

Testimony of F. Stuart Bresler, III
on Behalf of PJM Interconnection

Pennsylvania House Consumer Affairs Committee
April 10, 2014





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Good morning, Chairman Godshall, Chairman Daley, members of the Pennsylvania House Consumer Affairs Committee. My name is Stu Bresler, and I am PJM's Vice President of Market Operations. I appreciate the opportunity to appear before you today. PJM is responsible in maintaining the reliability of the bulk electric system, commonly known as 'the grid', in conjunction with running the world's largest wholesale electricity market. PJM is the federally-regulated Regional Transmission Organization (RTO) operating in all of Pennsylvania and all or parts of twelve other states and the District of Columbia. Its day-to-day operations, market structure, and transmission system planning provide a foundation at the wholesale level for reliable and competitively priced retail electricity for 61 million people in a 243,000 square mile market area. PJM's market does not encompass Pennsylvania retail transactions or the Pennsylvania retail market, which is under the jurisdiction of the Pennsylvania Public Utility Commission.

Today, in addition to discussing PJM's typical operation of the grid and wholesale electricity markets, I will discuss with you PJM's System and Market Operations during the month of January 2014. As you are aware, extraordinarily cold weather gripped Pennsylvania and much of the United States during much of the month January. As a rule, electric demand tends to reach its peak in the winter when the weather is coldest and in the summer when the weather is at its hottest, as electricity is used for heating in the winter and for air conditioning in the summer. Demand for electricity was considerably higher this January, with many days experiencing demand that was 15,000 MWs to 20,000 MWs above the normal January peaks – or the amount equivalent to the power produced by 12 to 15 nuclear generators. January's cold weather resulted in much higher than normal generation outages, which along with an increase in dependency on natural gas for electric generation within PJM over the past five years, greatly complicated our System Operations and resulted in significantly higher wholesale electricity prices during the month of January. I will discuss the challenges we were able to meet in January, and those that we see in the not-so-distant future, as we continue the transition in PJM to less coal and more natural gas generation.

Arctic Weather, High Power Demands and Operational Challenges Met

PJM and its member companies successfully met unprecedented high demand during the January periods of extremely cold temperatures. Neighboring regions also experienced high demands and tight power supplies. PJM set a new wintertime peak demand record of 141,312 megawatts on January 7, and eight of the 10 all-time highest wintertime hourly peak demands occurred in January 2014. The month also saw the highest wintertime electricity use ever in PJM (77,950,000,000 kilowatt-hours) and is the only winter month among the top 10 months for electricity use in PJM's history. In fact, only 18 U.S. states used more electricity during the entire year of 2012 than consumers in the PJM footprint used during the single month of January 2014.

During several periods in January's cold weather, PJM through its emergency procedures, called on all available resources, and at times called on voluntary reduction by the general public. At times, we called on load management resources, which responded voluntarily because January is not currently part of the period when load management capacity resources are required to respond. The experience this January reinforces the value of PJM's capacity market rule changes to encourage more annual demand resources and demonstrates the value of load management to system reliability throughout the year.

Power Prices and Spiking Natural Gas Prices

Despite the challenges, the PJM wholesale energy markets successfully 'kept the lights on'. When spiking natural gas prices pushed some generators' costs above the existing \$1,000/megawatt-hour cost-based offer cap, PJM sought and received a temporary waiver from the Federal Energy Regulatory Commission (FERC) to allow "make whole payments" to those generators through uplift charges to wholesale power buyers. Subsequently, the FERC approved a second waiver allowing cost-based offers to exceed the cap and to set the locational marginal price (LMP). Reflecting the higher costs in LMP rather than in ancillary service charges maintains price transparency and enables wholesale power buyers to hedge against higher costs. For those reasons, retail power suppliers supported the waiver. Prior to January, the PJM stakeholder process – through the Energy Market Up-lift Senior Task Force – had begun discussions on the best ways to minimize uplift charges like these.

Wholesale power prices were affected by high demand, spiking natural gas prices and generators' forced outages. At the time of the peak demand hour on January 7, approximately 20 percent of total installed generation capacity in PJM (of all fuel types) was unavailable because of forced outages associated with routine equipment breakdowns, problems related to operating in extreme cold temperatures and, to a lesser extent, fuel-supply issues. (For example, curtailment of natural gas supplies to generators caused about 3 percent of generation to be unavailable during the peak demand hour on January 7.) January natural gas prices were much higher than recent averages as cold weather increased use of gas. On January 7, spot market natural gas prices in the eastern portion of the PJM footprint were about 15 times the average price for the previous four months, and on January 22 they were 27 times the previous four months average. The high cost of natural gas directly impacted the cost to produce electricity through PJM's LMP. When gas prices were at their highest, the cost to produce electricity from a gas-fired generator sometimes exceeded \$1,000 per megawatt-hour.

Because wholesale electricity prices have been stable and very low for several years, the high costs of power in January were unexpected for some market participants. Adjusted for inflation, wholesale electricity prices in PJM have been generally decreasing for more than five years. The supply of low-cost natural gas has been a major driver pushing down power prices.

Ensuring Future Power Supplies

The electric power industry is in the midst of the greatest fuel shift in its history, and the PJM wholesale markets are making the transition manageable. Coal-fired generating units are retiring in the face of low natural-gas prices, new renewable power resources and the cost of adding pollution controls to meet state and federal emission standards. At the same time, natural gas is the overwhelming fuel of choice for new generation on the PJM system. Future years will have a different mix of resources committed to meet consumers' needs. PJM has actively addressed reliability needs for the future. Through the Reliability Pricing Model (RPM) capacity auction we have committed a resource mix – including new generation and demand response – that is sufficient to preserve reliability. As we go through the transition, operating reserves will narrow because excess resources will be retired, and energy prices could become more volatile.

As the generation fuel mix changes, the resources needed to meet peak demands in extreme winter weather may be different. PJM traditionally has relied on an abundance of coal-fired generation during winter peak-demand periods to

mitigate the availability of other resources. The marketplace is substituting new resources to meet demands, such as new gas units and demand response, in place of retired or soon-to-be retired base load coal-fired generation. PJM's proposals to increase the amount of demand response resources available year-round and to increase operational flexibility of demand response are examples of moving in this direction.

As more generation in PJM is natural gas-fired, PJM and the electricity industry have been working with the natural gas pipelines operators to better coordinate operations of the electric grid and the gas pipelines along with the electric and gas markets. The Gas Electric Senior Task Force, consisting of PJM stakeholders, has been working towards a process to align gas and electric market days and increase communications between both industries. During January, PJM took advantage of a FERC waiver to share confidential information with natural gas pipelines serving our footprint to ensure reliable power supplies. Subsequently, PJM filed for approval of changes that would allow information sharing on a permanent basis.

Summary

The unusual arctic temperatures made January 2014 a challenging month for grid operations, generators, fuel supplies, markets and customers. Through it all, PJM and its members maintained the vital flow of power to consumers. PJM, its members and the industry are learning from the experience. PJM continues to work with members, stakeholders and regulators, like the Pennsylvania Public Utility Commission to provide information and analysis of operations and markets during January 2014 and to ensure the long-term reliability of the electric power supply system, and the stability and competitiveness of PJM's wholesale electricity markets.



PJM Winter Operations - January 2014

Pennsylvania House Consumer Affairs
Committee

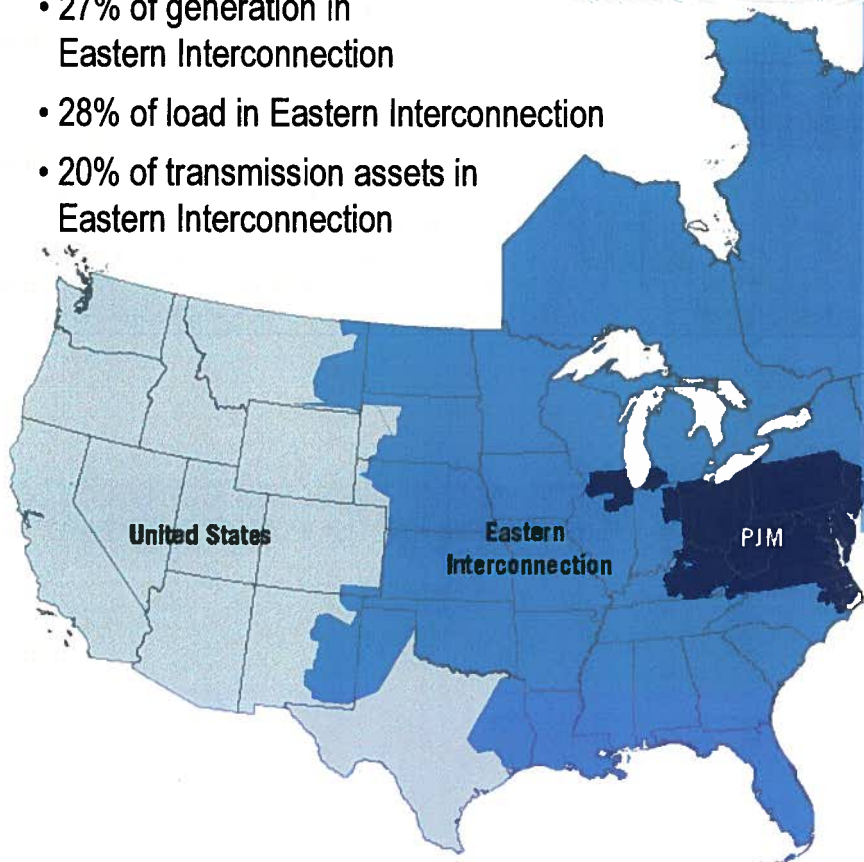
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F. Stuart Bresler, III,
Vice President, Market Operations
PJM Interconnection



PJM as Part of the Eastern Interconnection

- 27% of generation in Eastern Interconnection
- 28% of load in Eastern Interconnection
- 20% of transmission assets in Eastern Interconnection



KEY STATISTICS

PJM member companies	875+
millions of people served	61
peak load in megawatts	165,492
MW of generating capacity	183,604
miles of transmission lines	62,556
2012 GWh of annual energy	793,679
generation sources	1,376
square miles of territory	243,417
area served	13 states + DC
externally facing tie lines	191

**21% of U.S. GDP
produced in PJM**

As of 3/17/2014



January 2014 Low (& Wind Chill) vs. Historic Temperatures

Unseasonably Cold Weather in January

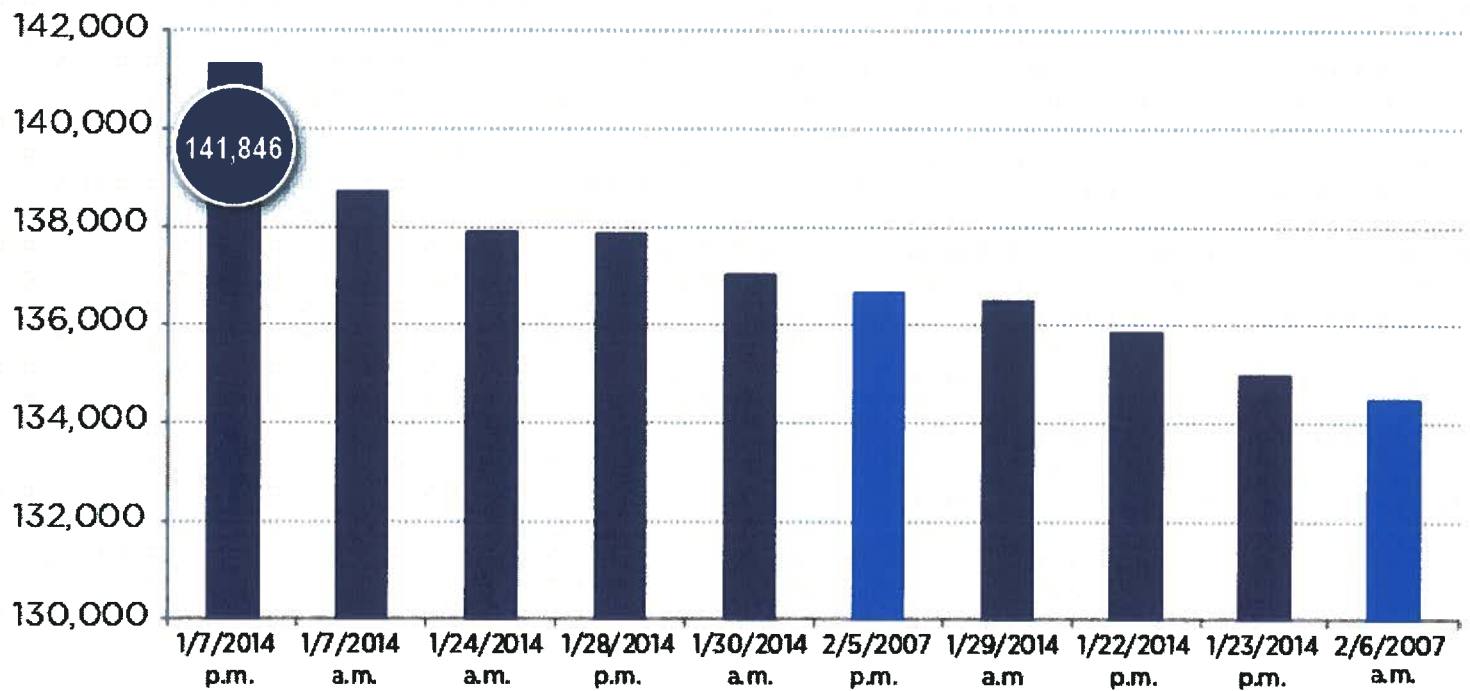
Region	Week of Jan 6	Week of Jan 20	Week of Jan 27	Avg Jan Low Temp	All-Time Record Low
Philadelphia	4° (1/7) -18° WC	4° (1/22) -17° WC	10° (1/30) -3° WC	25.5°	-7° (1982 & 84) -16° & -33° WC
Richmond	10° (1/7) -8° WC	7° (1/23) -2° WC	4° (1/30) 4° WC	28.4°	-12° (1940) WC N/A
Chicago	-16° (1/6) -41° WC	-6° (1/24) -24° WC	-11° (1/28) -30° WC	16.3°	-27° (1985) -57° WC

All temperatures are in Fahrenheit and WC denotes wind chill



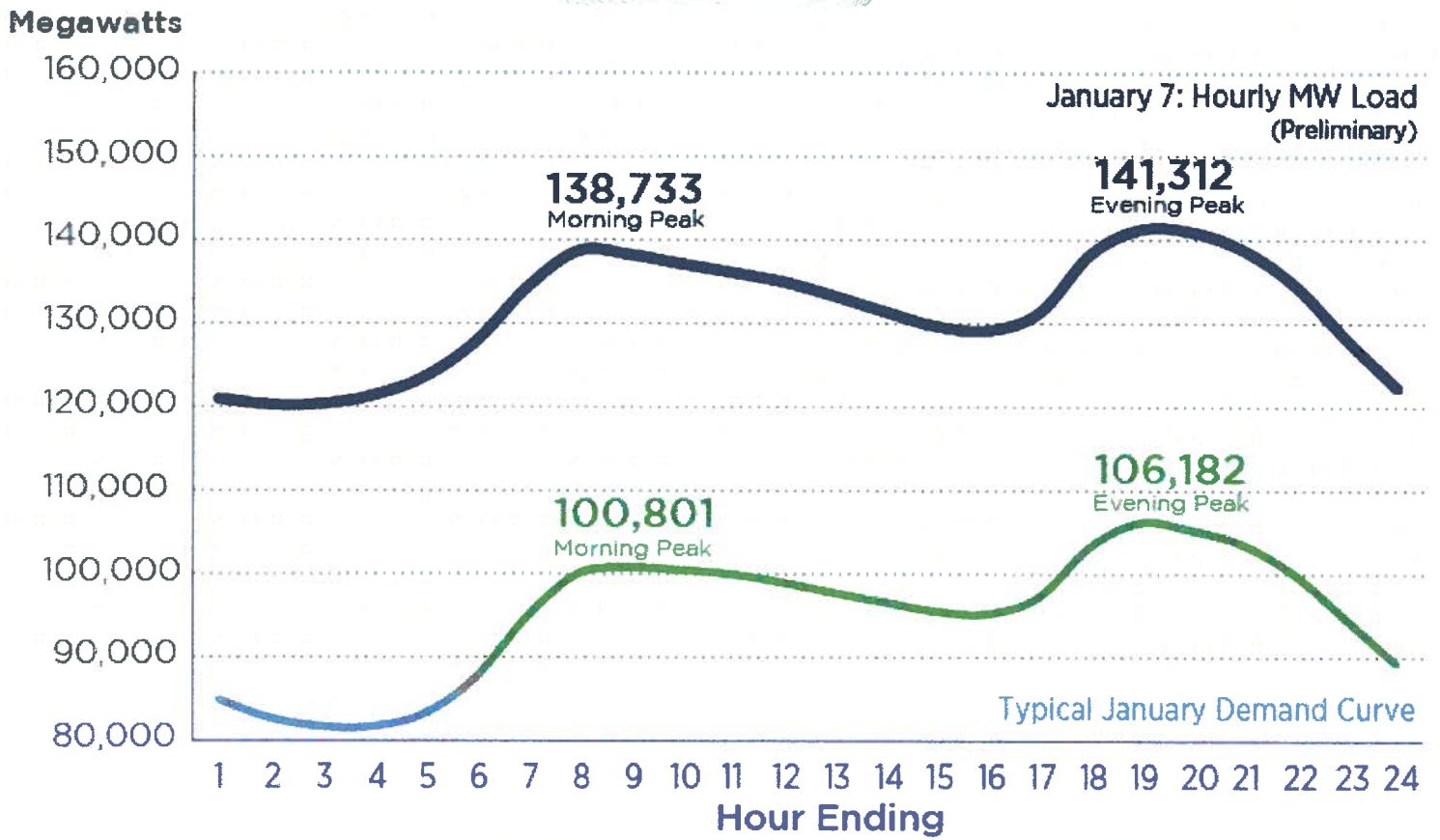
PJM RTO Highest Historic Winter Demands

Megawatts



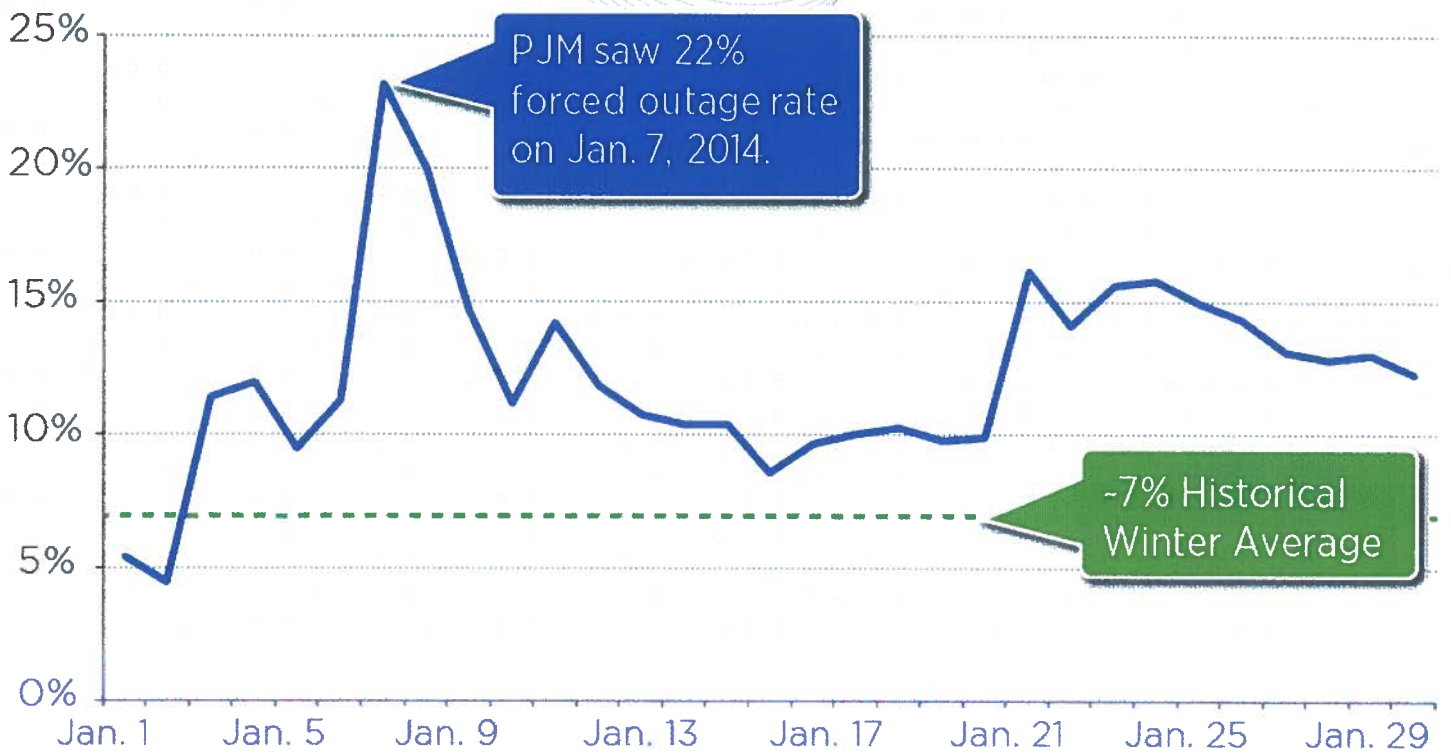


January 7 – Peak Load vs. Typical Load



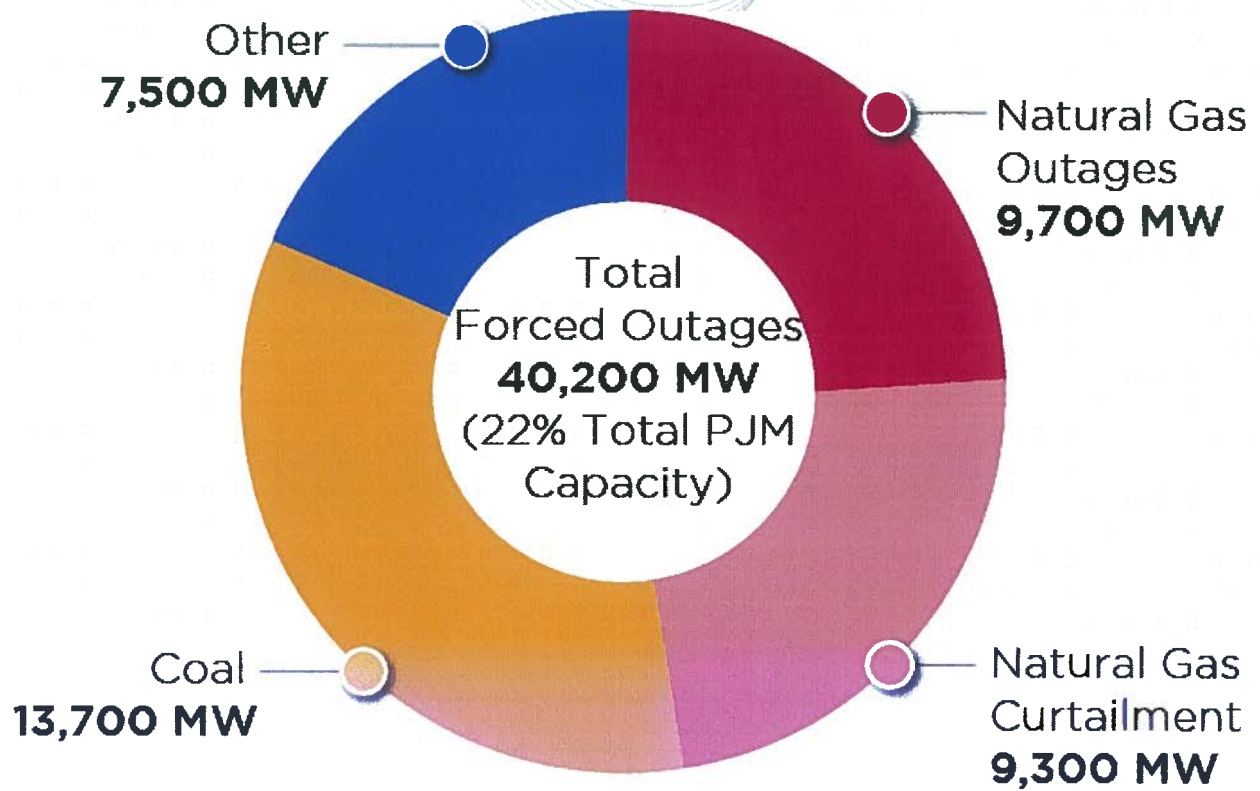


January Forced Outages Compared to History



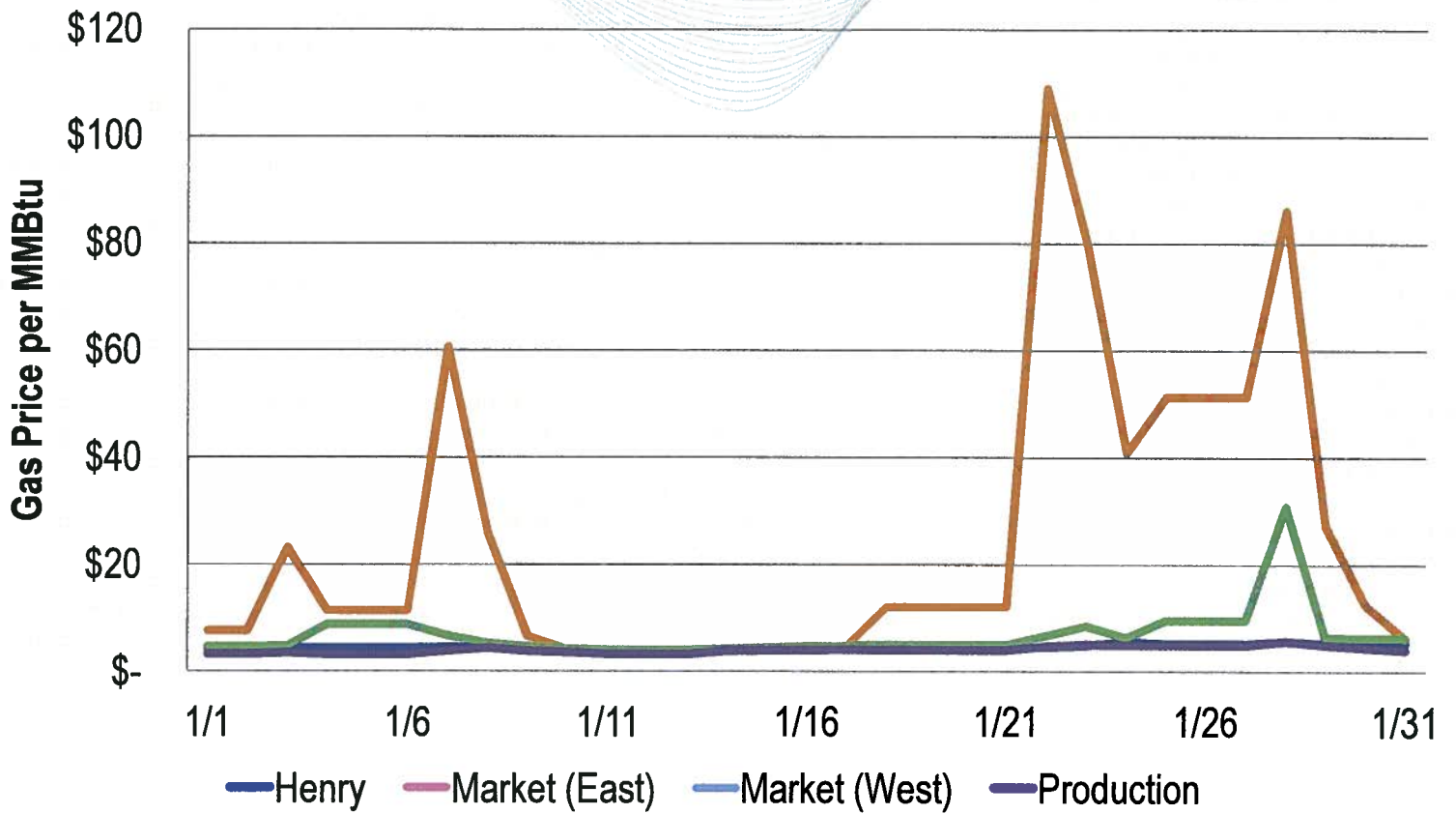


January 7th Forced Outage Breakdown



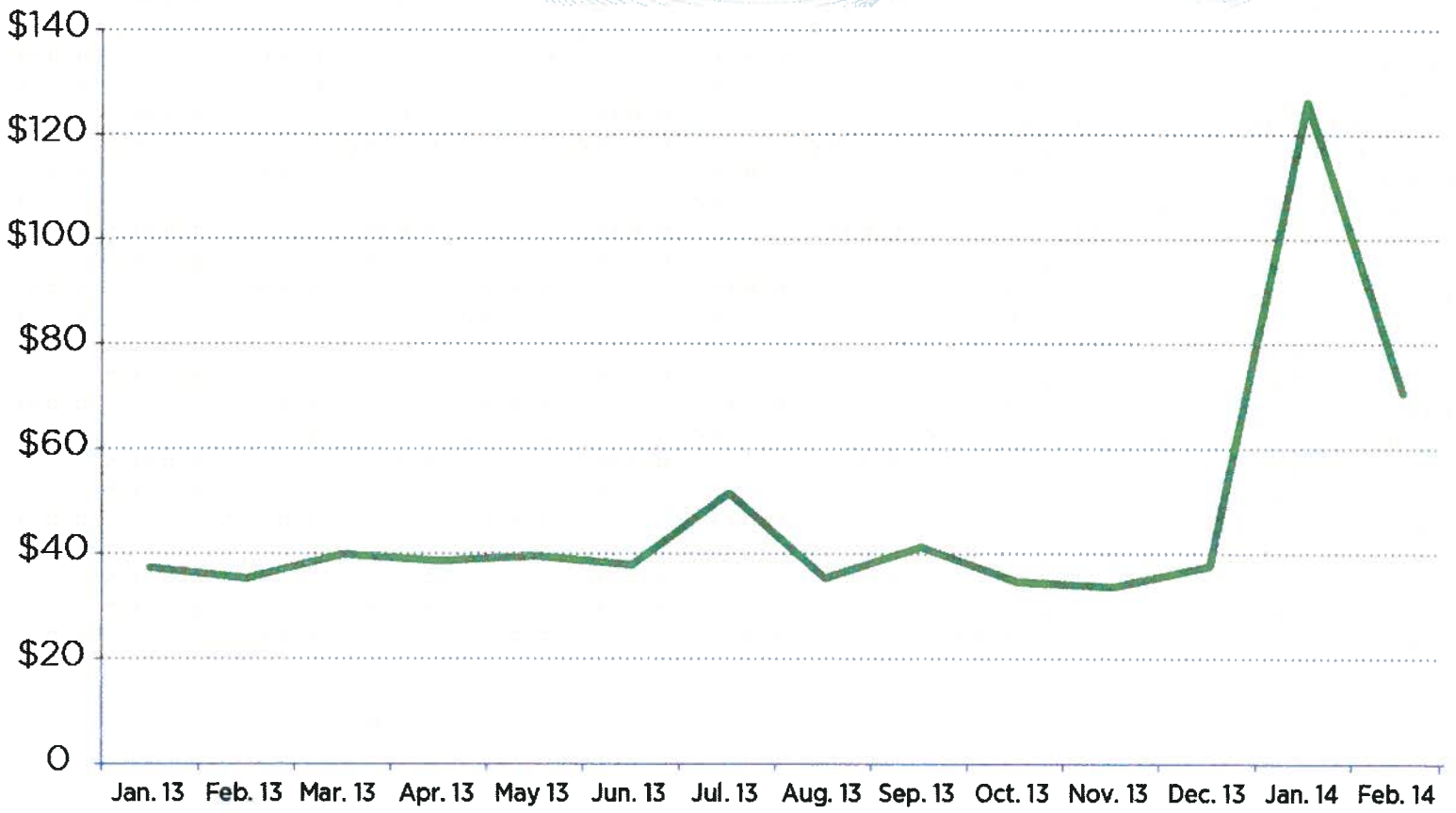


Natural Gas Prices – January 2014





Load-Weighted LMP, Monthly

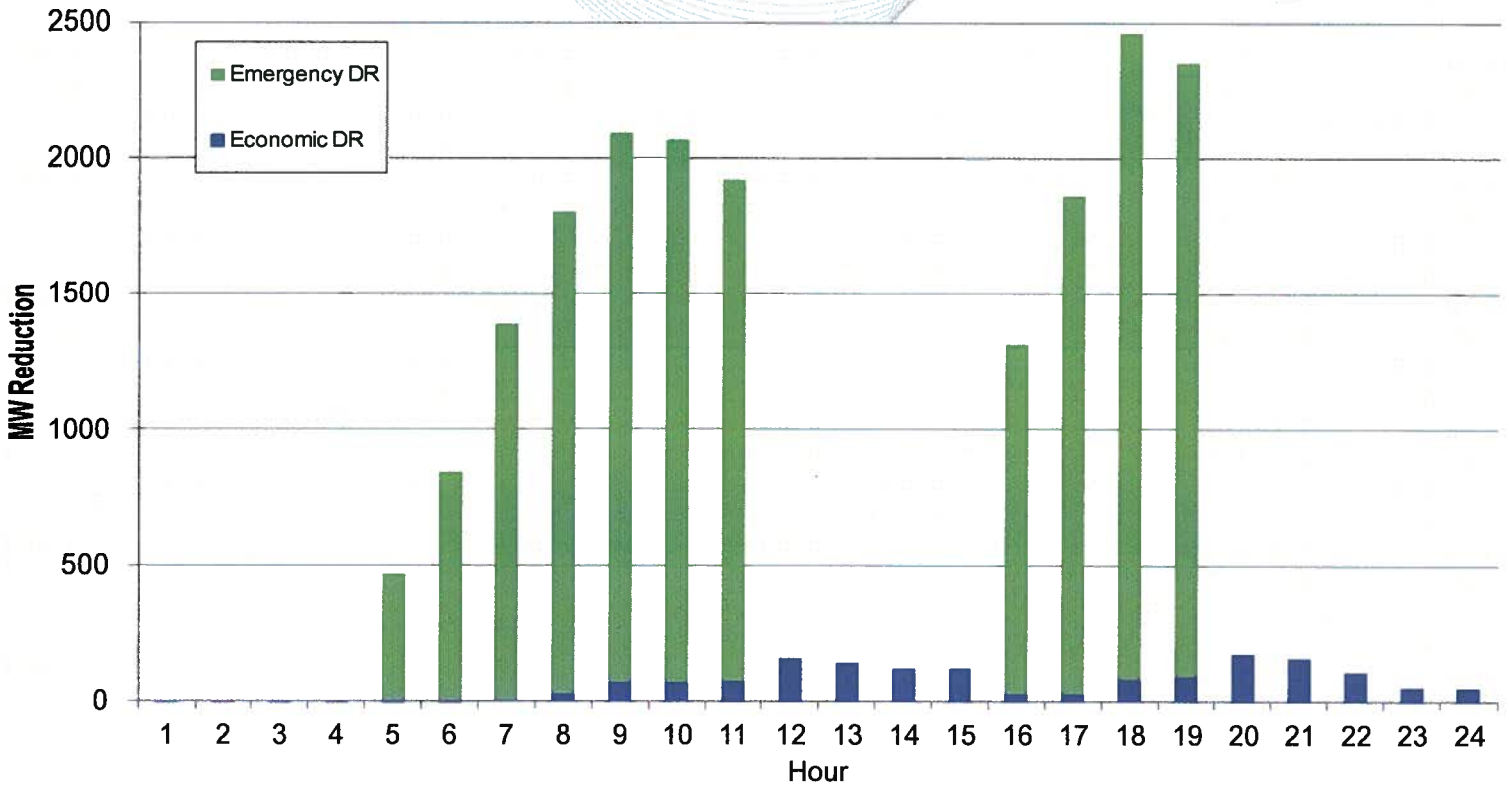




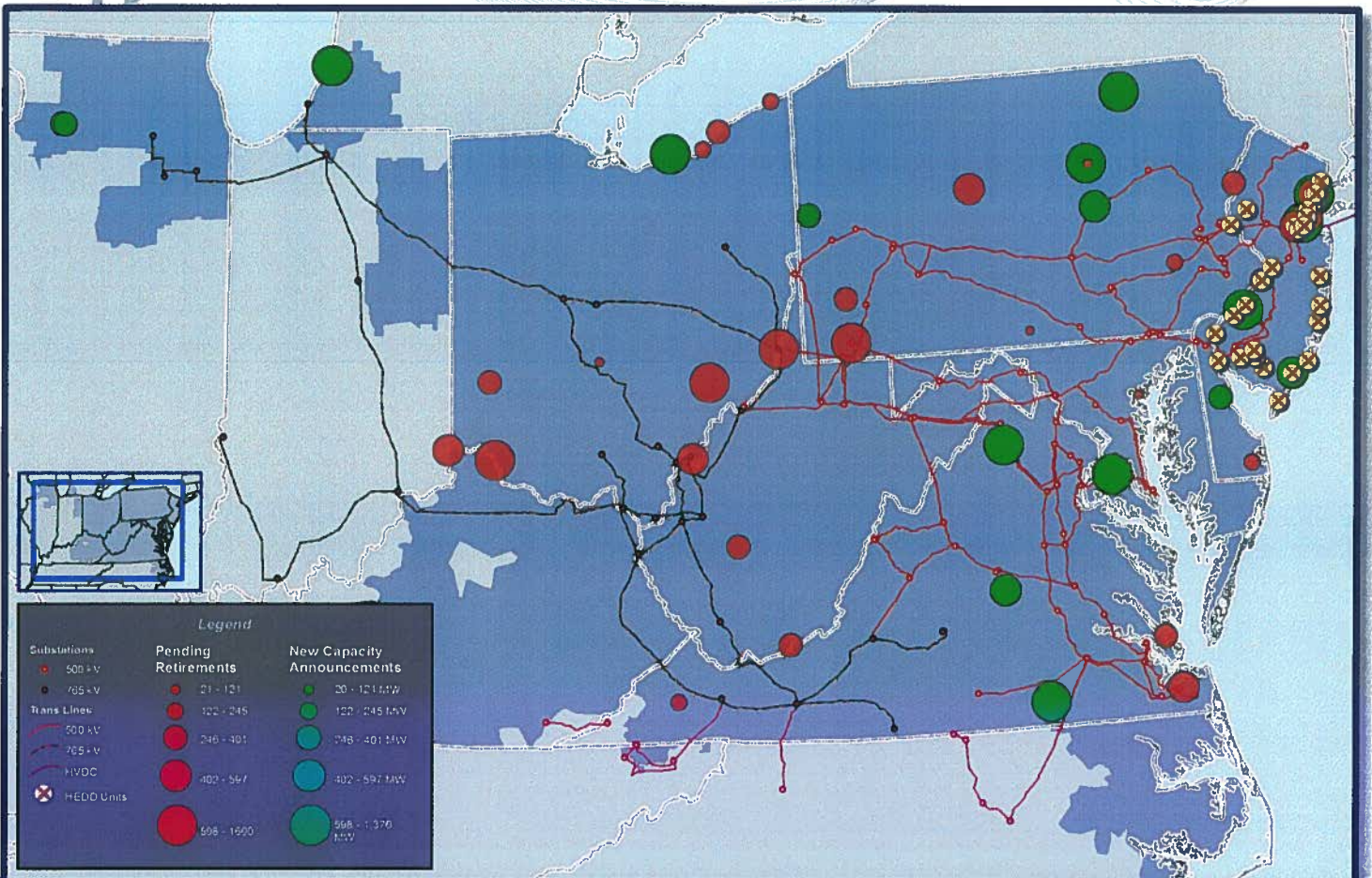
- **Information Sharing / Coordination**
 - FERC Order 787 Emergency Waivers
 - Daily communication of generation commitment to pipelines
 - Implemented joint status calls
- **Gas Pricing Issues January 22 – 28**
 - Gas units variable cost > \$1000/MWh offer cap
 - PJM emergency waiver filings
 - Long-term solution required
- **Scheduling and Commercial Issues**



Demand Response in PJM: January 7, 2014



Notes:
Emergency DR Amounts are Emergency Energy Settlement Reductions.





PJM Wholesale Prices

