# Department of Energy Transmission Reliability Program Review

## Grid Reliability Metrics

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**by**

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# *Briefing Outline*

- Assessment
- Project Goals
- Project Plan and Methodology
- Grid Metrics Performance Areas
- Current ISO/RTO Comparative Data
- Future ISO/RTO Comparative Data
- Monitoring System for Real-Time Performance and Support Policymakers Decision Making
- Project Deliverables

# Assessment

- Current grid metrics were designed for vertically integrated utility.
- Industry is transitioning to a competitive market structure, with reliability management shifting from a central utility to ISOs/RTOs.
- NERC and Regional Reliability Councils:
  - Relied on peer pressure to achieve desired reliability performance.
  - Reliability criteria and standards lacked effective performance measurements.
  - Lack the ability to evaluate standards performance in real-time.
- Transactions, incidence of TLRs, voltage problems, and abnormal frequency excursions are increasing.
- Actual performance of the systems frequency responsive reserves is inadequate.
- Current control metrics (e.g. CPS1 and CPS2) need to be reviewed to determine if they are effective measures for competitive markets with ISOs/RTOs.
- Metrics for market functions impacting reliability need to be developed.

# *Grid Reliability Metrics - Goal*

- Develop metrics to measure the reliability performance of grids.
- Utilize metrics to enable comparative assessment of ISOs and RTOs.
- Enable policymakers to utilize metrics to identify targets of improvements for reliability, market efficiency, bottlenecks.
- Develop tools and technologies for measuring, monitoring, and tracking grid metrics for use by policymakers and operators. Grid metrics to cover supply, transmission, demand, markets, operations, and interconnections.

# Project Plan and Methodology

Define Reliability Performance Areas

Identify Associated Reliability Standards/Criteria

Definition of Expected Performance and Measure

Determine the Data Required to Calculate Compliance

Define & Test Revised or New Metrics Using Operating Data

Determine the Appropriate Reliability Metrics for a changing Industry and Provide Policy Makers with Comparative Analysis Information on Performance.

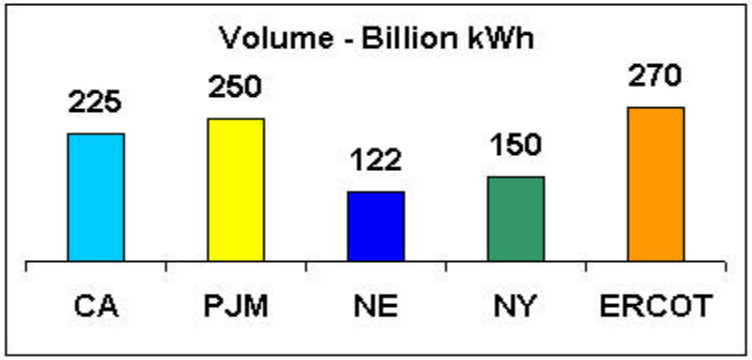
# Grid Metrics Performance Areas – Examples of Measures

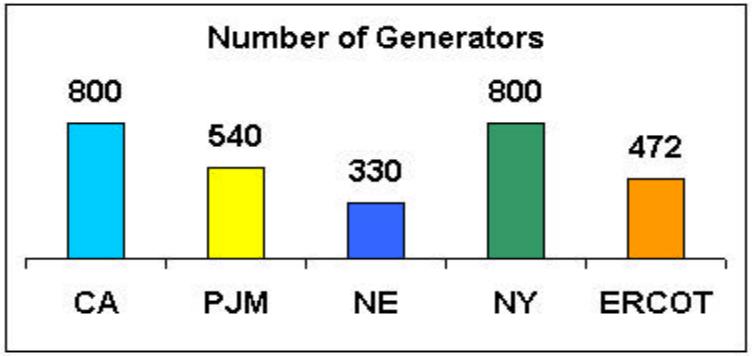
| PERFORMANCE AREA | MEASURE |
|---|---|
| **SUPPLY**<br>▪ **System**<br>▪ **Generators** | ➢ Maintain 60 Hz. Frequency (balance generation and loads)<br>➢ Provide a fixed amount of Frequency Responsive Reserves (FRR).<br>➢ After a disturbance, return ACE to zero or pre-disturbance value.<br>➢ Deliver kWh, VARS and ancillary services consistent with committed schedule(s). |
| **TRANSMISSION** | ➢ At critical stations:<br>▪ maintain voltages within a regionally defined range.<br>▪ maintain reactive reserve margins to meet regional criteria.<br>➢ After a security limit violation, return system to a safe limit within 30 minutes. |
| **DEMAND** | ➢ Manage loads to meet committed schedules for demand and load management |

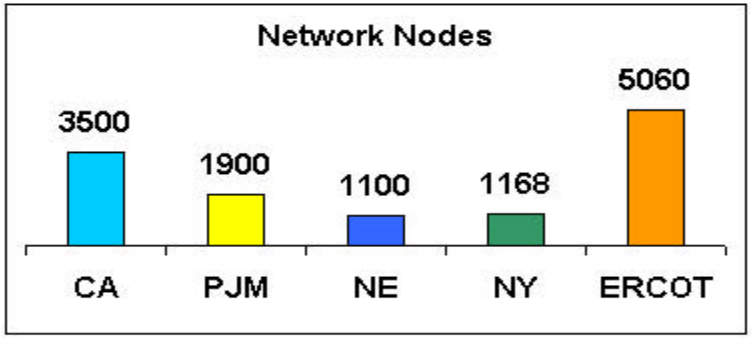
# Grid Metrics Performance Areas – Examples of Measures

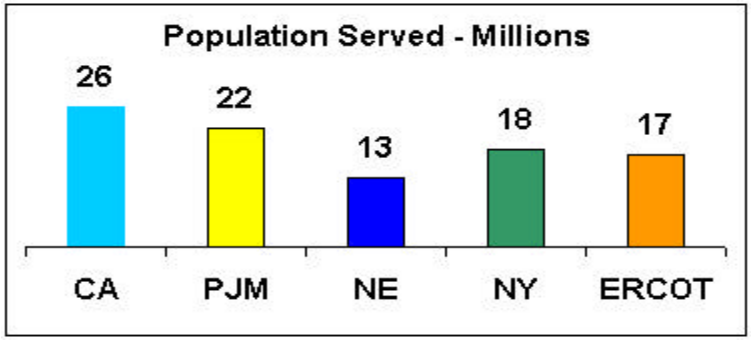
| PERFORMANCE AREA | MEASURE |
|---|---|
| MARKET | ➢ Assure efficient and reliable market operations:<br>▪ Energy price spikes and trends<br>▪ Ancillary Service price spikes and trends<br>▪ Resource adequacy and trends<br>➢ Congestion (number of paths, magnitude, TLRs) |
| OPERATIONS | ➢ Assure coordinated and reliable grid operations:<br>▪ Control Center EMS and RTUs available 99.5% of time<br>▪ Inter-company data sharing capability with an availability rate of 99.5%<br>▪ Critical inter-company communications system with availability of 99.5% |
| INTER-ONNECTION | ➢ Import/export ATC |

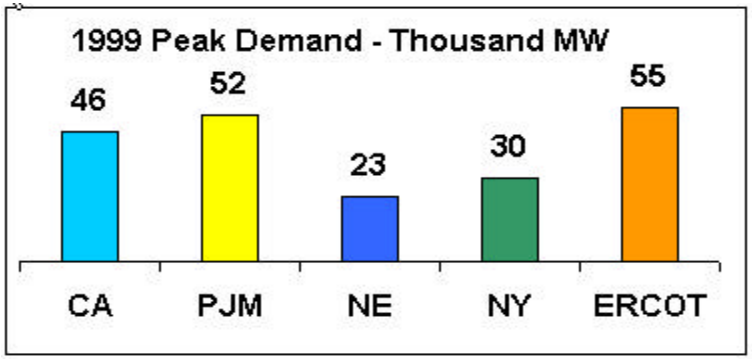
# Current ISO/RTO Comparative Data

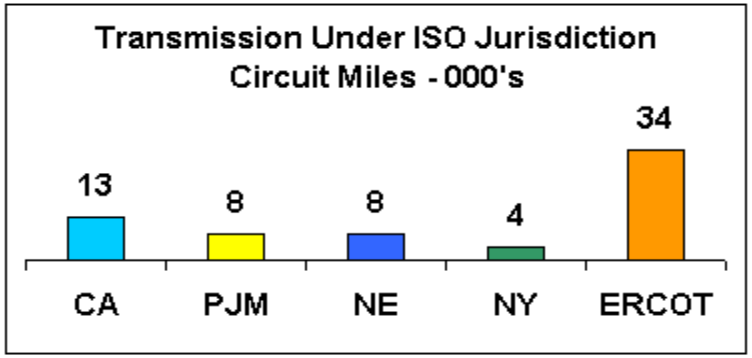


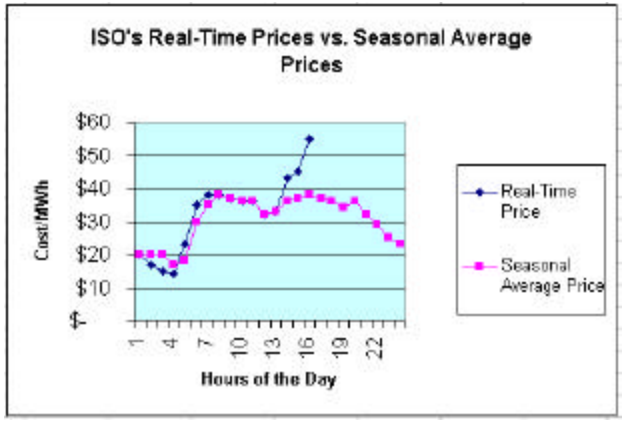



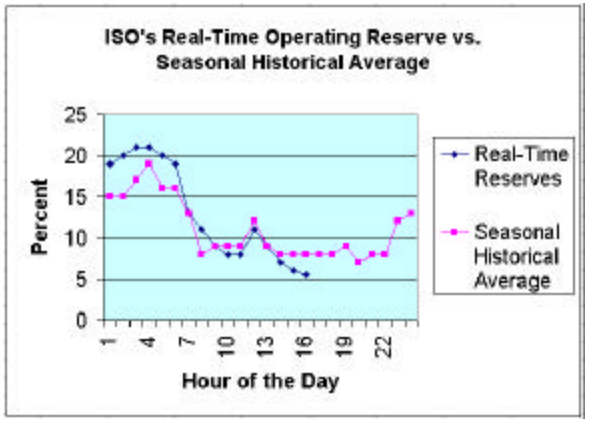



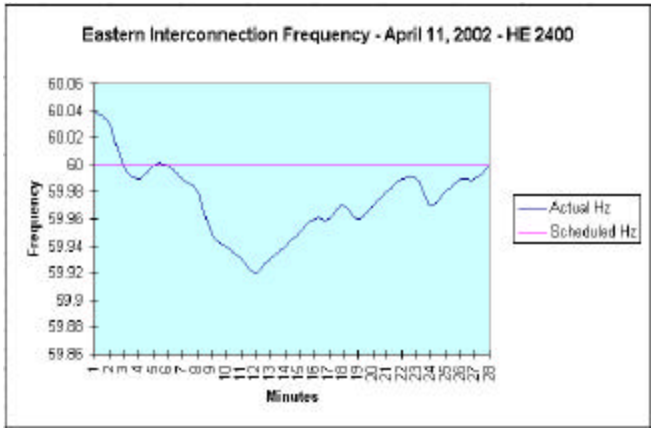
# Future ISO/RTO Comparative Data




- **Track Market Indicators**
  - Number of Price Spike (Hours per Year)
  - Compare Data Against Other ISO/RTOs

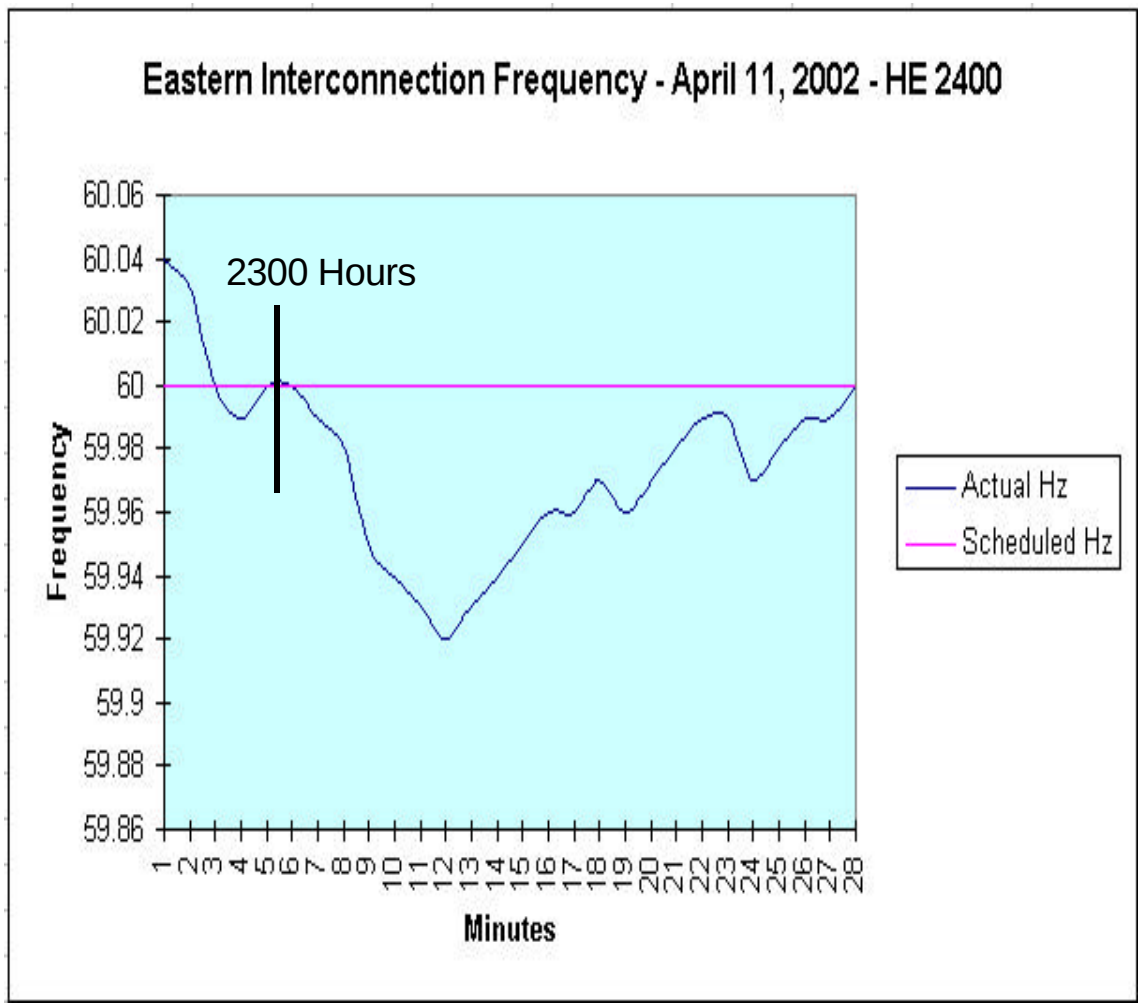



- **Track Supply Side Reliability Indicators**
  - Actual Reserves vs. Standards
  - Number of Annual Energy Alerts
  - FRR Performance



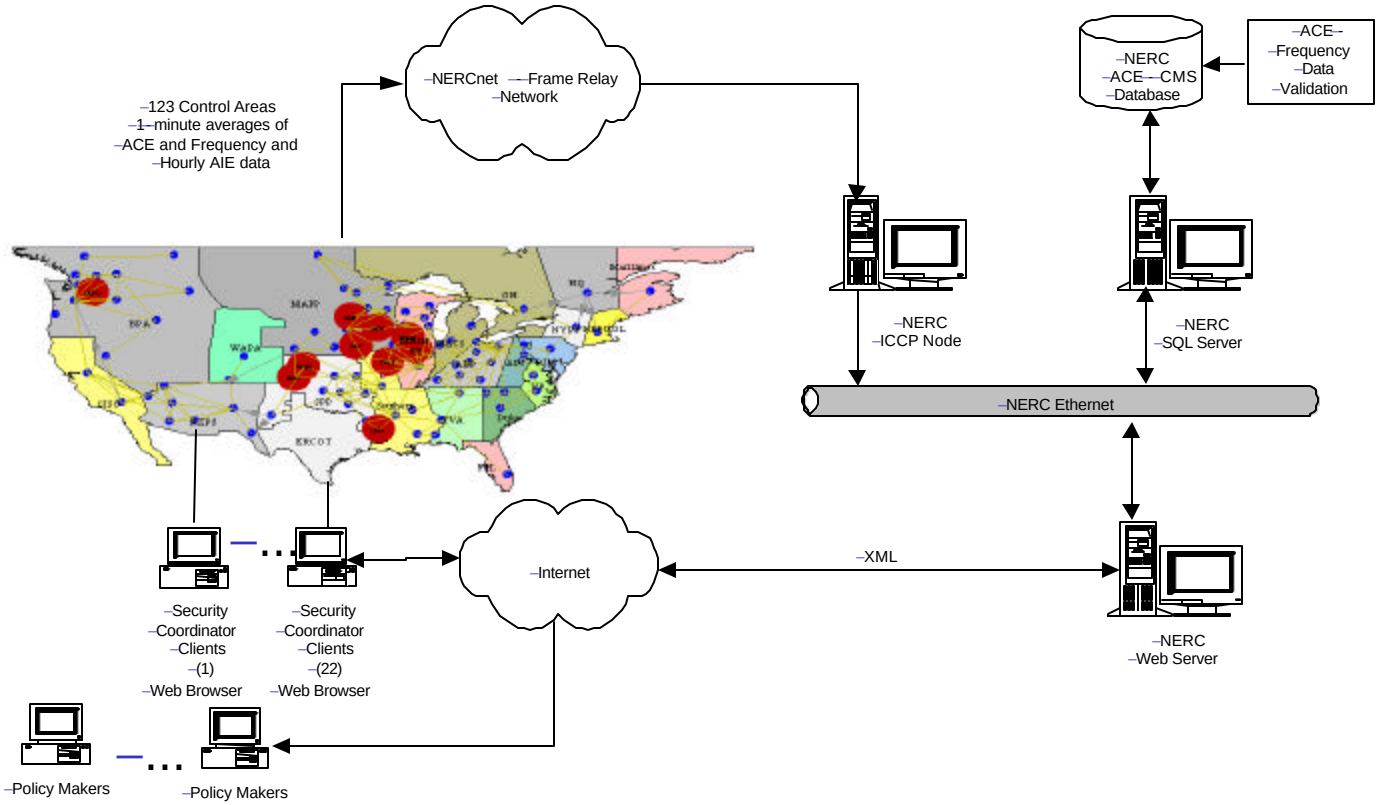

- **Track Interconnection and RTOs Grid Reliability**
  - Identify and Address Common Issues and Concerns
  - Track Performance in Key Areas (e.g. Voltage, Reactive Reserves)
  - Compare Interconnection and RTO Performance Data

# Common Interconnection Issues




- **Track Interconnection Performance**
  - Identify and track undesirable performance within the Interconnection.
  - Identify and track Control Areas contributing to the issue.
  - Identify and track suppliers that are contributing to the issue.
  - Recommend appropriate standards and performance metrics to measure compliance.
  - Establish market rules to ensure compliance with standards.

# Monitoring System For Real-Time Performance and Support Policy Makers Decision Making




**–Real Time Performance Data Overlapped**

**–On Recent Historical Patterns for Policymakers**

# *Project Deliverables*

- Determine if standards and associated metrics are appropriate in the changing environment of the electric industry.
- Assemble Grid Metrics for Comparative Assessment of ISOs and RTOs
  - ✓ How are they performing in key reliability metrics
  - ✓ How do they compare with each other
  - ✓ What are the causes of poor performance
  - ✓ Methods of enhancing performance
  - ✓ Develop tools and technologies for monitoring grid reliability performance