NASPI Control Room Solutions Task Team Monthly Meeting

Presenters: Mike Cassiadoro & Jim Kleitsch

May 28, 2019

Agenda

I. Introductions
II. Recap April 2019 NASPI Working Group Meeting
III. Review CRSTT mission, goals and objectives
IV. Review and discuss status of CRSTT work products
    - Focus Area Documents
    - Video Event Files
    - Use Case Documents
V. Discuss opportunities for CRSTT to coordinate with DisTT and other industry bodies
VI. Adjourn

April 2019 NASPI WG Mtg. Recap

Highlights of the most recent NASPI WG Mtg. include:

- Communications & Networking Technical Workshop
- Increased focus on Point-On-Wave Measurements
- Significant discussion about use of Artificial Intelligence and Machine Learning in the control room
- New format for NASPI task team breakout sessions
- CRSTT & DisTT commitment to coordinate work products

CRSTT Mission

CRSTT will work collectively with other NASPI task teams to advance the use of real-time synchrophasor apps for the purpose of improving control room operations and grid reliability.

CRSTT will utilize its experience and regional diversity to provide advice, direction, support and guidance to NASPI stakeholders and other organizations involved in the development and implementation of real-time synchrophasor apps.

CRSTT Goals

1. Develop a series of use case summary docs that define how entities are using synchrophasor data to provide operational value.
2. Create additional video event files for use cases and simulated events.
3. Gather operator feedback on synchrophasor-based apps.
4. Support the design, development and delivery of synchrophasor-related training for ops staff.
5. Develop a series of Lessons Learned docs related to the use of synchrophasor technology in the operations environment.
6. Draft new and update existing focus area documents as the need arises.

CRSTT Objectives

1. Identify and help to address issues that are impeding the implementation of synchrophasor-based applications in the Operations Horizon.
2. Develop documentation that defines the safety, reliability and economic benefits that synchrophasor technology provides.
3. Recognize and share industry best practices.
4. Support the design, development and delivery of synchrophasor-based application training for end users.
5. Promote operational event analysis to demonstrate the value of synchrophasor technology.

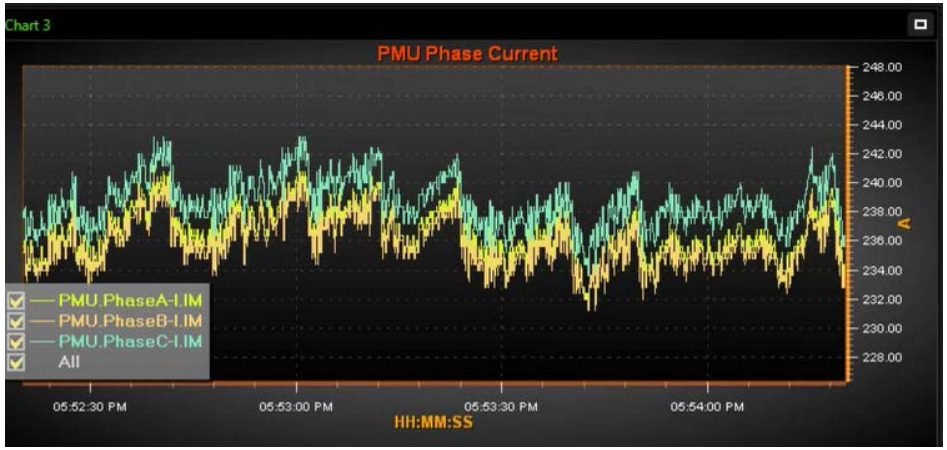
Focus Area Documents

1. **System Islanding Detection and Blackstart Restoration – June 2015.**
   - (Kleitsch – ATC, Cassiadoro – TRS)
2. **Using Synchrophasor Data for Voltage Stability Assessment – Nov. 2015.**
   - **(**Farantatos – EPRI, Vaiman – V&R Energy)
3. **Using Synchrophasor Data for Phase Angle Monitoring – May 2016.**
   - (Cassiadoro – TRS, Nuthalapati – ERCOT)
4. **Enhanced State Estimation Survey –Preliminary responses received, more analysis needed.**
   - (Vaiman – V&R Energy, Kleitsch – ATC)
5. **Using Synchrophasor Data for Oscillation Detection – Feb. 2018.**
   - (Nuthalapati –Peak, Dyer –EPG, Blevins and Rjagopalan –ERCOT, Patel -EPRI)
6. **Using Synchrophasor Data to Determine Disturbance Location – Feb. 2019.**

   (Nuthalapati – LCRA, Zweigle –SEL Inc., Cassiadoro –TRS)
7. **Using Synchrophasor Data to Monitor Reactive Power Balancing – FUTURE**
   - (Cassiadoro -TRS, Peak –Zhang, Vaiman –V&R Energy)

Video Event Files

Objective – Continue building library of events to demonstrate value PMU data provides when analyzing abnormal events and disturbances.



Video
PMU versus SCADA Video Events Summary. Please refer to EPG's template and the Synchrophasor Data File Format .CSV when creating a video event.
Video 1 - Current and voltage oscillations observed on the 138 kV system during testing of new generator controls (65 MW gas turbine). RTDMS PMU vs. SCADA Video 1
Video 2 - Voltage oscillations observed on the 230 kV system when a water pump was taken offline. RTDMS PMU vs. SCADA Video 2
Video 3 - Voltage oscillations observed following the loss of a 345 kV line during a period of high wind generation. RTDMS PMU vs. SCADA Video 3
Video 4 - Real and Reactive Power oscillations observed on the 69 kV system during a period of high wind generation with the plant radially connected (i.e. one of two normal source lines out of service). RTDMS PMU vs. SCADA Video 4
Video 5 - Real and Reactive Power oscillations observed during a period of high wind generation. RTDMS PMU vs. SCADA Video 5
Video 6 - Real Power and voltage oscillations observed following the loss of a large generator. RTDMS PMU vs. SCADA Video 6
Video 7 - Wind farm Oscillation Detection and Mitigation using Synchrophasor Technology Wind Farm Oscillation Detection and Mitigation
Video 8 - A 230kV fault followed by a loss of a large generation plant caused system frequency to drop approximately 72mHz momentarily, while having an impact on nearby system voltages and online generators (Clip 1, Clip 2 , Clip 3)
Video 9 - Please be patient with the download, the video is very large. This video captures the actual synchronization of a large generator to the electric grid. The windows in the visualization tool capture frequency, output power, voltage angle, and voltage magnitude of the generator and at a reference point on the electric grid.

Use Case Documents

Objective – Develop docs that demonstrate ways that grid operators and electric utilities are using synchrophasor data to provide operational value.

Event ID	Event	Event Category	Entities Involved	Event Description	Extended Description in Related NASPI Technical Paper	Safety Impact	Reliability Impact	Budgetary Impact
TE02	Failing potential transformer	Transmission Equipment	ATC	Abnormal voltage signature found while reviewing PMU data led to discovery of a failing potential transformer which was subsequently isolated and replaced.	p.38	The utility avoided safety risk to personnel that might have been in close proximity to the PT during its failure.		Utility avoided costs associated with customer minutes of interruption that would have resulted from the potential transformer's failure had the condition not been identified and a mobile transformer placed in service to facilitate the outages necessary for its replacement.
TE03	Loose connections in potential circuits	Transmission Equipment	OG&E	Fluctuations observed in positive sequence voltage data collected from PMUs led to discovery of a loose fuse connection in a CCVT safety switch. PMU data has been used in a similar fashion to reveal faulty terminations, animal-damaged conductor and contact corrosion.	p.40			Utility avoided costs associated with equipment damage and customer minutes of interruption that might have resulted had the issues not been addressed.

Reference: **Using Synchrophasor Data to Diagnose Equipment Health and Misoperations Event Summary Table**

CRSTT Work Plan

NASPI North American SynchroPhasor Initiative

1 Introduction

This document defines the CRSTT's mission, priorities and goals, and planned activities for 2019.

The CRSTT will review and update this plan annually to ensure a common understanding of the team's purpose and direction.

2 Mission Statement

This task team's mission is to work collectively with other NASPI task teams to advance the use of real-time synchrophasor applications for the purpose of improving control room operations and grid reliability. This team will utilize its experience and regional diversity to provide advice, direction, support and guidance to NASPI stakeholders and other organizations involved in the development and implementation of real-time synchrophasor applications.

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Next NASPI CRSTT Conference Call: June 25, 2019.
Next NASPI WG Meeting: Oct. 2019 in Richmond, VA.