

Transmission Reliability Research Review

Grid Reliability Metrics

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CERTS
CONSORTIUM FOR ELECTRIC RELIABILITY TECHNOLOGY SOLUTIONS

Briefing Outline

- Grid Reliability Metrics - Project Concept
- Approach
- Status and Results To Date
- Standard Metrics and Monitoring Needed
- Application of Grid Metrics
- Key Issues



Grid Reliability Metrics - Project Concept

- The project was initiated in anticipation of the electric industry need for developing standard metrics for grid reliability and market operations to:
 - Enable real time performance and compliance monitoring
 - Identify and correct reliability and market problems to prevent outages and market dysfunction
 - Utilize common metrics for mandatory reliability standards
 - Enable tracking and comparison of reliability and market performance



Grid Reliability Metrics - Approach

- Review and assess current metrics.
- Work with NERC and ISOs to refine metrics and develop new metrics for reliability and market performance monitoring.
- Utilize historical data on metrics to enable performance assessment of ISOs and RTOs.
- Develop tools and technologies for measuring, monitoring, and tracking grid and market metrics.

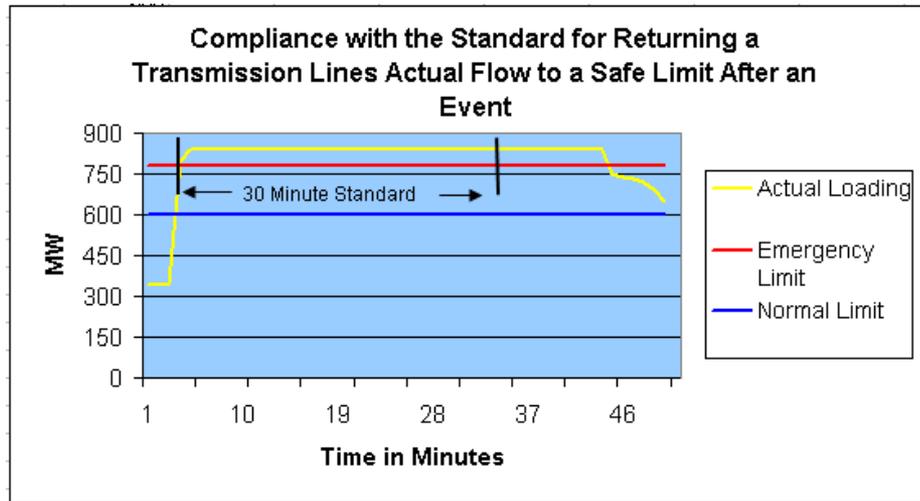


Status and Results To Date

- Worked with NERC to assess and refine metrics including CPS1 and CPS2
- Identified key areas for common metrics development including
 - Transmission (e.g. voltage and thermal limits)
 - Generation (e.g. suppliers control error for MW and MVARs)
 - Control Area (e.g. control and disturbance performance)
- Demonstrated GRID-3P prototypes for real time metrics monitoring to NERC, ISOs, FERC, and other stakeholders for
 - ACE-Frequency
 - VAR
 - Power System Dynamics
- Supporting NERC Subcommittees on testing new metrics for reliability and control standards for NERC Policy 1

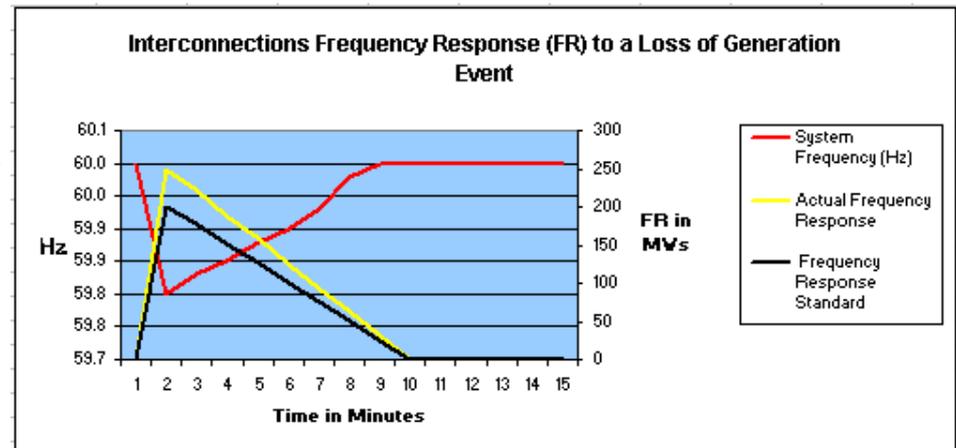


Metrics and Performance Tracking



- Lines and equipment have MW limits.
- Standard defines the maximum allowable time to operate above limit.
- Monitor actual flows on critical lines and equipment.
- Track performance when limits are exceeded.
- Evaluate performance for compliance.

- Generators connected to the grid are expected to have a governor that responds to frequency deviations (increase/decrease MW output).
- Monitor system frequency (Hz) and frequency response for each interconnection.
- Track performance during loss of generation events (Interconnection, control area, generator).
- Evaluate performance for compliance



Application of Grid Metrics

Metrics -- Illustrative

Frequency Deviations – Magnitude and Duration

Voltage & VARs – Reactive Reserve, Actual Performance at Critical Facilities, Disturbance Performance

Stability – Transmission Reliability Margin

Transmission – Frequency, Magnitude, Duration, Cost and Location of Congestion/Over Loads

Supplier Performance – Ancillary Services and Frequency Response

Market Performance – Frequency, Duration, Magnitude of Price Spikes

Applications

Reliability Management

Vulnerability Assessment

Compliance Monitoring

System Planning

Actions

Redispatch

Nomogram/Remedial Actions

Operating Procedures

Investment Decisions

Benchmarking

Market Rules



Standard Metrics and Monitoring Needed As Part of Blackout Response -- Sponsorship Required to Advance Project

- To implement an effective grid and market performance monitoring and tracking system that provides the ability to detect and react to real-time compliance issues will require regulatory (FERC) and NERC (assuming they have legislative authority) sponsorship. Sponsorship would include linking their current or developing Performance/Compliance Monitoring Functions with this project to address the following:
 - Definition of what would be monitored
 - Ensuring consistency in reported data
 - Defining who will do the performance monitoring
 - Defining the area of responsibility for each monitor
 - Mandatory provision of critical performance data in real-time
 - Actions to be taken for non-compliance



Key Issues

- ISOs raised the question, “Who is the client and user of Grid Metrics?”
- Separation between market monitoring units and reliability monitoring
- August 14, 2003 Blackout – project activity interrupted while at the same time reinforced needs identified in this project.
- Consensus on need to establish both grid reliability and market performance standards but details on who sets direction and assumes leadership evolving
- Policy questions on who, how, and when do you monitor or track performance?
 - Self-monitoring or third party monitoring
 - Post assessment (quarterly or annually)
 - Real-time monitoring
 - Data reporting – ISO, NERC, FERC?



Backup Slides



NERC's Current Standards Under Development

Standards Under Development	Progress Through the Steps in the Standards Development Process											Status
	SAR Development				Standard Development				Approval & Implementation			
	Submit	Post	Solicit	Auth.	Draft	Post	Test	Anal.	Ballot	Adopt	Impl.	
Urgent Action												
1200 - Cyber Security (Urgent Action)												Adopted by Board
Reliability Standards												
100 - Coordinate Operations												
200 - Operate Within Interconnected Reliability Operating Limits												
300 - Balance Resources and Demand												
400 - Coordinate Interchange												
500 - Assess Transmission Future Needs and Develop Transmission Plans												
600 - Determine Facility Ratings, Operating Limits, and Transfer Capabilities												
700 - Define (Physical) Connection Requirements												
800 - Design, Install, and Coordinate Control and Protection Systems												
900 - Monitor and Analyze Disturbances, Events, and Conditions												
1000 - Prepare for and Respond to Abnormal or Emergency Conditions												
1100 - Prepare for and Respond to Blackout or Island Conditions												
1300 - Cyber Security (Permanent)												

