MISO Wide-Area Visualization

NASPI Work Group Meeting

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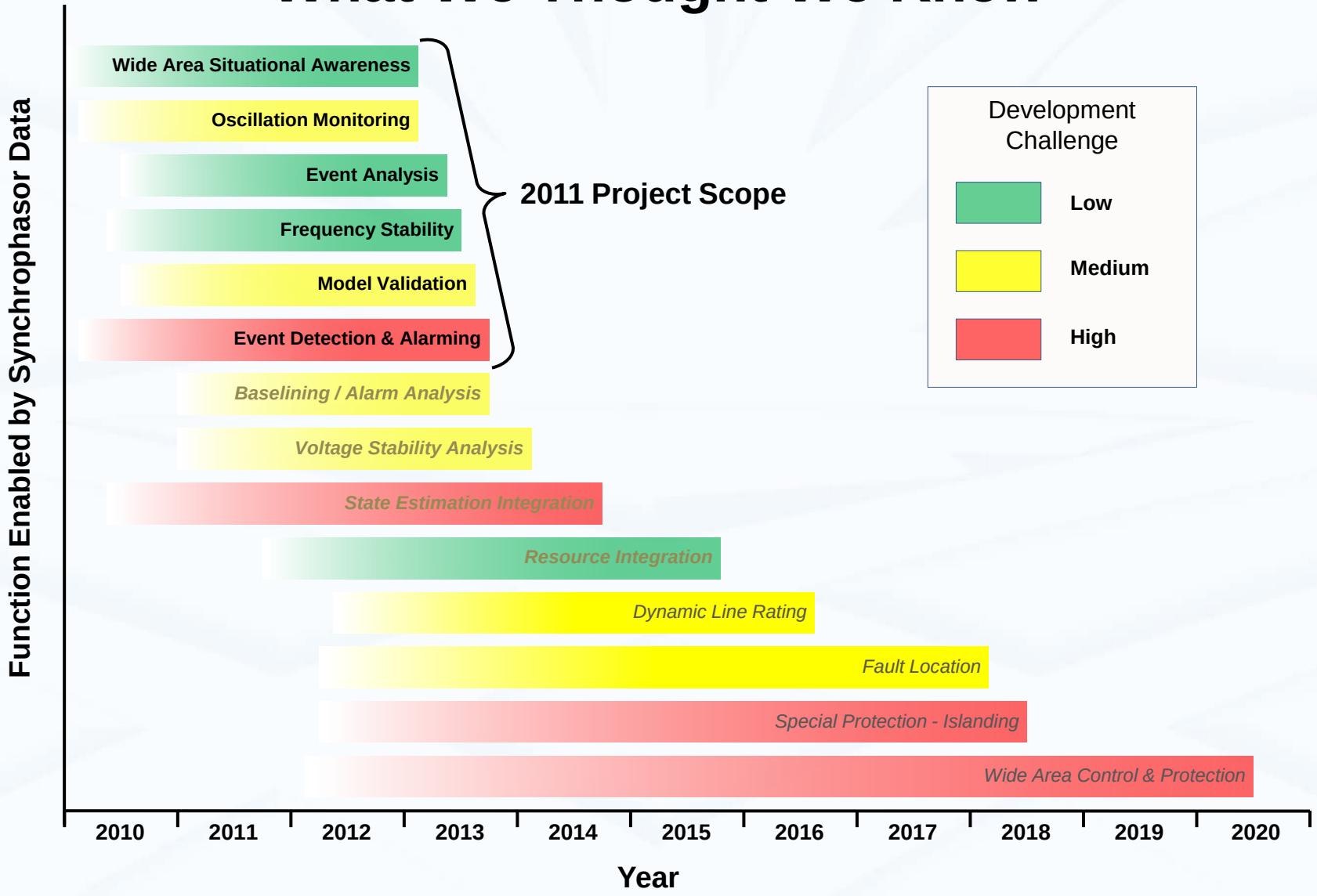
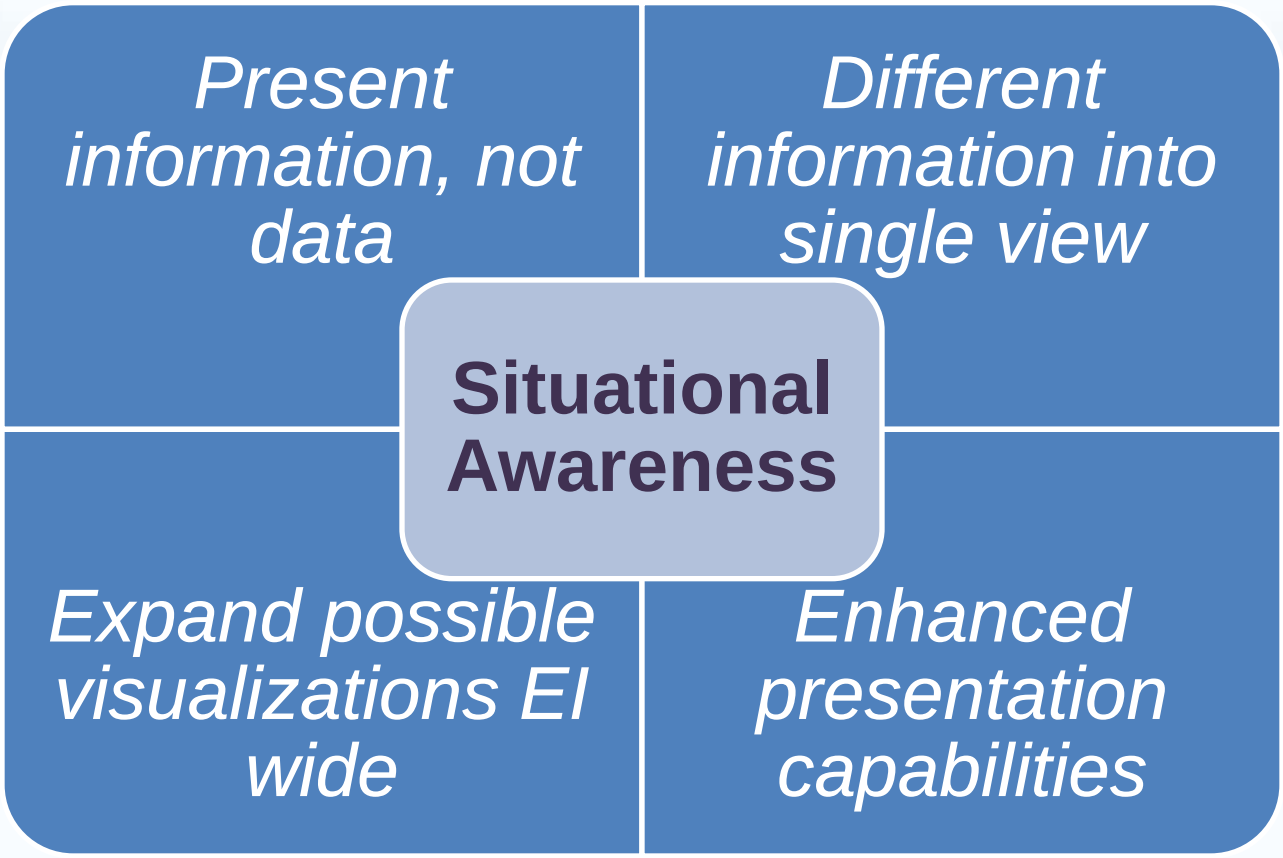
What We Thought We Knew



Visualization Approach



Build for the Future

PSYMETRIX PhasorPoint

- Wide Area View
- Angle Monitoring
- Power Flow Monitoring
- Oscillation Monitoring
- Oscillation Detection
- Real-Time Alarming
- Event Detection

- Wide Area View
- Data Aggregation
- Power Flow Monitoring
- High Speed Gradient Mapping
- Member Visualization

- System Baselining
- Resource Integration

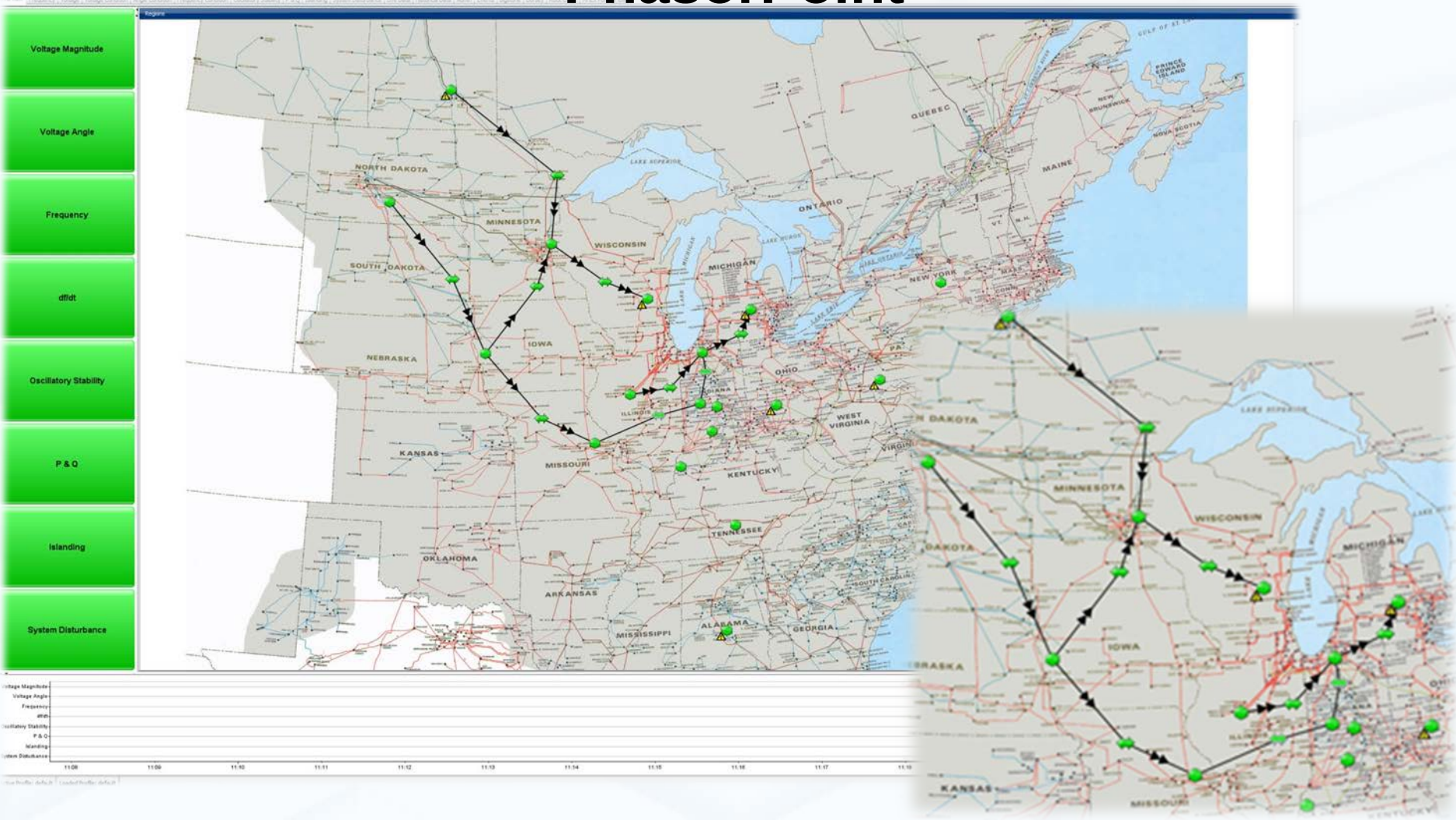
Phasor Grid Dynamics Analyzer

- Frequency Response Analysis
- Stability Assessment
- Model Validation
- Root Cause Analysis

APPLICATION INTEGRATION

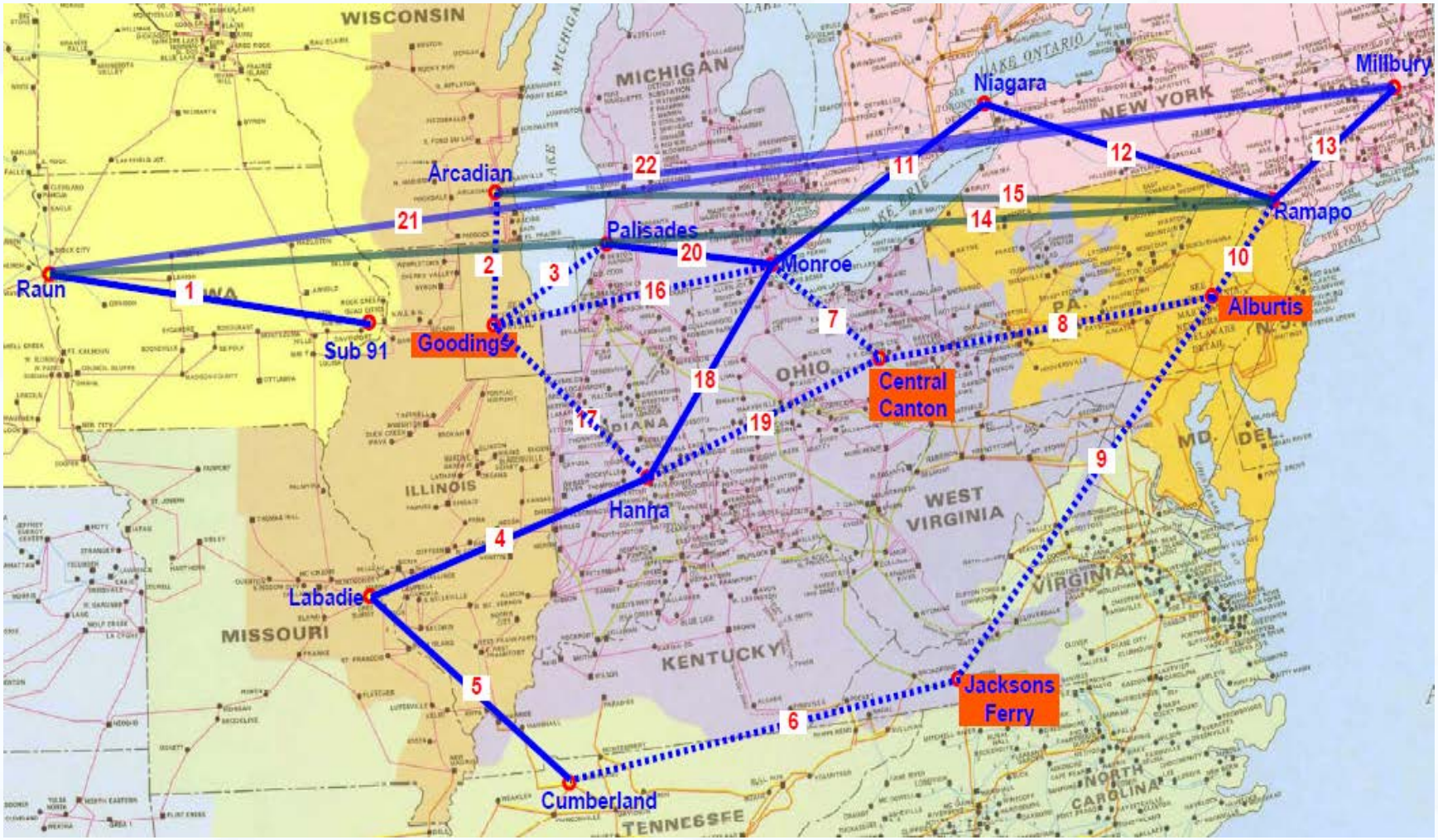
ADVANCED VISUALIZATIONS

PhasorPoint



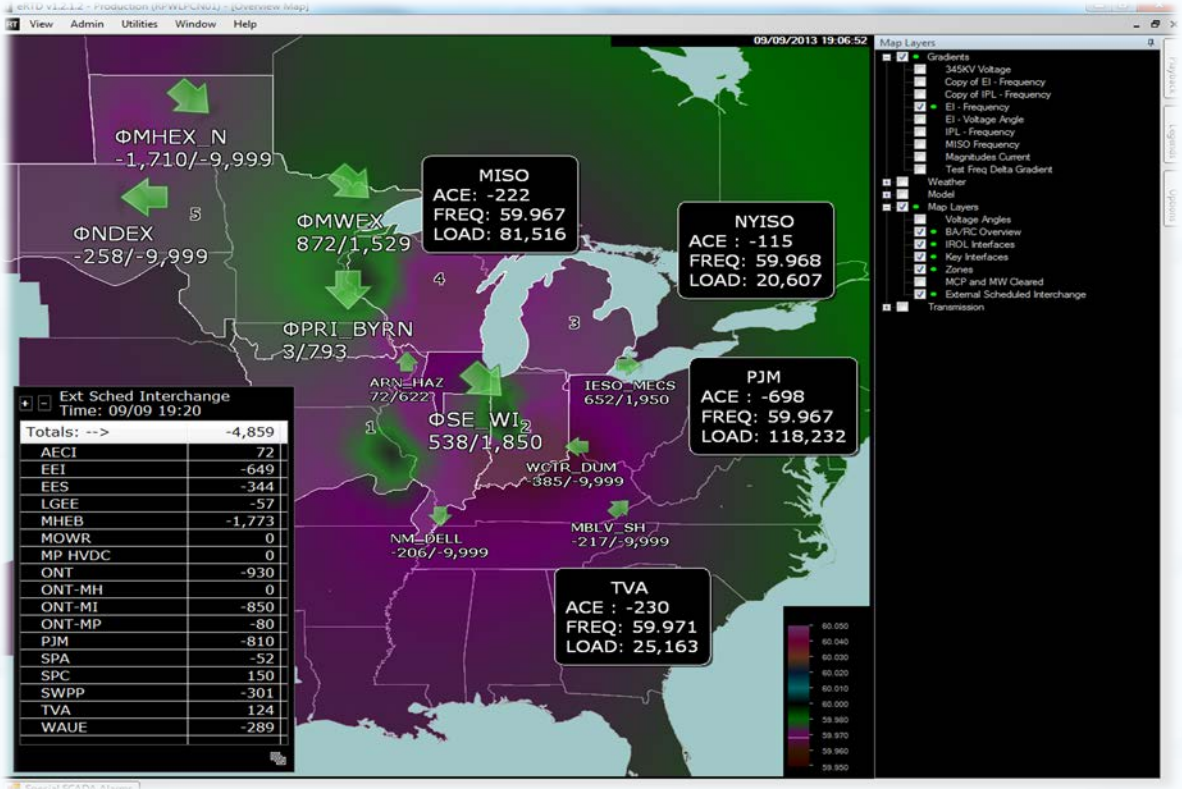
Wide Area PMU Information, Existing Application Integration

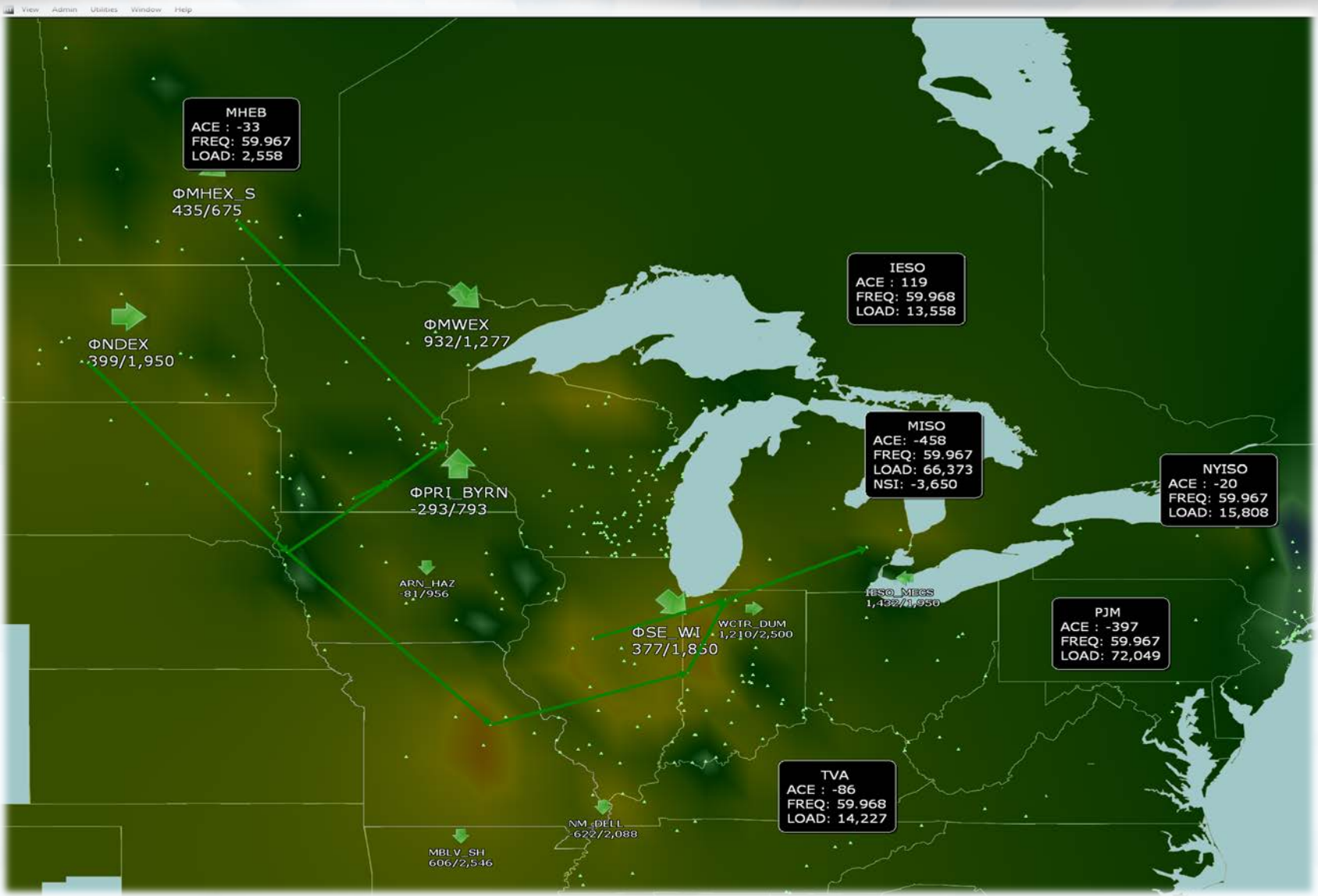
Expanded Angle Pair Monitoring?



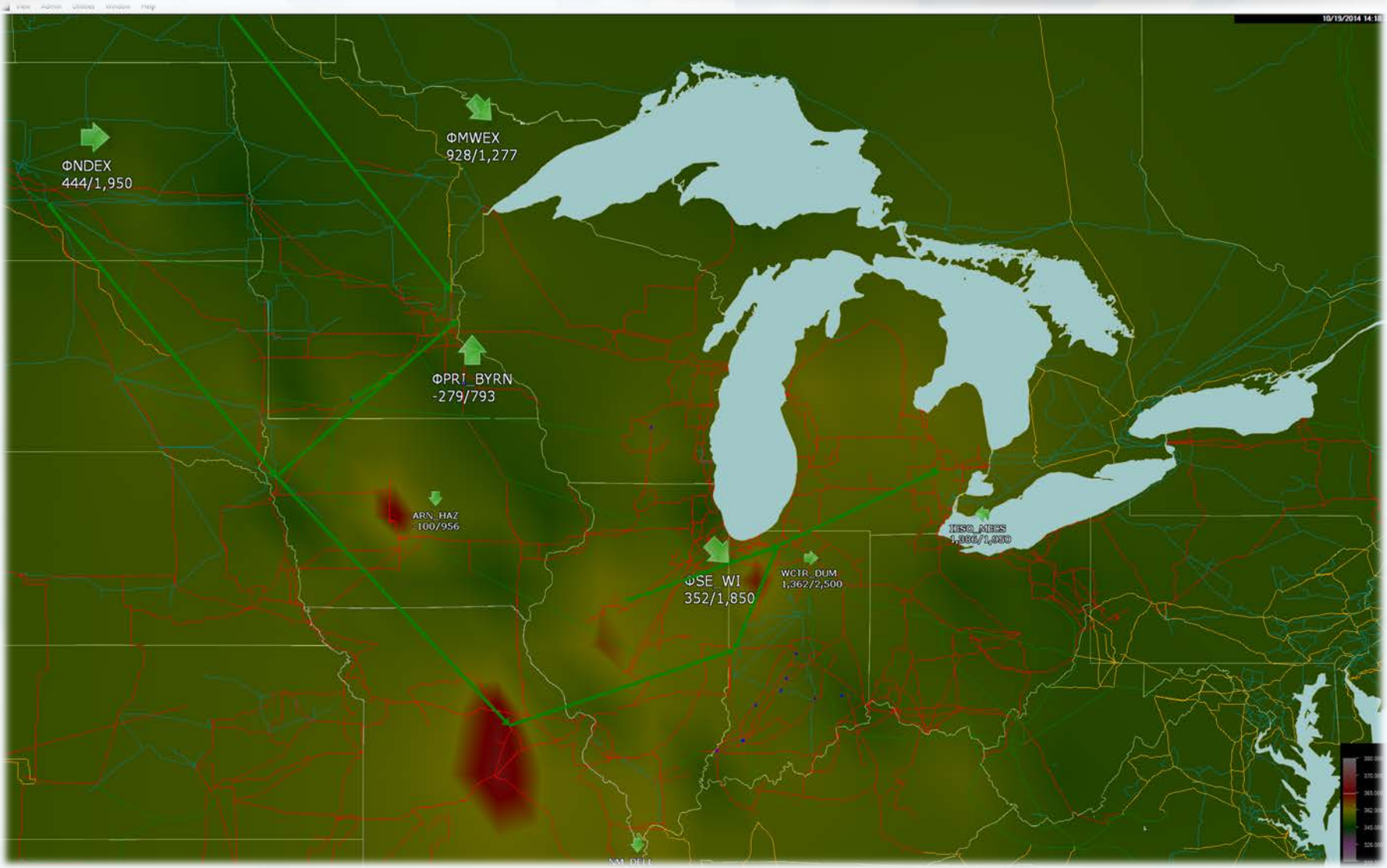
Enhanced Real-Time Displays (eRTD)

- Internally developed geospatial visualization
  - Present Information and not data
  - More information displayed in less space
  - Extended MISO visualization capabilities

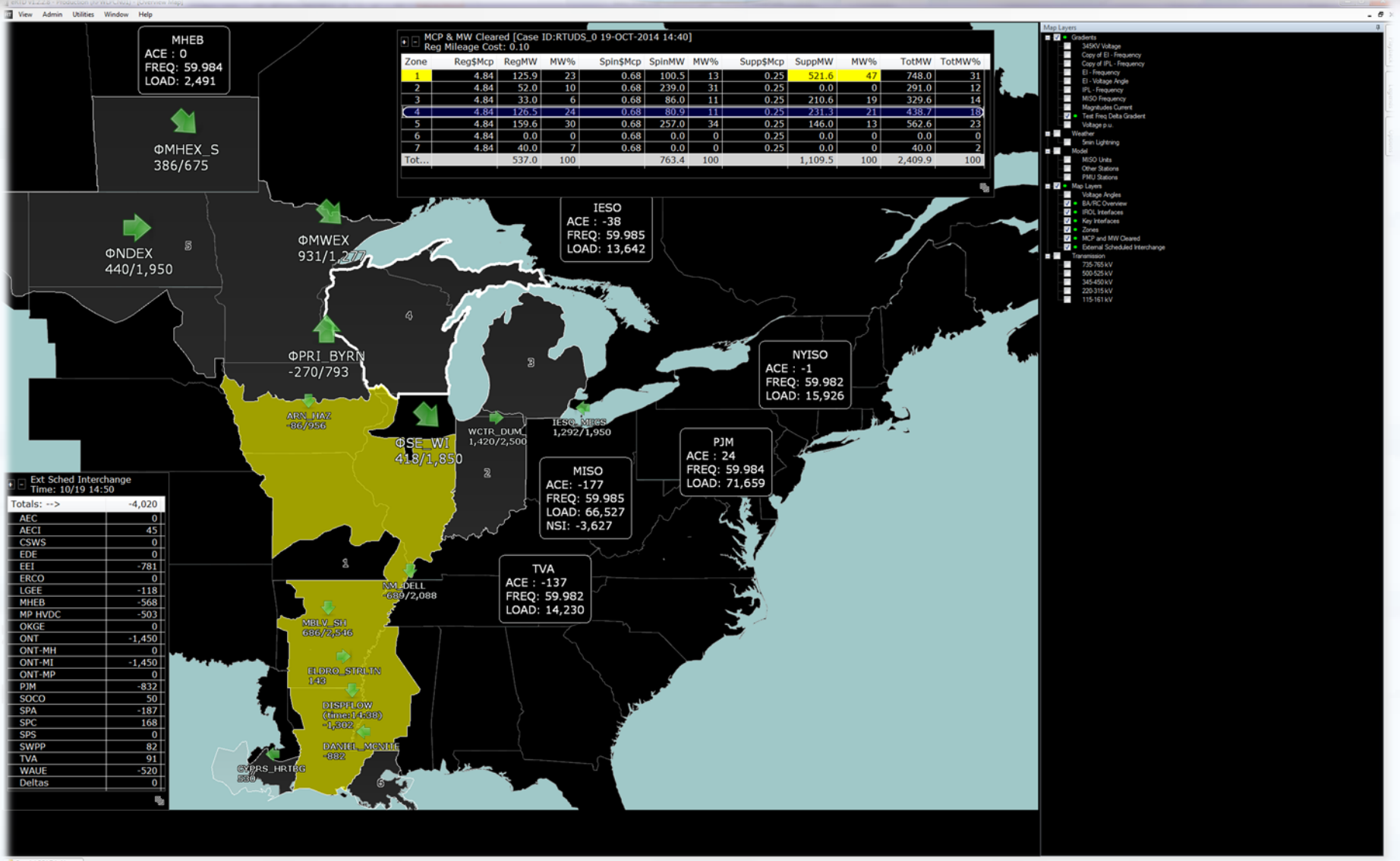




Voltage Gradient; Angle Pairs; PMU Stations; IROL / Key interfaces; BA Information



345kV Gradient / Angle Pairs; Transmission Line Overlays; IROL and key interfaces

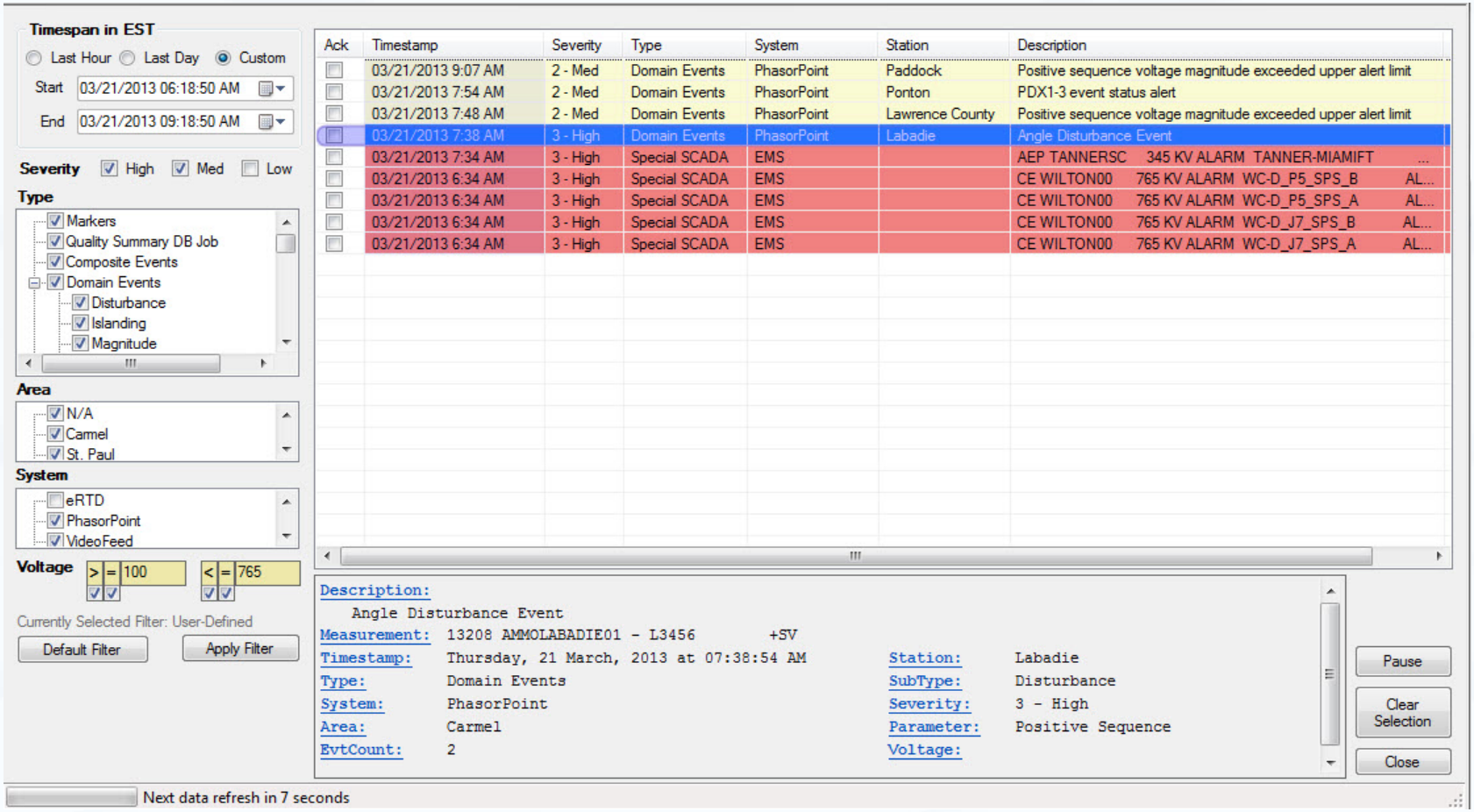


Zone	Reg$Mcp	RegMW	MW%	Spin$Mcp	SpinMW	MW%	Supp$Mcp	SuppMW	MW%	TotMW	TotMW%
1	4.84	125.9	23	0.68	100.5	13	0.25	521.6	47	748.0	31
2	4.84	52.0	10	0.68	239.0	31	0.25	0.0	0	291.0	12
3	4.84	33.0	6	0.68	86.0	11	0.25	210.6	19	329.6	14
4	4.84	126.5	24	0.68	80.9	11	0.25	231.3	21	438.7	18
5	4.84	159.6	30	0.68	257.0	34	0.25	146.0	13	562.6	23
6	4.84	0.0	0	0.68	0.0	0	0.25	0.0	0	0.0	0
7	4.84	40.0	7	0.68	0.0	0	0.25	0.0	0	40.0	2
Tot...		537.0	100		763.4	100		1,109.5	100	2,409.9	100

BA/RC Overview; IROL-Key Interfaces; Anc. Service MW and $; Ext Sched Interchange

eRTD

- **Aggregates alerts into a single display**
  - Correlates phasor data with EMS and stability monitoring alerts



Operational Processes

- Operators have processes for Oscillation Monitoring and Phase Angle Monitoring alarms

Oscillation Monitoring Process

- Review alarms to determine if transmission or generation equipment was lost in the local area of the oscillation
- Look for power swings on transmission or generation equipment in the local area of the oscillation
- Review State Estimator solution for any equipment outages in the local area
- Contact local Utilities in the area of the oscillations to see if they have noticed any operational issues on their equipment

Phase Angle Monitoring

- Review Pre/Post contingency Voltage
- Check for unsolved contingencies
- Check for low voltage in the area of the interface
- Check that the State Estimator is solving with no voltage violations

Questions?

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