NASPI Update

April 4, 2023

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Electricity Security Group / Resilience Team

Pacific Northwest National Laboratory

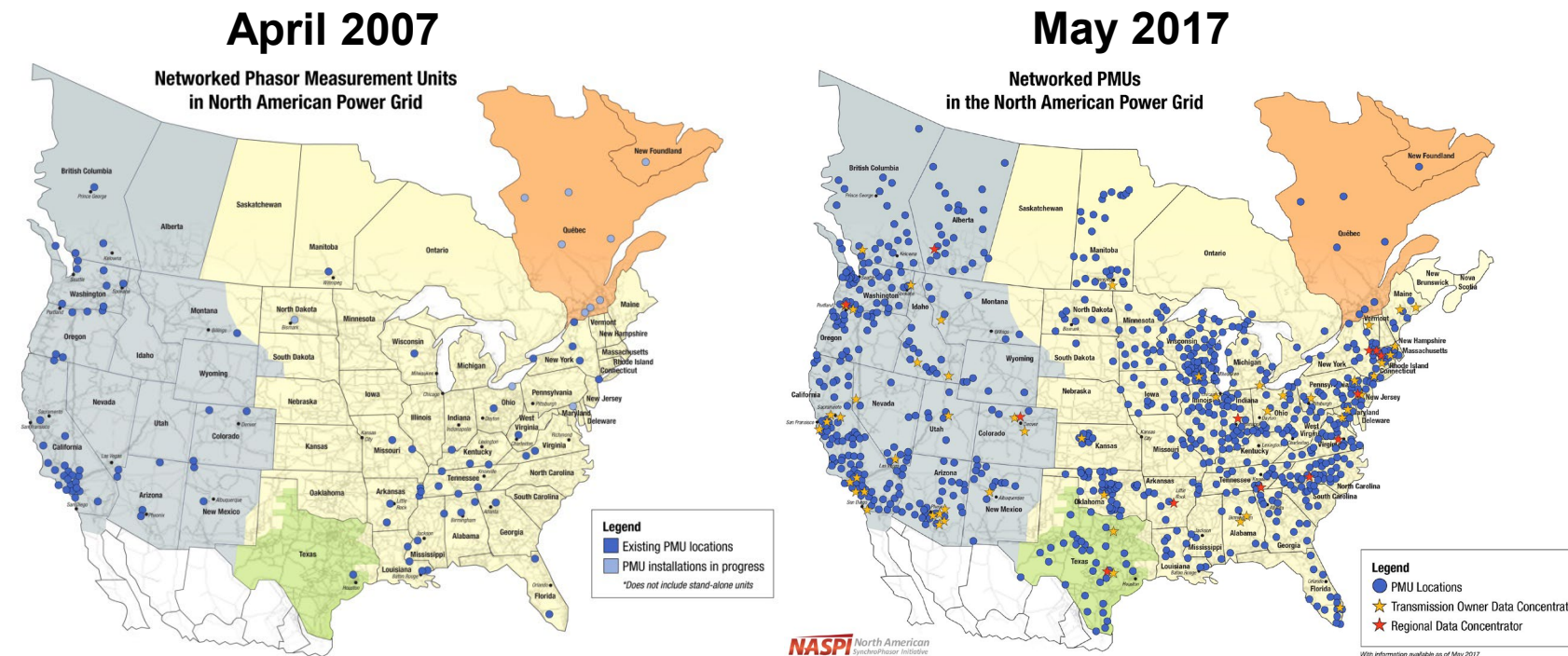PNNL is operated by Battelle for the U.S. Department of Energy

The North American SynchroPhasor Initiative (NASPI)

The U.S. Department of Energy (DOE) and EPRI are working together closely with industry to enable wide-area time-synchronized measurements that will enhance the reliability of the electric power grid through improved situational awareness and other applications.

Current and emerging areas of emphasis/focus for NASPI:

- Networking and communications technologies (advanced architectures)
- Statistical analysis and deep learning for extracting actionable information from large datasets
- High-resolution sensors to characterize the transient behavior of inverter-based resources and other fast-acting phenomena

"Better information supports better - and faster - decisions."

NASPI Status Report

- Prior work group meeting October 18-19, 2022, Charlotte NC (hybrid)
  - ✓ Vendor show
  - ✓ Meta analysis to support big data analytics
  - ✓ Utility digital transformation and DOE prize panel
  - ✓ Distribution systems and edge computing
  - ✓ Locating generator outages
  - ✓ DOE projects in advanced sensing and analytics
  - ✓ GPS alternatives for timing in support of PMUs
  - ✓ Multi-function measurement devices application at grid edge

- This work group meeting – April 4-5, 2023, Tempe AZ (in-person)
  - ✓ Vendor show and poster session
  - ✓ Inverter-Based-Resources Super Session
  - ✓ Practical Applications of Synchrophasor Technology
  - ✓ Streaming Telemetry Transport Protocol (STTP)
  - ✓ Data Quality
  - ✓ Advanced Applications
  - ✓ Inertia Estimation
  - ✓ Visualization and Operator Training

- Next work group meeting – September 26-27, 2023, Charlotte NC (hybrid)

Tuesday's Agenda – April 4

All times Arizona time zone: MST/PDT

Time	Session
8:00 - 9:00 am	**Registration and coffee**
9:00 - 9:05 am	Welcome, Introductions, and Logistics Review: Jeff Dagle (PNNL)
9:05 - 9:25 am	Keynote Speaker: Chris Janick, SRP Senior Director of Power Delivery
9:25 – 9:45 am	NASPI Update – Jeff Dagle (Pacific Northwest National Laboratory)
9:45 – 10:05 am	Financial Impact of High-Resolution Telemetry on the Clean Energy Transition - Kevin Jones (Dominion Energy)
10:05 – 10:25 am	Observed challenges specific to distribution grid synchrophasor deployments from a Distribution System Operations perspective - Bryce Johanneck (Quanta Technology, LLC)
10:25 – 10:45 am	Categorizing and Understanding the State of Applications Driven by Time-Synchronized Grid Data - Sean Murphy (PingThings, Inc.)
10:45 - 11:10 am	**Break – 15 Minutes**
11:10 - 11:30 am	Interaction of Forced Oscillation with Multiple System Modes - Mani Venkatasubramanian (Washington State University)
	American-Made Utility Digital Transformation Prize Session Hosted by Sandra Jenkins, U.S. Department of Energy
11:30– 12:00 pm	• Phase 1 Outcomes • Utility partner Discussions • Video • Phase 2 Next Steps

Tuesday's Agenda – April 4 continued
All times Arizona time zone: MST/PDT

Time	Session
12:00 – 1:00 pm	**Lunch**
	Inverter-Based-Resources Super Session
1:00 – 1:20 pm	Monitoring Momentary Cessation of IBRs with Synchrophasors - Tariq Rahman (San Diego Gas & Electric)
1:20 – 1:40 pm	Modeling Dynamic Response of Inverter-Based Resources Using Waveform Measurements - Hamed Mohsenian-Rad (University of California)
1:40 – 2:00 pm	Measurements and Analytics for Resilient Integration of Inverter-Based Resources - Jim Follum (Pacific Northwest National Laboratory)
	Technology Partner Flash talks (5 minutes talk)
2:00 – 2:40 pm	- PingThings - Schweitzer Engineering Laboratories - Oscilloquartz - Meinberg - Powerside - MathWorks - Vendor 8
2:40 – 3:00 pm	**Break – 20 Minutes**

Tuesday's Agenda – April 4 continued
All times Arizona time zone: MST/PDT

	Task Team Breakout Sessions
3:00 – 5:00 pm	Control Room Solutions Task Team (CRSTT) - James Kleitsch and Cody Parker
	Data & Network Management Task Team (DMTT) - Dan Brancaccio
	Distribution Task Team (DisTT) - Dan Dietmeyer and Panos Moutis
	Engineering Analysis Task Team (EATT) - Evangelos Farantatos and Matthew Rhodes • The Grid Event Signature Library: A Centralized Repository of Power System Waveform Data - Aaron Wilson (Oak Ridge National Laboratory) and Jhi-Young Joo (Lawrence Livermore National Laboratory) • The Use of High-Speed Synchronized Measurements to Create Dynamic Indicators of Grid Resilience - David A. Schoenwald (Sandia National Laboratory)
5:00 - 7:30 pm	**NASPI Reception, Vender Show, & Poster Session**

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Wednesday's Agenda – April 5

All times Arizona time zone: MST/PDT

Time	Description
8:00 - 9:00 am	**Registration and coffee**
	NASPI Task Team Updates (10 minutes each) Panel Session
9:00 – 9:50 am	• CRSTT - James Kleitsch and Cody Parker • DNMTT - Dan Brancaccio • DisTT - Dan Dietmeyer and Panos Moutis • EATT - Evangelos Farantatos and Matthew Rhodes
	Organization Updates (10 minutes each)
9:50 – 10:20 am	• IEEE - Yi Hu • NERC SMWG - Clifton Black • EIDSN - TBD
10:20-10:40	**Break – 20 minutes**
	Practical Applications of Synchrophasor Technology
10:40 – 11:00am	AEP's Experience in Configuring and Deploying Linear State Estimator to Enhance Grid Resilience - Yidan Lu (American Electric Power)
11:00 – 11:20 am	Tracking Periodic Voltage Sags via Synchrophasor Data in a Geographically Bounded Service Territory - Luigi Vanfretti (Rensselaer Polytechnic Institute, on behalf of Dominion Energy)
	Streaming Telemetry Transport Protocol (STTP)
11:20 – 12:00pm	The new IEEE Standard for the Streaming Telemetry Transport Protocol (STTP) - Session moderated by Christoph Lackner (Grid Protection Alliance)
12:00 - 1:00 pm	**Lunch – 1 hour**

Wednesday's Agenda – April 5 continued

All times Arizona time zone: MST/PDT

	Data Quality
1:00 – 1:20 pm	Synchrophaser system data quality - Can we do better? - Yi Hu (Quanta Technology, LLC)
	Advanced Applications
1:20 – 1:40 pm	Localizing and Mitigating Delayed Voltage Recovery in Distribution Systems via DER & Load Control - Amarsagar Reddy Ramapuram Matavalam (Arizona State University)
1:40 – 2:00 pm	Fault Location using Realistic PMU data: Physics-Informed Machine Learning for enhancing robustness and verification - Wenting Li (Los Alamos National Laboratory)
2:00 – 2:20 pm	Designing Model-Free Time Derivatives in the Frequency Domain for Ambient PMU Data Applications - Luigi Vanfretti (Rensselaer Polytechnic Institute, on behalf of Dominion Energy)
2:20 – 2:40 pm	Break 20 minutes

Wednesday's Agenda – April 5 continued

All times Arizona time zone: MST/PDT

	Inertia Estimation
2:40 – 3:00 pm	Real-Time Inertia Estimation Monitor Based on Pumped Hydro Operation Signatures - Yilu Liu (University of Tennessee)
3:00 – 3:20 pm	Assessment of Inertia Using PMU Data for Indian Power System - Male Pradeep Reddy (Grid Controller of India Limited)
	Visualization and Operator Training
3:20 – 3:40 pm	Visualizing PMU data for the end-user: A human factors approach - Mary Ngo (Pacific Science and Engineering Group)
3:40 – 4:00 pm	Dynamic Synchrophasor Simulator for Real-Time Operator Training - Arthur Mouco (Brazilian Independent System Operator – ONS)
4:00 – 4:30 pm	Closing remarks, open discussion, next steps – moderated by Jeff Dagle
4:30pm	**Adjourn**

Thank you
NASPI Partners for your continued support

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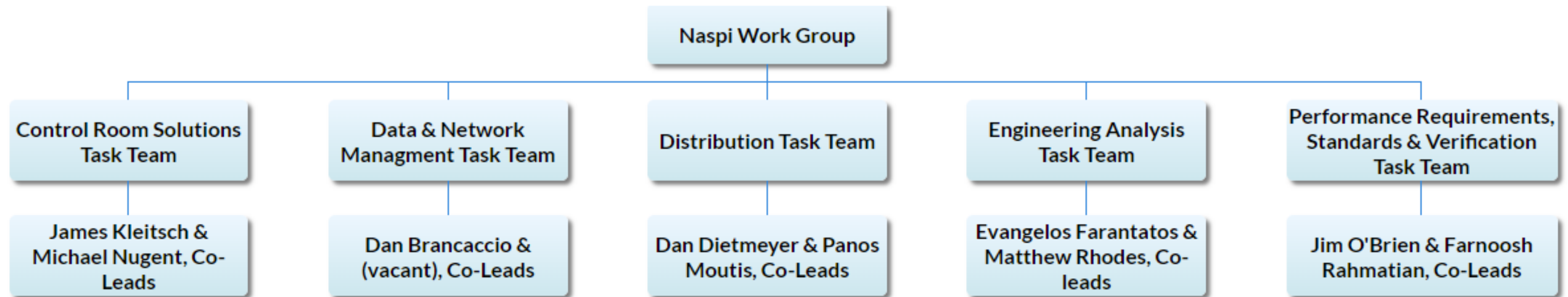
NASPI 2023 Webinar Series

- Webinar materials are available at www.naspi.org/webinars

- January 25 – Demystifying Distribution Synchrophasors: Use Cases, Requirements, and Integration from Field Experience - Paolo Romano (Zaphiro Technologies)

- February 22 – Compression of Sampled Current and Voltage Signals Via a Multi-Model Coding Scheme - Corentin Presvôts and Thibault Prevost (RTE-France)

- March 29 – Value Proposition for Getting Buy-in for Synchrophasor Technology – Matthew Rhodes (SRP)

- The summer webinar series will kick off June 28

The NASPI Technical Task Teams

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                        │ Naspi Work Group │
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Control Room Solutions Task Team	Data & Network Managment Task Team	Distribution Task Team	Engineering Analysis Task Team	Performance Requirements, Standards & Verification Task Team
James Kleitsch & Michael Nugent, Co-Leads	Dan Brancaccio & (vacant), Co-Leads	Dan Dietmeyer & Panos Moutis, Co-Leads	Evangelos Farantatos & Matthew Rhodes, Co-leads	Jim O'Brien & Farnoosh Rahmatian, Co-Leads

- Email naspi@pnnl.gov if you would like to be part of a task team.

NASPI Roadmap

- NASPI has covered a broad spectrum of needs among industry, and has been serving as a launchpad for the successful maturation of synchrophasor technology
  - Convening a forum for the exchange of best practices
  - Fostered the development of guidelines and standards
  - Supported the industry with tools, knowledge, lessons learned, training, and more
- A gap analysis was recently performed that evaluated what NASPI has accomplished and to determine if there are areas that should received renewed attention and focus
- The draft report includes the following priorities:
  - Real-time operations
  - Effective use of historical data
  - New and integrated data sources
  - Distribution system deployment

Human Factors Workshop

- In March 2023, PNNL hosted, with OE sponsorship, a 2-day workshop on human factors for real-time control room operations
  - Day 1 was a full day of presentations showcasing a wide range of human factors projects from national labs, small businesses, and academia. The full day session was hosted via Zoom so that we might reach a wider audience. Attendance numbers were on the order of 40+ attendees.
  - Day 2 was in-person only, and intended to be a day of working meetings and breakout sessions to address the challenges that human factors and cognitive science researchers are facing, and how we might work together to overcome those challenges.

We are now creating a larger collaboration effort that includes exploring the development of a human factors testbed and several high-impact use cases that will help advance human factors and cognitive research for the grid.

NASPI Path Forward

- Continue to support and liaison with industry
  - Various IEEE Standards activities
  - North American Electric Reliability Corporation
    - ✓ Synchronized Measurement Working Group
  - Western Electricity Coordinating Council

- Changes to the NASPI leadership teams
  - Sunsetting the Performance Requirements, Standards, and Verification Task Team (PRSVTT)
  - Refocusing the other task teams based on current need and priority focus areas

- No major changes to overall NASPI work group activities
  - Intending to maintain status quo work group meeting tempo (twice per year)
  - Continuing monthly webinar series between work group meetings
  - Desire to maintain approximately equal representation among utilities, vendors, and academia, which has been a unique attribute and key value proposition for NASPI

- Current and emerging areas of emphasis/focus for NASPI:
  - Networking and communications technologies (advanced architectures)
  - Statistical analysis and deep learning for extracting actionable information from large datasets
  - High-resolution sensors to characterize the transient behavior of inverter-based resources and other fast-acting phenomena

Save the Date

The next NASPI Work Group **Hybrid** Meeting and Vendor Show will be held:

September 26-27, 2023

Charlotte, NC

Note: The NERC SMWG is planned for September 28, 2023

www.naspi.org

Thank you