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USA







Grid Integration and Management: A US Perspective

Session II: Grid Integration and Management Ann Rendahl

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US Regulation and Renewables

- US energy grid is evolving due to state and federal laws, and customer and utility goals.
- States regulate generation preferences and retail rates
- Federal government regulates organized markets and interstate transmission
- Level of renewables serving load, and integration, varies by state
- New federal administration and Congress will impact federal policies and funding







Jan. 24 – Feb. 25: Percent of Power from Renewables

(https://www.fool.com/research/renewable-energy-by-state/).

Challenges in Grid Integration and Management

- Intermittency of renewable • resources
- Decentralized energy systems •
- Inverter-based resources •
- System operator control and visibility







Key Strategies

Evolve from grid of the past to meet current and future needs

• Variable, local generation, with multidirectional, flexible and dynamic grid

Resource Management

- Demand flexibility
- Virtual Power Plants

Grid Management

- Grid optimization
- Reliability standards







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Resource and Demand Flexibility

• Energy Storage:

- Energy storage can shift generated energy to a peak period, avoid curtailment, support reliability.
- California: Storage target of 1.3 GW by 2020 / 13.3 GW achieved by 2024; New goals: 52 GW of BESSand 4 GW of long-duration storage by 2045.

Demand/Load Flexibility:

- Incentive pricing or direct control of demand in residential, commercial, and industrial buildings.
- Aggregated DER: Dynamic rate events or peak pricing
- National Lab Report





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Virtual Power Plants

- Aggregated DERs that can balance electricity demand and supply, providing utility-scale grid services.
 - Effective peak load management
 - 33 GW of VPP operating in US
 - Hawaii, Massachusetts, New York Low cost, low emissions peaking capacity
 - Hawaii, Utah, Vermont Direct customer battery control

DOE Releases New Report on Pathways to Commercial Liftoff for Virtual Power Plants | Department of Energy





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Grid Optimization

Distribution System

- Distributed energy resource management systems (DERMS)/Advanced distribution management system
- Monitor, control, optimize and predict operations and DERS
- Michigan approved use of ADMS/DERMS
 <u>NARUC Smart Grid Report</u>
- Transmission System
 - Synchrophasors
 - Advanced Power Flow Conductors
 - Topology Optimization





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Reliability Standards

- **Event:** Grid disturbances in California and Texas due to ride-through failure of solar inverter-based resources.
- **Response:** NERC rules for bulk power system connected inverter-based resources, effective May 2025
 - No minimum capacity
 - Register with NERC as generator owner
 - Meet reliability standards, including PRC-024, \bullet frequency and voltage protection
 - Ride through for normal system disturbances that fall within predetermined criteria.

NERC Launches IBR Registration Initiative





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