Control Room Solutions Task Team Update
NASPI Work Group Virtual Meeting

November 4, 2020

Update Summary

- CRSTT Work Products
  - Focus Area Docs
  - Video Event Files
  - Ops Use Case Docs
- Time-Synchronized Measurements Training
- Enhanced Operational Use Cases

Focus Area Documents

1. **System Islanding Detection and Blackstart Restoration – Posted June 2015.**
   - (Kleitsch – ATC, Cassiadoro – TRS)
2. **Using Synchrophasor Data for Voltage Stability Assessment – Posted Nov. 2015.**
   - **(**Farantatos – EPRI, Vaiman – V&R Energy)
3. **Using Synchrophasor Data for Phase Angle Monitoring – Posted May 2016.**

   (Cassiadoro – TRS, Nuthalapati – LCRA)
   - **NDR to follow-up w/ participants in Spring 2021 for updates**
4. **Enhanced State Estimation Survey –Preliminary responses received but little direction provided at time of survey.**

   (Vaiman – V&R Energy, Kleitsch – ATC)
   - **We are considering closing this item. Please provide feedback if you think there would be value revisiting at a later date.**

Focus Area Documents (cont'd)

5. **Using Synchrophasor Data for Oscillation Detection – Posted Feb. 2018.**

   (Nuthalapati –LCRA, Dyer –EPG, Blevins and Rjagopalan –ERCOT, Patel -EPRI)

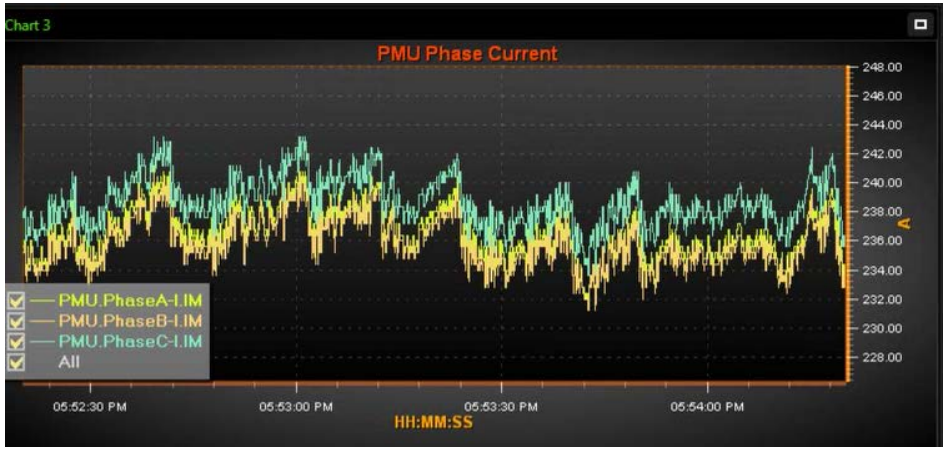
6. **Using Synchrophasor Data to Determine Disturbance Location – Posted Feb. 2019.**

   (Nuthalapati – LCRA, Zweigle –SEL Inc., Cassiadoro –TRS)

NOTE: CRSTT to update existing docs from time to time but does not expect to develop new focus area docs in this format.

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**

Time-Synched Measures Training Update

2019: TRS and PNNL collaborated to develop a *Use of Time-Synchronized Measurements in the Real-time Ops Horizon* training course (8 CEH).

2020: TRS and PNNL developing a *Time-Synchronized Measurements Simulation Training* course (8 CEH).

Related Objective: Work with industry to develop improved operational use cases that clearly demonstrate how synchrophasor technology can be used to perform reliability-related tasks.

Enhancing Ops Use Cases: Strategy & Approach

- Engage Industry – Collaborate with grid operators and electric utilities, vendors and others to develop cases.
- Focus on Reliability-Related Tasks – Build cases that highlight use of synchrophasor technology to perform reliability-related tasks.
- Apply Consistent Structure – Create a common framework for presenting cases.
- Present All Pertinent Info – Expand beyond sub-set of PMU data trends presented in most current cases.
- Introduce Enhanced Visualizations – Make it easier to access information and understand how it can be used to inform operational decisions.

Operational Use Case Discussion

CRSTT and DisTT members would like to explore the following areas with interested parties:

1. Wildfire Mitigation
2. Microgrid Control
3. Cybersecurity Awareness
4. Inertia Monitoring
5. Topology Identification

The teams are actively searching for grid operators, electric utilities and vendors that wish to engage.

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If you want to be added to the CRSTT or DisTT email list or have questions about the NASPI website please contact teresa.carlon@pnnl.gov