalytics.com/reports/Market_Messages/Messages/Energy_Offers_Greater_Than_1000_Per_MWh_20180106.pdf>.

based offers greater than \$1,000/MWh, as calculated in accordance with the Cost Development Guidelines and applicable fuel cost policy, to submit market-based or cost-based offers greater than \$1,000/MWh.⁷

PJM's systems do not block offers on price schedules greater than \$1,000 per MWh, regardless of the level of the corresponding cost based offer. PJM will change this functionality upon Federal Energy Regulatory Commission approval of its Order No. 831 compliance filing requiring *ex ante* verification of offers exceeding \$1,000 per MWh.^{8 9}

Issues

Pipeline Penalty Rates in Gas Prices

Natural gas pipelines and local distribution companies ("LDCs") charge unauthorized use penalties to customers who take certain defined actions that may threaten the operations of the pipeline. In a 2016 order for the New York Independent System Operator, the Commission found that "[a]llowing the recovery of the cost of the penalties would neutralize the economic incentive for generators to adhere to interstate natural gas pipeline and LDC tariff requirements, contrary to the purpose of the penalties."¹⁰

In the first week of January 2018, natural gas prices on the Intercontinental Exchange ("ICE") and price quotes from independent, third party gas suppliers to some PJM generators reached levels reflecting the inclusion of an unauthorized use penalty. PJM generators' fuel cost policies do not allow for the addition of penalty gas costs to market gas prices. However, fuel cost policies allow the use of prices determined by the natural gas market, such as ICE prices and third party quotes. As a result, some cost based offers included the price of penalty gas.

High Cost Offer Inputs

Some generating units' cost-based offers reached levels exceeding \$1,000 per MWh at lower fuel prices than other similar units due to high heat rates and/or high variable operations and maintenance ("VOM") costs. The Market Monitor has recommended that

⁷ Filing to Increase Energy Offer Cap, PJM Interconnection, LLC, FERC Docket No. ER16-76 (October 14, 2015) at 7.

⁸ See FERC Docket ER17-1567.

⁹ See "Energy Offer Verification Education Session," PJM Presentation to the Tech Change Forum (September 27, 2017) at 7.

¹⁰ *New York Independent System Operator, Inc.*, 154 FERC ¶ 61,111 (February 18, 2016) at P39.

PJM restrict VOM costs to short run marginal costs by excluding maintenance costs and cyclic peaking factors from cost based offers.¹¹ The high VOM costs that resulted in offers greater than \$1,000 per MWh were not consistent with the Market Monitor's recommendation.

Hourly Fuel Reporting

As part of the implementation of hourly and intraday offers beginning November 1, 2017, PJM rules allow dual fuel units to update the availability of their cost schedules intraday as fuels become available or unavailable intraday. For example, if a dual gas and oil fired combustion turbine unit is unable to purchase gas, it may make its gas cost schedule unavailable, leaving its oil cost schedule available for PJM commitment. But the PJM rules do not permit dual fuel units to submit multiple price schedules or to change the availability of price schedules intraday. The ability to change schedule availability intraday in the Markets Gateway system is not allowed for units not designated as dual fuel.¹²

During the first week of January 2018, PJM committed most dual fuel units on their price schedules. The price schedule includes a fuel type designation that cannot change intraday. In some cases, units ran on price schedules designated with oil as the fuel type with prices exceeding \$1,000 per MWh, based on a gas price. Offers submitted with incorrect fuel types complicate the evaluation of the correct application of the \$1,000 per MWh offer cap rule.

¹¹ See the 2017 State of the Market Report for PJM: January through September, Vol. 2, Section 3 Energy Market, p. 146.

¹² See "Intraday Offers Education," PJM Presentation to the Tech Change Form, September 15, 2017 <<http://pjm.com/-/media/committees-groups/forums/tech-change/20170915/20170915-intraday-offers-education.ashx>>.