

NASPI Control Room Solutions Task Team

April 27, 2021



Agenda

- Industry Update
- Developing/Updating List Of Real Time Operations Uses
- System Inertia Monitoring Ops Use Case
- Time-Synchronized Measurements Training

Industry Update

NASPI Work Group Meetings

- Virtual meetings held Tuesday 4/13/2021 thru Thursday 4/15/2021
- Over 180 Attendees
- Significant discussion on impacts of inverter-based resources and the use of time synchronized measurements to monitor and eventually mitigate these impacts
- All presentations have been posted to the NASPI web site under the Work Group Meetings page at the following site
<https://www.naspi.org/work-group-meetings>
- Our updated work plan has also been posted to the NASPI site (Thanks Teresa for getting that done!)

Industry Update (continued)

NERC Synchronized Measurement Work Group [SMWG]

- Virtual meeting held last week Thursday 4/22/2021 and Friday 4/23/2021
- Developing oscillation report template to standardize reporting to help better understand causes and impacts
- Developing white paper on “Oscillation Monitoring and Analysis”
- Discussion by different ISOs (SPP, CAISO, PJM, ISONE, and NYISO) related to PMU requirements, including CIP implications.
- David Schooley from CE discussed their PMU implementation program and how they are expanding to other EXELON companies
- Gary Kobe from TVA discussed their program including issues observed with PMU updates stopping when DFRs writing fault data. Also analyzing all 500kV events for unit response

Industry Update (continued)

Upcoming IEEE Smart Grid Synchronized Measurements and Analytics virtual event [SGSMA]

- Tuesday 5/25/2021 thru Thursday 5/27/2021
- Originally planned on site in Croatia
- Event web site <http://www.sgsma2021.org/>
- NASPI work group updates on Wednesday 5/26/2021

Updated List Of Real Time Ops Uses

- There are several utilities using synchrophasor technology to support real time operations
- Need to make sure we adequately document and make that information available to others interested in the technology
- NDR suggested having liaisons at each company we can reach out to for better understanding of what they are, and are not, doing. Any volunteers?
- Beginning to put together a list. If others are aware of something like this that already exists, Please let us know.

Updated List Of Real Time Ops Uses (cont'd)

- Oscillation Monitoring
 - TVA, BPA, ISO-NE
 - Others?
- Oscillation Source Detection
 - ISO-NE
- Inertia Monitoring
 - ??
- Islanding Detection and Monitoring
 - ??
- SCADA Backup
 - ??
- Disturbance Monitoring
 - ??
- Linear State Estimator
 - ??

System Inertia Monitoring Ops Use Case

Title: Use of Time-Synchronized Measurements for System Inertia Monitoring

Primary Objectives:

- Identify traditional methods used by grid operators and electric utilities to monitor system inertia.
- Consider significant changes taking place as a result of grid modernization.
- Explain how time-synched measurements can be used to monitor actual inertia levels.
- Describe how these measurements can be used by System Ops staff to manage risk and identify potential stability issues before they occur.

Time-Synched Measures Training Update

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

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

2021: TRS and PNNL to finish developing *Time-Synchronized Measurements Simulation Training* course and create a “train-the-trainer” video for interested parties.

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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



Distribution Task Team (DisTT)

call April 27, 2021

Agenda:

- Review edits to Mission statement
- Discussion and input on measurement requirements
- Round table

Mission Statement

The mission of the NASPI Distribution Task Team is to foster the use and capabilities of ~~networked PMUs~~ **synchronized measurement data** at the medium-voltage distribution level, beyond the substation.

This group shares information in support of effective research, development and deployment of distribution PMUs **and related measurement devices**.

We aim to ~~create~~ a community to solve technical and other challenges specific to ~~distribution PMU~~ **synchronized measurement** technology and **its** applications **in distribution system operation, planning and analysis**.

Ongoing Effort: Characterize use cases for synchronized measurements in distribution systems, and associated requirements

Compile information about

- types of measurements and their uses
- the measurement environment and its impact on PMU performance requirements
- applications and their data needs

to support the development of standards.

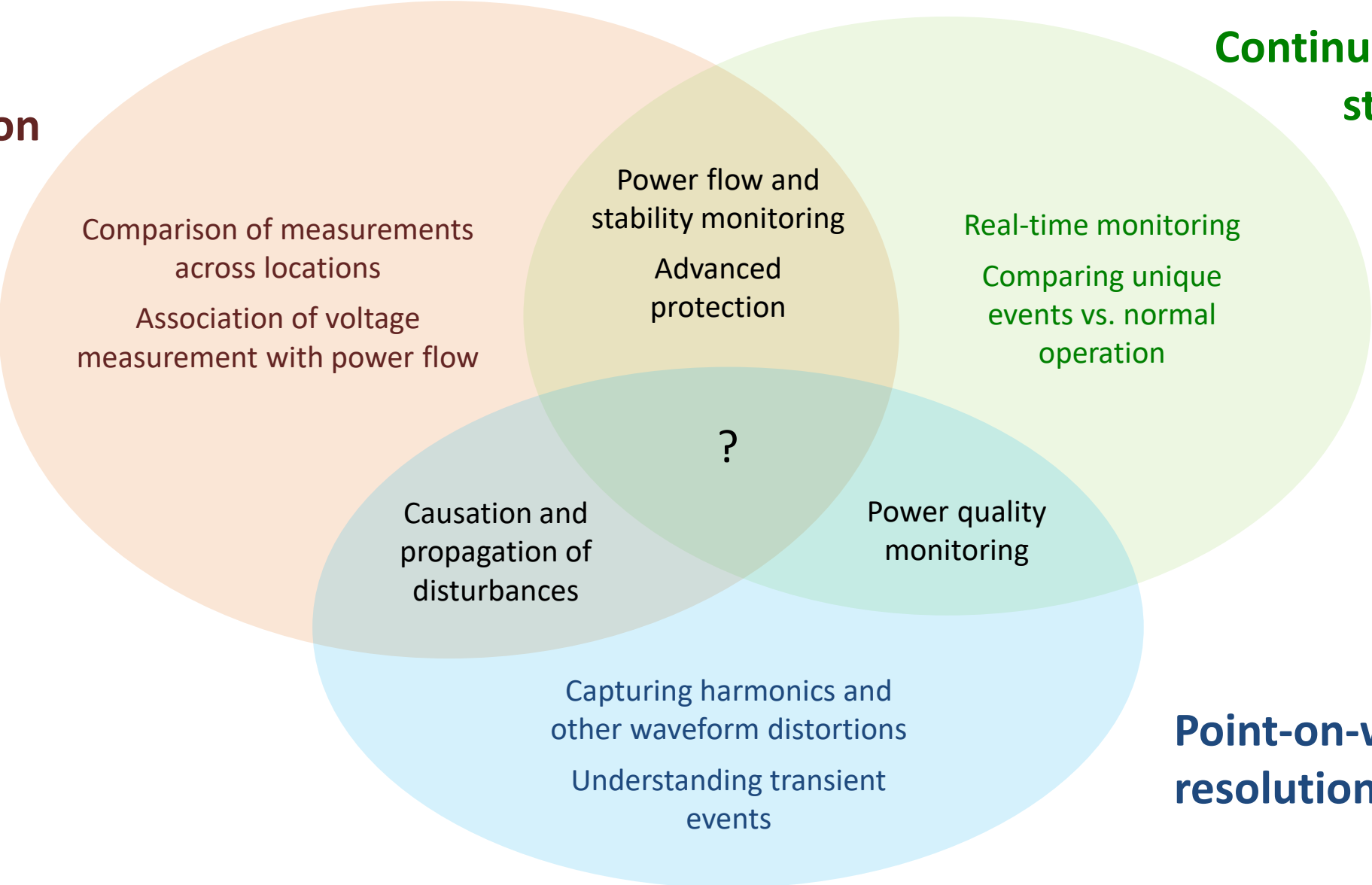
Priority: *field-deployed applications*

but information about lower-TRL research applications is also relevant.

Different Dimensions of Requirements: Thinking out Loud

Precise time-synchronization

Continuous data streaming



Comparison of measurements across locations
Association of voltage measurement with power flow

Power flow and stability monitoring
Advanced protection

Real-time monitoring
Comparing unique events vs. normal operation

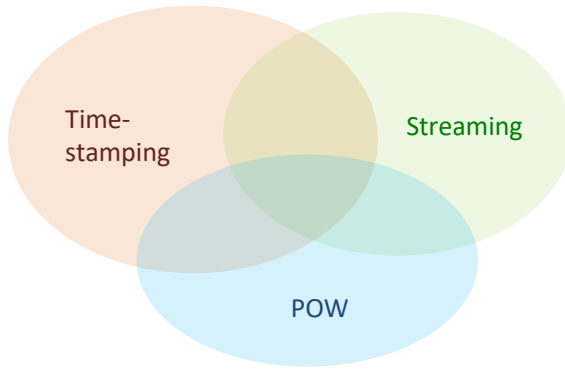
Causation and propagation of disturbances

Power quality monitoring

?

Capturing harmonics and other waveform distortions
Understanding transient events

Point-on-wave resolution



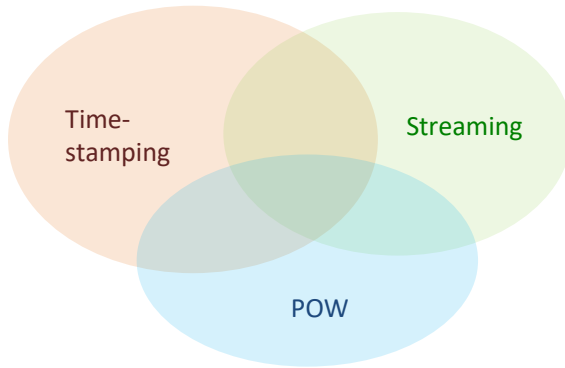
Precise time-synchronization

Comparison of measurements across locations

Association of voltage measurement with power flow

Significant applications and requirements

- Event analysis – comparing disturbance signatures observed from multiple locations
Alignment of rms magnitude reports to within the same cycle?
- Distribution state estimation
Resolution of 0.05° in reported phase angle?
- Network model validation – branch impedance calculation
Resolution of 0.01° in reported phase angle?
- Traveling wave fault location (Kirby, NASPI WG mtg April 2021, Session 2)
1 MHz CPOW, time error $< 10 \mu\text{s}$

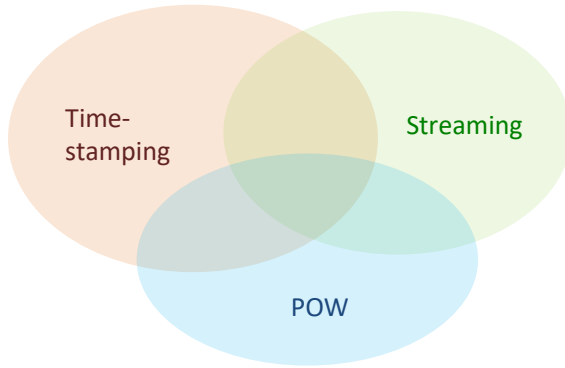


Point-on-Wave Resolution

Capturing harmonics and other waveform distortions
Understanding transient events

Significant applications and requirements

- Characterizing harmonic distortion from inverters and loads
Match inverter switching frequencies? 10, 30, 50 kHz?
- Identifying inverter-caused oscillation modes (Wang et al, NASPI WG mtg April 2021, Session 1)
used 960 Hz POW to identify 22-Hz mode
- Traveling wave fault location (Kirby, NASPI WG mtg April 2021, Session 2)
1 MHz CPOW, time error < 10 μS
- Fault detection (Blair, NASPI WG mtg April 2021, Session 2)
- Inverter fault identification (Cozzolino, NASPI WG mtg April 2021, Session 2)
1 ms resolution
- ...



Continuous data streaming

Real-time monitoring

Comparing unique events vs. normal operation

Significant applications and requirements

- Monitoring DER generation
does data stream have to capture full resolution, or is reporting every few seconds sufficient?
- Informing protection systems (e.g. fallen conductor)
continuous real-time stream required, latency is of the essence
- Identification and mitigation of wildfires
- ...

Next call: TBD, *no call in May due to SGSMA May 24-27*

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