NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Lesson Learned

Unanticipated Wind Generation Cutoffs during a Cold Weather Event

Primary Interest Groups

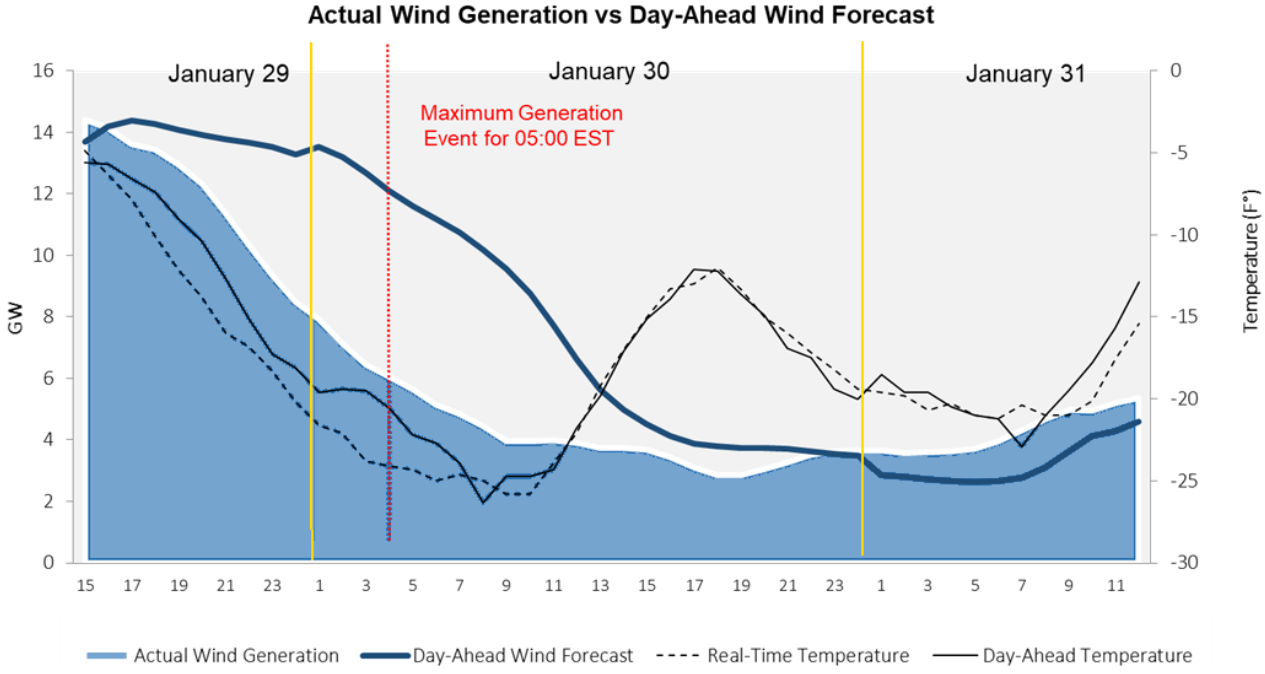
Reliability Coordinators (RCs)	Balancing Authorities (BAs)
Transmission Operators (TOPs)	Generator Owners (GOs)
Generator Operators (GOPs)	Reserve Sharing Groups (RSGs)

Problem Statement

A registered entity experienced extreme cold weather January 29-31, 2019. Unplanned wind generation outages contributed to a maximum generation event, resulting in the entity calling on load management resources (including demand response, behind-the-meter generation, and voluntary reductions) to avoid using emergency power purchases.

Details

The registered entity experienced severe cold temperatures January 29-31, 2019. The actual overnight temperatures between January 29 and 30 were a few degrees colder than forecasted. The severe cold temperatures affected the ability of wind generation to operate. Wind generation was unexpectedly shutting off because the temperature fell below -21°F, the cutoff point for some wind farms to avoid mechanical damage. The steep drop in wind production led to a large deviation from planned wind production output early on January 30. Extrapolation of the trend suggested a rising risk of insufficient generation to meet increasing load by the morning peak, triggering a maximum generation event. When the maximum generation event was declared, temperatures in the area were around four degrees lower than expected and wind generation output was 6 GW (50%) lower than the day-ahead forecast.



The registered entity had planned for approximately 8.5 GW of wind generation in its unit commitment for January 30, a plan already accounting for an anticipated output reduction of 1 GW due to unit cutoffs from cold temperatures. In actuality, only about 4 GW of wind generation was observed for the morning peak load hour. Many temperatures across the area were below the -21°F operational temperature cutoff common to wind units without heating packages. These wind turbines have software that senses when the air temperature drops below -21°F and forces the wind turbine to shut down, thereby protecting the gearbox from damage during extremely cold weather. This resulted in 98 of 216 wind generators needing to be derated or shut down. Units that remained on-line had heating packages installed in the gearbox to reduce the risk of oil freezing, thereby allowing them to operate down to -40°F.

Corrective Actions

As part of calling the maximum generation event, the entity deployed load modifications (including demand response, load modifying resources, and public appeals for voluntary reductions) to address increasing load and declining capacity availability. Coupled with simultaneous school and business closings, demand was reduced by 3 GW or more, eliminating the need for emergency power purchases from neighboring areas.

Lessons Learned

- Improve wind forecasting with additional resource parameters
  - Obtain accurate cold cut-out temperature information for all wind farms in the system footprint.
  - Wind unit owners should prepare for extreme cold weather performance and promptly communicate anticipated operating parameters and data to their BA, RC, and TOP to ensure readiness and provide situational awareness in both operations and planning.
- See other cold weather issues for wind generation discussed in NERC Lesson Learned 20120901 "Wind Farm Winter Storm Issues."

Click here for: Lesson Learned Comment Form

For more Information please contact:

NERC – Lessons Learned (via email)	MRO Reliability Assessment and Performance Analysis
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