



# Welcome to the NASPI Spring 2020 Working Group

April 15 & 16, 2020



# Welcome to the NASPI Spring 2020 Working Group

Host: Eric Andersen  
Pacific Northwest National Laboratory





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<https://www.naspi.org>

# **NASPI** *North American SynchroPhasor Initiative*

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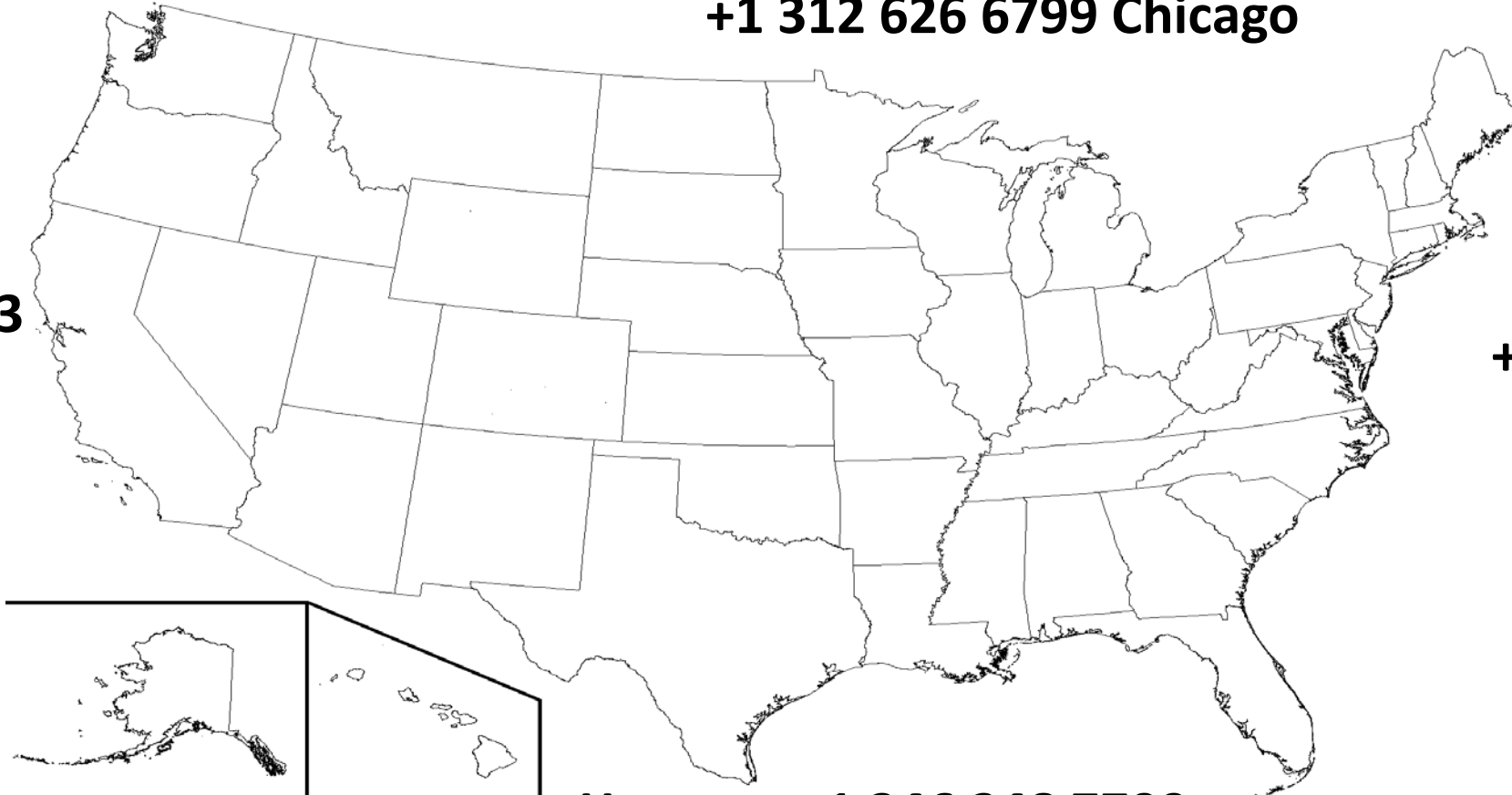
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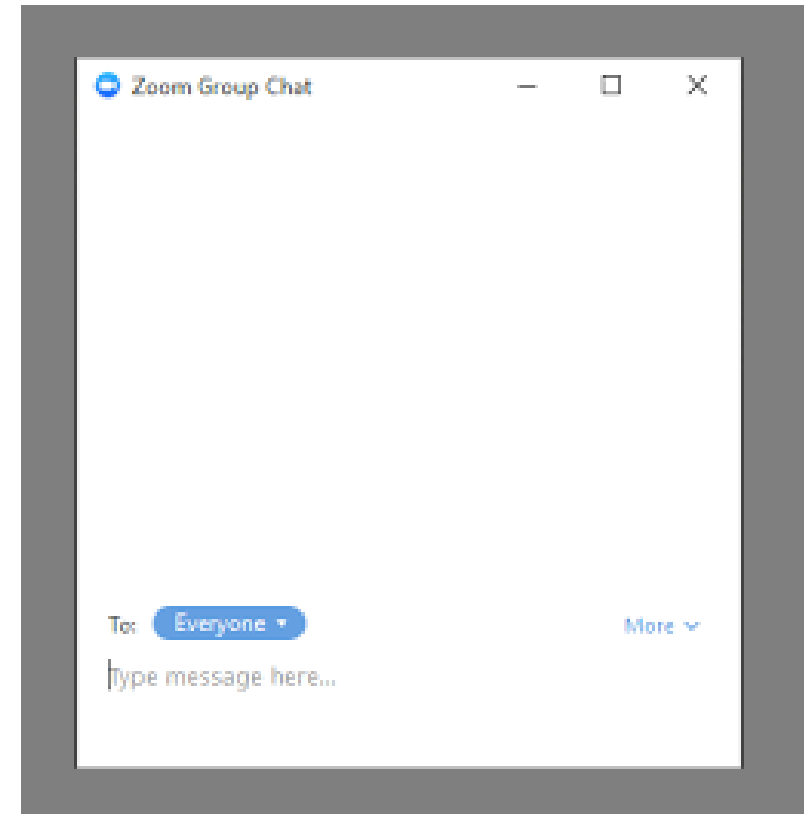
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Q&A – The Zoom interface  
and how to post a comment  
or to ask a question



# **NASPI** *North American SynchroPhasor Initiative*



**Moderator:**  
**Jeff Dagle**  
Pacific Northwest  
National Laboratory

## Program Updates

**Description:** Overview of the use of synchrophasor technologies, tools, and applications to operate a more resilient and efficient electric grid continue to evolve. Listen to what the leaders have to say about what they are doing to continue the advancement of time-synchronized telemetry. Expected updates from DOE, EPRI, FERC, NERC, EIDSN, and the NASPI technical task team leaders.





## Today's Webinar Agenda

- Ali Ghassemian, U.S. Department of Energy
- Paul Myrda, Electric Power Research Institute
- Ken Simendinger, Eastern Interconnection Data Sharing Network
- Bahram Barazesh, Federal Energy Regulatory Commission
- Ryan Quint, North American Electric Reliability Corporation
- Aftab Alam and Tim Fritch, NERC Synchronized Measurement Subcommittee



## Today's Webinar Agenda (continued)

- Control Room Solutions Task Team
  - Mike Cassiadoro, Jim Kleitsch, and Sarma (NDR) Nuthalapati
- Data and Network Management Task Team
  - Dan Brancaccio and Matthew Rhodes
- Distribution Task Team
  - Sascha von Meier and Dan Dietmeyer
- Engineering Analysis Task Team
  - Evangelos Farantatos and Shaun Murphy
- Performance Requirements Standards & Verification Task Team
  - Jim O'Brien and Farnoosh Rahmatian



# Department of Energy North American SynchroPhasor Initiative (NASPI)

**Ali Ghassemian Ph.D., EE**

Program Manager, Advanced Modeling Grid Research

Office of Electricity

Department of Energy

April, 2020

# Office of Electricity (OE) Objectives

- Provide national leadership to ensure a secure resilient and reliable energy delivery system.
- Develop technologies to improve the infrastructure that brings electricity into our homes, offices, and factories.
- Support development of the federal and state electricity policies and programs that shape electricity system planning and market operations.
- Drive electric grid modernization and resiliency through research, partnerships, facilitations, and modeling and analytics.



# OE's Synchrophasor FY19 Goals

- Completed 4 industry cost-shared pre-commercial synchrophasor-based demonstrations of advanced applications under NETL FOA 1492
  1. Real Time Applications Using Linear State Estimation Technology
  2. Substation Secondary Asset Health Monitoring and Management System
  3. Operationalizing Synchrophasors for Enhanced Electric Grid Reliability and Asset Utilization
  4. Advanced Synchrophasor Protocol (ASP) Development and Demonstration Project
- Made awards under FOA-1861 (Big Data Analysis of Synchrophasor Data)
  - The goal of this FOA is to explore the use of big data, artificial intelligence and machine learning technology to discover insights and tools for better grid operation and management. This work is focused on discovery of additional information that might reside in the existing PMU data that could precursors to abnormal events
- Completed Eastern Interconnection Situational Awareness Monitoring System (ESAMS) demonstration with PJM, ISO-NE, NYISO, and MISO
- Continued development of next generation PMUs
- Initiated development of new dynamic load modeling techniques, based in part on advanced grid monitoring technologies
- Conducted two meetings of NASPI

# OE's Synchrophasor FY20 Plans

- Transfer ESAMS (Eastern Interconnection Situational Awareness Monitoring System) to EIDSN (Eastern Interconnection Data Sharing Network)
- Re-focus NASPI to support next generation advanced grid monitoring technology and system analysis needs
  - Emerging emphasis on high-speed point-on-wave measurements to characterize system-level impacts of inverter-based resources and other fast acting phenomena during off normal condition
- Support Development of combined Transmission/Distribution design and buildout.
- Continue improving data quality
- Data-sharing for real-time situational awareness and with researchers and transmission operators to do big data analysis for baselining, anomaly detection, mis-operations diagnosis and operator decision support tools
- Webinars on the NASPI functionalities
- Gap Analysis – What are the future needs/desires going forward



# OE's Initiatives

**Existing capabilities are not sufficient for understanding and mitigating the reliability and resiliency of the grid.**

## **1. North American Energy Resiliency Model (NAERM)**

Working with the national labs and relevant stakeholders OE will develop an integrated model of multiple infrastructures to study, analyze, and address vulnerabilities in the North American Energy System. This model is intended to allow us for sequencing of events to understand risk across critical energy infrastructure sectors and identifying key energy infrastructure interdependencies as well as identify potential infrastructure investments to improve resiliency and mitigate risks associated with energy system interdependencies

## **2. Revolutionize Sensing Technology Utilization**

In order to get the understanding of what the next generation of sensors should be in order to support the reliability and resiliency of the system, in December 2018 the department has put coordinated roadmap of sensor technology and data analytics to get a better understanding of:

- Infrastructures interdependency;
- System resiliency;
- Fault detection and failure identification;
- Behind the meter DER impact.

# NASPI's areas of activities

DOE is considering leveraging NASPI for additional programmatic linkages that supports OE's Initiatives:

- Processing of data into information (data analytics)
- Further developing data practices for collection, sharing, and management of data to make efficient use of data
- Advancement in sensors and its application applied to the protective relaying
- Reducing high Operation and Maintenance cost associated with PMUs data quality and outages
- Further utilization of Artificial Intelligence and Machine Learning techniques
- Wide-Area Oscillation Assessment and Trending Analysis and automated, autonomous system protection schemes, including wide-area damping.
- Incorporating the DOE's Sensing and Measurement Roadmap study recommendations into NASPI.
- Wide adoption of developed technologies under NASPI



# Summary of EPRI Synchrophasor Related Activities

Paul Myrda  
Evangelos Farantatos  
Mahendra Patel  
Hossein Hooshyar

**NASPI Webinar – Organizational Updates**  
April 16, 2020

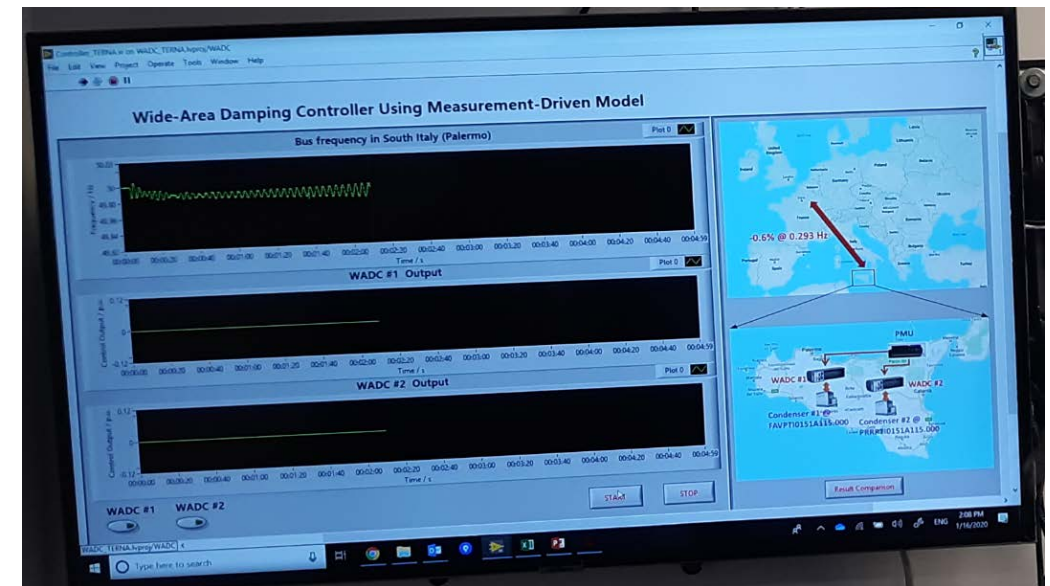
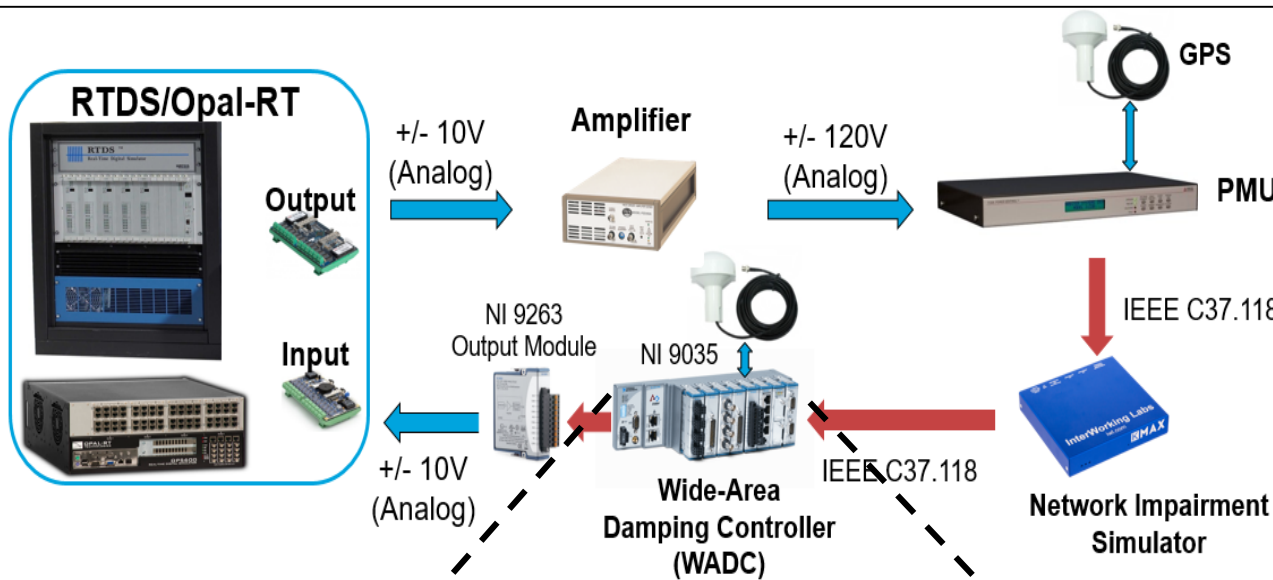




# 1. Synchrophasor-Based Wide Area Oscillations Damping Controller

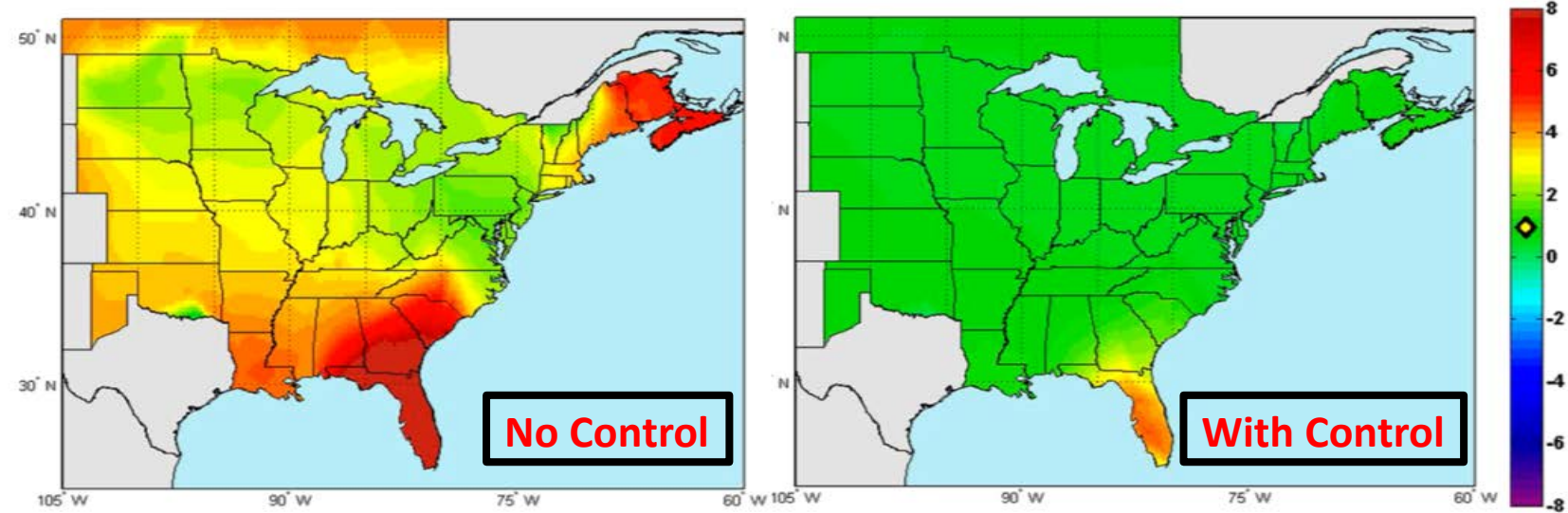
*In collaboration with University  
Tennessee Knoxville (UTK)*

- WADC via generator excitation system or FACTS/HVDC controller
- Adaptive controller
- Hardware-In-the-Loop (RTDS/Opal-RT) implementation
- Ongoing case studies with NYPA, TERN (Italy) & SEC (Saudi Arabia)
  - Jan. 2020 Demo at NYPA AGILE

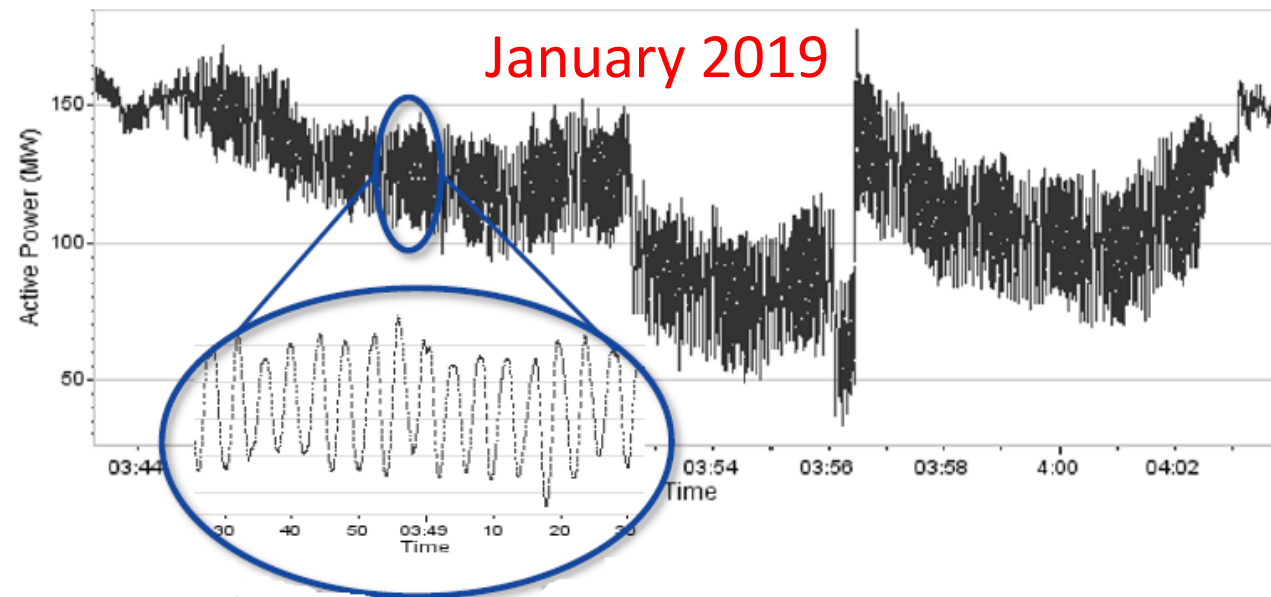


## 2. Wide Area Forced Oscillations Control & Mitigation

- Use of Battery Energy Storage Systems (BESS) and Inverter Based Resources (IBRs) to suppress magnitude of forced oscillations



MW flow in 345 KV tie-line between NYISO and ISO-NE

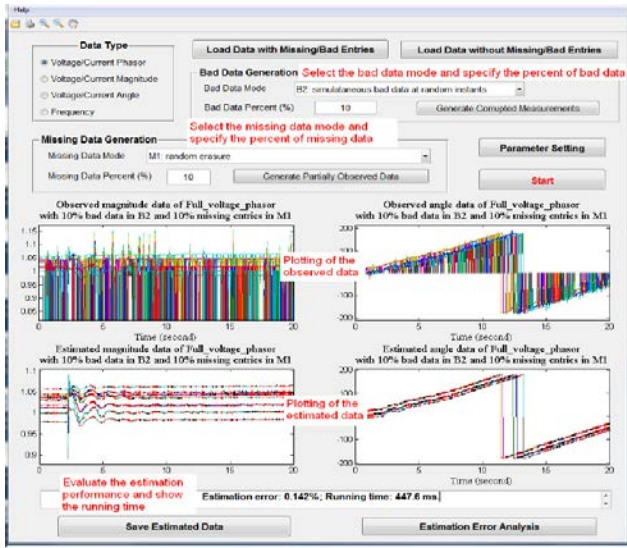


*In collaboration with University  
Tennessee Knoxville (UTK)*

# 3. Data Quality Conditioning of Streaming Synchrophasor Data

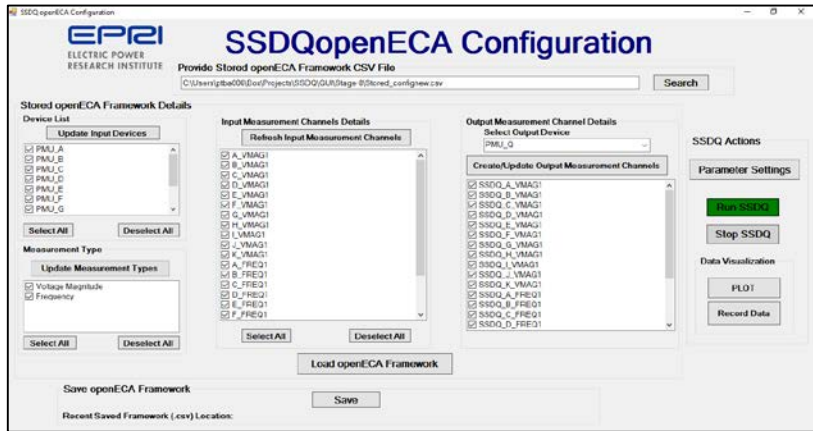
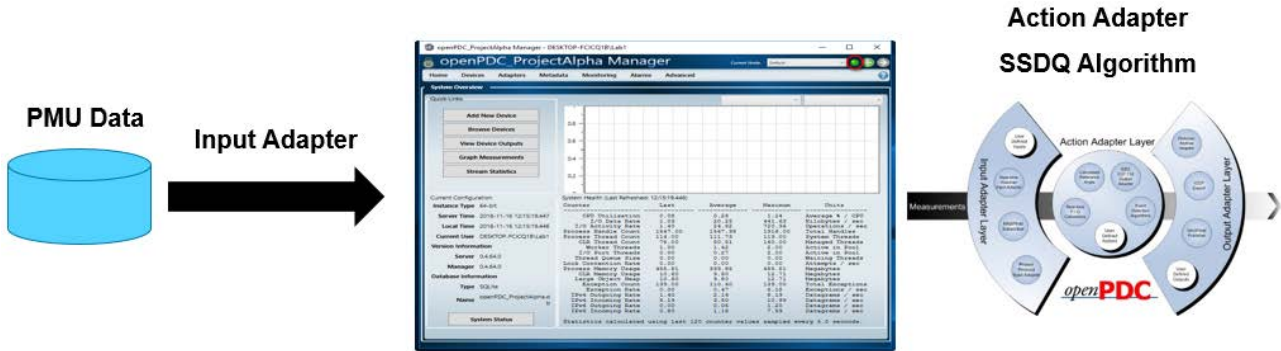
- Goal: Improve synchrophasor data quality by estimating missing data and replacing bad data in synchrophasor streams
- Model free technique, no need for topology information or system parameters
- Computationally efficient for real-time implementation
- Algorithms have been tested with recorded synchrophasor data provided by EPRI members
- Demos with streaming synchrophasor data hosted by utilities/ISOs
- Collaboration with vendors for implementation in commercial platforms

## Offline SSDQ Tool



*In collaboration with RPI*

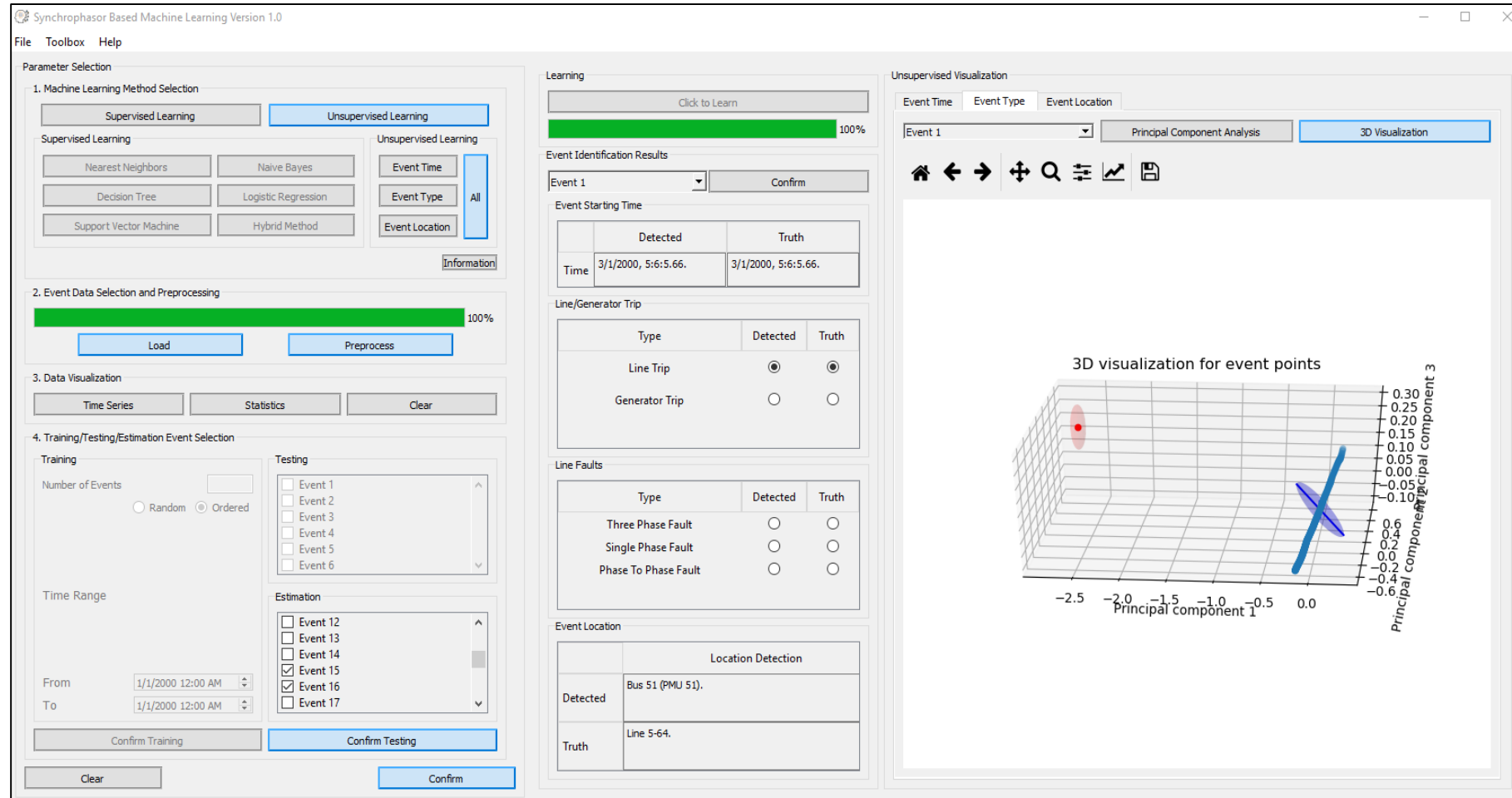
## Online SSDQ Tool (OpenPDC & OpenECA)





# 4. Machine Learning Using Synchrophasor Data

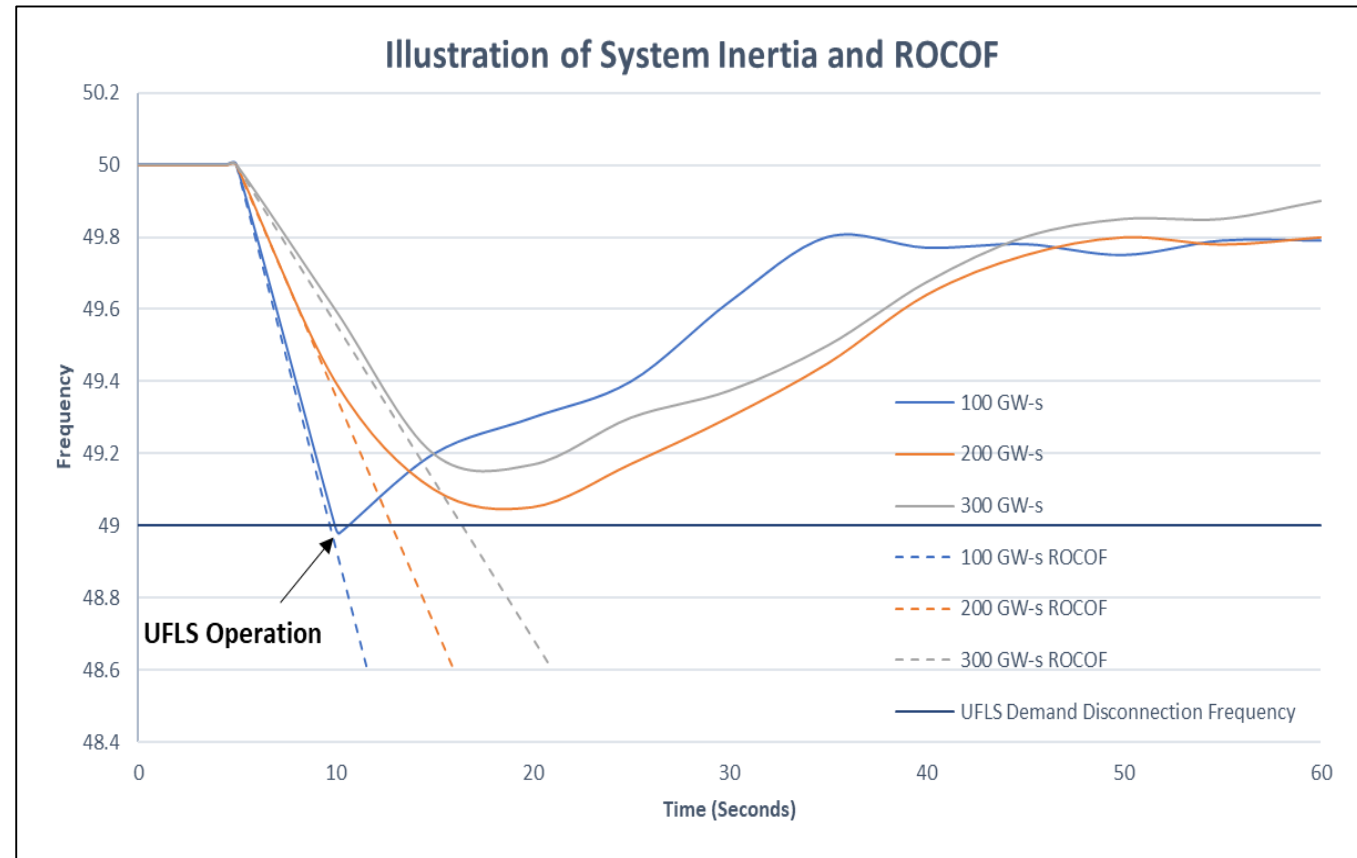
- Event Identification (time, type & location) through supervised & unsupervised machine learning
- **Synchrophasor Based Machine Learning (SBML) software**



*In collaboration with ASU*

## 5. PMU Based Inertia Monitoring

- With increasing levels of IBRs, system inertia is decreasing
- RoCoF increase, less time for PFR to respond
- Growing interest and need for online inertia monitoring using PMUs
  - Monitor against inertia floors
  - Estimate regional inertia
- EPRI white paper “Online Inertia Estimation & Monitoring - Industry Practices & Research Activities”
  1. Present Industry Practices
  2. Research Activities and Proposed Technologies



# 6. Synchrophasor Applications Database

Synchrophasor Applications Database

Filter by:

- Agencies
  - ☐ AEP
  - ☐ AESO (Canada)
  - ☐ APG (Austria)
  - ☐ ATC
  - ☐ BPA
  - ☐ Cemig Utility (Brazil)
  - ☐ ComEd
  - ☐ DVP
  - ☐ Duke Energy
  - ☐ EPRI
  - ☒ ERCOT
  - ☐ Entergy
  - ☐ FINGRID (Finland)
  - ☐ FPL
  - ☐ Hydro-Québec (Canada)
  - ☒ ISO-NE
  - ☐ ISONE
  - ☐ Jiangsu Electric Power Grid (China)
  - ☐ LBNL
  - ☐ MISO
  - ☐ Manitoba Hydro (Canada)
  - ☐ Maui Electric
  - ☒ NYISO
  - ☐ NYPA
  - ☐ Norwegian Transmission Network
  - ☒ OG&E
  - ☐ PG&E

Search Results:

Agency Name	Application Type	Vendor Name	Tool Name
ERCOT	Situational Awareness	EPG	RTDMS
ERCOT	Oscillation Detection	EPG	RTDMS
ERCOT	Event Analysis	EPG	PGDA
ERCOT	Model Validation	Mathworks	MATLAB
ERCOT	Model Validation	Powertech Labs, Inc.	TSAT
ERCOT	Operator Training	EPG	PSOT
ISO-NE	Voltage Stability	V&R Energy	ROSE
ISO-NE	Event Detection	GE	PhasorPoint
ISO-NE	Oscillation Detection	GE	PhasorPoint
ISO-NE	Model Validation	Powertech Labs, Inc.	TSAT
ISO-NE	Data Quality Management	In-house	DQMS
NYISO	Situational Awareness	EPG	RTDMS
NYISO	Voltage Stability	ABB	Phasor Enhanced Voltage Stability
NYISO	State Estimation	ABB	Phasor Enhanced State Estimator
NYISO	Oscillation Detection	EPG	RTDMS
NYISO	Event Analysis	EPG	PGDA
NYPA	Model Validation	EPRI	SVSMV
OG&E	Situational Awareness	In-house	PhasorView
OG&E	Event Detection	In-house	PhasorView
OG&E	Oscillation Detection	In-house	PhasorView

Apply Filter

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Details

Alstom/GE's PhasorPoint

Description:

e-terraphasorpoint is an advanced, fully integrated, smart grid ready suite of products for the 21st century grid. Transmission operators must maintain stable operation of the power system and increase the use of assets, while aging infrastructure and a changing generation profile introduce new challenges. e-terraphasorpoint can bring great insight, reducing costs through more effective use of power system capacity, safeguarding its stability.

This flexible, scalable and extensible phasor-based Wide Area Management System (WAMS) is integrated with the e-terra solutions for Energy Management Systems (EMS), in order to:

- Transform phasor data into actionable information to improve system security and capacity.
- Coordinate WAMS and EMS to produce a unified view of the power system, enhancing operator and analyst decision-making.
- Enable strategic development of the control center systems with the critical involvement of phasor-based information sources.

Key benefits include:

- Mitigate risk of major disturbance.
- Relieve transmission constraints.
- Improve dynamic models.
- Fulfill regulatory reporting requirements.
- Improve emergency response.
- Scalable – grow to the largest foreseeable systems.
- Extensible – add new applications when required.

Other details about the product are described in [1].

Built-in Data Quality Management:

GE's built-in functionality for data quality management includes two aspects, which are e-terraphasorpoint PDC processing and synchrophasor applications (i.e.: oscillation detection, state estimation) level data handling. The e-terraphasorpoint PDC processing provides users both live stream statistics and live PMU statistics. Live stream statistics include packet latency, percentage of time quality errors, percentage of missing data frames and last valid data frame. Whereas, live PMU statistics include percentages of GPS lock, valid data, data error and missing data. And the data handling of application level is based on three heuristics. These heuristics are at utilization of PMU data quality status information from the field of PMU.

References:

[1] "e-terraphasorpoint", GE Software Solutions.

[2] Alstom/GE "Grid Software Solutions - Built-in Data Quality", presented at NASPI, Mar. 2016.

Figure 1: Reference Angle Selection of Alstom/GE's e-terraphasorpoint.

Model Validation at NYPA

Description:

NYPA has used EPRI's "Static Var System Model Validation" tool to validate the models of a STATCOM (Marcy substation) and an SVC. The generic dynamic Static Var Systems models (also developed by EPRI) were used to parameterize [1], [2]. Figure 1 [2] shows representative results of the model validation.

References:

[1] EPRI and NYPA, "Model Validation of SVC and STATCOM Using PMU Data", presented at NASPI, Oct. 2013.

[2] EPRI and NYPA, "Validation of Generic Models for Stability Analysis of two Large Static Var Systems in New York using PMU Data", presented at IEEE PES GM, Apr. 2014.

Figure 1: SVC Model Validation Using SVSMO1 Model at NYPA.

- Entries based on publicly available documents
- For each entry, summary description of application and related references

**Value: Inform utility/ISO engineers and executive management about uses cases and derived value of synchrophasor technology**

# Together...Shaping the Future of Electricity



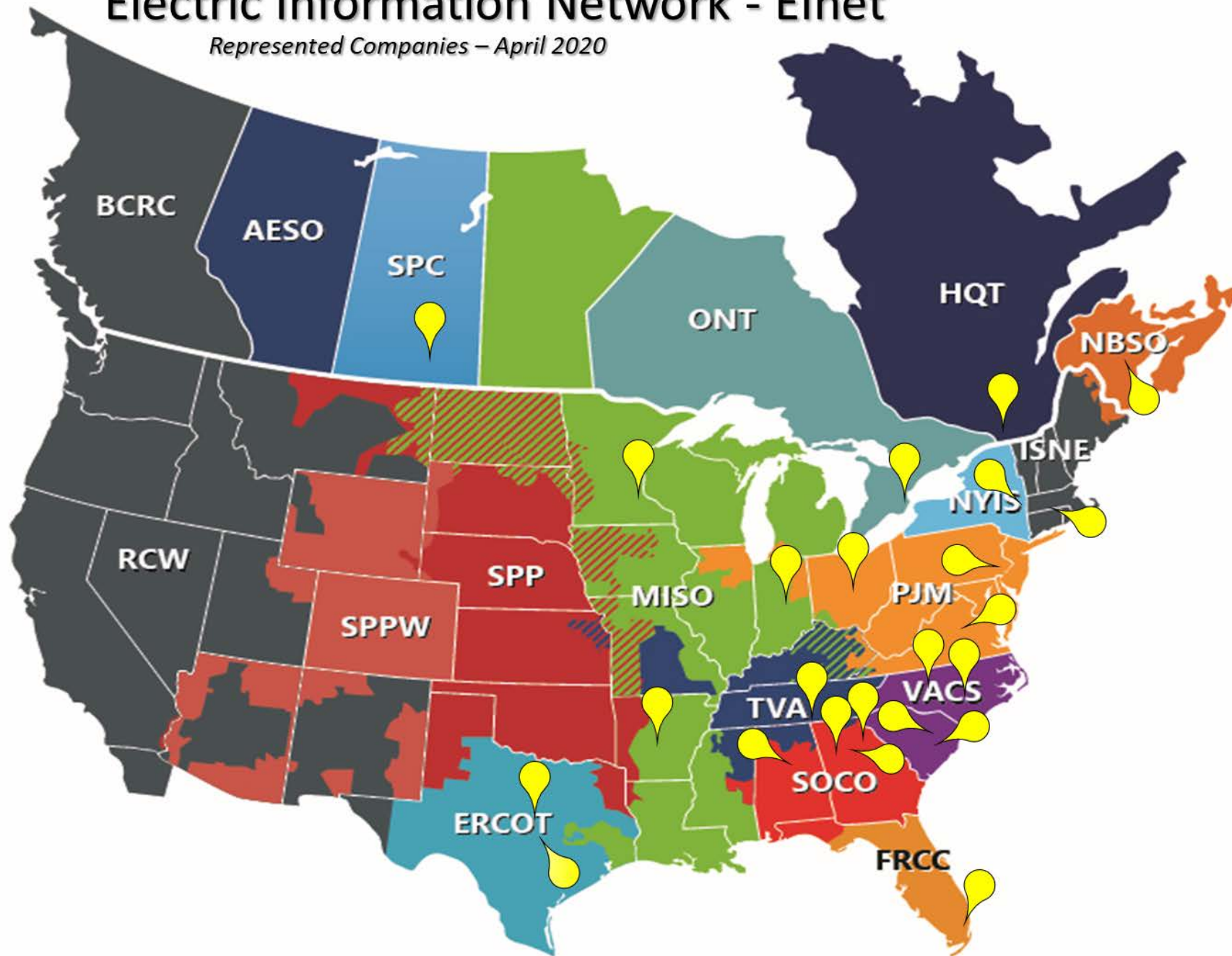
# EIDSN's Purposes

- Facilitate an efficient, effective and secure network for the sharing of operating reliability data within the Eastern and Quebec Interconnections among its members and participants.
- Promote the reliable and efficient operation of the Bulk Electric System (BES) through use of Electric Information Network (Elnet).
- Currently includes sharing both SCADA and synchrophasor data among appropriate entities.
- Facilitate the adoption, development and support for various software tools for members and participants that promotes the reliable and efficient operation of the Bulk Electric System.



# Electric Information Network - Elnet

*Represented Companies – April 2020*



# Joining EIDSN, Inc.

- Nonstock, nonprofit corporation - 501(c)(6)
- In early 2018, EIDSN's Board of Directors approved the removal of the geographic restriction for joining the Company
  - Any NERC designated Reliability Coordinator (RC), Transmission Operator (TOP), Transmission Owner (TO), and Balancing Authority (BA) in North America can join as Member or Participant
- Agreements requiring execution
  - Master Confidentiality Agreement
  - Network Service Agreement
  - Member OR Participant Agreement







**Staff remarks  
(Office of Electric Reliability)**

**North American SynchroPhasor Initiative (NASPI)**

**Panel Discussion – Program Updates**

**April 16, 2020**

888



## Note

The views and comments expressed in this presentation are those of the staff speaker and do not represent the views or position of the Commission or any of the Commissioners.

- **SynchroPhasors and related developments**
  - Operations, planning and engineering applications
- **Insight into the grid impact of resource mix change**
  - DOE-PNNL Project - **Wide Area Oscillation Assessment and Trending Analysis**
    - Trends in system performance and properties using captured PMU data
    - Model based analysis for future resource mix scenarios
- **Going forward**
  - Initiatives to facilitate further deployments
  - “Synchronized sample value” or “point-on-wave” discussions
  - Further insight into grid transition
  - Cyber security considerations

# NERC

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# NERC Update

NASPI Webinar

Ryan Quint, PhD, PE

Advanced System Analytics and Modeling, NERC

April 16, 2020

RELIABILITY | RESILIENCE | SECURITY





**NERC**  
NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

## 1,200 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report

Southern California 8/16/2016 Event

June 2017

**NERC**  
NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

## 900 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report

Southern California Event: October 9, 2017  
Joint NERC and WECC Staff Report

February 2018

**NERC**  
NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

## April and May 2018 Fault Induced Solar Photovoltaic Resource Interruption Disturbances Report

Southern California Events: April 20, 2018 and May 11, 2018  
Joint NERC and WECC Staff Report

January 2019

**NERC**  
NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

### Industry Recommendation

Loss of Solar Resources during Transmission Disturbances due to Inverter Settings

Initial Distribution: June 20, 2017

NERC identified a potential characteristic exhibited by some inverter-based resources, particularly utility-scale solar photovoltaic (PV) generation, which reduces power output during fault conditions on the transmission system. An example of this behavior has been observed during recent BPS disturbances, highlighting potential risks to BPS reliability. With the recent and expected increase of utility-scale solar resources, the causes of this reduction in power output from utility-scale power resources needs to be widely communicated and addressed by the industry. The industry should identify reliability preserving actions in the areas of power system planning and operations to reduce the system reliability impact in the event of widespread loss of solar resources during faults on the power system.

For more information, see the 1,200 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report.

[About NERC Alerts](#)

**Status:** Acknowledgment Required by Midnight Eastern on June 27, 2017  
Reporting Required by Midnight Eastern on August 15, 2017

**Public:** No Restrictions  
[View on IIR Portal](#)

**Instructions:** This recommendation provides specific actions NERC registered entities should consider taking in response to a particular issue. Pursuant to Rule 515 of NERC's Rules of Procedure, NERC registered entities shall (1) acknowledge receipt of this advisory within the NERC alert system, and (2) report to NERC on the status of their activities in relation to this recommendation as provided below. Per 12, entities NERC will compile the responses and report the results to the Federal Energy Regulatory Commission.

RELIABILITY | ACCOUNTABILITY

**NERC**  
NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

### Industry Recommendation

Loss of Solar Resources during Transmission Disturbances due to Inverter Settings - 12

Initial Distribution: May 1, 2018

NERC has identified adverse characteristics of inverter-based resource performance during grid faults that could present potential risks to reliability of the BPS. As the penetration of inverter-based resources (particularly solar PV resources) continues to increase in North America, these adverse characteristics need to be widely communicated. This Level 2 Industry Recommendation alerts industry to these adverse characteristics observed with BPS-connected solar PV resources, and provides recommended actions to address fault ride-through and timely restoration of current injection by all inverter-based resources connected to the BPS.

(See background section for more information.)

Although this NERC alert pertains specifically to solar PV resources, the same characteristics may exist for non-PV solar PV resources connected to the BPS regardless of installed generating capacity or interconnection settings. Owners and operators of these facilities are encouraged to consult their inverter manufacturers, review inverter settings, and implement the recommendations described herein. While this NERC alert focuses on solar PV, we encourage similar attention for other inverter-based resources such as, but not limited to, battery energy storage and wind resources.

For more information, see the October 9, 2017 Canyon Fire Disturbance Report.

[About NERC Alerts](#)

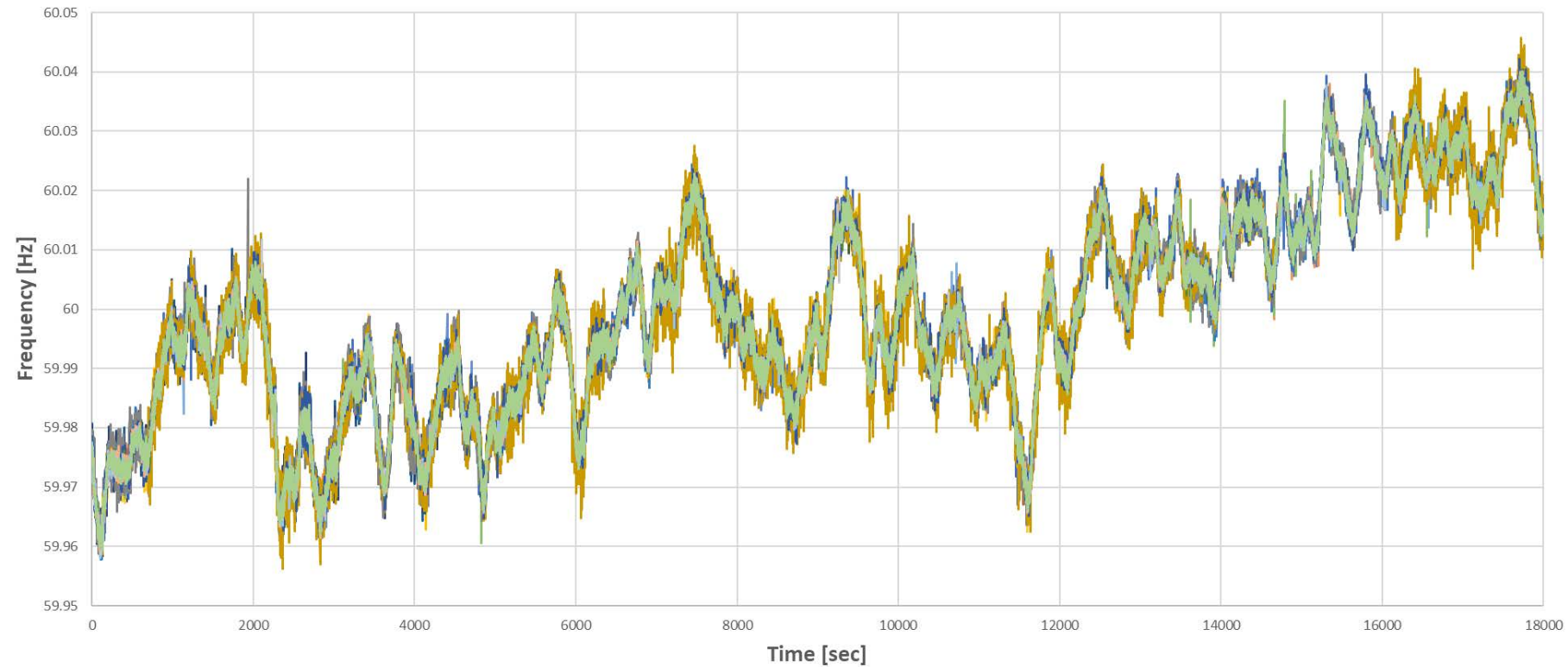
**Status:** Acknowledgment Required by Midnight Eastern on May 8, 2018  
Reporting Required by Midnight Eastern on July 21, 2018

**Public:** No Restrictions  
[View on IIR Portal](#)

RELIABILITY | ACCOUNTABILITY

**RELIABILITY | ACCOUNTABILITY**

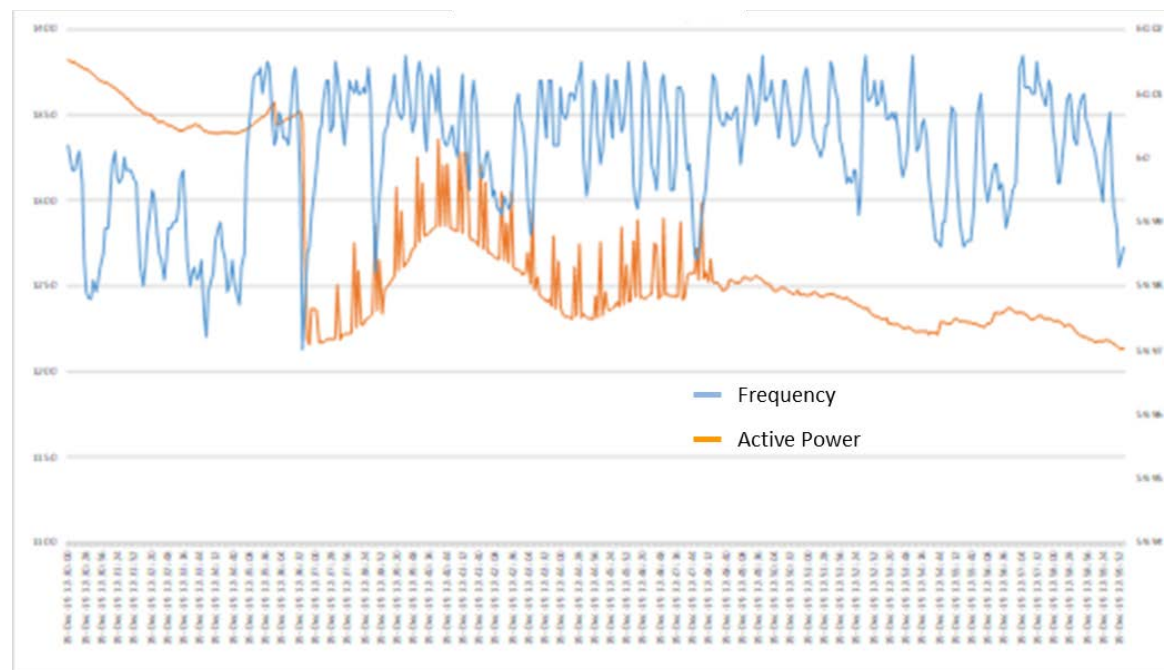
3353 Peachtree Road NE  
Suite 600, North Tower  
Atlanta, GA 30326  
404-446-2560 | [www.nerc.com](http://www.nerc.com)



Question: Where is the generation loss event? It's in there...

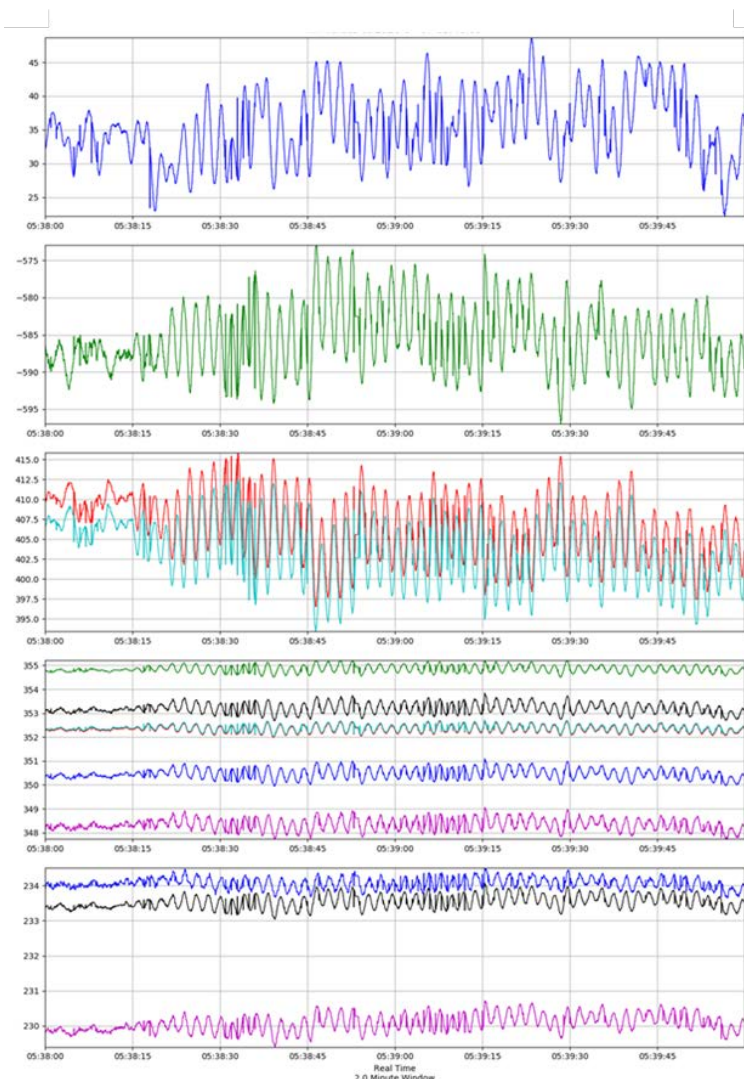


- High resolution data needed to determine root causes
  - 1 sample per cycle is insufficient in today's world...
- This data is typically VERY rare – it shouldn't need to be...



- Oscillations occurring during solar PV plant commissioning
- Issue detected within plant – due to momentary cessation and plant controls – and plant testing aborted
- Oscillation frequency near natural system mode





- Jan 11 2019 Florida Oscillation Event
  - Disturbance Report published
  - Lessons learned disseminated via webinar
  - Focus on interactions between system modes and forced oscillations
- Continue to observe forced oscillations across interconnections
  - Example here shows relatively small oscillation across ISO in Eastern Interconnection; source not determined

- The industry needs better capabilities on the following:
  - Improved operational procedures and communication for widespread oscillations
  - Faster source location detection – commercialization and testing of oscillation tools
  - High speed data recordings (much faster than PMUs) at “new” locations
    - Transmission-distribution interface for high DER conditions
    - Point of interconnection (or measurement) of inverter-based resources
  - More sensitive triggering or recording of grid events to capture the behavior of inverter-based resources



# Questions and Answers

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Advanced System Analytics and Modeling

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# NERC

NORTH AMERICAN ELECTRIC  
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# Synchronized Measurement Subcommittee (SMS) Meeting Update

Aftab Alam, Tim Fritch  
April 16, 2020

RELIABILITY | RESILIENCE | SECURITY



- Meeting held over webex on 14 April 2020
- White Paper on Recommended Monitoring for Inverter Based Resources
  - Approved
- Update on Organization changes from NERC
- Updates from various entities and working groups
- Discussion on new SMS task item: Oscillation Analysis for Monitoring and Mitigation
- Initial briefing on Eastern Interconnection Oscillation event



# Questions and Answers

# **NASPI Control Room Solutions Task Team Update**

**April 16, 2020**





# CRSTT Mission, Goals, and Objectives

- CRSTT's mission, goals, and objectives can be found on the NASPI CRSTT webpage:  
<https://www.naspi.org/crstt>
- Ongoing work items on the CRSTT web page:
  - CRSTT Work Plan
  - Use case documents, mis-operations with PMU Data Summary Table
  - PMU versus SCADA video events summary video

# 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.

# Ops Use Cases – General 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.

# CRSTT – Primary Contacts

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Name: Jim Kleitsch

Email: [jkleitsch@atcllc.com](mailto:jkleitsch@atcllc.com), Phone: 608-877-8102

Name: Sarma Nuthalapati (NDR)

Email: [ndrsarma@ieee.org](mailto:ndrsarma@ieee.org); Phone: 512 801 3191

Next NASPI CRSTT Conference Call:  
Tuesday April 28, 2020





# Data & Network Management Task Team Update

Co-Chairs:

Dan Brancaccio, Quanta Technology

Matthew Rhodes, Salt River Project

April 16, 2020



# D&NMTT Mission Statement Update

- **Mission Statement**

The mission of the Data & Network Management Task Team (DNMTT) is to provide guidance for synchrophasor data networking, archiving and access issues and to review new archiving and networking technologies for the best fit to synchrophasor application realization.



# D&NMTT Work Plan

## ○ **Planned Activities**

- NASPI Report on utility and industry archive strategies – Data Archive Strategy report (tentative title)
- Synchrophasor Application-Based Guide for Archive and Network Strategies (SABGANS)
- Develop recommendations for a PMU Registry



# D&NMTT Work Plan

- **NASPI Report on utility and industry archive strategies**

- Collect utility perspective on existing and desired archive strategies – Survey complete and results summarized. **Thanks to John Volpert for his assistance in summarizing the survey results.**
- Release Call for Papers to the industry to collect in-service or proposed advanced archiving strategies – Due December 2021.
- Proposed advanced presentations at Fall 2020 NASPI meeting to encourage early paper submissions.





# D&NMTT Work Plan

- **Synchrophasor Application-Based Guide for Archive and Network Strategies (SABGANS)**
- Review new and existing industry archiving and network concepts for best fit for application development.
  - Discussing basic structure for such an application guide.
  - *Example: ML for Asset Failure tracking - best fit to cloud-based offline analytics structure; Real-time operator visualization - best fit to local PDC based architecture.*



Thank you for participating!



## Distribution Task Team (DisTT)

# Mission Statement

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

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

We aim to create a community to solve technical and other challenges specific to distribution PMU technology and applications.





# DisTT Report in Preparation

Members of the Task Team are in the process of drafting an update report on emerging use cases for synchronized measurement data in the distribution context.

The purpose is to help inform requirements for sensors and infrastructure going forward.

Examples include:

- Fault detection and localization
- Asset Health
- Topology Identification
- Distributed Energy Resource (DER) Integration
- Microgrid Control
- Distribution State Estimation





# Distribution Task Team (DisTT)

Co-Leads:           Sascha von Meier  
                          Adjunct Professor, Electrical Engineering and Computer Science  
                          UC Berkeley [vonmeier@berkeley.edu](mailto:vonmeier@berkeley.edu)

                          Dan Dietmeyer  
                          Senior Engineer, System Protection and Control Engineering, SDG&E  
                          [ddietmeyer@sdge.com](mailto:ddietmeyer@sdge.com)



# Engineering Analysis Task Team

Evangelos Farantatos (EPRI) – Co-Lead

Shaun Murphy (PJM) – Co-Lead

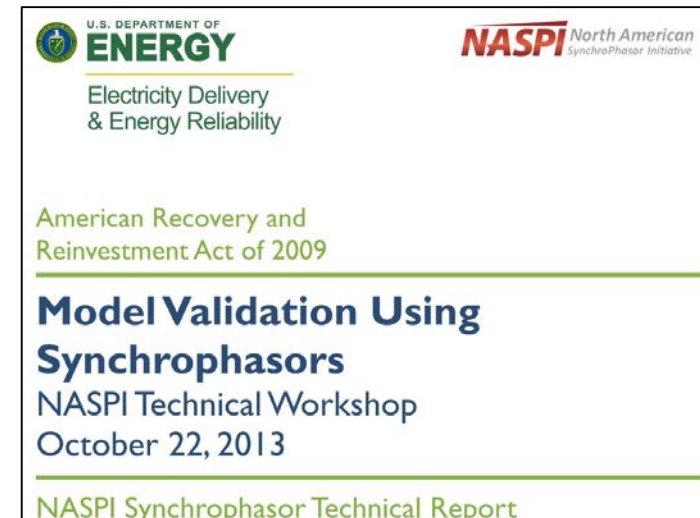
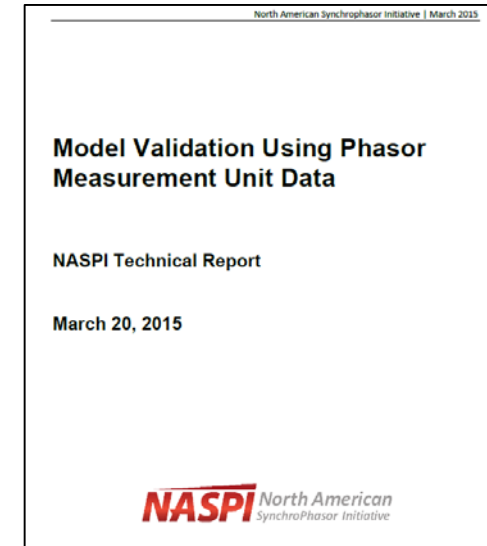
NASPI Web-Meeting

April 16 2020

# Advanced Model Validation & Calibration

- New EATT White Paper
- Lead: Honggang Wang (GE)

**Objective: Document industry advancements in model validation and calibration**





# Proposed Outline

- 1 Introduction
  - 1.1 Motivation for Model Validation & Calibration
  - 1.2 Datasets and Data Requirements for Model Validation & Calibration
  - 1.3 State-of-the-Art Methods and Tools for Model Validation & Calibration
  - 1.4 Limitations of Existing Methods and Desired Features of Enhanced Model Validation & Calibration
- 2 Enhanced Model Validation
  - 2.1 Proposed Method (GE)
  - 2.2 Other Proposed Method
  - 2.3 Performance Metrics
- 3 Enhanced Model Calibration
  - 3.1 Enhanced Parameter Selection
    - 3.1.1 Trajectory Sensitivity Approach
    - 3.1.2 PCA and Similarity Based Methods (GE)
    - 3.1.3 Other
  - 3.2 Enhanced Model Parameter Tuning/Estimation
    - 3.2.1 Estimation Based Approach
      - 3.2.1.1 Kalman Filter (PNNL)
      - 3.2.1.2 Other
    - 3.2.2 Optimization Based Approach
      - 3.2.2.1 Efficient Trust Region Approach (GE)
      - 3.2.2.2 Other
  - 3.3 Performance Metrics
- 4 Multiple Event Based Model Validation & Calibration
  - 4.1 Event Selection
  - 4.2 Aggregation of Performance Metrics Across Multiple Events
  - 4.3 Multiple Event Model Calibration

## Performance Requirements, Standards & Verification Task Team

- Task Team Co-Leaders:
  - Farnoosh Rahmatian, NuGrid Power
  - Jim O'Brien, Duke Energy
- Task Team Support:
  - Teresa Carlon, PNNL

## PRSVTT – 04/16/2020

### IEEE Updates

- C37.242 Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control – Allen Goldstein
- C37.118.2 Standard for Synchrophasor Data Transfer for Power Systems – Vasudev Gharpure
- P2664 Standard for Steaming Telemetry Transport Protocol – Ken Martin

## PRSVTT – 04/16/2020

### IEEE Updates

- PSRC Task Force C41 Investigate Performance Requirements for Distribution PMUs – Ken Martin

## PRSVTT– 10/29/2019

### Ongoing Work

1. Analyzing PMU performance requirements for Synchrophasor based Control Applications – Pratim Kundu
2. Survey of instrument transformers connected to installed PMUs – Farnoosh Rahmatian





# **NASPI** *North American SynchroPhasor Initiative*



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## NASPI Webinar series **Phasors, the Next Generation**

Terry Boston, PJM (retired)

Russell Robertson, Grid Protection Alliance

**May 6, 11 am PDT / 2 pm EDT**

Details will be posted here:

<https://www.naspi.org/webinars>



# Thank you for attending the NASPI Spring 2020 Working Group Webinars

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<https://www.naspi.org>