NASPI Control Room Solutions Task Team & Distribution Task Team – Joint Meeting

August 25, 2020

Meeting Agenda

- Introductions
- Revisit meeting minutes from June 23, 2020 conference call (July 2020 meeting cancelled)
- Discuss NASPI webinars
  - Real-Time Oscillation Analysis
  - Synchrophasor Data Networks and Management
  - Detection of Distribution Circuit Wildfire Ignition Mechanisms
- Review status of CRSTT work products
  - Focus Area Docs
  - Video Event Files
  - Ops Use Case Docs
- Provide update on Time-Synchronized Measurements Training
- Discuss next steps with enhanced operational use cases
- Adjourn

Meetings Minutes – June 23, 2020

NASPI North American SynchroPhasor Initiative

June 23, 2020 - Combined CRSTT/DisTT Call Notes

Control Room Solutions Task Team (CRSTT)
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Distribution Task Team (DisTT)
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Teresa Carlon, NASPI support and website and listserv contact (teresa.carlon@pnnl.gov)

Attendees
Roll call – see list below. Call led by Sacha and Mike.

Action Items

- NASPI webinar series; our next webinar will by **July 29 with Matt Rhodes and Dan Brancaccio**. Learn more about this webinar and how to register.
- Reactive Power Balancing paper; remove from Focus Area document list.
- Using Synchrophasor Data for Phase Angle Monitoring - NDR suggested we take this off our list and come back to this in early 2021.
- Reza has done some work on wildfire mitigation and Sascha suggested he could share what he has done with the DisTT.
- Teresa set up a Use Case "working" document on Google Docs. Anyone with this link can edit the document: https://drive.google.com/file/d/1t1ms1RGVmkrNSmAIjf5hEYh6RpkRH47v/view?usp=sharing

NASPI CRSTT & DisTT June 2020 Meeting Materials

NASPI Webinar – June 2020

NASPI

THE NORTH AMERICAN SYNCHROPHASOR INITIATIVE

WEBINAR SERIES

Jim Follum, Ph.D.

Pacific Northwest National Laboratory (PNNL)

Real-Time Oscillation Analysis: Technology Readiness, and a Vision for Future Needs and Applications

Power system operators have made significant progress detecting and mitigating oscillations using synchrophasor measurements. Commercial and custom-made software is used to monitor stability margins, detect sustained oscillations, and identify underlying problems. Despite the progress, recent wide-area oscillation events have highlighted the need for improved coordination among grid operators and wider use of oscillation detection and source localization tools. Grid operators have also identified the need to better understand changes in system dynamics related to the rapidly changing generation mix. During this webinar, panelists will first present success stories from oscillation analysis technology deployments and provide an overview of efforts to address current and emerging challenges. These will focus on activities among the WECC Oscillation Analysis Working Group (OAWG), NERC Synchronized Measurement Subcommittee (SMS), and DOE-funded research teams.

Real-Time Oscillation Analysis Webinar Materials

NASPI Webinar – July 2020

NASPI

THE NORTH AMERICAN SYNCHROPHASOR INITIATIVE

WEBINAR SERIES

Synchrophasor Data Networks and Management: Journey of Successes and Failures

Matthew Rhodes – Salt River Project (SRP) and **Dan Brancaccio** – Quanta Technology, Co-leads of the NASPI Data and Network Management Task Team (DNMTT)

Matthew Rhodes is a Principal Engineer in Grid Operations Support at Salt River Project in Phoenix, Arizona. His research focuses on developing new methods to improve synchrophasor data network and archive management to enable the discovery of new tools and methodologies for the enhancement of electric grid resiliency.

Dan Brancaccio is an Executive Advisor with over 30 years of experience in systems engineering and integration, development, developer management, and project management. He has developed large-scale, mission-critical, enterprise applications for energy utilities and corporate clients. Participated in the Western Interconnect Synchrophasor Program as the Chief Technical Architect responsible for designing and deploying large scale infrastructure for measuring, sharing, and archiving synchrophasor data for the Western Interconnect.

Join Salt River Project's Matthew Rhodes and Quanta Technology's Dan Brancaccio as they share their experiences, both successes and failures, with networking and data management challenges for time synchronized telemetry in the electric utility industry. They'll explore strategies that worked, and some that didn't, around enabling wide-area measurements for improved situational awareness, and the challenges with getting field data to the application. Constrained networking and data management structures have been a challenge in developing synchrophasor applications from the beginning, Matthew and Dan will discuss game-changing technologies and efforts under way that will redefine how grid telemetry is used in the future. They'll also cover topics around the benefits and drawbacks of data archiving and examine vendor-based solutions versus home-grown utility-built solutions, cloud storage, bringing applications to the data versus streaming data to the application and advanced synchrophasor applications development under these new architectures.

Synchrophasor Data Networks Webinar Materials

NASPI Webinar – August 2020

NASPI

THE NORTH AMERICAN SYNCHROPHASOR INITIATIVE

WEBINAR SERIES

Detection of distribution circuit wildfire ignition mechanisms using substation-only sensors and data analytics

Dr. B. Don Russell, Dr. Jeff Wischkaemper, and Carl Benner – Texas A&M

Recent emphasis on wildfire mitigation has generated interest in many forms of distributed sensing to detect wildfire ignition mechanisms. These include PMUs, RF sensors, and line current sensors as well as sensors that detect light, vibration, weather, etc. It is postulated that distributed sensing provides data that allows for more sophisticated detection and location as compared to systems that only use substation current and potential transformers. This presentation explores the capabilities of substation only monitoring architectures and provides a benchmark for use in cost/benefit comparisons to distributed sensing architectures. Detection examples of ignition mechanisms on operating utility circuits are presented.

Dr. B. Don Russell is Regents Professor in the Department of Electrical and Computer Engineering at Texas A&M University where he directs the research activities of the Power Systems Automation Laboratory. For more than 35 years, he has investigated advanced signal processing and waveform analysis techniques applied to distribution system faults and device failures. He is best known for his work, beginning in the 1970s, which scientifically characterized the behavior of arcing faults and for developing the first algorithms to detection high impedance faults. These techniques were commercialized and are incorporated today in utility relay platforms.

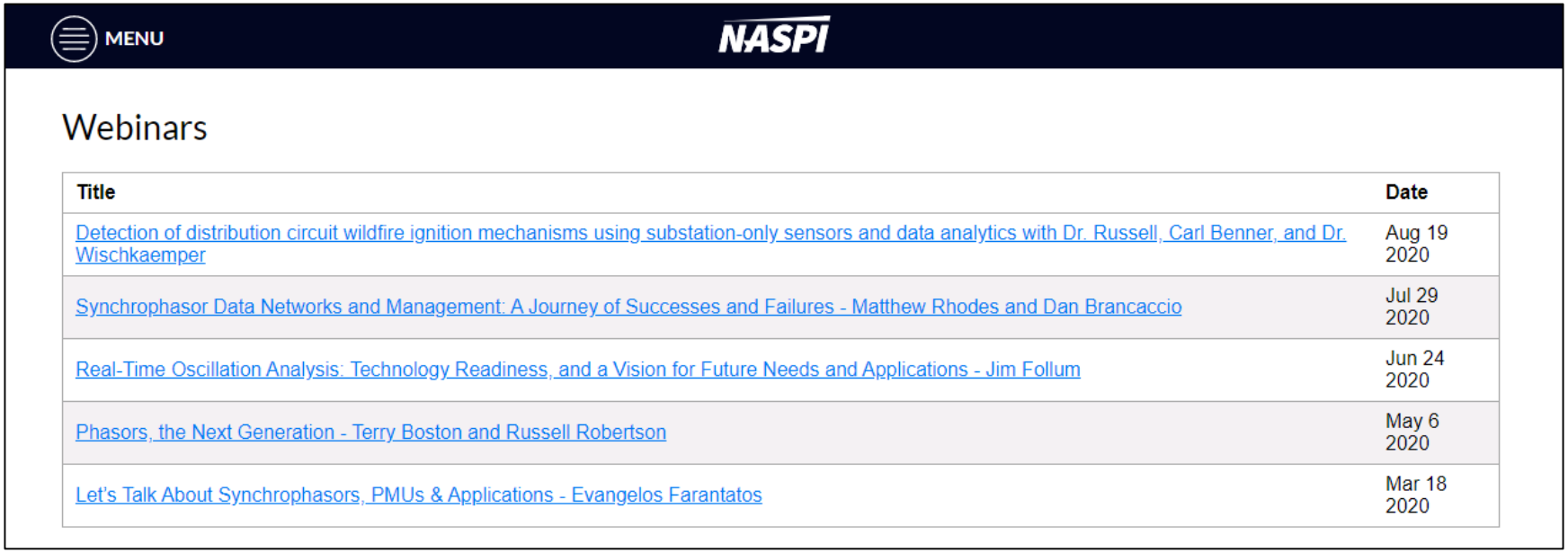
Carl Benner holds B.S. and M.S. degrees in Electrical Engineering from Texas A&M University in 1986 and 1988. He serves as Research Professor in the Department of Electrical and Computer Engineering at Texas A&M University. His work centers on the application of advanced technologies to the solution of challenging power system problems, with an emphasis on waveform analytics. Mr. Benner is a registered Professional Engineer in the state of Texas. He is a Fellow of IEEE and a member of the IEEE Power and Energy Society, the IEEE Industry Applications Society, and CIGRE.

Dr. Jeff Wischkaemper received his B.S. and Ph.D. degrees from Texas A&M University in Electrical Engineering in 2003 and 2011 respectively. Dr. Wischkaemper is a Research Assistant Professor in the Power System Automation Laboratory and has worked on a variety of research projects including investigating arcing on low-voltage networks, characterizing transient response behavior for alternative distribution sensor technologies, and electrically characterizing vegetation contacts with conductors.

Detection of Wildfire Ignition Mechanisms Webinar Materials

NASPI Webinar Topics

General Discussion: What topics would you like future NASPI webinars to address?



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; more analysis needed.**

   (Vaiman – V&R Energy, Kleitsch – ATC)

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)

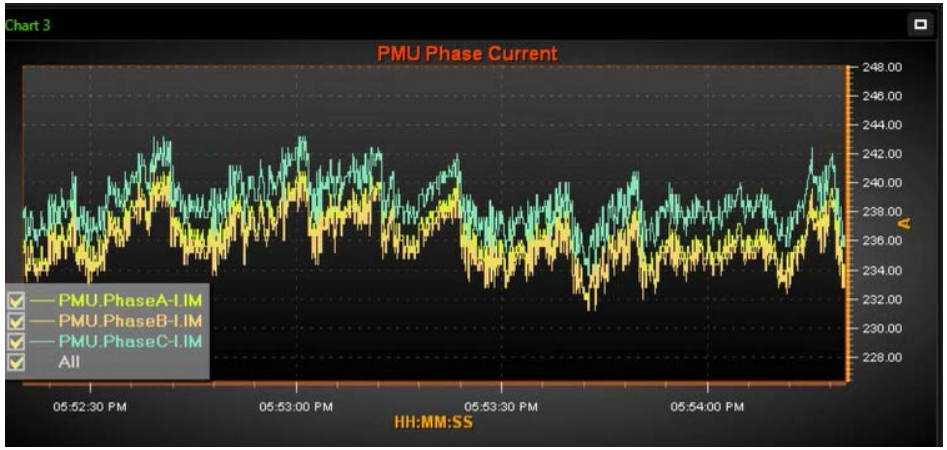
6. **Using Synchrophasor Data to Determine Disturbance Location – Posted Feb. 2019.**

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

NOTE: CRSTT may 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 to build on existing training by 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 access info and understand how it can be used to inform operational decisions.

Operational Use Case Discussion

Continue discussion about the initial set of operational use cases that we should focus on developing.

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

Any recommendations for vendors and utilities 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

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