

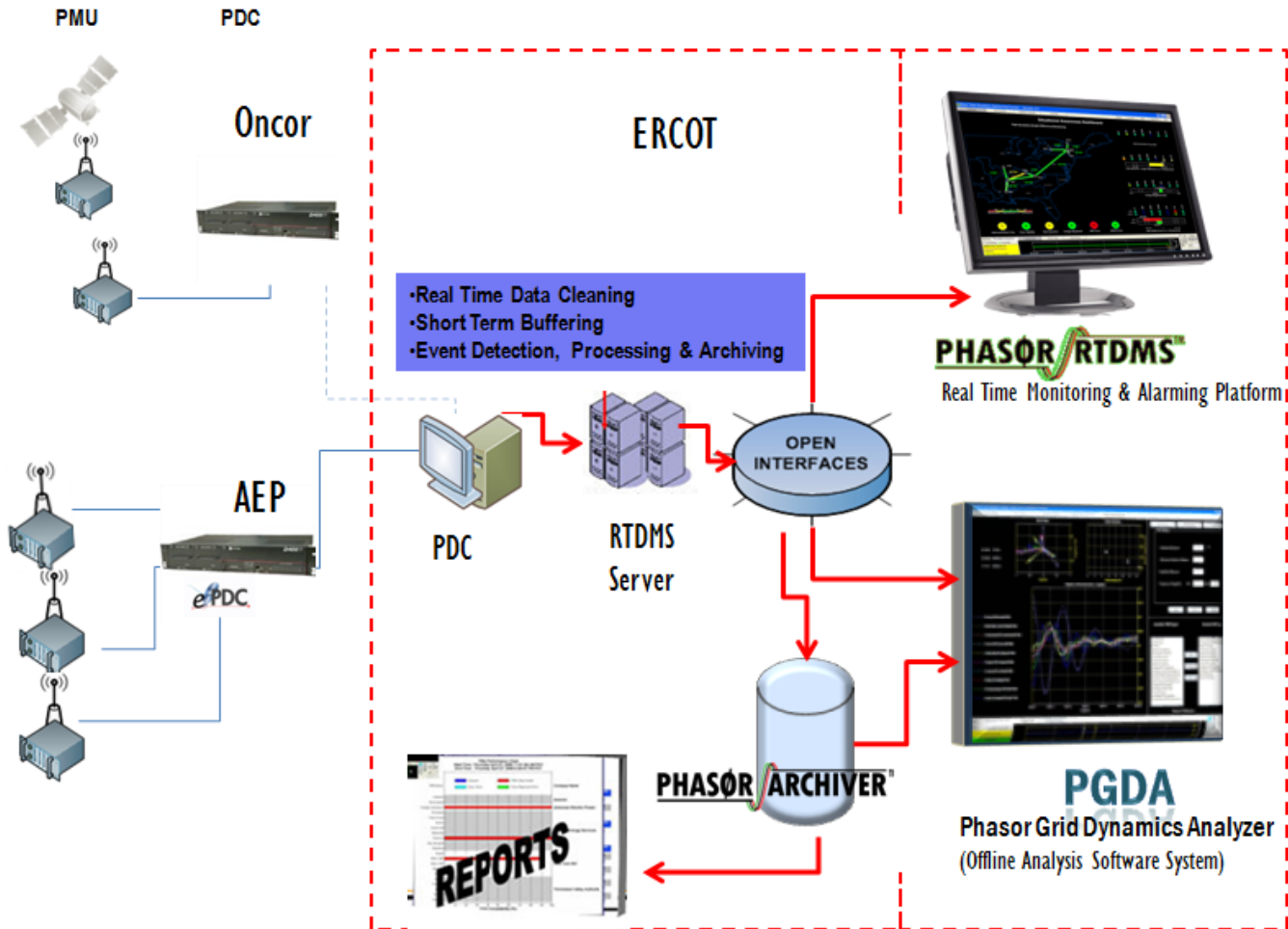


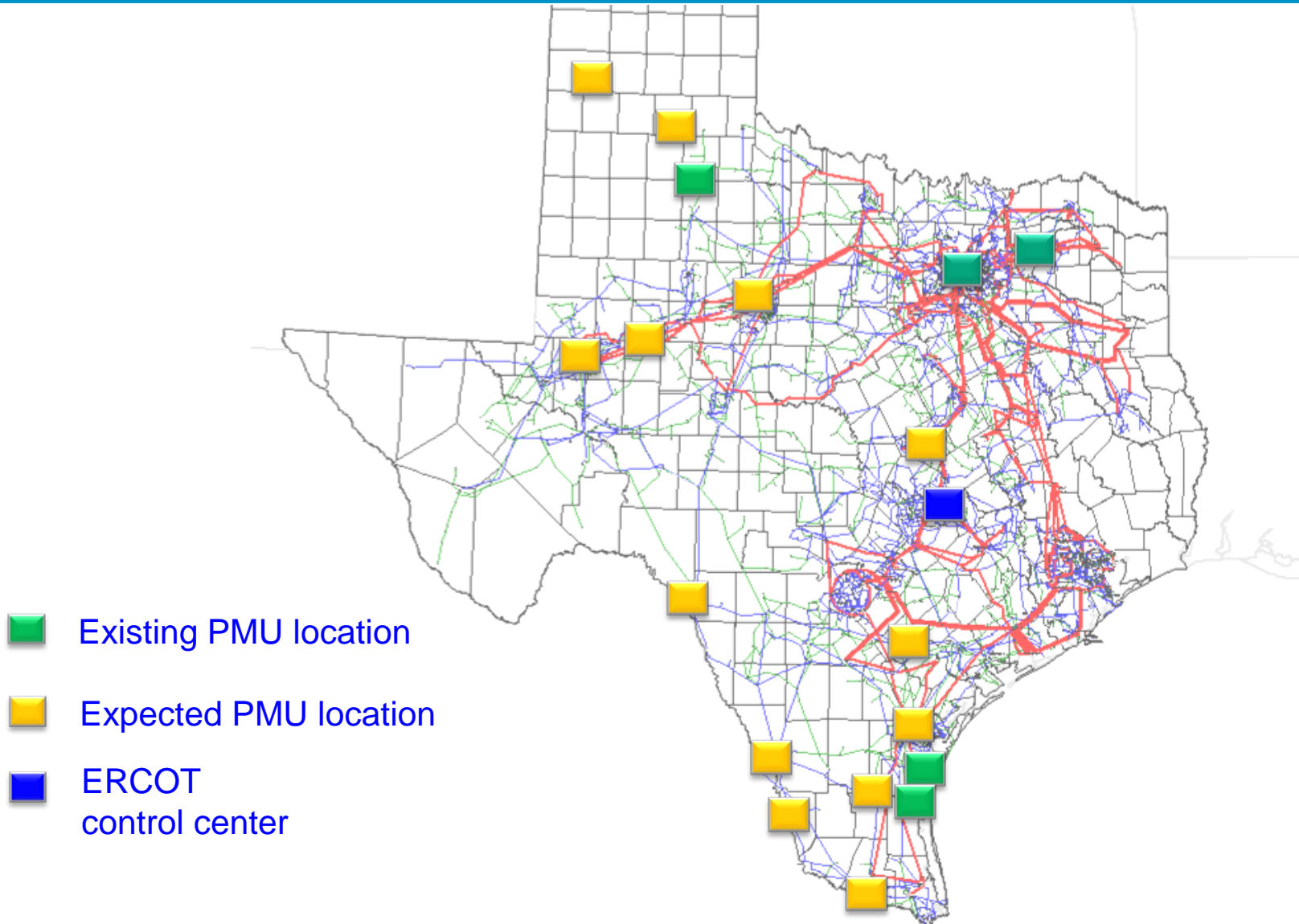
Phasor Measurements in ERCOT

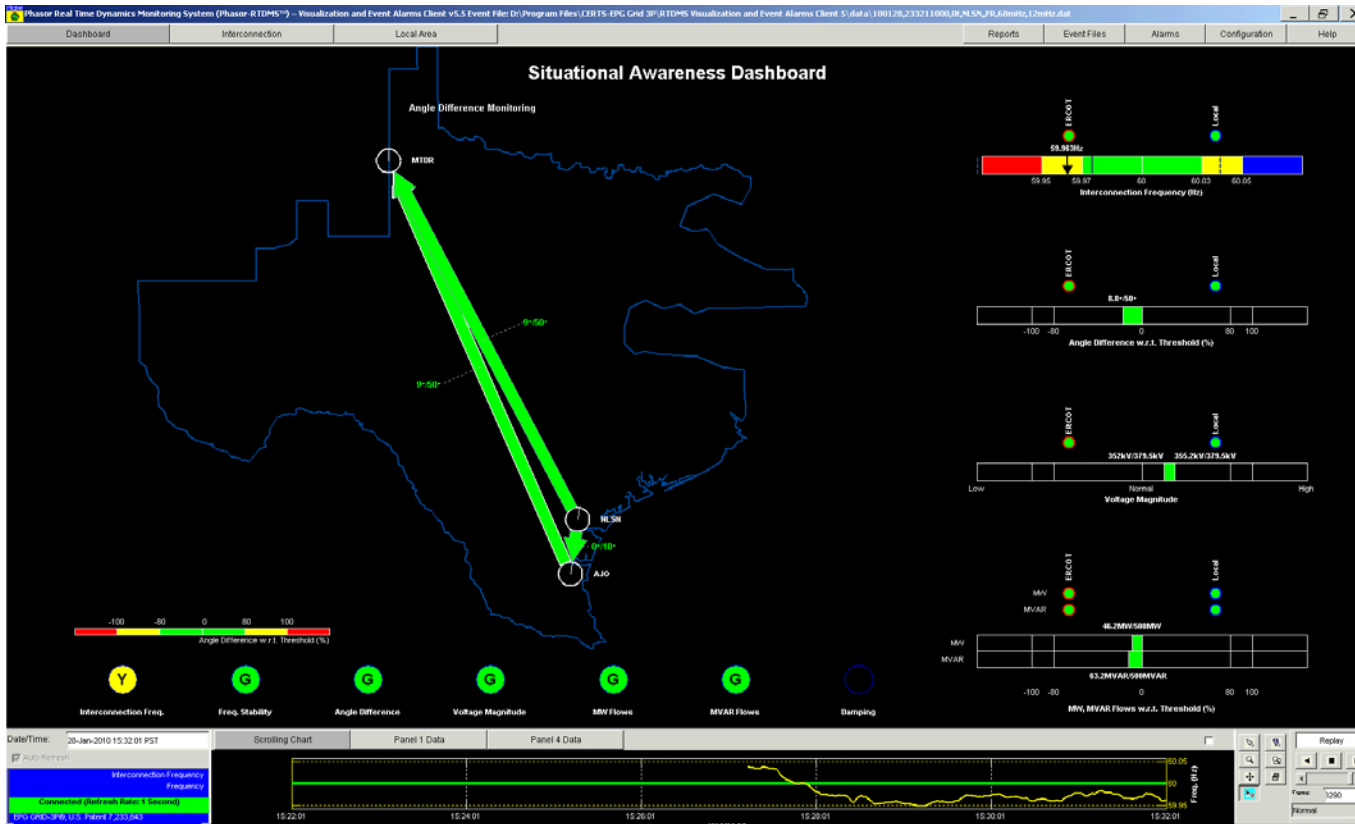
Dan Woodfin

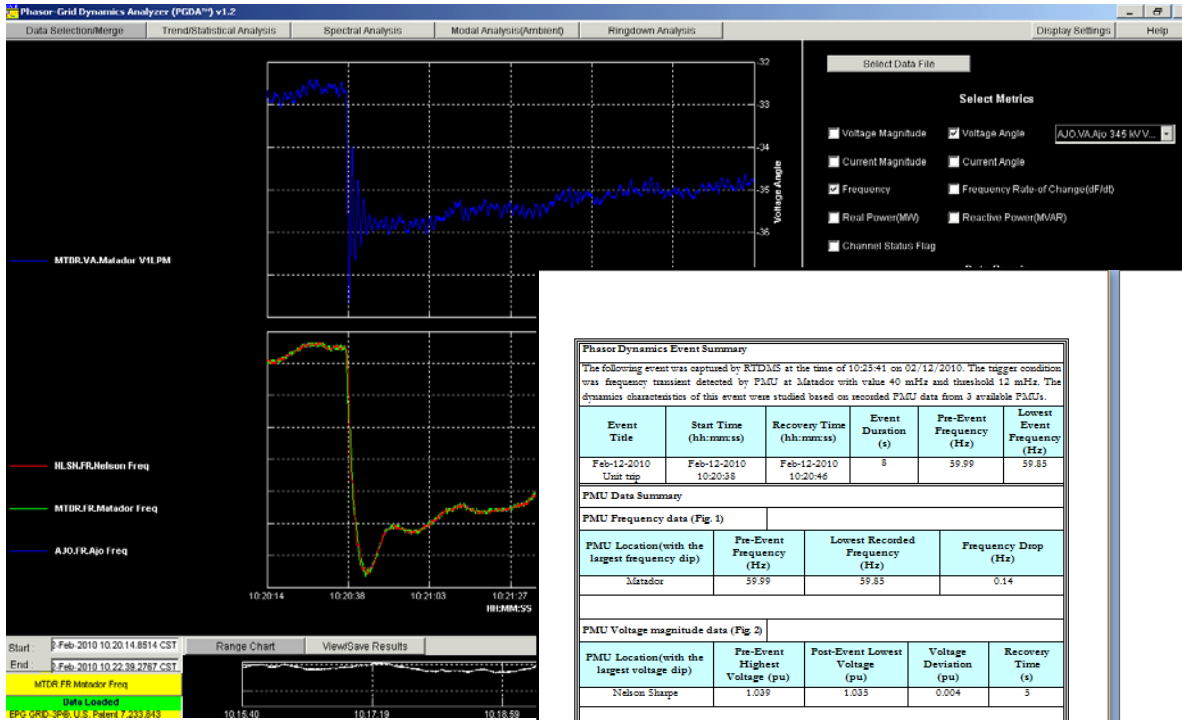
Director, System Planning

**NASPI Work Group Meeting
Feb. 24-25, 2010, Austin**









Phasor Dynamics Event Summary

The following event was captured by RTDMS at the time of 10:23:41 on 02/12/2010. The trigger condition was frequency transient detected by PMU at Matador with value 40 mHz and threshold 12 mHz. The dynamics characteristics of this event were studied based on recorded PMU data from 3 available PMUs.

Event Title	Start Time (hh:mm:ss)	Recovery Time (hh:mm:ss)	Event Duration (s)	Pre-Event Frequency (Hz)	Lowest Event Frequency (Hz)
Feb-12-2010 Unit trip	Feb-12-2010 10:20:38	Feb-12-2010 10:20:46	8	59.99	59.85

PMU Data Summary

PMU Frequency data (Fig. 1)

PMU Location (with the largest frequency dip)	Pre-Event Frequency (Hz)	Lowest Recorded Frequency (Hz)	Frequency Drop (Hz)
Matador	59.99	59.85	0.14

PMU Voltage magnitude data (Fig. 2)

PMU Location (with the largest voltage dip)	Pre-Event Highest Voltage (p.u)	Post-Event Lowest Voltage (p.u)	Voltage Deviation (p.u)	Recovery Time (s)
Nelson Sharpe	1.039	1.035	0.004	5

PMU Voltage angle data (Fig. 3)

PMU Location (with the largest Angular Swing)	Pre-Event Angle (degree)	Post-Event Angle (degree)	Angle Deviation (degree)	Largest Swing (degree)	Dynamic Swing Time (s)
Matador	-32.5	-36	3.5	3.5	6

Oscillation-Mode Analysis Results

Dominant Modal Frequency (Hz)	Damping Rate (%)	Mode Shape Description
0.58	9.6	Identified by both frequency and angle data analysis. Matador oscillated against Nelson and Ajo.

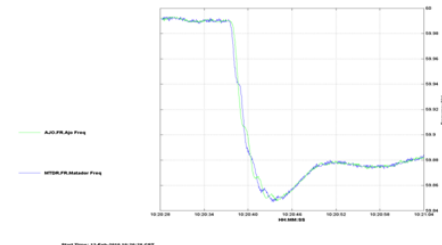


Fig. 1 The frequency captured by the PMUs located at station MATADOR and AJO.

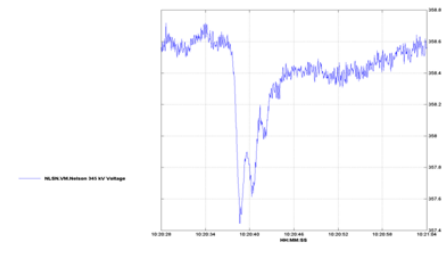


Fig. 2 The voltage magnitude measured at the station NELSON SHARPE.