

# Emerging Technologies

A Threat to Reliability?

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# Essential Reliability Services

## Task Force/Work Group

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Formed in 2014

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Representatives  
from

Transmission planning and operations

Renewable developers

Regulatory organizations

Distribution utility

Researchers

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Final report - To  
NERC Technical  
Committees

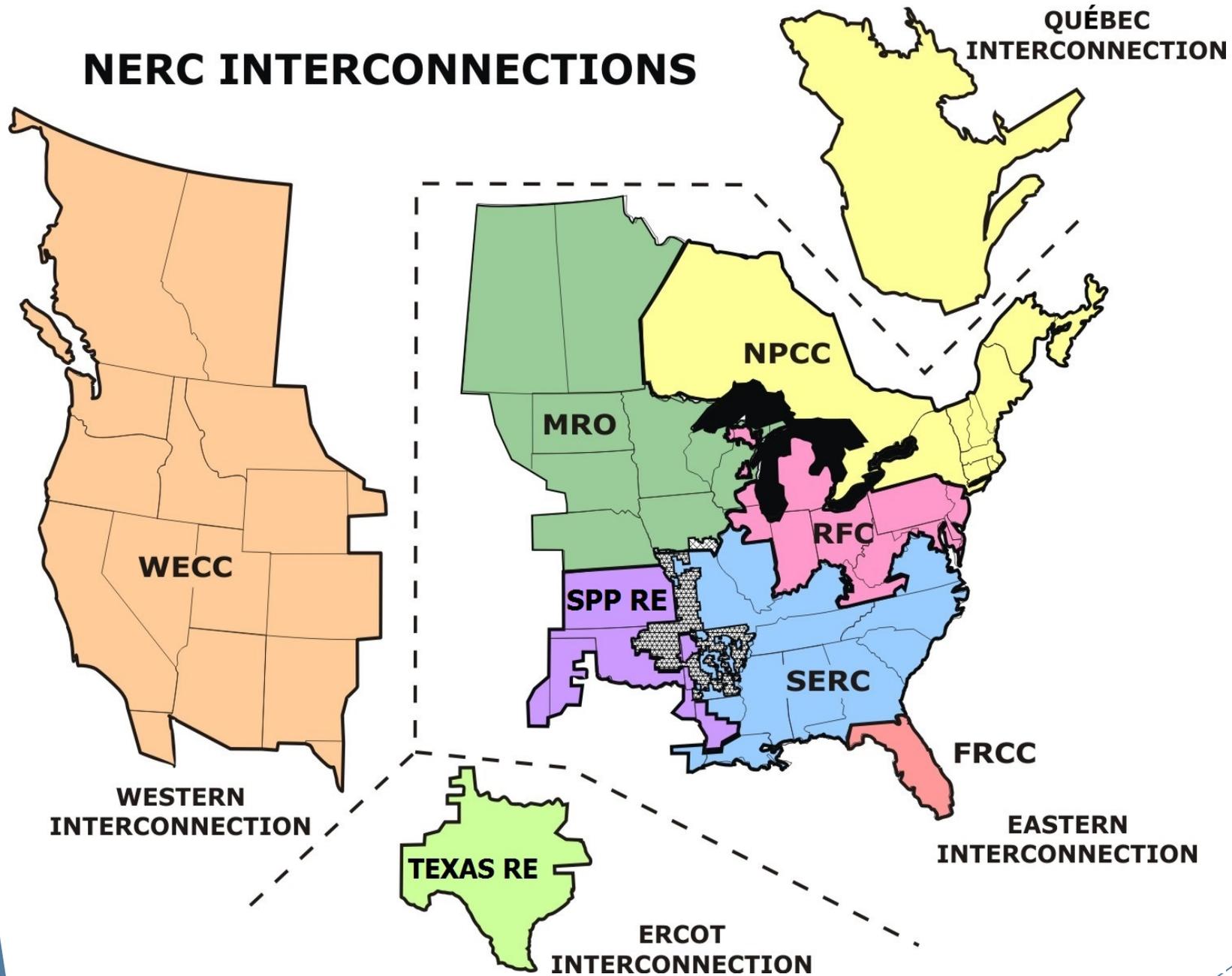
Identify current state

Recommendations to plan the bulk  
power system for reliable  
operations

# Essential Reliability Services

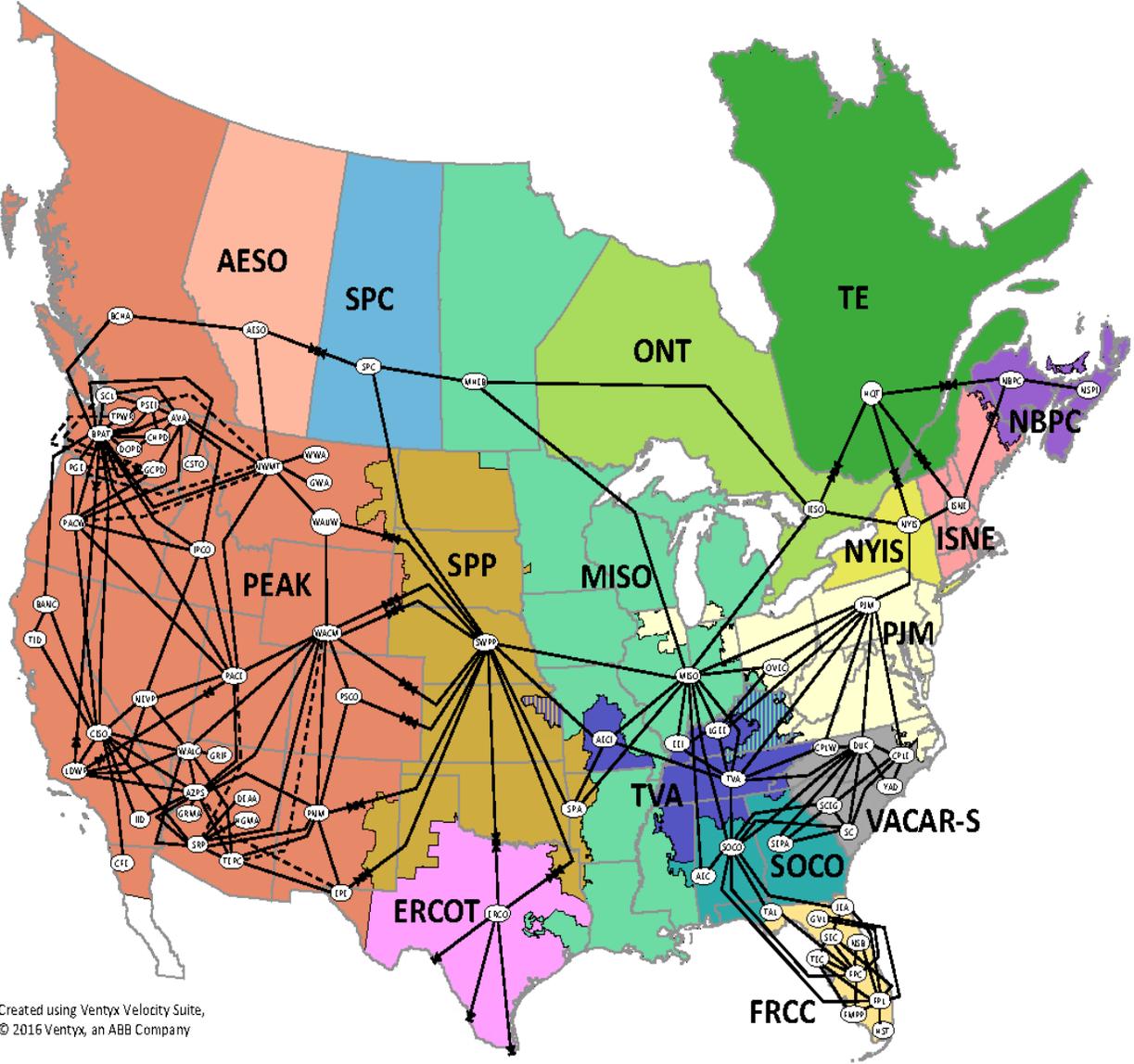
- ▶ Based upon original NERC Interconnected Operating Services, early 2000s
- ▶ Consensus agreed that there were two primary services continued:
  - Frequency
  - Voltage
- ▶ The ERSWG added
  - Ramping/Balancing
- ▶ Plus some other interesting services
- ▶ Then we hit on Distribution Energy Resources and Distribution/Transmission Interface

# NERC INTERCONNECTIONS



# NERC Balancing Authorities

As of October 1, 2015



--- Dynamically controlled generation

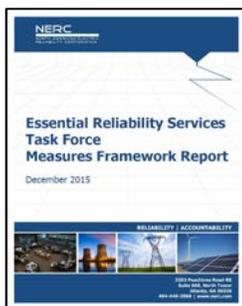
⏪ Back-to-Back DC Converter

Submit changes to [balancing@nerc.com](mailto:balancing@nerc.com)

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## Endorsed Assignments from ERS Framework

| Ref Number | Title                                  | ERS Recommendation | Ongoing Responsibility |
|------------|--|--------------------|------------------------|
| 1          | Synch Inertia at Interconnection Level | Measure            | RS & FWG               |
| 2          | Initial Frequency Deviation            | Measure            |                        |
| 3          | Synch Inertia at BA Level              | Measure            |                        |
| 4          | Freq Response at Interconnection Level | Measure            |                        |
| 5          | Real Time Inertial Model               | Industry Practice  | BA                     |
| 6          | Net Demand Ramping Variability         | Measure            | RAS                    |
| 7          | Reactive Capability on the System      | Measure            | PAS & SAMS             |
| 9          | Overall System Reactive Performance    | Industry Practice  | EAS                    |
| 10         | System Strength                        | Industry Practice  | PC                     |

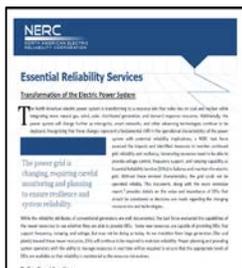


- ▶ December 2015 – NERC Board approved the 2015 ERS Framework Report:
- ▶ Framework Report

<http://www.nerc.com/comm/Other/esntlrlbltysrvdstskfrcDL/ERSTF%20Framework%20Report%20-%20Final.pdf>

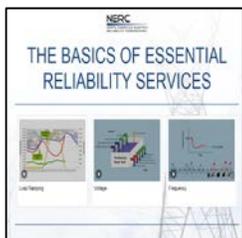
- Abstract Document

<http://www.nerc.com/comm/Other/esntlrlbltysrvdstskfrcDL/ERSAbstractReportFinal.pdf>



- ERS Videos

<https://vimeopro.com/nerclearning/erstf-1>



# Distributed Energy Resources (DER)



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DERs are rapidly growing in the BES

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The reliability impact of DERs on distribution system is well understood, but less so on BES level

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DERs will increasingly have state-of-the-art capabilities for active power control and reliability services.

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This report focuses on understanding the basics of modeling, planning and operating DERs

# Distributed Energy Resources (DER)

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Operational impacts in areas with high penetration of distributed energy resources

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Recommendation for consistent modeling and assessing DER

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Review existing NERC Reliability Standards and coordinate with IEEE 1547 standard related efforts

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Review the NERC Functional Model, registration categories

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Evaluate the need for Reliability Guidelines and/or Standard Authorization Requests (SAR)

# Distributed Energy Resources (DER)

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How should DER be included in planning and operating models?

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What level of control is needed for reliable system operations?

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What level of visibility do system operators require?

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How can DER characteristics contribute to or impact the reliability of the bulk power system?

More than load modifiers

Impacts dynamic character of the power system

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What does the ERO need to consider?

# Conclusions

- ▶ 1) **Guidelines:** The DERTF recommends that a set of guidelines be developed to assist in modeling and assessments, such that owners/operators of the BPS can account for the impact of DERs. The DERTF also recommends that Distribution Provider (DP) be added as an applicable entity in MOD-032, replacing the Load Serving Entity that is currently an applicable entity, to provide for collecting pertinent information related to distribution impacts on the BPS (similar to what is already included in TOP-003-3).

# Conclusions

- ▶ **2) Data Sharing:** Data requirements and sharing of information across the transmission-distribution (T-D) interface should be further evaluated to allow for adequate assessment of future DER deployments. Additional consideration may be needed for stability, protection, forecasting, reactive needs, and real time estimates for operating needs.
- ▶ **3) Modeling:** Based on reliability considerations for modeling purposes, generation from DERs should not be netted with load as penetration increases. Load and DERs should be explicitly modeled in (a) steady-state power flow and short-circuit studies and (b) dynamic disturbance ride-through studies and transient stability studies

# Conclusions

- ▶ **4) Dynamic Models:** Dynamic models for different DER technologies are available and can presently be used to model the evolving interconnection requirements and related performance requirements. WECC's simplified distributed PV model (*PVD1*) provides a reasonable balance between modeling accuracy, computational requirements, and handling of the system model, but some further improvement may be needed.
- ▶ **5) Coordination:** A coordinated effort by distribution and transmission entities is needed to determine appropriate use of future DER capabilities (such as settings available under proposed IEEE 1547 revisions).

# Conclusions

- ▶ **6) Definitions:** Further examination is needed to determine whether DSM should be included in the DER definition and if the DER definition should be added to the NERC glossary and/or NERC functional model.
- ▶ **7) Industry Collaboration:** Finally, the limited existing knowledge and experience of modeling DERs in system planning studies and operating with higher levels of DERs will require future collaborative research, knowledge exchange and learning. The industry should collaborate with vendors of power system simulation software and DER product vendors to continuously enhance models for DER representation in BPS planning studies.

# Next Steps

- ▶ 1. Developed SAR to amend MOD-032 for changing LSE to DP
- ▶ 2. Developing Guides for
  - ▶ Data Collection
  - ▶ Data Modeling
  - ▶ Load Forecasting
- ▶ 3. Conflict between UFLS and Frequency Protection
- ▶ 4. Assessing Planning versus Operations



*Thank you*

Brian Evans-Mongeon  
President and CEO

Reliability  
Compliance  
Security



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