NERC NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Accommodating High Levels of Variable Generation

the reliability of the bulk power syst



About NERC

Agenda

- About the Integration of Variable Generation Task Force (IVGTF)
- "Variable" Resources
- Recommendations
- Next Steps







International regulatory authority for electric reliability in North America

Develop & enforce reliability standards



- Analyze system outages and near-misses & recommend improved practices
- Assess current and future reliability



- Formed by NERC's Planning & Operating Committees in December 2007
- 100 participants
 - Utilities, ISO / RTO's, wind and solar manufacturers, associations, government
 - Strong cross-border collaboration (U.S. & Canada)
- Focus on reliability



Keeping Reliability in the Balance

- Bulk power system reliability must be maintained, regardless of the generation mix;
- All generation must contribute to system reliability within their physical capabilities; and
- Industry standards and criteria must be fair, transparent and performance-based.

New Renewable Capacity





Variable Fuels Must Be Used Where Available



 Variable generation often located in areas remote from demand centers and existing transmission infrastructure





Highlight New Renewable Capacity



- 229 GW of additional installed wind capacity
- 38 GW expected on-peak capacity
- Expected on-peak capacity range from 0-37% of total installed capacity across different subregions

70,000 60,000 50,000 МŇ 40,000 30,000 20,000 10,000 0 ERCOT FRCC MRO NPCC RFC SERC SPP WECC Existing Future Conceptual

2018 Projected Wind On-Peak Capacity



- 1.2 Consistent and accurate methods are needed to calculate capacity values attributable to variable generation.
- 1.4 Resource adequacy and transmission planning approaches must consider needed system flexibility to accommodate the characteristics of variable resources as part of bulk power system design.
- 1.6 Probabilistic planning techniques and approaches are needed to ensure that system designs maintain bulk power system reliability.





- 1.1 Standard, valid, generic, non-confidential, and public power flow and stability models (variable generation) are needed and must be developed, enabling planners to maintain bulk power system reliability.
- 1.5 Integration of large amounts of plug-in hybrid electric vehicles, storage and demand response programs may provide additional resource flexibility and influence bulk power system reliability and should be considered in planning studies.
- 1.8 Variable distributed resources can have a significant impact on system operation and must be considered and included in power system planning studies (2011).

Work Plan: Interconnection



- 1.3 Interconnection procedures and standards should be enhanced to address voltage and frequency ridethrough, reactive and real power control, frequency and inertial response and must be applied in a consistent manner to all generation technologies.
- 1.7 Existing bulk power system voltage ride-through performance requirements and distribution system antiislanding voltage drop-out requirements of IEEE Standard 1547 must be reconciled.
- 2.2 Balancing Areas must have sufficient communications for monitoring and sending dispatch instructions to variable resources.





Question & Answer



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