ODEC Old Dominion Electric Cooperative℠

FEDERAL ENERGY REGULATORY COMMISSION

Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators

Operator Actions
Docket No. AD14-14-000
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General

- Need to understand model limitations; Can a constraint be ***accurately*** modeled?
  - Yes: in LMP
  - No: in uplift
- Decision should be based on what provides lowest cost to consumers. ***Not possible to capture all costs in LMP.***
- Models are tools to help our operators:
  - Highly trained experts with a focus on reliability.
  - Models cannot foresee every possible future; need operator judgment.
  - Must consider not only cost/benefit of model enhancements but potential impact on reliability.

General

- Operators need useful and accurate information.
  - Unit design characteristics
  - Fuel and operational status
- The higher the level of uncertainty, the more likelihood of operator intervention.
- Operators need clear protocols and scripts for communicating:
  - Emergency status
  - Unit commitment instructions

General

- Price formation is but one tool to address operator actions:
  - Reduce uncertainty with detailed information relative to unit design and fuel security.
  - Reduce uncertainty with clear pre-scripted operator communications for unit commitment.
  - Provide additional transparency for operator actions:
    - General guidelines/situations that could occur
  - Incorporate reactive limits into local transmission planning.

Examples

- ER13-481; EL13-2
  - When gas prices went under coal prices, local reactive constraints resulted in units committed day ahead not being able to run in real time. Load had to pay lost opportunity costs to units committed but not run day ahead, as well as for the more expensive coal units that provided necessary reactive power. When PJM took action to recognize this constraint day-ahead, it did not initially allocate the costs of this local constraint as had been allocated in real time.
  - Complaint filed 10/19/12. DVP estimated company costs of $40k/day; $90k/month and $500k by 3/1/13.

Examples

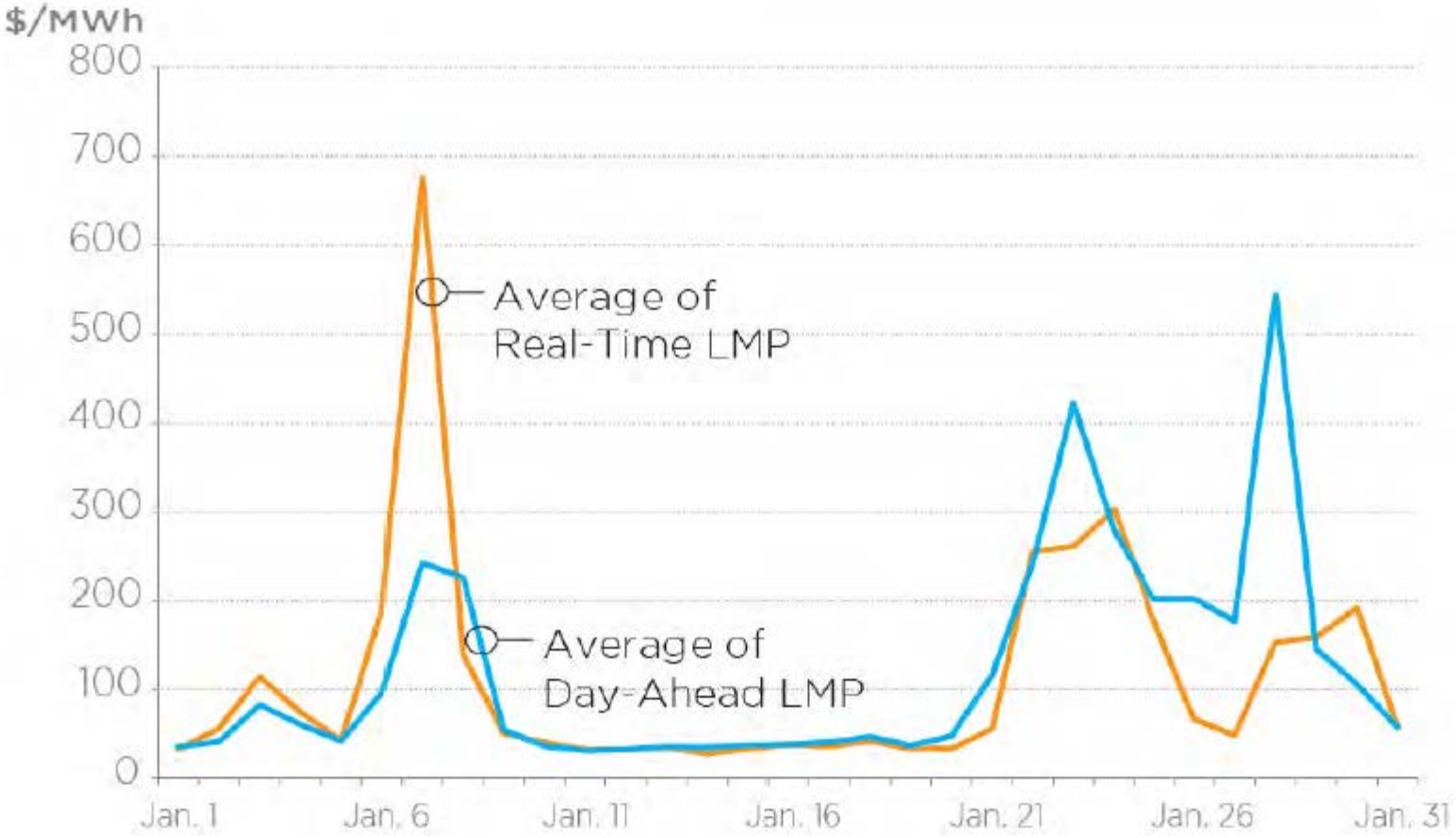
- On May 8, 2014, PJM issued an "Analysis of Operational Events and Market Impacts During the January 2014 Cold Weather Events."
  - http://pjm.com/~/media/documents/reports/20140509-analysis-of-operational-events-and-market-impacts-during-the-jan-2014-cold-weather-events.ashx
- "As depicted in Figure 15, at the all-time winter peak at 7 p.m. on January 7, PJM experienced a 22 percent forced outage rate, which was far above the historical average of 7 percent, with a total of 40,200 MW unavailable due to forced outages." The outage rate for the second winter event was approximately 15%.

Figure 15: Generator Outage Rate – January 2014

Examples

- Figure 28 shows day-ahead and real-time LMPs for each event. Real time LMP for the first event was much higher than the day ahead price for that time period, as well as the day-ahead and real-time prices for the second event.
- Figure 28 also depicts market learning in pricing between the first and second event. Later in the month, the day-ahead prices expected pricing similar to that experienced in real-time earlier that month. But real-time prices were lower due to operator action.

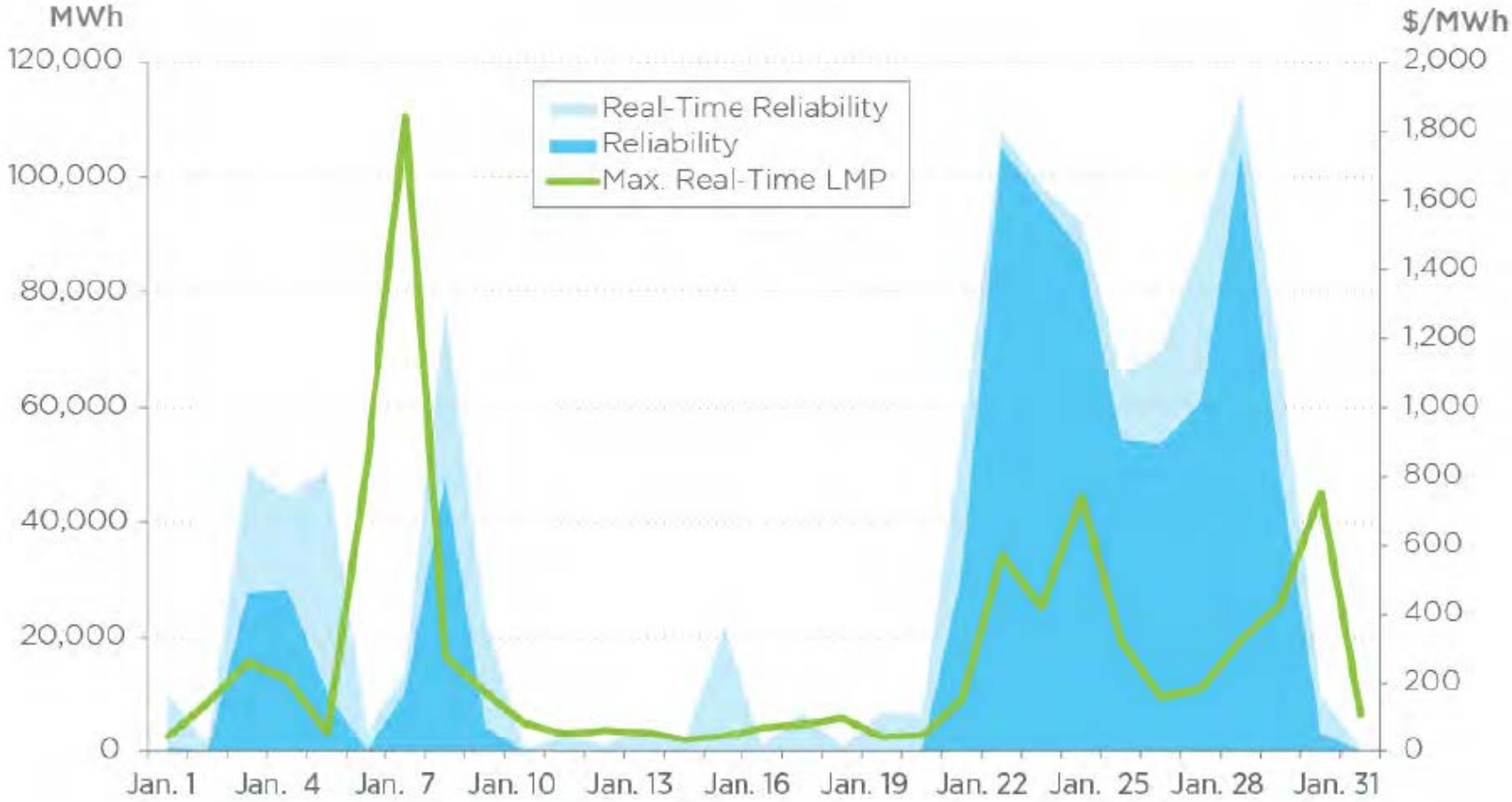
Figure 28: Average of Real-Time and Day-Ahead Locational Marginal Prices – January 2014



Examples

- Figure 35 shows real-time LMPs and balancing operating reserves (uplift) experienced over the two periods in January.
- "In the latter part of January, PJM scheduled generation based on the load forecast and expected generation outages. ***But the inflexible terms and conditions of natural gas supplies*** caused generators operating on 24-burn minimums to have extremely high offer prices compared to lower-cost resources that set locational marginal prices."
- ***Until gas/electric industry differences are resolved, gas deliverability needs to a recognized constraint in the dispatch algorithm.***

Figure 35: Balancing Operating Reserve Megawatt-hours and Locational Marginal Prices in January



Addressing Un-modeled Constraints in PJM

- Closed Loop interfaces
  - Approximate reactive constraints; ad hoc, evolutionary
  - Real-time, day-ahead, sometimes both
  - **IMM Recommendation: "**PJM should be transparent in the formulation of closed loop interfaces with adjustable limits and develop rules to reduce the levels of subjectivity around the creation and implementation of these interfaces. PJM should estimate the impact such interfaces could have on additional uplift payments inside closed loops, transmission planning, offer capping, FTR and ARR revenue, ancillary services markets and the capacity market to avoid unintended consequences."
  - **PJM Response –"**PJM agrees with this recommendation and continues to improve processes and standards related to the formation of closed loop interfaces."
    - From PJM response to IMM 2013 SOM (5/7/14)

Addressing Un-modeled Constraints in PJM

- Energy Reserve Pricing & Interchange Volatility
  - Use economic max value of units instead of the emergency max value when calculating the DASR capability on individual resources. Include startup and notification time in the calculation of capability from offline units.
  - Changes to the day-ahead commitment of units committed ahead of the day-ahead market.
  - Increase the synchronized and primary reserve requirements during emergency conditions by the amount of any additional resources that have been intentionally scheduled for operational uncertainty after the Reliability Assurance Commitment (RAC) run.
- See also Hot and Cold Weather Recommendation Status from 12/3/14 PJM Operating Committee

Useful Information

- What is driving the operator's uncertainty?
  - Lack of knowledge of unit design parameters?
  - Lack of knowledge about fuel security?
  - Prior experience?
- This can be addressed via improved information sharing and situational awareness.
- Certain operator actions can be contemplated:
  - Recurring reactive constraints
  - Natural gas deliverability during pipeline constraints
  - Additional operating reserves during peak periods
- But can these actions be accurately included in the dispatch algorithm?

Recommendations

- Gas deliverability must be considered a constraint during gas pipeline restrictions. This can be addressed via notification and minimum run times.
- To extent possible, include known constraints in LMP given modeling limitations.
- Do not expect to capture all costs in LMP.
- Choose lowest cost to consumers in determining whether to price a constraint or include in uplift.
- Do not inadvertently limit operator's ability to exercise professional judgment to maintain reliability. Models are tools.15
- Assure operators have adequate relevant information about the capability and fuel security of the generation fleet.
- Assure operators have clear communication protocols and scripts to direct unit commitment.