

# MISO Wide-Area Visualization

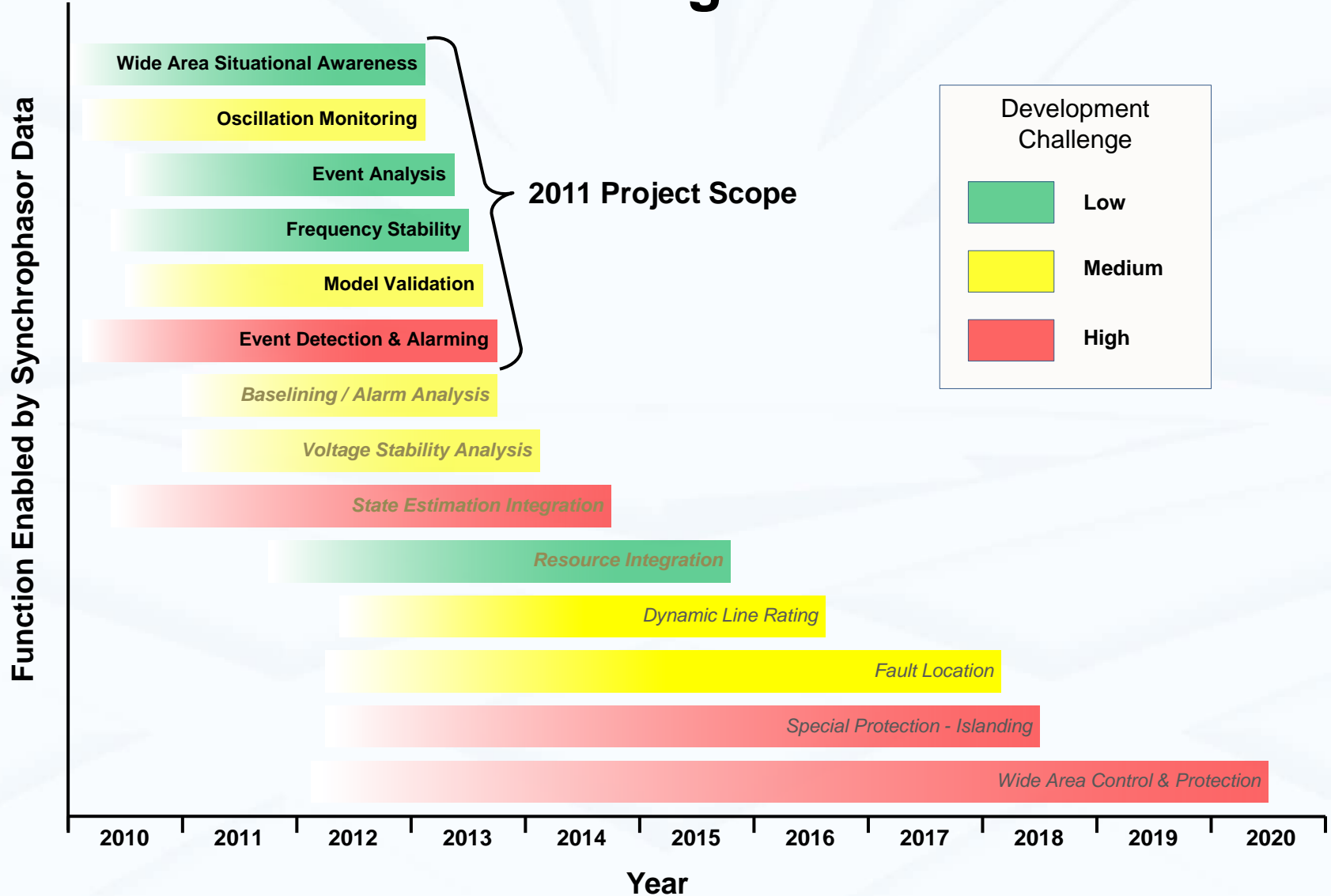
*NASPI Work Group Meeting*

*October 22-24, 2014*

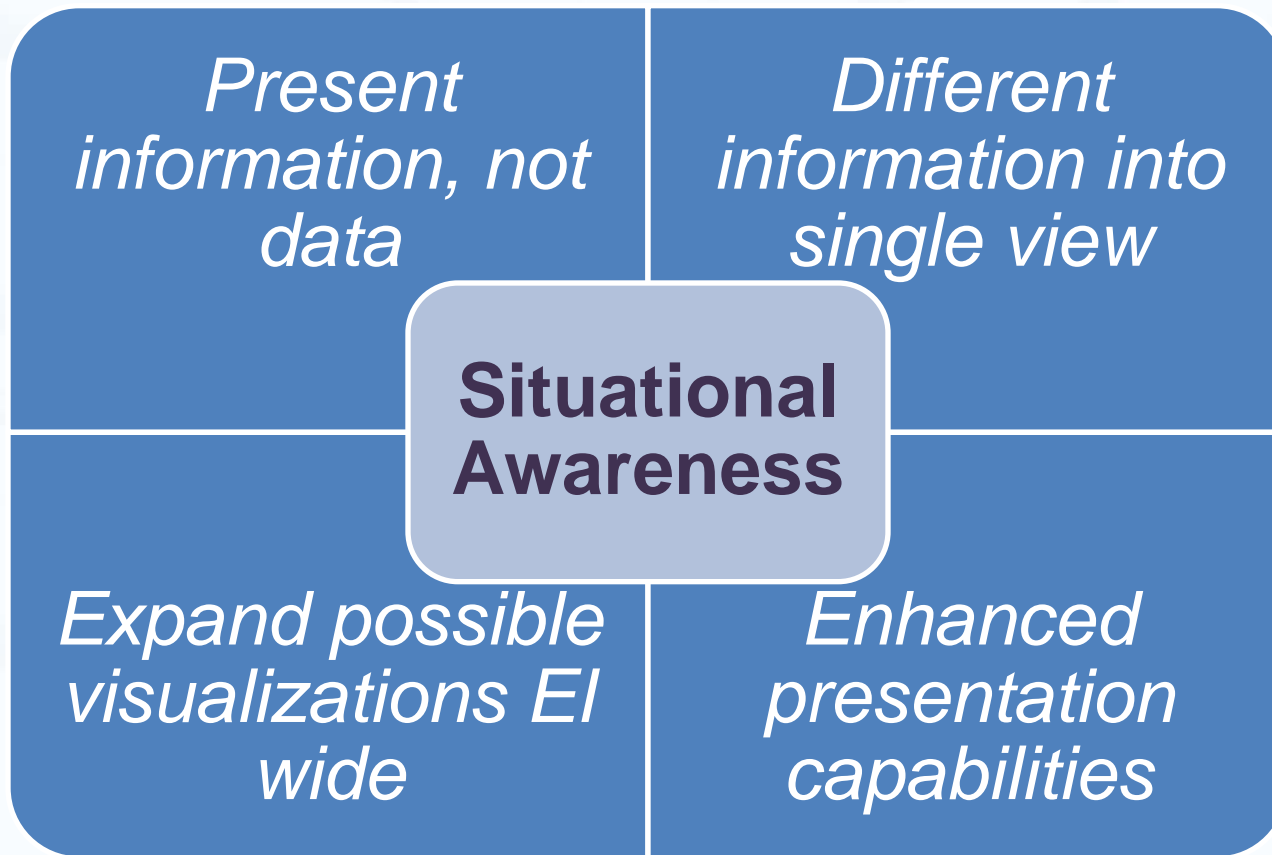
Kevin Frankeny

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# What We Thought We Knew



# Visualization Approach



# Build for the Future



Wide Area View

Angle Monitoring

Power Flow Monitoring

Oscillation Monitoring

Oscillation Detection

Real-Time Alarming

Event Detection

**APPLICATION  
INTEGRATION**



Wide Area View

Data Aggregation

Power Flow  
Monitoring

High Speed  
Gradient Mapping

Member  
Visualization

**ADVANCED  
VISUALIZATIONS**



System  
Baselining

Resource  
Integration



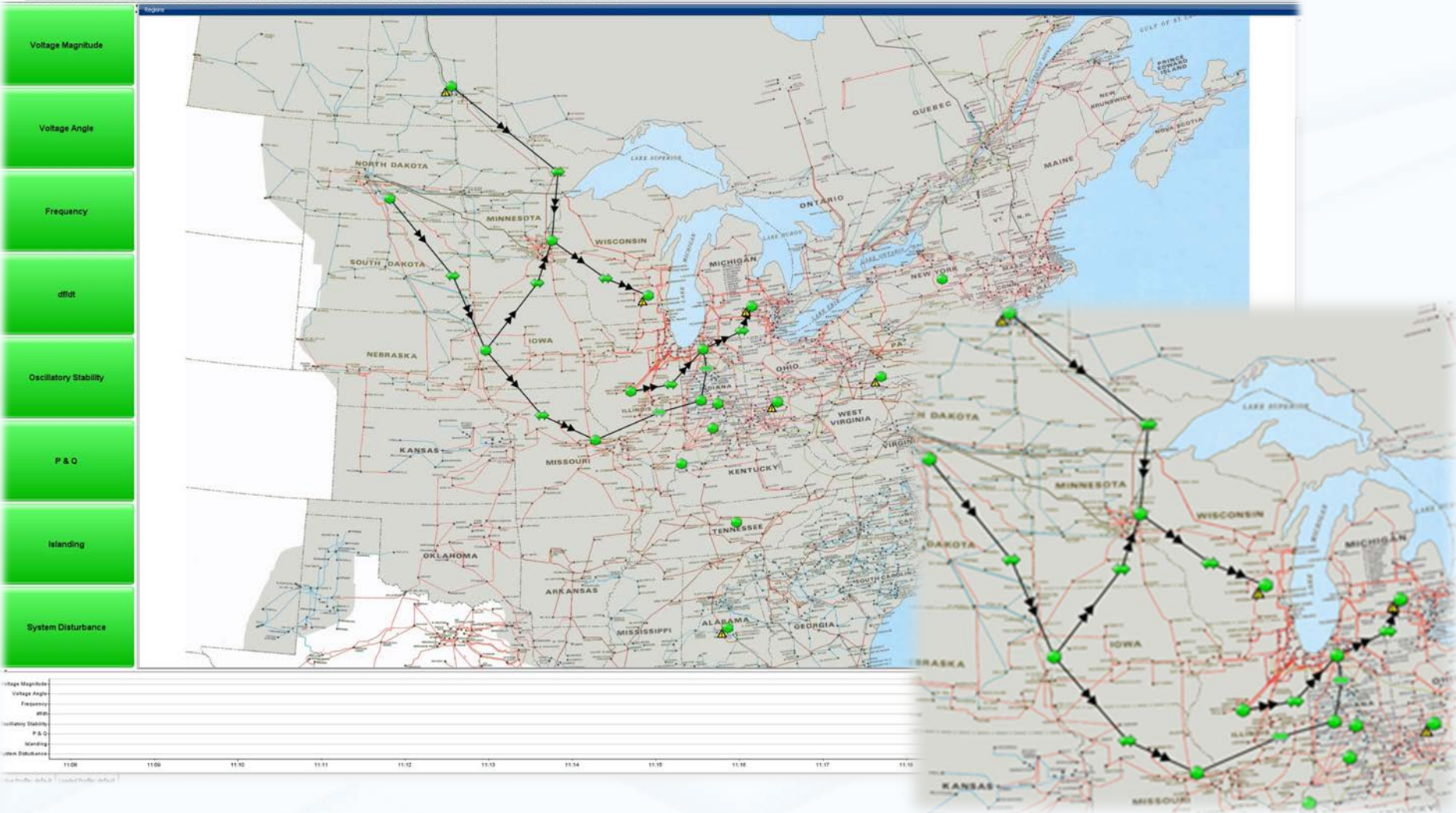
Frequency  
Response Analysis

Stability  
Assessment

Model Validation

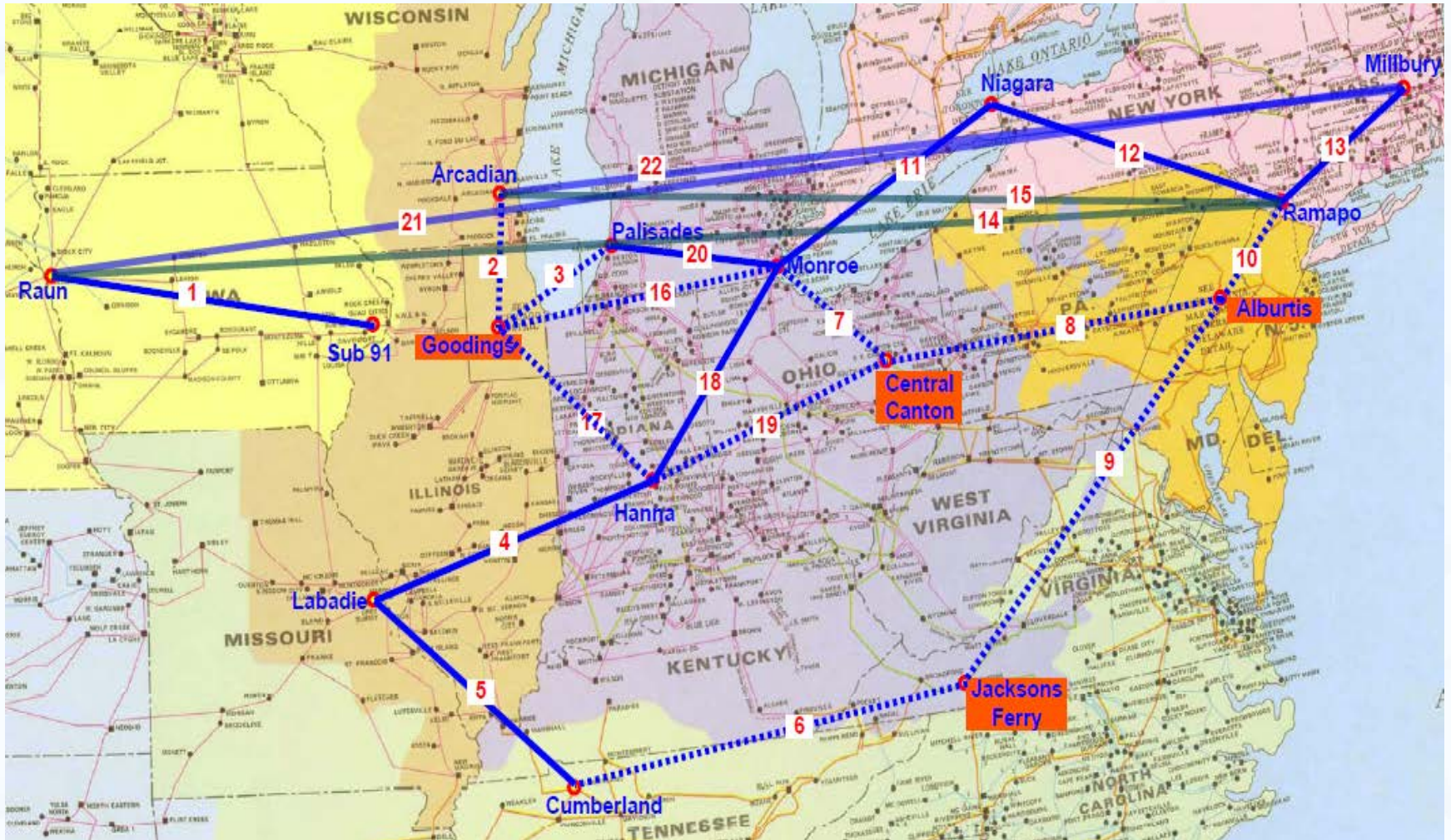
Root Cause  
Analysis

# PhasorPoint



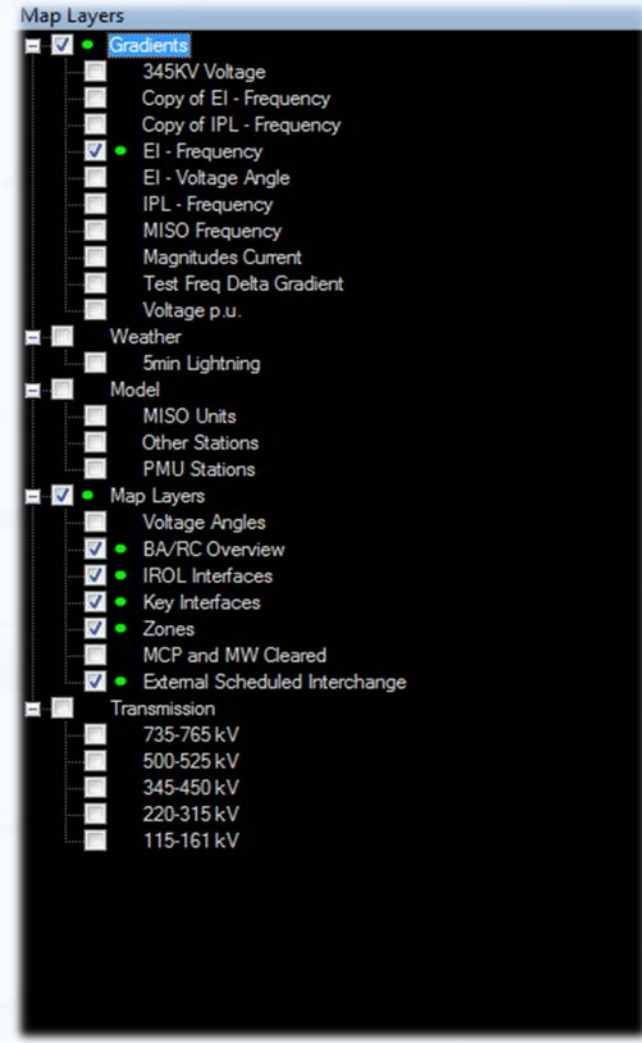
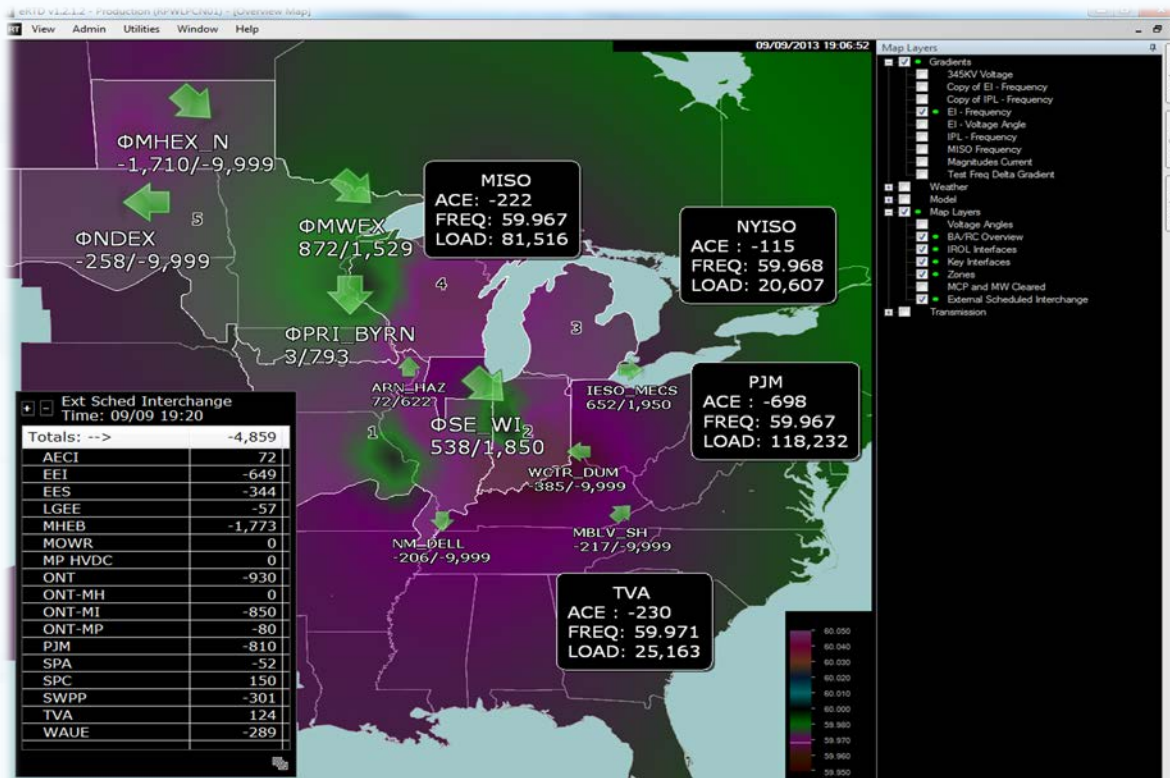
Wide Area PMU Information, Existing Application Integration

# Expanded Angle Pair Monitoring?



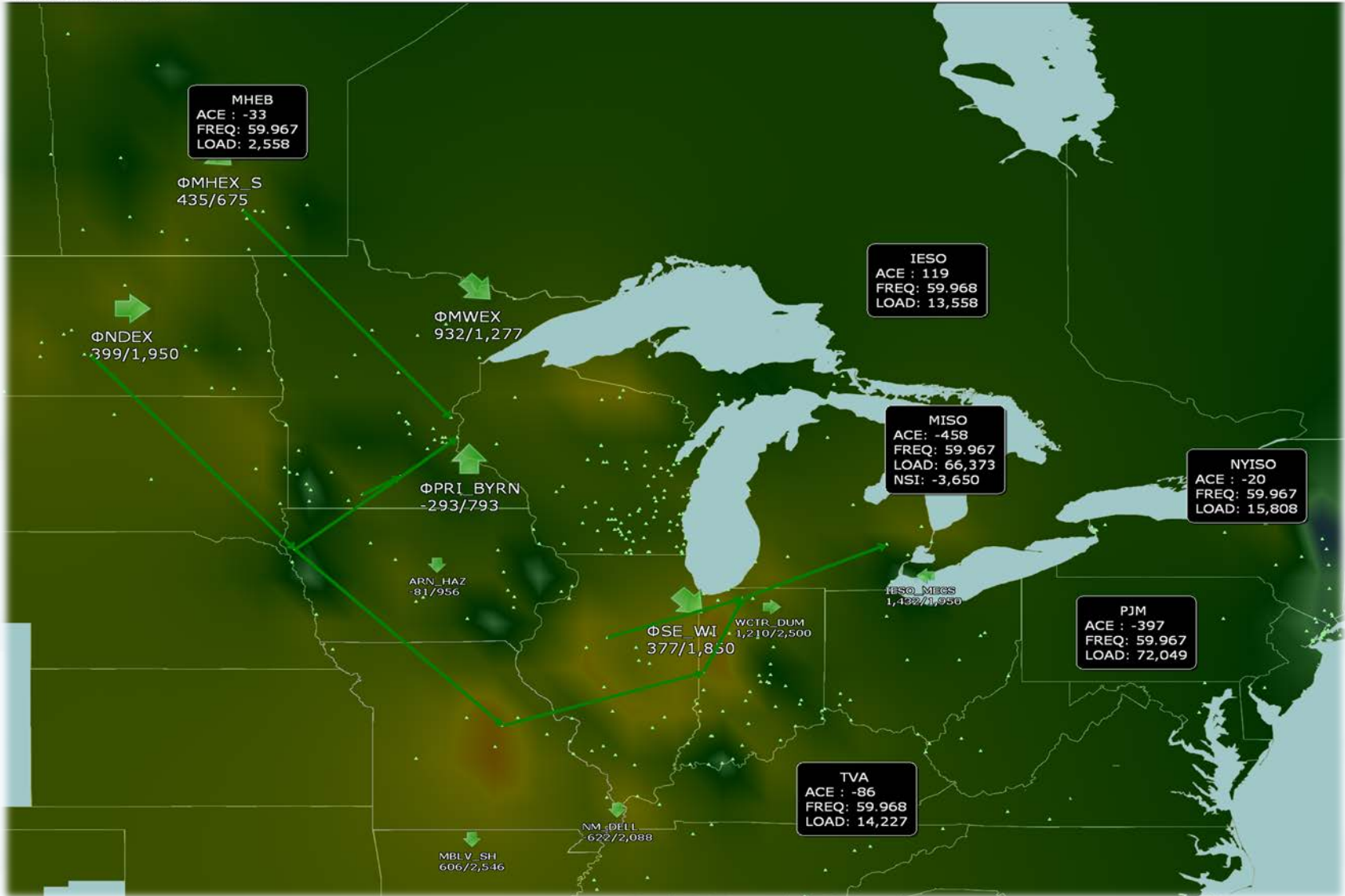
# Enhanced Real-Time Displays (eRTD)

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

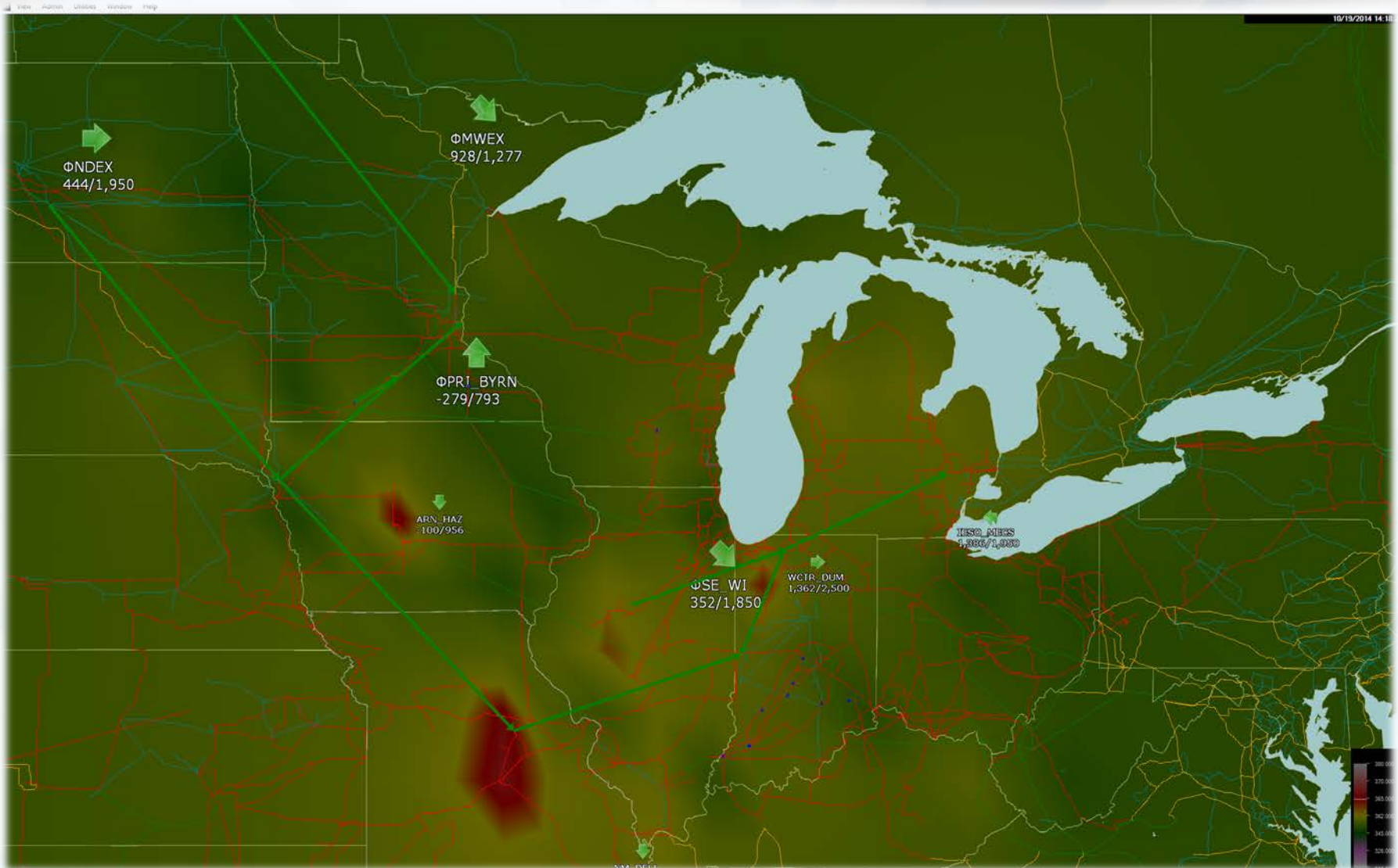




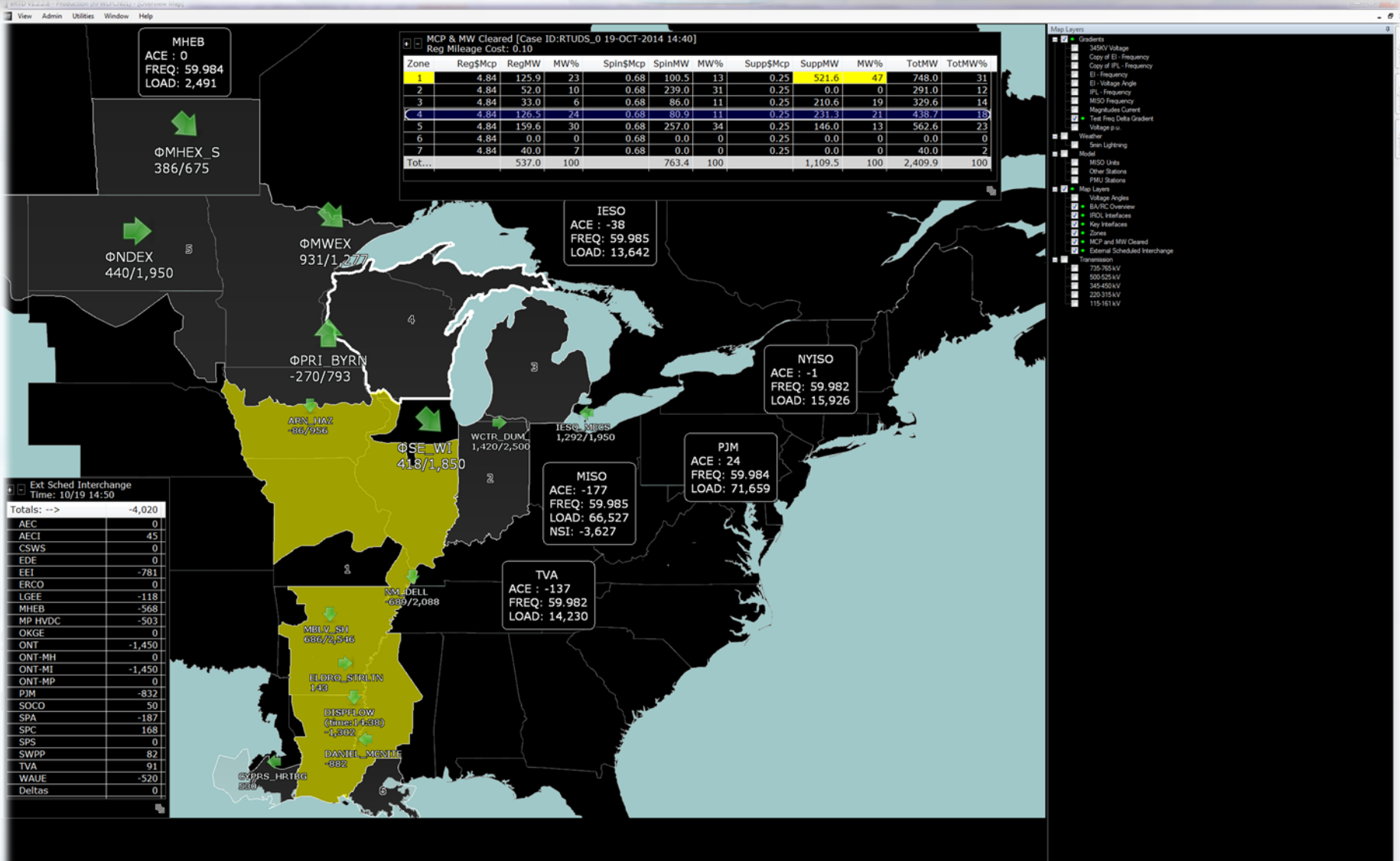
View Admin Utilities Window Help



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



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



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

**Timespan in EST**

Last Hour  Last Day  Custom

Start: 03/21/2013 06:18:50 AM

End: 03/21/2013 09:18:50 AM

**Severity**  High  Med  Low

**Type**

- Markers
- Quality Summary DB Job
- Composite Events
- Domain Events
  - Disturbance
  - Islanding
  - Magnitude

**Area**

- N/A
- Carmel
- St. Paul

**System**

- eRTD
- PhasorPoint
- VideoFeed

**Voltage**  >= 100  <= 765

Currently Selected Filter: User-Defined

Ack	Timestamp	Severity	Type	System	Station	Description
<input type="checkbox"/>	03/21/2013 9:07 AM	2 - Med	Domain Events	PhasorPoint	Paddock	Positive sequence voltage magnitude exceeded upper alert limit
<input type="checkbox"/>	03/21/2013 7:54 AM	2 - Med	Domain Events	PhasorPoint	Ponton	PDX1-3 event status alert
<input type="checkbox"/>	03/21/2013 7:48 AM	2 - Med	Domain Events	PhasorPoint	Lawrence County	Positive sequence voltage magnitude exceeded upper alert limit
<input checked="" type="checkbox"/>	03/21/2013 7:38 AM	3 - High	Domain Events	PhasorPoint	Labadie	Angle Disturbance Event
<input type="checkbox"/>	03/21/2013 7:34 AM	3 - High	Special SCADA	EMS		AEP TANNERSC 345 KV ALARM TANNER-MIAMIFT ...
<input type="checkbox"/>	03/21/2013 6:34 AM	3 - High	Special SCADA	EMS		CE WILTON00 765 KV ALARM WC-D_P5_SPS_B AL...
<input type="checkbox"/>	03/21/2013 6:34 AM	3 - High	Special SCADA	EMS		CE WILTON00 765 KV ALARM WC-D_P5_SPS_A AL...
<input type="checkbox"/>	03/21/2013 6:34 AM	3 - High	Special SCADA	EMS		CE WILTON00 765 KV ALARM WC-D_J7_SPS_B AL...
<input type="checkbox"/>	03/21/2013 6:34 AM	3 - High	Special SCADA	EMS		CE WILTON00 765 KV ALARM WC-D_J7_SPS_A AL...

Description:  
Angle Disturbance Event

Measurement: 13208 AMMOLABADIE01 - L3456 +SV

Timestamp: Thursday, 21 March, 2013 at 07:38:54 AM

Type: Domain Events

System: PhasorPoint

Area: Carmel

EvtCount: 2

Station: Labadie

SubType: Disturbance

Severity: 3 - High

Parameter: Positive Sequence

Voltage:

Next data refresh in 7 seconds

# 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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317-249-5620