Survey of Current and Innovative Practices in the Integration of Wind and Solar Generation

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Project Description

- Intent of project was to research and suggest “best practices” in wind and solar integration
- Any practices considered particularly innovative would be modeled by the GE team
- Inform PJM and PJM stakeholders of such practices
- Primary focus is on system operations, not on transmission planning
- Because of length of report, this presentation will discuss only the best practice chapter
Report

• 186 pages, including two Appendices
• Available on the IRTF section of the PJM web site
Topics Addressed in Report

• Energy Market Scheduling
• Energy Imbalances
• Visibility of Distributed Generation
• Reserves
• Contingency Reserves
• Wind and Solar Forecasting
• Capacity Value of Variable Generation
• Best Practices
Energy Market Scheduling

- Sub-hourly scheduling for both within-RTO and for scheduling on external interconnections
- Already practiced within PJM and increasingly between PJM and external interconnections (NYISO at one bus, MISO)
Visibility of Solar DG

• Expect significant amounts of either distributed or central station solar in PJM in response to solar requirements under state RPS policies

• DG solar not visible to system operators

• Lack of reconciliation between IEEE-1547 and low-voltage ride-through requirements
Visibility of Solar DG (2)

- Install telecommunications and remote control capability to clusters of solar DG in PJM
- Alternatively, have distribution utilities install that capability and communicate data and generation to PJM
- Account for non-metered solar DG in load forecasting
- Include utility-scale solar in variable generation forecasting
Reserves

• Have operating reserve requirements set by season or level of expected variable generation
• Rely on demand response to provide reserves (PJM does this but limits demand response to 25%)
• Require wind and solar generators to be capable of providing AGC
Wind and Solar Forecasting

• Implement centralized forecasting for wind and utility-scale solar that includes day-ahead, very short-term, short-term and medium or long-term forecasts (PJM has done this except for solar)

• Incorporate estimates of non-metered solar production into day-ahead and short-term load forecasts

• Evaluate whether short-term forecasts can capture the probability of ramps, or institute separate ramping forecast
Wind and Solar Forecasting (2)

• Monitor use of confidence intervals and consider adjusting them accordingly
• Institute requirements for data collection from wind and solar generators
• Integrate wind and solar forecasts with load forecasts to produce a “net load” forecast
Other Best Practices

• Incorporate near-term wind and solar forecasts as part of Intra-day Unit Commitment (6 hours ahead)
• Look-ahead Dispatch for very short periods (10-15 minutes ahead) (PJM does this)
• Conduct ELCC study of wind and solar generation at regular intervals and use the results to recalibrate and/or benchmark PJM’s approximation method of capacity value
• Require wind generators to be equipped with ability to limit ramps
Other Emerging Best Practices

• Short-term dispatch and scheduling for wind
• Use contingency reserves for rare and severe wind ramps that happen infrequently
• Development of slower and longer lasting reserve beyond 30-minute non-spinning reserve
• Other initiatives:
  – CAISO Flexible Ramping Constraint
  – MISO Ramp Management project
Questions?
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