Pacific Northwest
NATIONAL LABORATORY

NASPI Update

April 16, 2024

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Electricity Security Group
Pacific Northwest National Laboratory

U.S. DEPARTMENT OF ENERGY BATTELLE

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PNNL-SA-197229

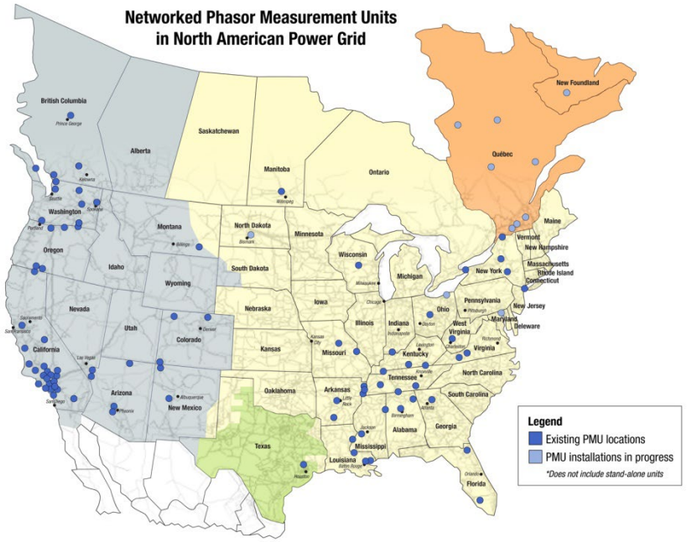
The North American SynchroPhasor Initiative (NASPI)

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.

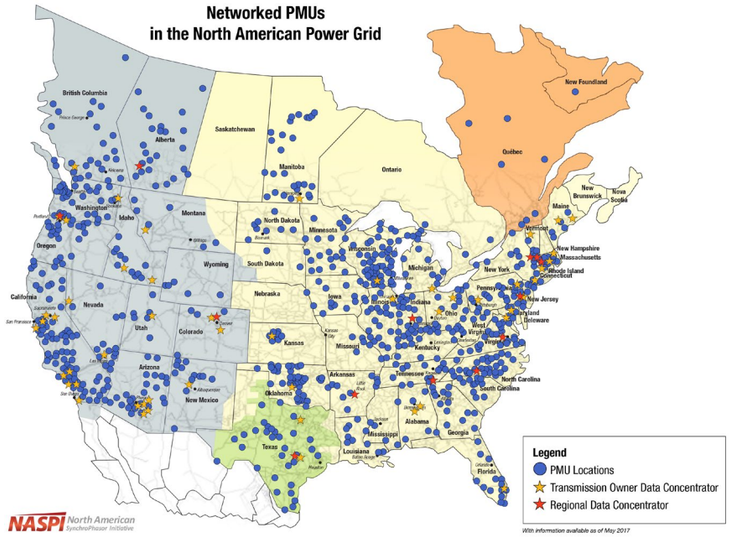
Current and emerging areas of emphasis/focus for NASPI:

- 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

April 2007



May 2017



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

NASPI Status Report

- Prior work group meeting – September 26-27, Charlotte NC (hybrid)
  - ✓ Utility digital transformation and DOE prize panel
  - ✓ Resilient Precision Timing
  - ✓ Operational Requirements for the Grid of the Future
  - ✓ Experiences with Integrating Inverter Based Resource Generation
  - ✓ Energy Management System (EMS) Tools and Technologies
  - ✓ Utility Experiences Deploying Time Synchronized Measurements
  - ✓ NASPI – NERC SMWG Joint Workshop - Next Generation Measurement-Based Reliability Tools
- This work group meeting – April 16-17, Salt Lake City UT (in-person)
  - ✓ Linear State Estimation
  - ✓ Modeling and Monitoring Generation Resources
  - ✓ Synchronized Waveforms in the Distribution System
  - ✓ Digitizing Utilities Prize Round 2 Announcement
  - ✓ Control Room Experience and Applications
  - ✓ Inertia Estimation and Monitoring
  - ✓ Data Management and Sharing
  - ✓ NASPI-NERC Synchrophasor Data Analytics Workshop
- Next work group meeting – October 15-16, Charlotte, NC (hybrid)

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Tuesday's Agenda – April 16

9:00 - 9:05 am	Welcome, Introductions, and Logistics Review: Jeff Dagle (PNNL)
9:05 - 9:25 am	Keynote Speaker: Branden Sudduth, WECC Vice President, Reliability Planning and Performance Analysis
9:25 – 9:40 am	NASPI Update – Jim Follum (PNNL)
	Session 1 Linear State Estimation
9:40 – 10:00 am	Update on PMU-based Power Network Analysis Applications at SDG&E – Robin Manuguid (SDG&E) and Marianna Vaiman (V&R Energy)
10:00 – 10:20 am	Linear State Estimation at TVA for Improving Grid Reliability and Resiliency - Neeraj Nayak (Electric Power Group) and Jonathan Sides (TVA)
10:20 – 10:40 am	Machine Learning Based State Estimation for PMU-Unobservable Transmission Systems – TVA Case Study – Evangelos Farantatos (Electric Power Research Institute)
10:40 - 11:00 am	**Break – 20 Minutes**
	Session 2 Modeling and Monitoring Generation Resources
11:00 - 11:20 am	Analysis of Oscillation in RE Complex of Indian Power System – Raj Kumar Anumasula (Grid Controller of India Limited)
11:20 - 11:40 am	Validation of IBR equivalent plant level PSCAD model using Synchrophasor measurements – Srinivas Chitturi (Grid Controller of India Limited)
11:40 - 12:00 pm	Field Demonstration of an Automated Generator Evaluation Tool at BPA – Jim Follum (PNNL), Priya Mana (PNNL), and Elliott Mitchell-Colgan (BPA)

Tuesday's Agenda – April 16 cont.

	Session 3 Synchronized Waveforms in the Distribution System
1:00 – 1:20 pm	Continuous (Gapless) Recording of Synchro waveforms: Field Experiments and Case Studies– Hamed Mohsenian-Rad (University of California, Riverside)
1:20 – 1:40 pm	Platform Enabling Smart Grid Monitoring & Sensing- Scott L. Caruso (Gridmetrics), and Ryan Quint (Elevate Energy)
1:40 – 2:00 pm	Case Study of Building Loads Using Continuous Time-Synchronized Waveform Measurements – Jared Bestebreur (Schweitzer Engineering Laboratories, Inc.)
	American-Made Challenge
2:00 – 2:10 pm	Digitizing Utilities Prize Round 2 – Sandra Jenkins (DOE)
	Session 4 Technology Partner Flash talks (5 minutes talk)
2:10 – 3:10 pm	• MathWorks - Graham Dudgeon • Schweitzer Engineering Laboratories - Jared Bestebreur • Data Society - Fred Knops • Grid Protection Alliance - Christoph Lackner • Meinberg • Oscilloquartz – Daniel Burch • Powerside - Nick Nakamura • STER - Dalibor Brnobić • PingThings - Mike Rhine • V&R Energy - Marianna Vaiman • GE Vernova – Sam Houge

Tuesday's Agenda – April 16 cont.

	Session 5 Task Team Breakout Sessions
3:30 – 5:00 pm	Control Room Solutions Task Team (CRSTT) - James Kleitsch and Mike Nugent
	Data & Network Management Task Team (DNMTT) - Dan Brancaccio
	Distribution Task Team (DisTT) - Dan Dietmeyer and Panos Moutis
	Engineering Analysis Task Team (EATT) - Evangelos Farantatos and Matthew Rhodes
5:00 - 7:00 pm	**NASPI Reception, Vender Show, & Poster Session**

Wednesday's Agenda – April 17

	Session 5 NASPI Task Team Updates (10 minutes each) Panel Session
9:00 – 9:45 am	• CRSTT - James Kleitsch and Mike Nugent • DNMTT - Dan Brancaccio • DisTT - Dan Dietmeyer and Panos Moutis • EATT - Matthew Rhodes
	Session 6 Organization Updates (10 minutes each)
9:45 – 10:20 am	• IEEE PSRC- Yi Hu • IEEE PES Task Force on Synchro-Waveforms - Hamed Mohsenian-Rad • NERC SMWG - Qiang "Frankie" Zhang
10:20 – 10:40	**Break – 20 minutes**
	Session 7 Control Room Experience and Applications
10:40 – 11:00am	BPA Use of Synchrophasors in the Control Room – Daniel Goodrich, and Kliff Hopson (Bonneville Power Administration)
11:00 – 11:20 am	Dominion Energy's Synchrophasor-Based Energy Management System Project – Synchrophasor Power Flow - Horacio Silva Saravia (Electric Power Group), Abigail Till (Dominion Energy)
11:20 – 11:40 pm	Real-Time Dynamic Security Assessment of Bulk Power Exchange in the Brazilian Interconnected System Using PMUs – Arthur Mouco (Operador Nacional do Sistema Eletrico)
11:40-12:00 pm	Bridging the Gap – Synchrophasor Technology in Realizing the Smart Grid - Qiang "Frankie" Zhang (ISO New England)

Wednesday's Agenda – April 17 cont.

	Session 8 Inertia Estimation and Monitoring
1:00 - 1:20 pm	Inertia Estimation Using Ambient and Probing Based PMU Measurement – Yilu Liu (University of Tennessee)
1:20 – 1:40 pm	Automatic Inertia Monitoring and Data Logging System – Azizul Hilmi Zulkifli (Tenaga Nasional Berhad, Malaysia)
	Session 9 Data Management and Sharing
1:40 – 2:00 pm	RTDMS CIM Integration at NYISO – Dan Ilse (NYISO) and Frank Carrera (Electric Power Group)
2:00 – 2:20 pm	Continuous Oscillography Waveforms from the Substation to the Cloud – TJ Purcell (Dominion Energy)
2:20 – 2:40 pm	Utility Data Sharing Risk and Economics Assessment Framework – Fleur de Peralta (PNNL)

Wednesday's Agenda – April 17 cont.

	NASPI-NERC Synchrophasor Data Analytics Workshop
3:00 – 4:45 pm	• Automatically Discerning Power System Dynamics in Synchrophasor Measurements Data Spectra - Chetan Mishra (Dominion Energy) • Identifying Faults in Large PMU Data-sets Using MATLAB - Mil Shastri (MathWorks) • Grid Performance Assessment using Synchrophasor Data Analytics - Neeraj Nayak (Electric Power Group) • Use Cases for Big Synchrophasor Data in Asset Health Analysis - Ritchie Carroll (Grid Protection Alliance)
4:45pm	Closing remarks, open discussion, next steps – moderated by Jim Follum
5:00 pm	**Adjourn**

The Data Analytics Workshop is being provided at no charge

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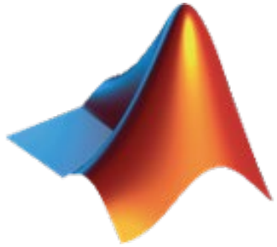
Thank you
NASPI Partners for your continued support



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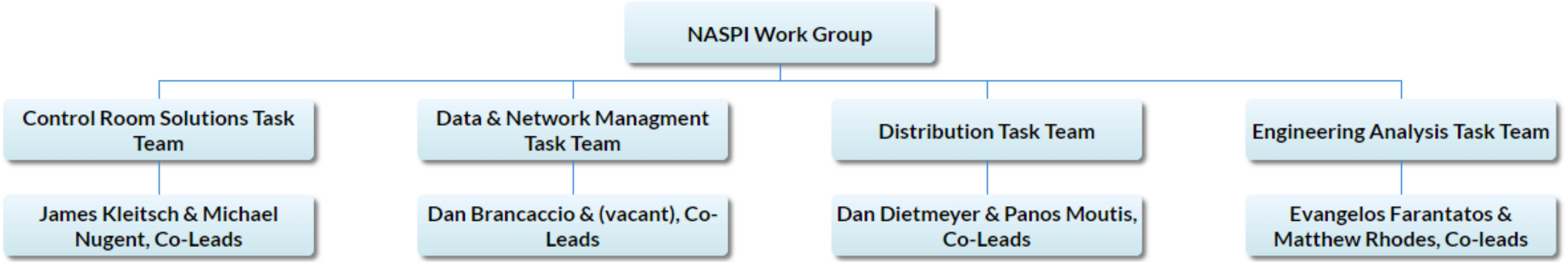
The NASPI Technical Task Teams



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

Task Team Activity Highlights

- CRSTT is coordinating with NERC SMWG on a roadmap for control room applications
- DisTT
  - Train the (utility) Trainer on Distribution Sync'd measurement uses
  - Inverter-Based Resources (IBR) & DG effects on PMU requirements
  - PMU-driven Value Cases for IBR-& DG-rich grids
  - Hosted the March webinar on challenges in developing PMU-rich feeders
- DNMTT working to address data sharing, data archiving, communication protocols, a PMU registry, and synchronization issues
- EATT formed the IBR Performance Response and Analytics Monitoring (IPRAM) Task Force to draft a white paper

Liaisons

- NERC Synchronized Measurement Working Group (SMWG) – Frankie Zhang and Clifton Black
- IEEE Power System Relaying & Control Committee (PSRC) – Yi Hu
- EIDSN – Kent Simendinger

New:

- IEEE PES Task Force on Synchro-Waveforms – Hamed Mohsemian-Rad and Jhi-Young Joo
- CIGRE Joint Working Group C4/C2.62 – Evangelos Farantatos

Outreach

Jeff Dagle presented NASPI overviews to:

- CIGRE Joint Working Group C4/C2.62 meeting October 6, 2023
- North American Transmission Forum (NATF) members meeting March 13, 2024

NASPI 2024 Webinar Series

Winter Webinar Series

- January 24 - Asset Health Monitoring: Value Proposition and Vendor Capabilities
  - Matthew Rhodes, Salt River Project, EATT Co-Lead
  - Jared Bestebreur, Schweitzer Engineering Laboratories
  - Neeraj Nayak, Electric Power Group
- March 27 - Distribution Grid Monitoring: Challenges in Developing PMU-Rich Feeders
  - Daniel Dietmeyer, SDG&E, DisTT Co-Lead
  - Panos Moutis, DisTT Co-Lead

The summer webinar series will kick off in May

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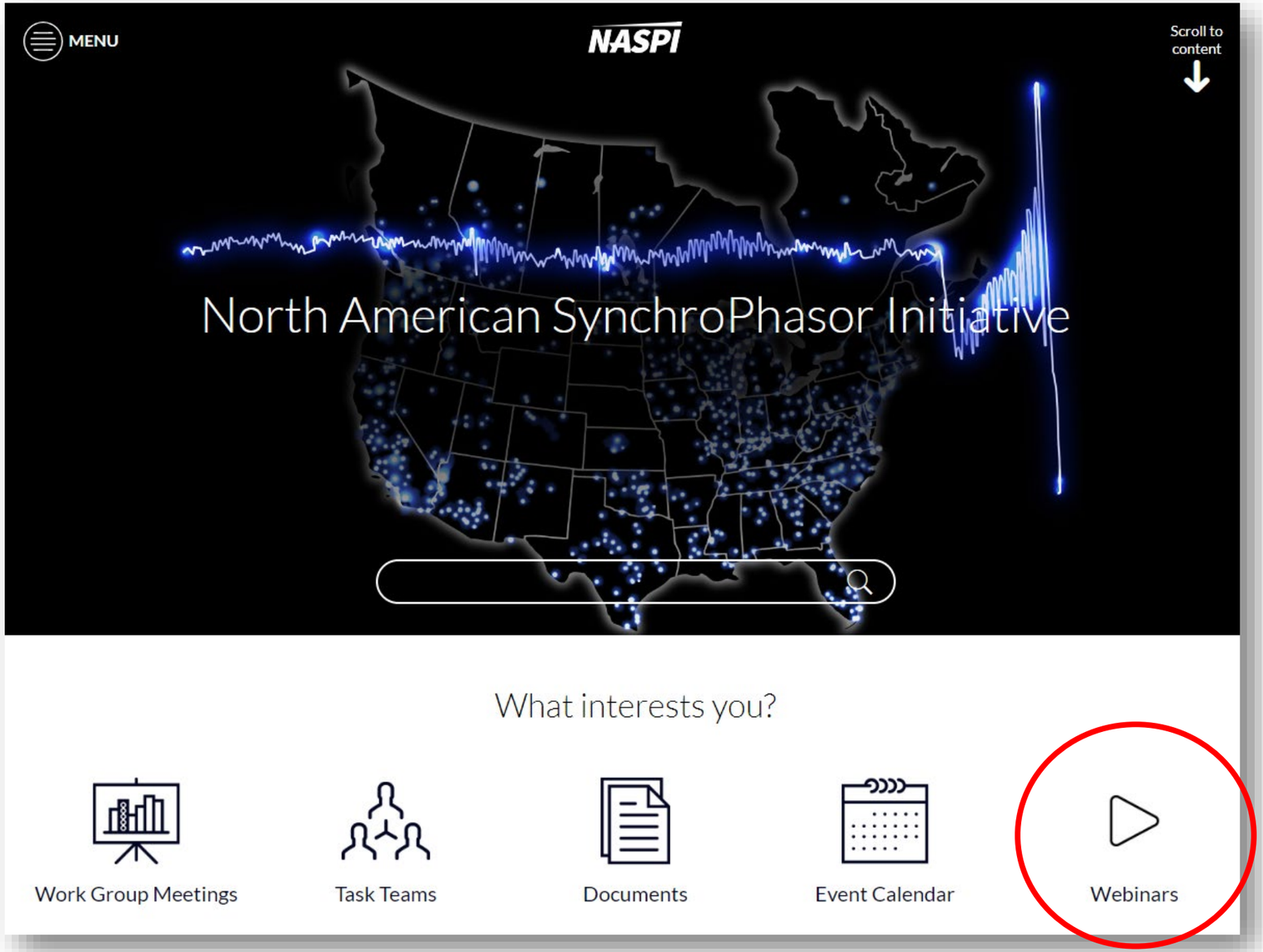
NASPI 2024 Webinar Series

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



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
- 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

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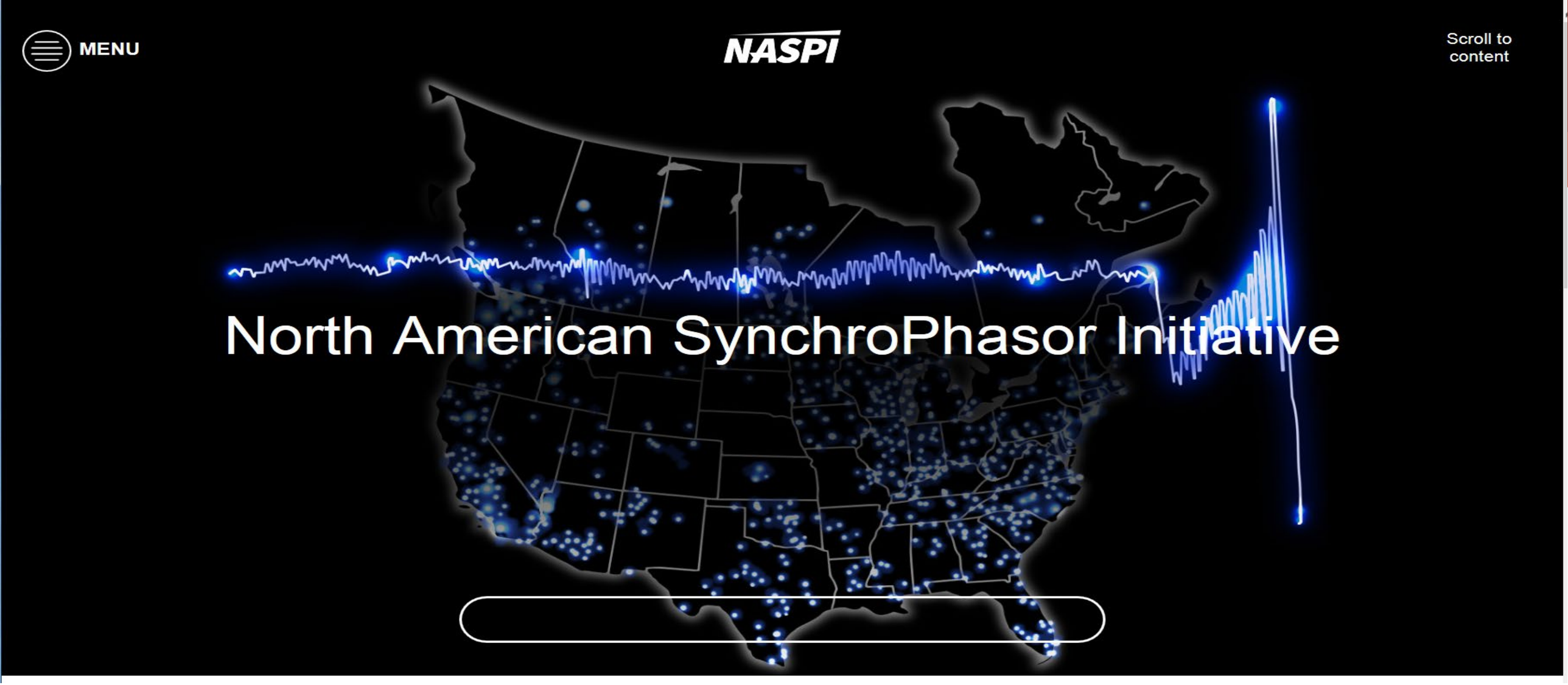
Save the Date

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

October 15-16, 2024

Charlotte, NC

Note: The NERC SMWG is planned for October 17, 2024



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Thank you