

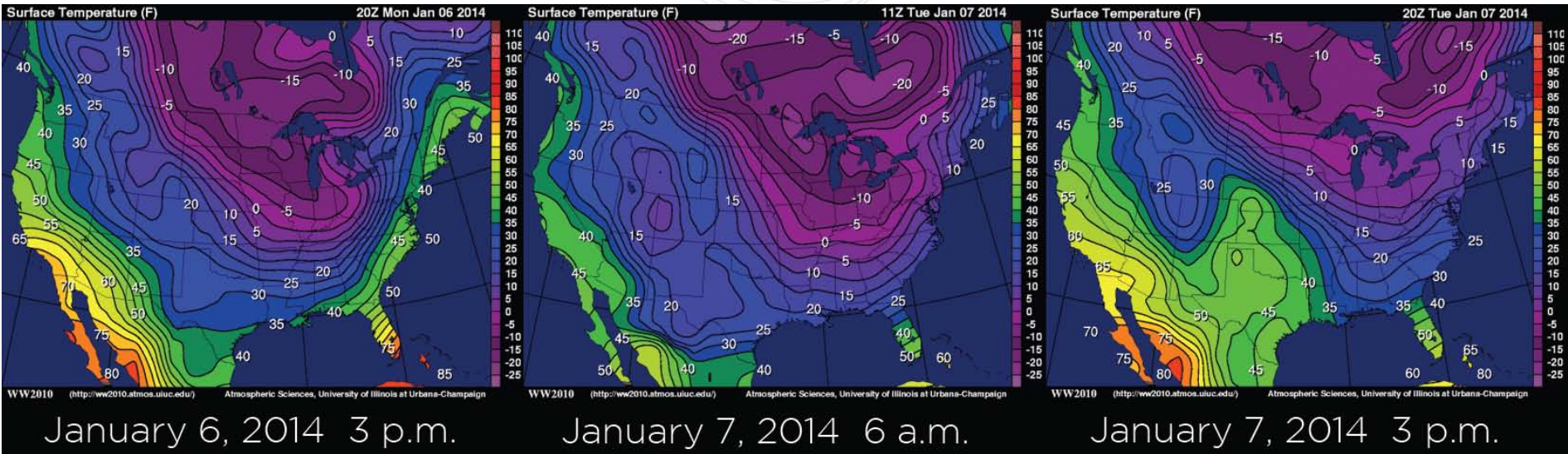
Operational Events and Market Impacts January 2014 Cold Weather

July 2, 2014

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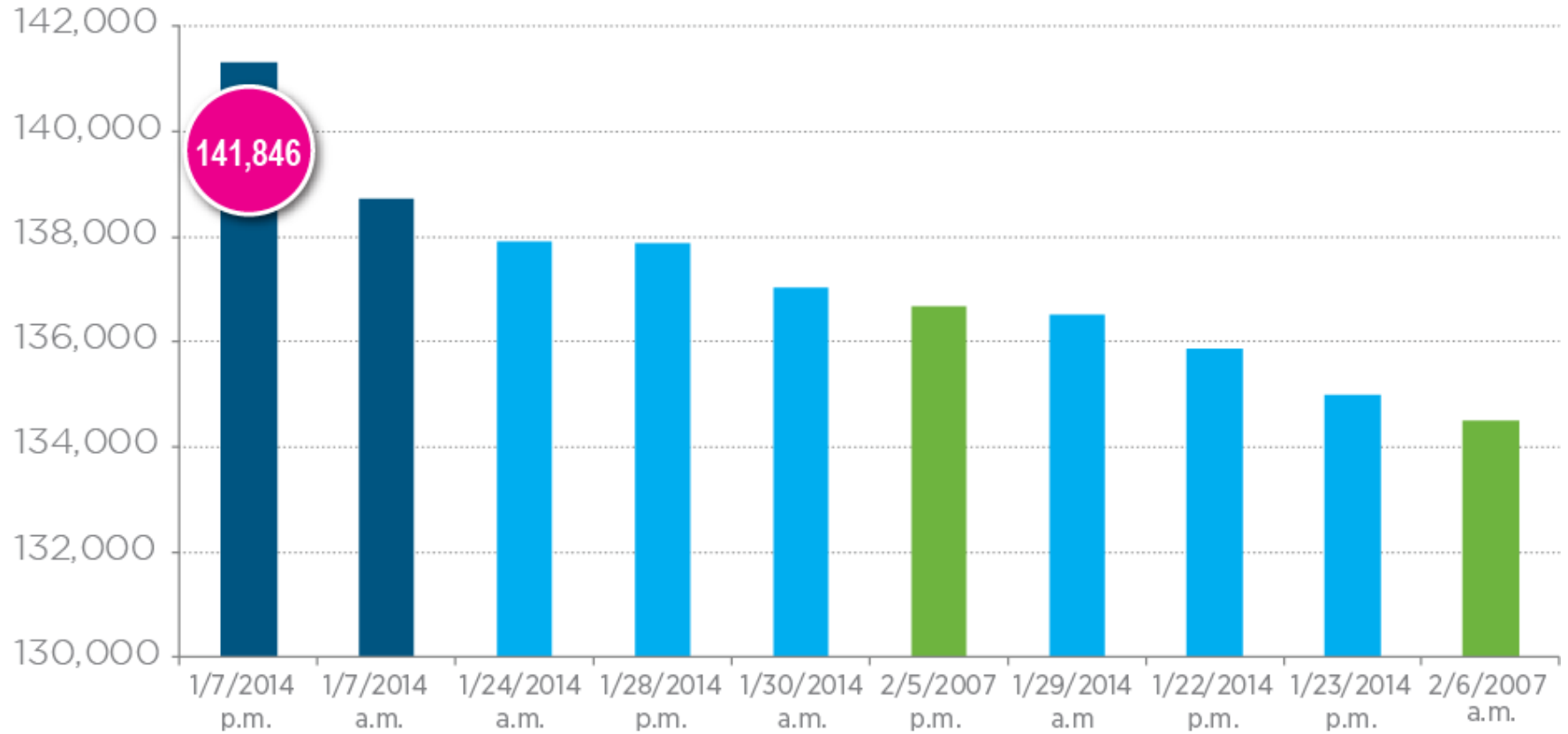
Source: University of Illinois at Urbana-Champaign

Minimum Temperatures – January 2014

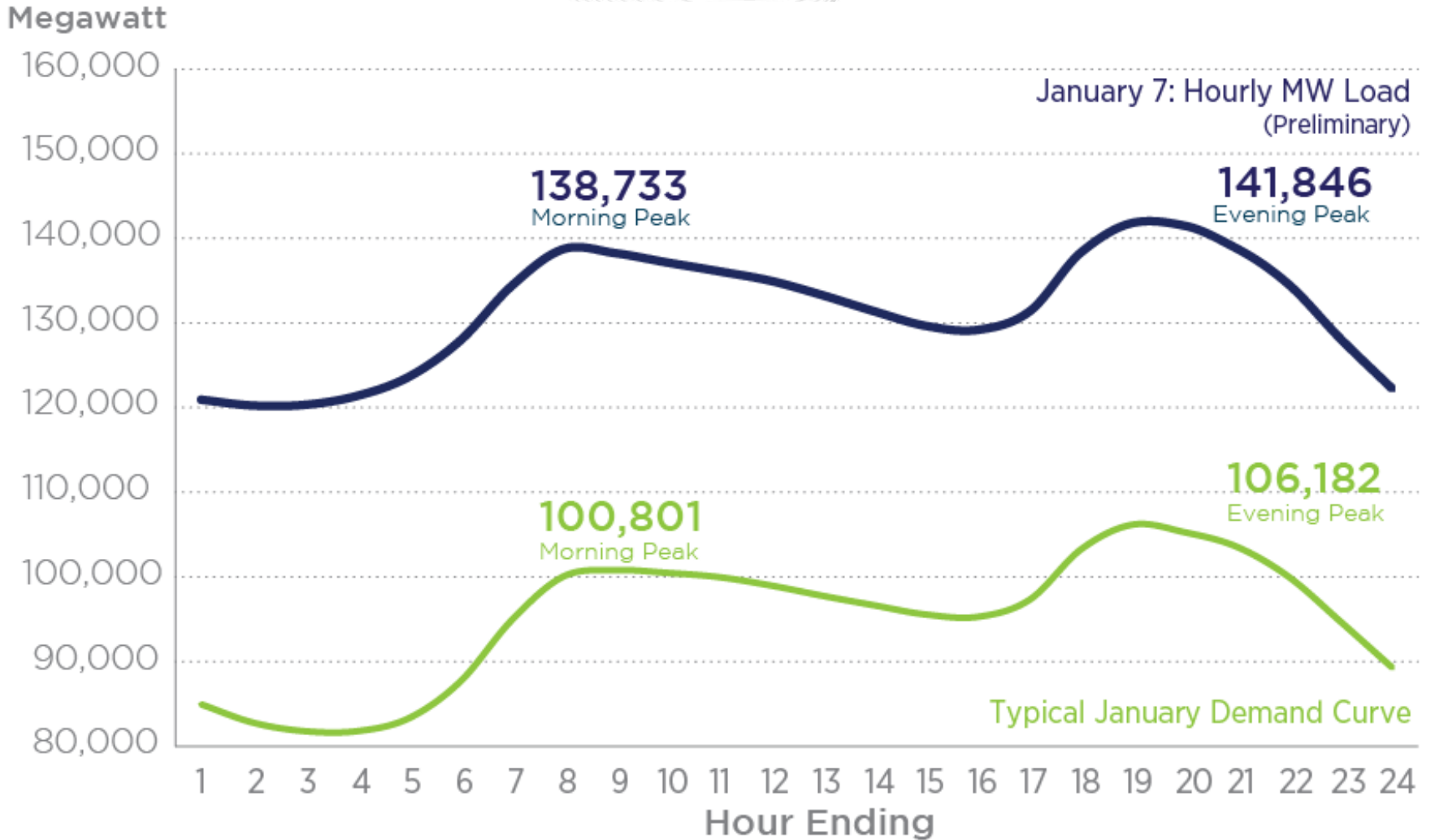
Columbus, Philadelphia, Chicago and Richmond

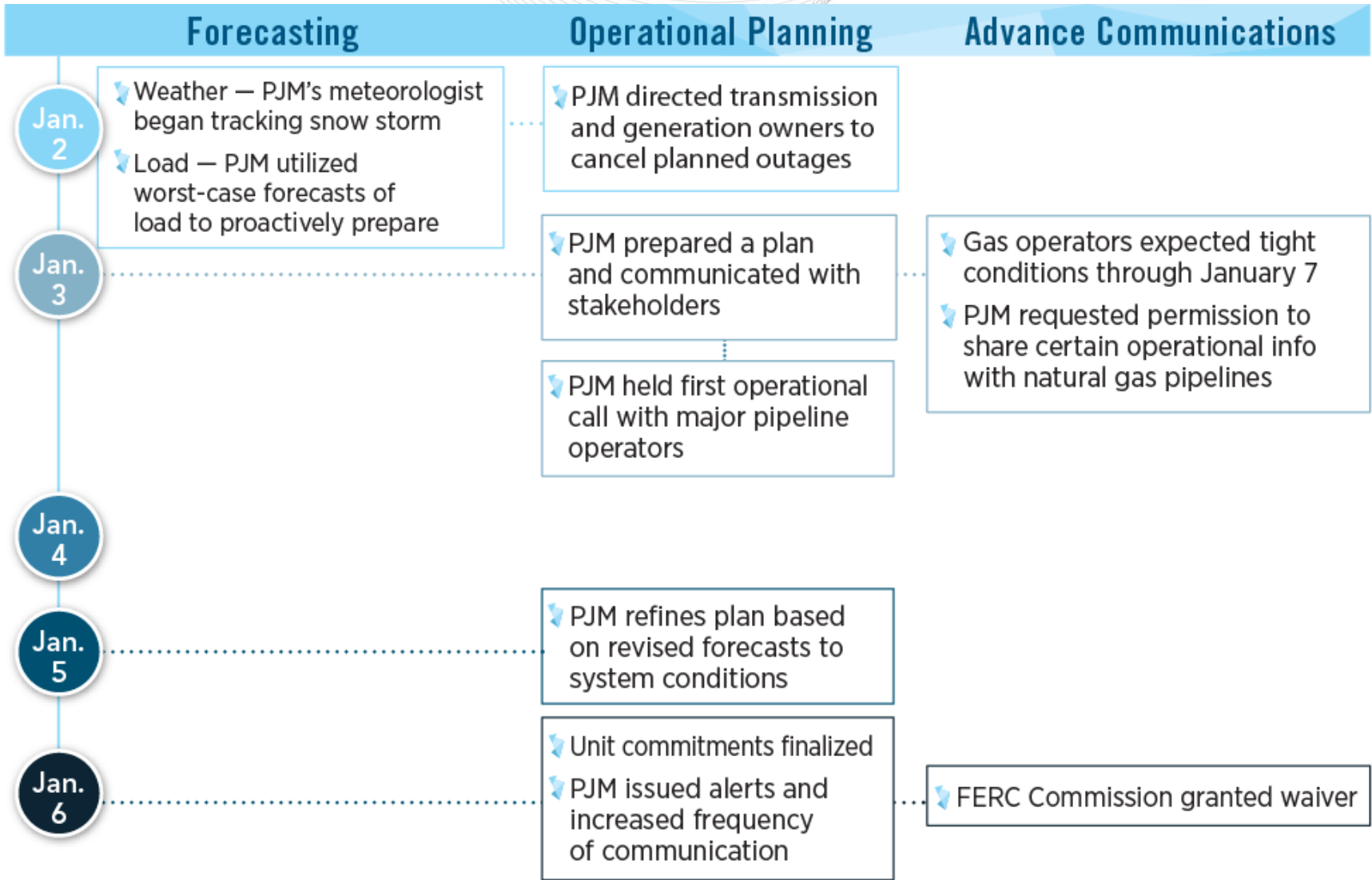


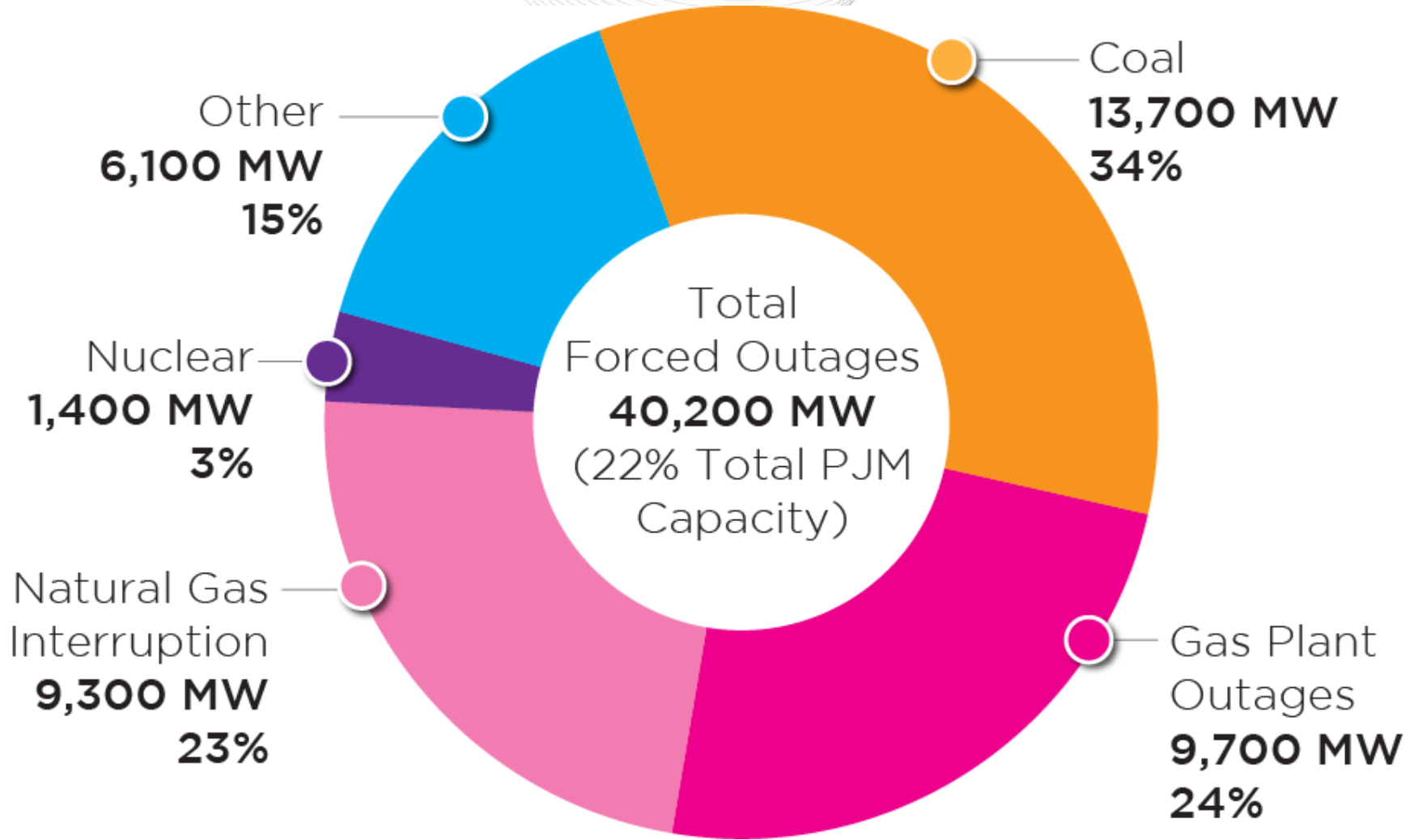
Megawatt



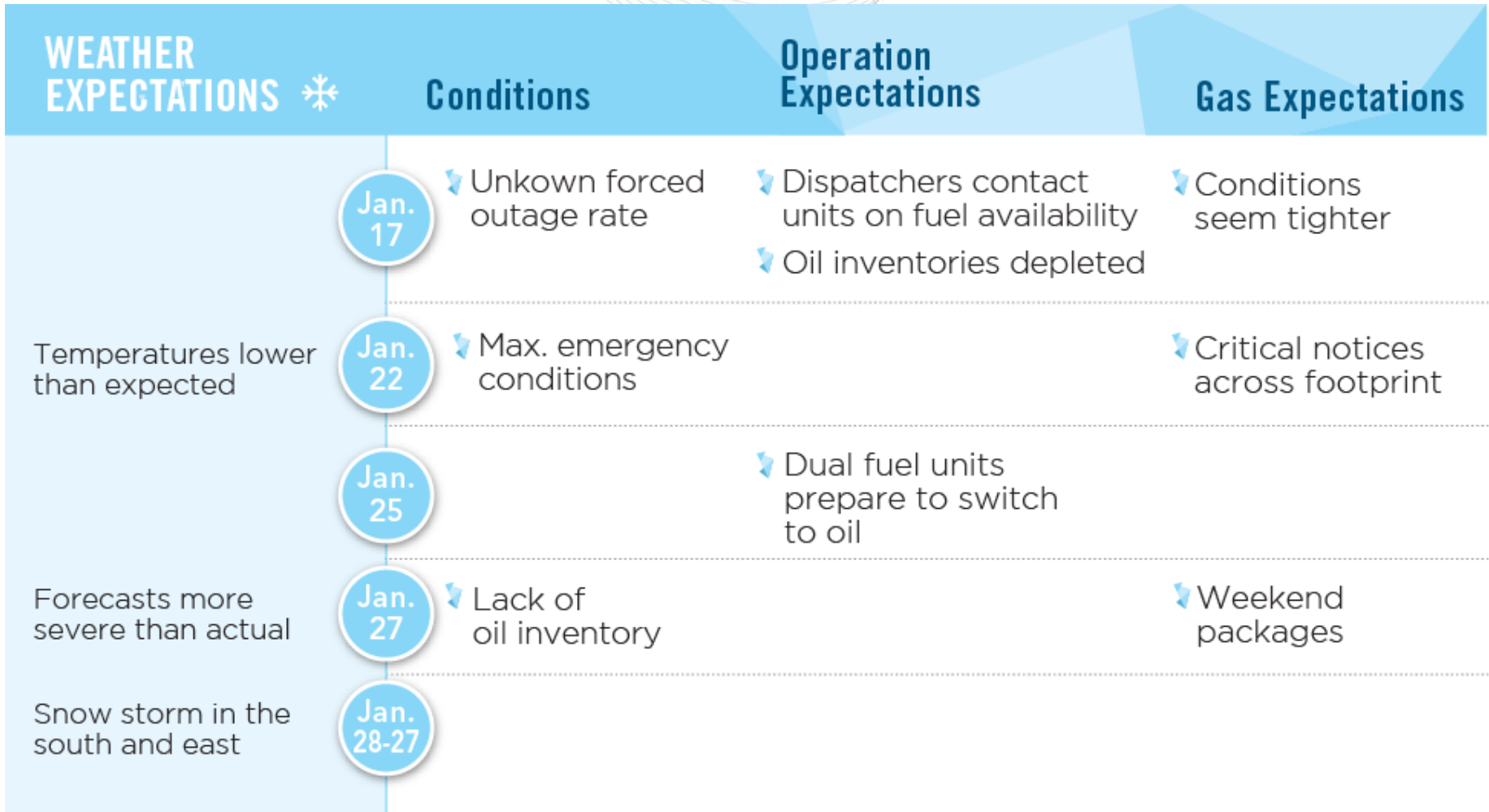
January 7 Load Compared to Typical January Day

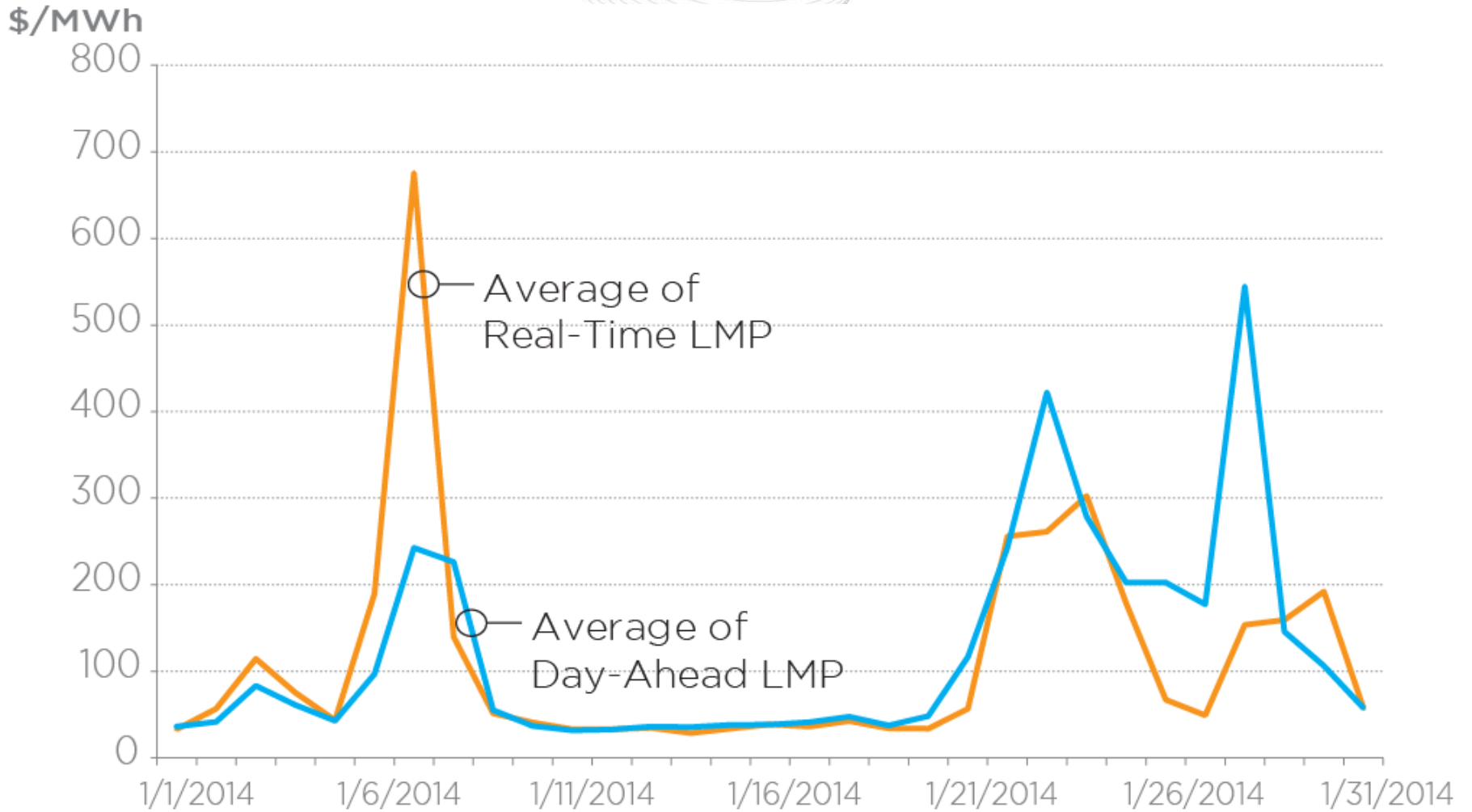


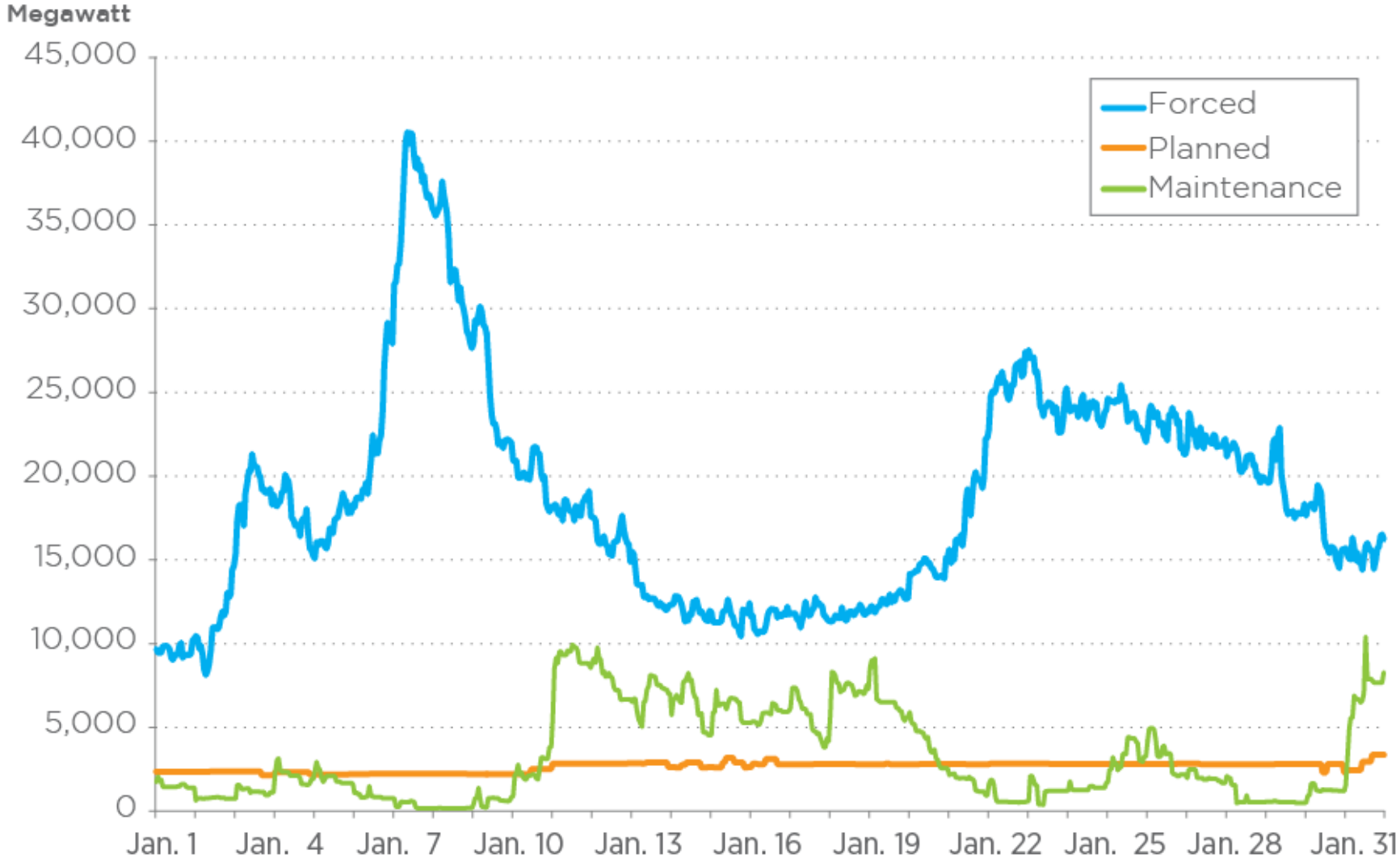


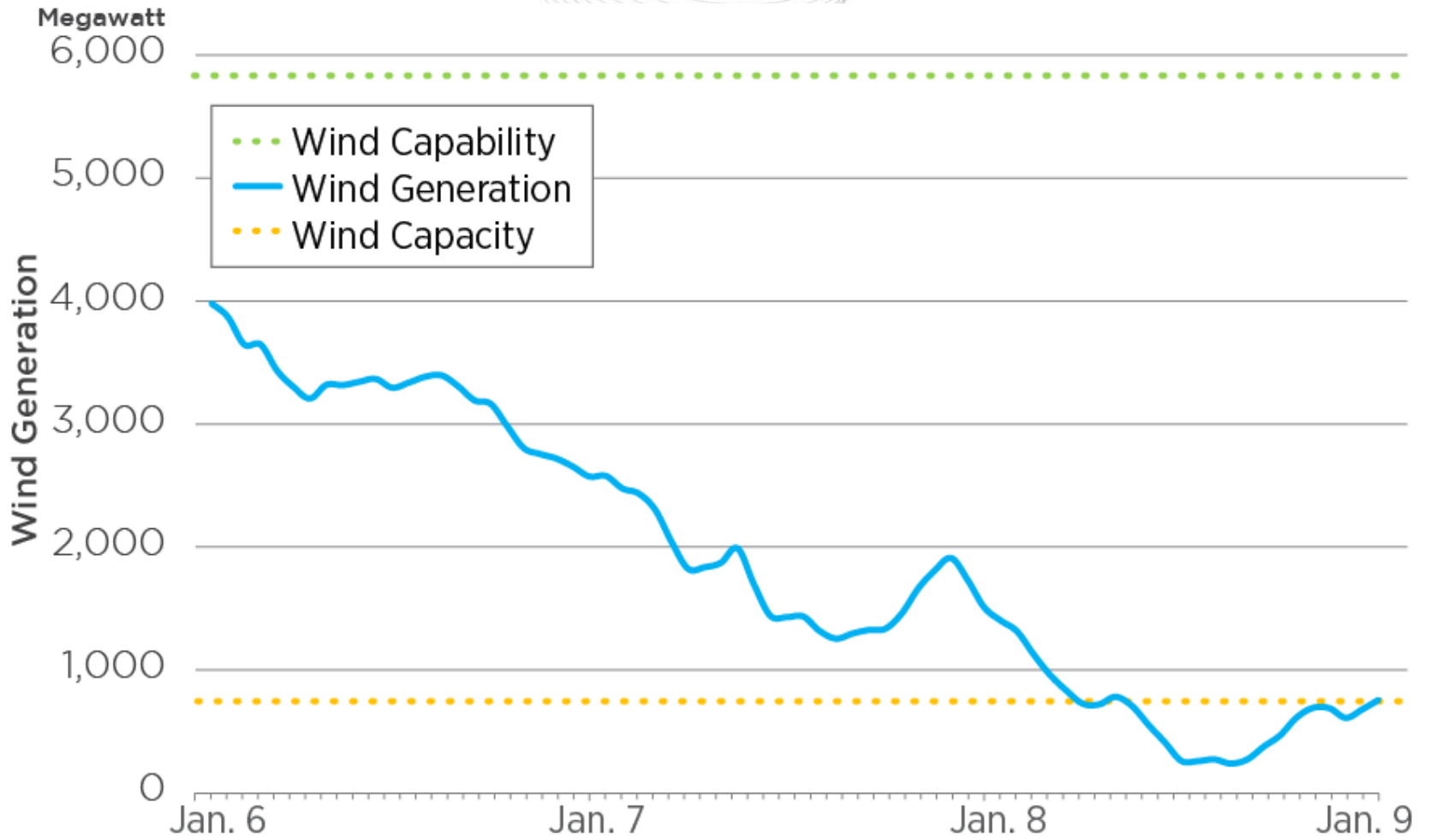


WEATHER CONDITIONS ❄️	Emergency Actions	Operation Expectations	Gas Expectations
Snowstorm across PJM Tracking extreme cold	<div style="text-align: center;">Jan. 2</div>	<ul style="list-style-type: none"> Issues with oil and emissions 	<ul style="list-style-type: none"> Gas unavailability
Record low temps	<div style="text-align: center;">Jan. 6</div> <ul style="list-style-type: none"> Voltage reduction and shortage pricing 	<ul style="list-style-type: none"> Concern about reserves and losing units 	<ul style="list-style-type: none"> Gas interruptions
Breaking cold weather records	<div style="text-align: center;">Jan. 7</div> <ul style="list-style-type: none"> Reserve action 	<ul style="list-style-type: none"> 22% forced outage rate 	<ul style="list-style-type: none"> Gas conditions deteriorate

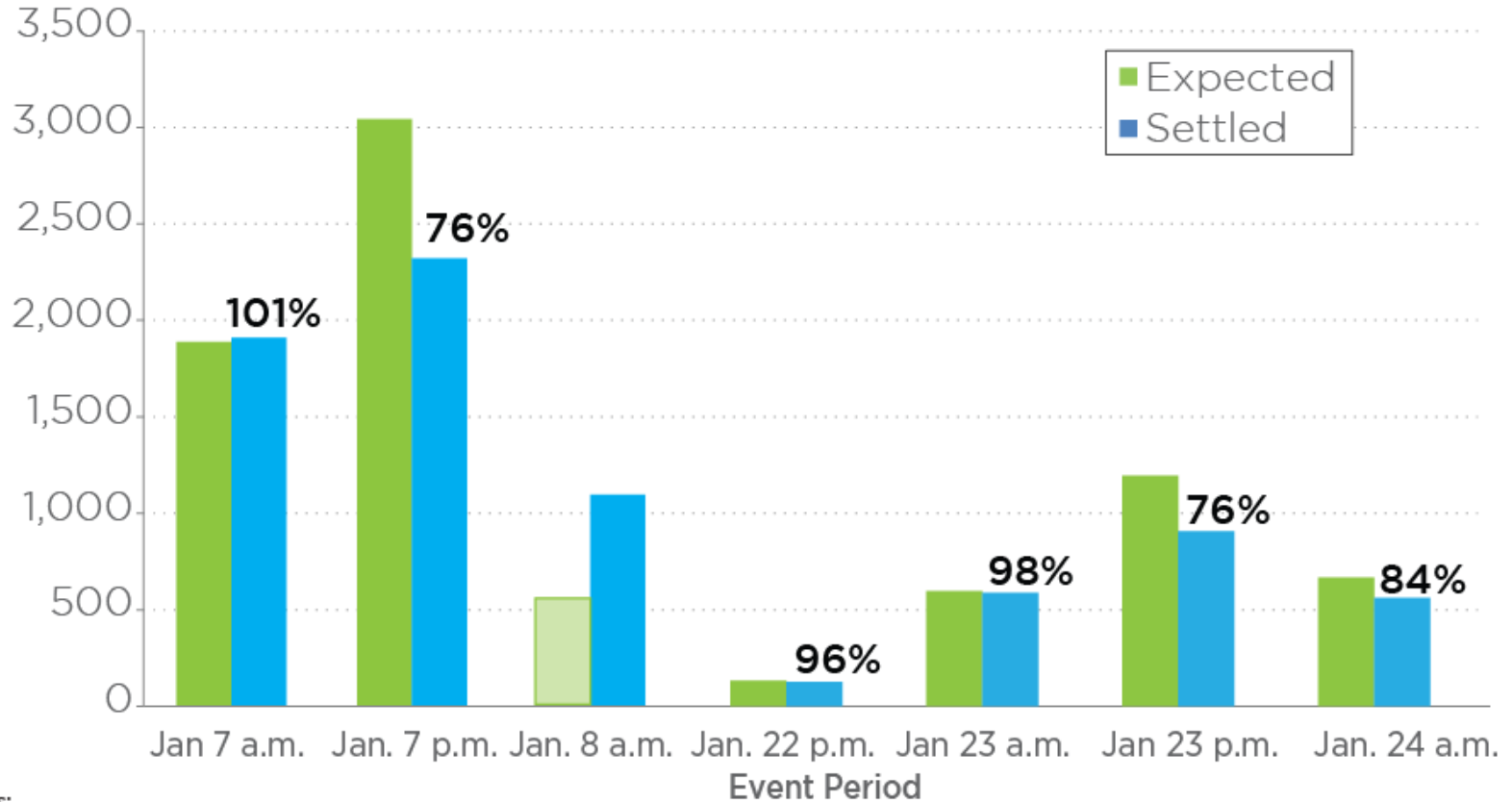






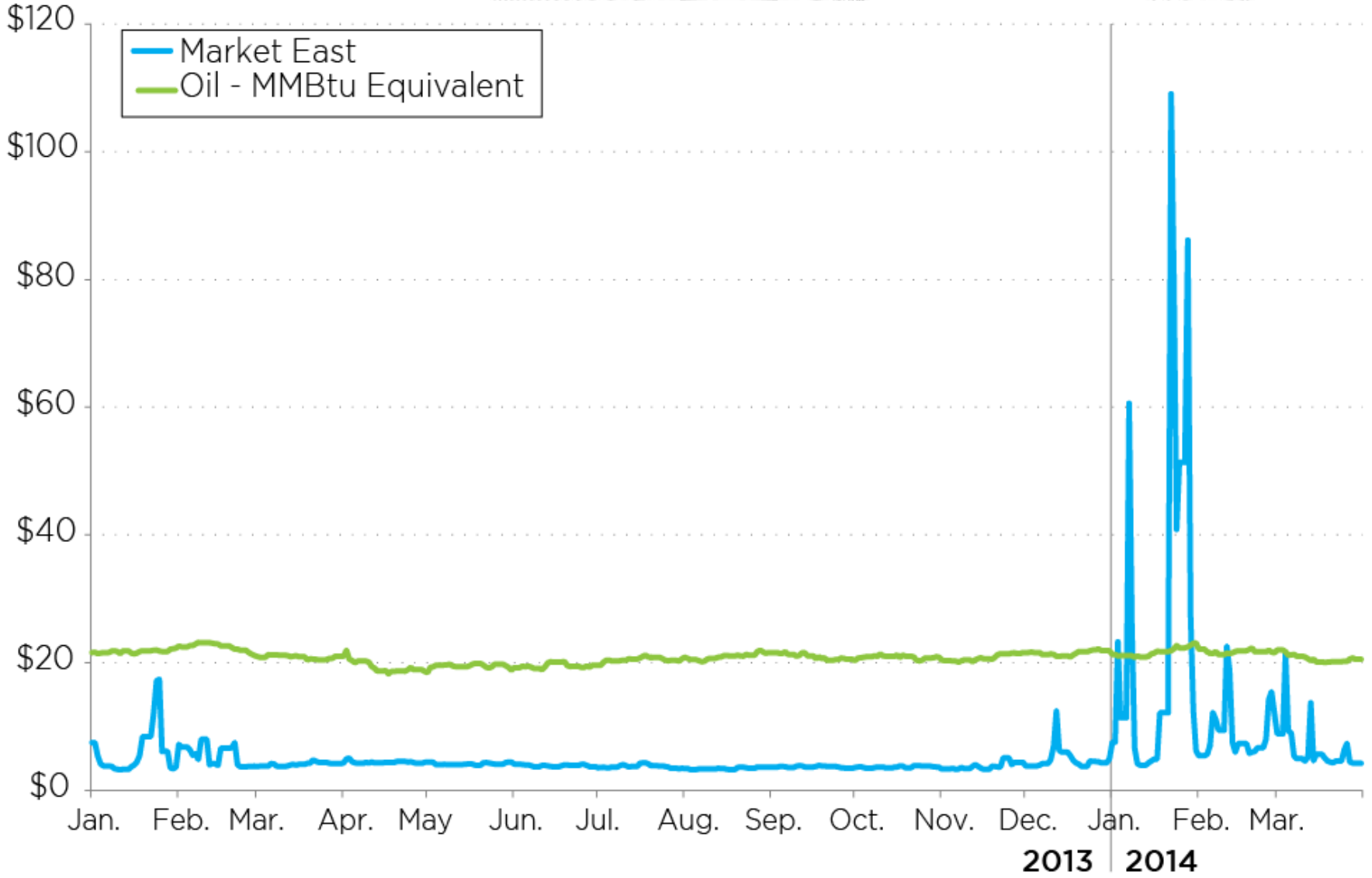


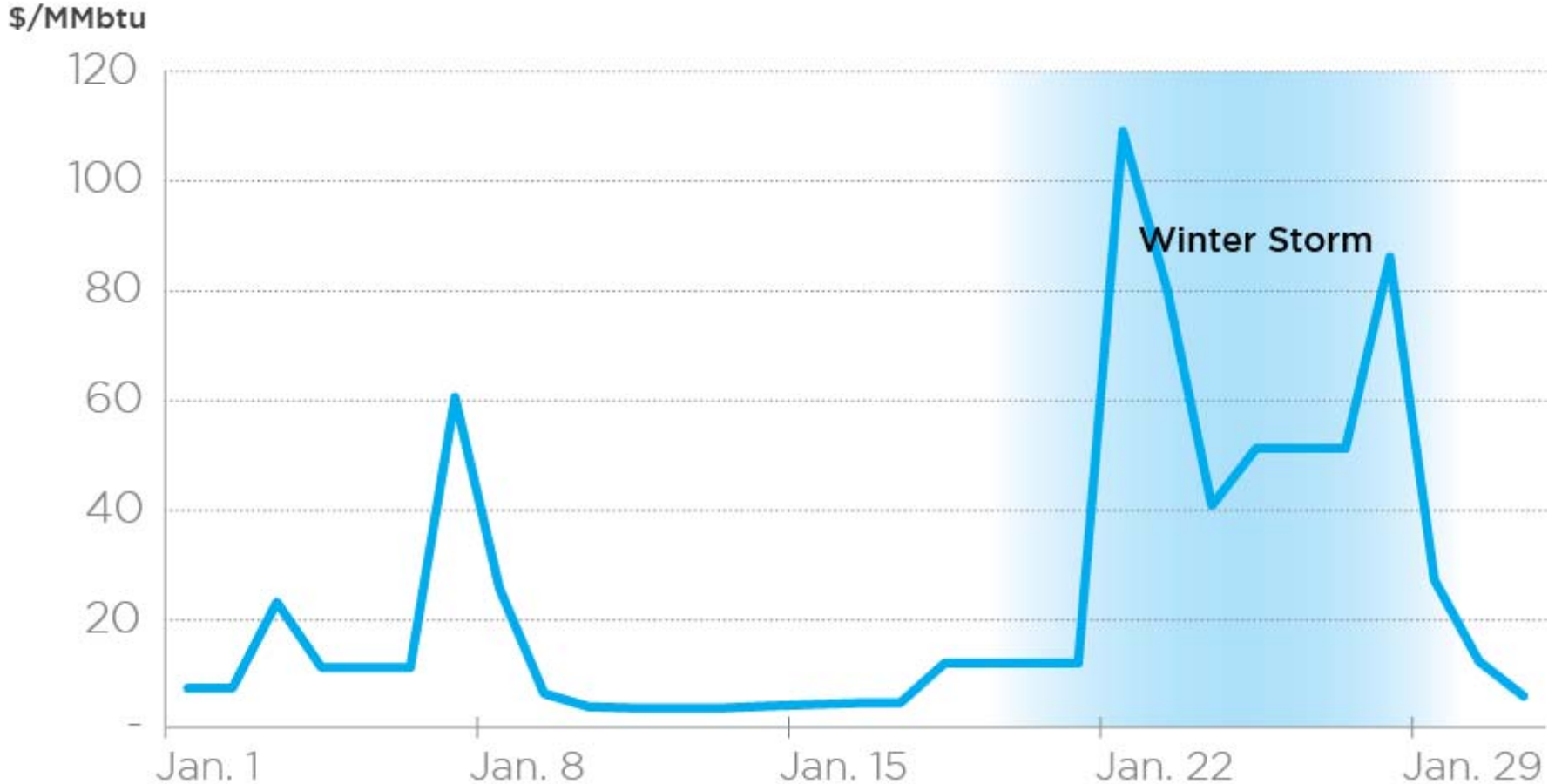
Load Reductions (MW)



Notes:

1. DR events dispatched during non-compliance period.
2. Expected Energy Load Reductions (MW) - CSP reported estimate based on current market rule.
3. MW value is average hourly load reduction for non-ramp in hours.
4. Event on Jan. 8 was cancelled by PJM prior to official start time. In order to honor the Emergency DR resource 2-hour minimum down time, PJM allowed CSPs to settle if their load reduction had started prior to cancellation and/or needed to reduce for 2 hours. PJM estimated amount of DR that needed to continue to reduce for 2 hours. "Performance" for this event cannot be measured based on the circumstances of this event





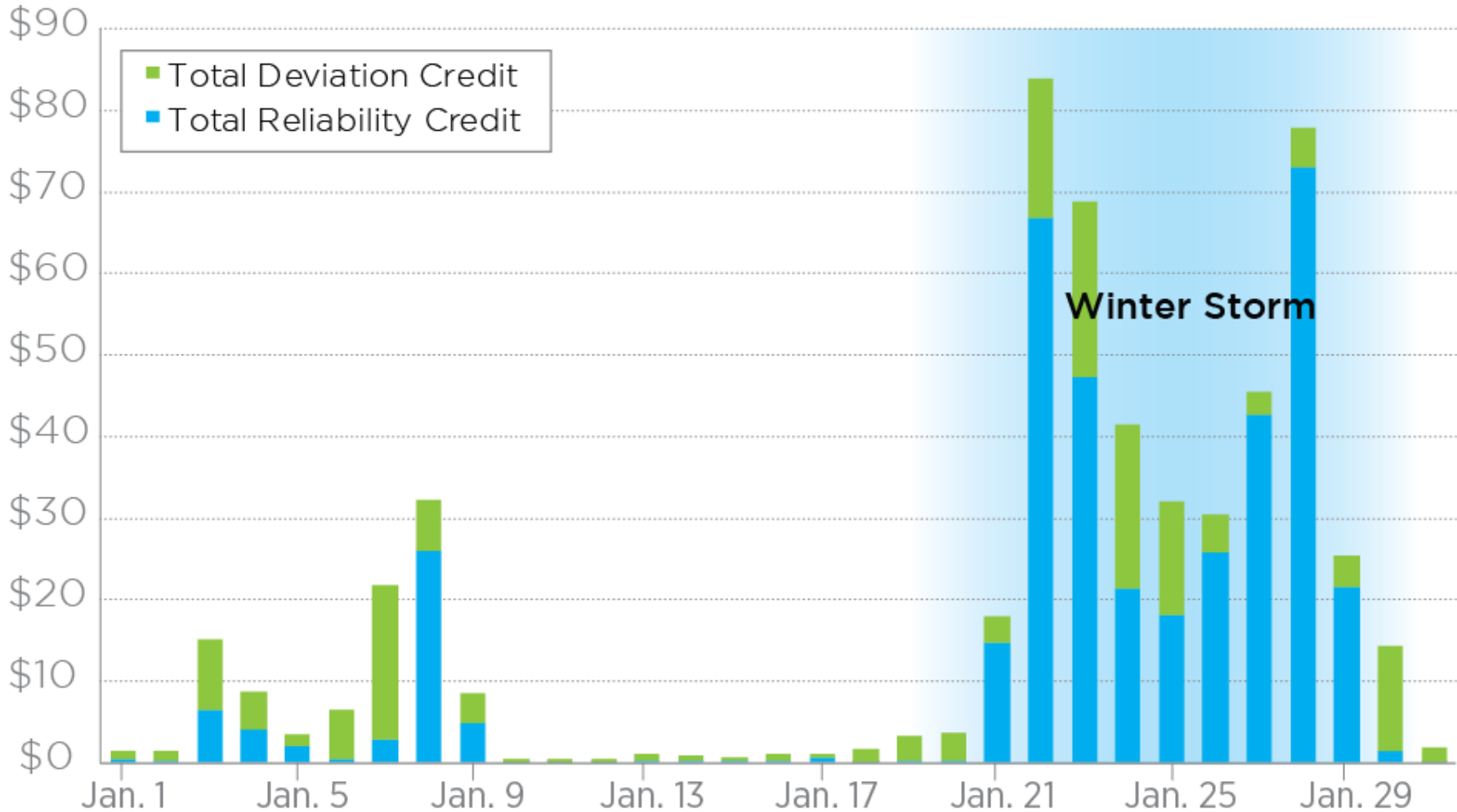
Reliability Credit

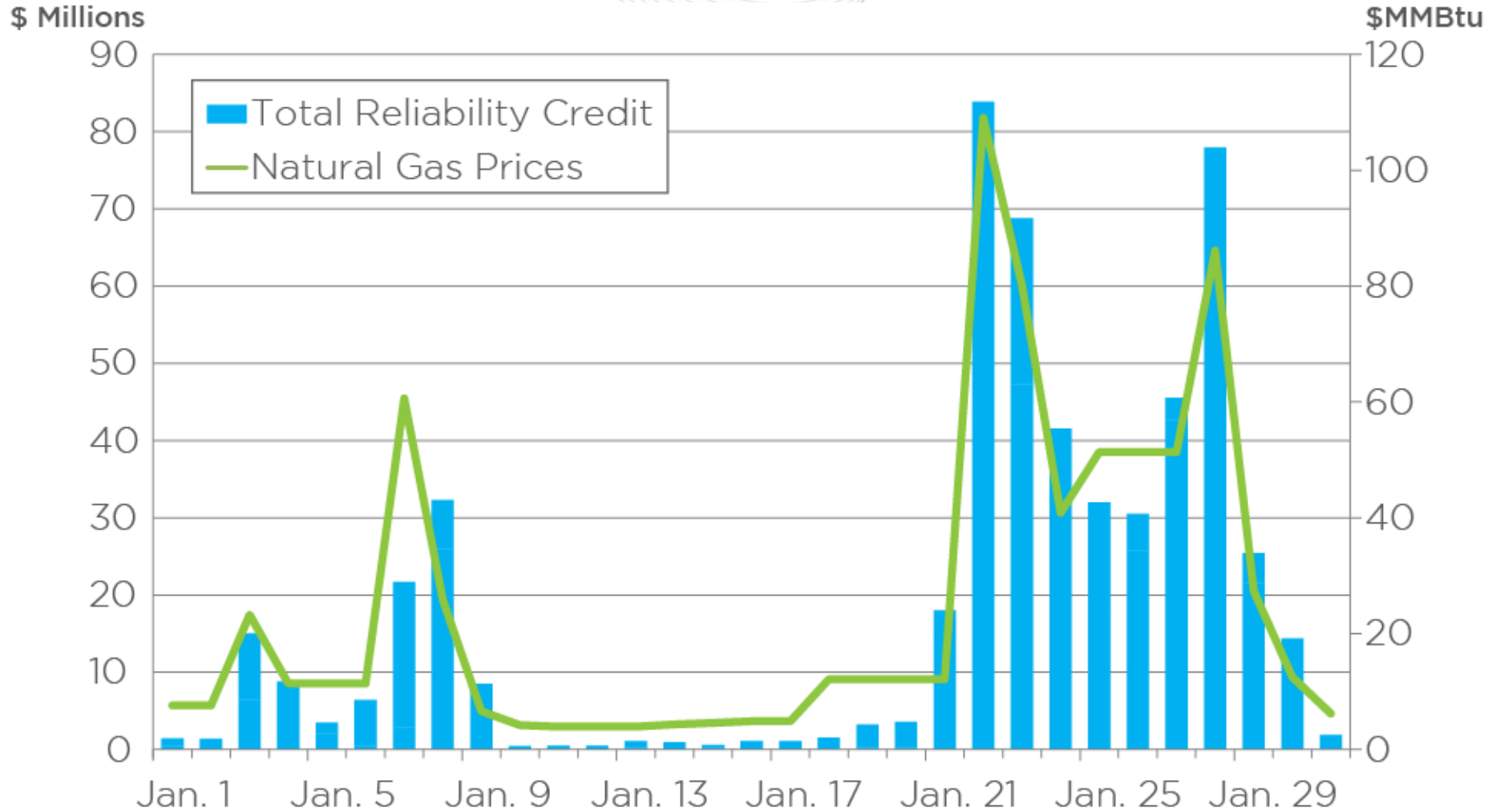
- Generator committed in advance of the operating day and outside of the Day-Ahead Market.
- Generator committed during the operating day and is out of the economic merit order.

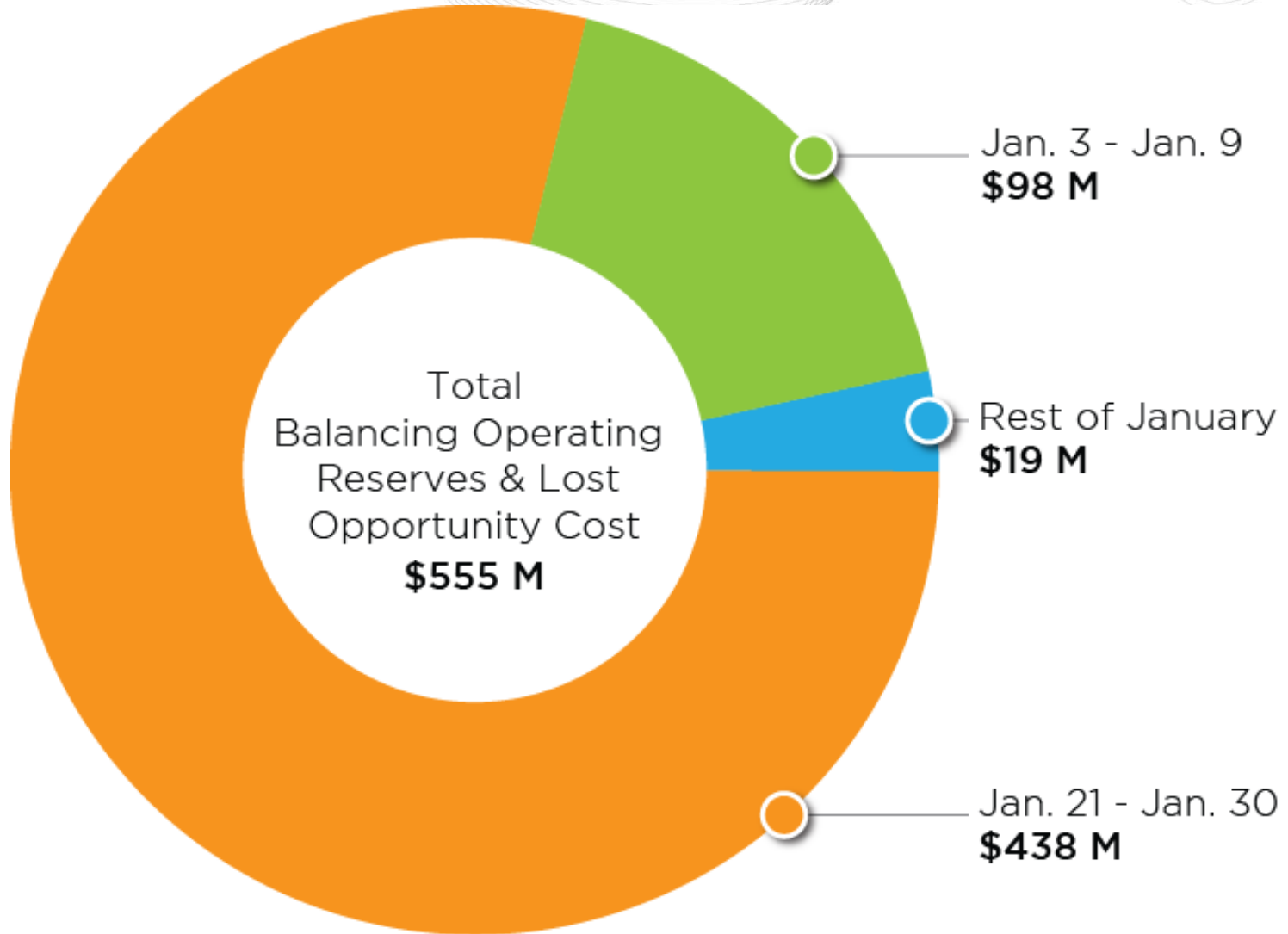
Deviation Credit

- Generator is needed to meet anticipated load plus reserves.
- Generator is committed during the operating day and cost is greater than locational marginal prices most of the time.

\$ Millions







- Improve generator availability and performance during extreme weather events,
- Implement performance verification or testing of generation in advance of winter operations,
- Continue to engage in discussions with industry and regulators to improve natural gas and electricity market alignment,





- Implement market mechanisms that encourage better generator availability, such as incentives for ensuring fuel availability or dual-fuel capability, and
- Review the cost allocation for uplift charges and investigate a mechanism to allocate uplift costs during emergency operations that minimizes volatility.

LET'S TALK...

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