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Transmission Operations Impacts Due to High Wind Cut-outs

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RELIABILITY | ACCOUNTABILITY



A Reliability Vignette

Future Wind Planning Informed by Current Operating Experience

Primary Takeaway(s)

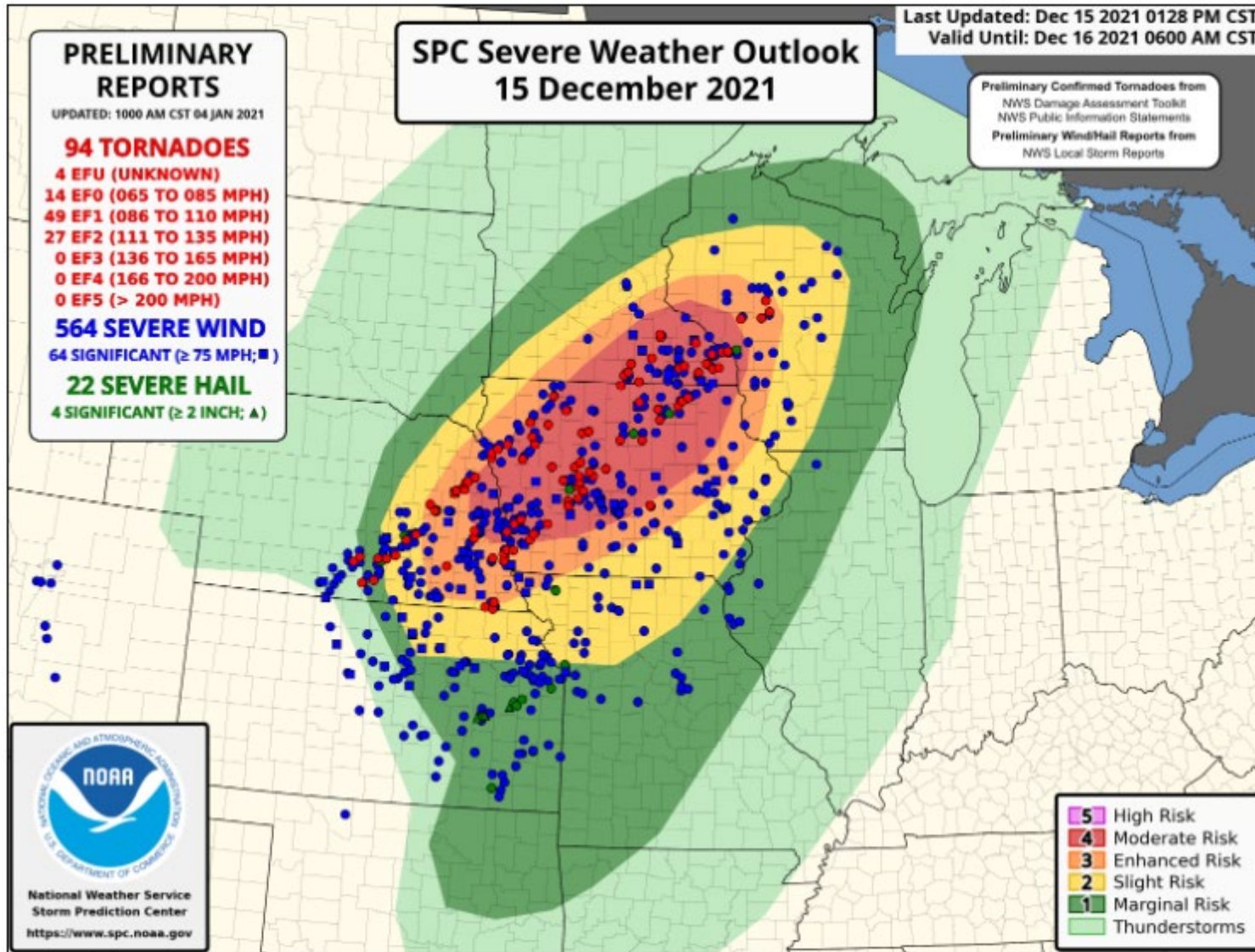
Power systems with large amounts of wind resources are being faced with operational challenges when high winds force wind generation off-line. This operating incident revealed successful transmission operations and identified resource balancing needs that should be considered in the future planning of high-wind generation systems.

Summary of Incident(s)

A severe storm with high winds impacted the footprint of two regional transmission/independent system operators. The operating organizations experienced transmission outages and high speed wind cut-outs for a portion of the day. Loss of load and generation did not reach a significant reliability risk threshold. However, system operating challenges during the incident demonstrated the potential for future resource shortages, provided a dependency on wind generation.

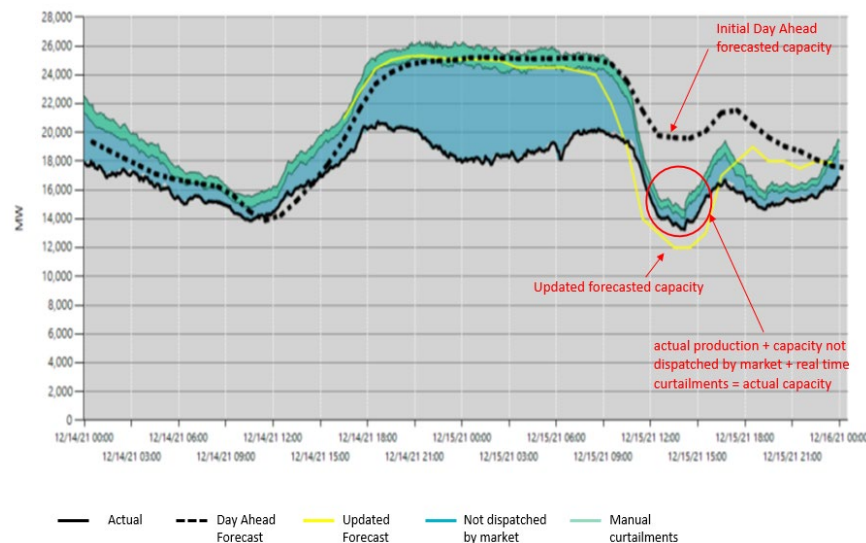
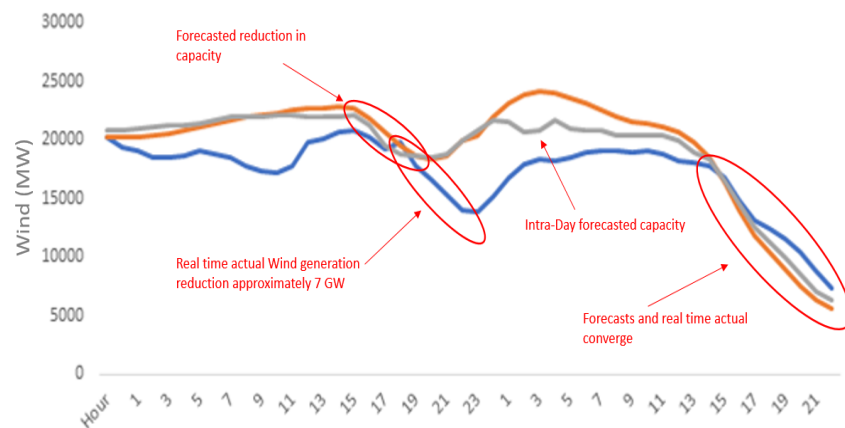
Two Balancing Authorities (BAs) were significantly affected by this high wind event, collectively losing approximately 13,000 MW of wind resources. Coincidentally, a large amount of transmission lines were also lost due to damage from the high winds. This combination of resource loss due to high wind cut-out protection and a constrained transmission system due to loss of transmission lines presented challenges for the BAs.

For BAs dependent on wind resources, a similar incident in the future could result in resource shortages if insufficient amounts of flexible generation are not available to offset the loss of wind generation.



- Large Derecho with winds from 60 to 80 MPH tracked from Kansas to Wisconsin

- Two large BAs were impacted
 - Wind generation losses due to high speed cutout
 - Transmission outages
- Updated day ahead forecasts for wind production are more accurate
- Transmission outages were more challenging than wind generation losses
- Natural gas and coal resources initially replaced lost wind resources



- What could the future hold for these types of events?
 - Higher percentages of wind resources equals higher percentages of losses
 - Lower percentages of natural gas and coal resources
 - Where do reserves come from in a high percentage carbon free grid?
 - If reserves are distant, transmission may be outaged and reserves may not be accessible.

- Adequate transmission and dispatchable/flexible generation resources are needed to support operator flexibility as the amount of variable resources increase.
- Natural-gas-fired generation is the current and near-future primary balancing resource, and ensuring a reliable and flexible natural gas delivery and transportation system is imperative.
- Batteries are expected to become the new dispatchable resource of the future. Adequate amounts of battery energy storage systems will assist operators in managing the system during these types of incidents.
- An alternative option to batteries for managing these scenarios could be geographically dispersed generation reserves with appropriate transmission facilities. This would enable generation not impacted by a high wind event to be dispatched to the area experiencing losses.
- Probabilistic composite planning methods for generation and transmission loss will need to be incorporated to properly plan for generation reserve amounts and locations to accommodate these types of losses on the future grid.

A stylized map of North America, including the United States, Canada, and Mexico. The map is rendered in shades of blue and grey, with the United States and Canada in a darker blue and Mexico in a lighter grey. The word "Questions" is overlaid on the map in a large, bold, black font.

Questions

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