

Synchrophasor Informational Update

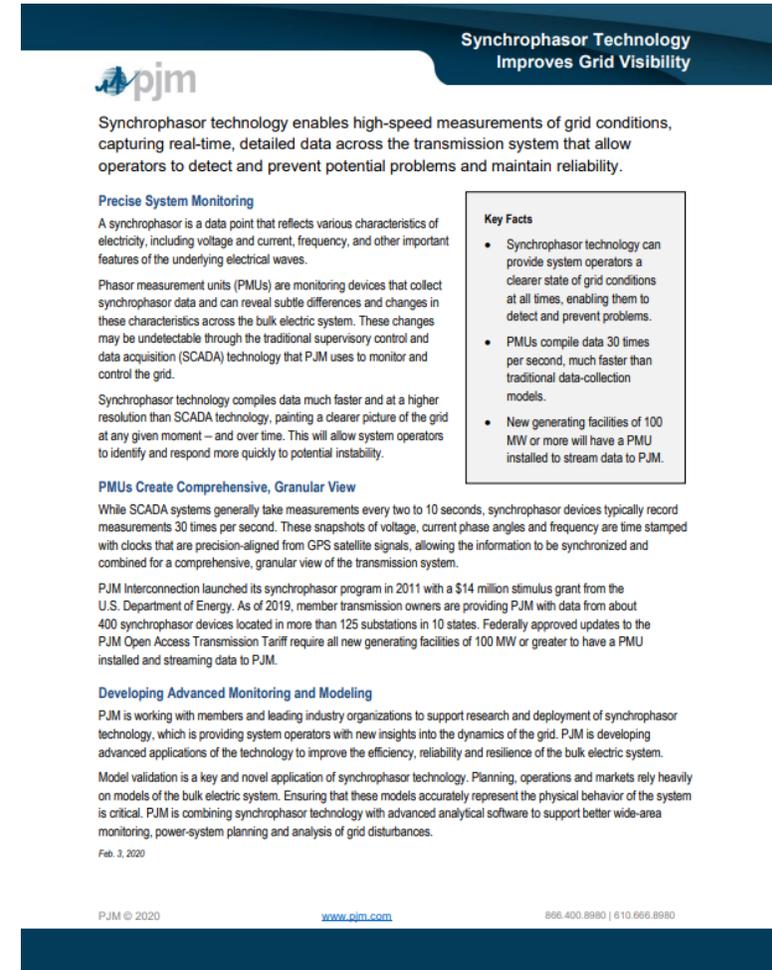
Shaun Murphy
Sr. Engineer, Applied Innovation

3/10/2020 – Planning Committee

- Updates to phasor materials on pjm.com
- New Data Exchanges - EIDSN
- PMU Placement Plan

Updated materials include:

- Synchrophasor Technology Fact Sheet
- Synchrophasor Technology Roadmap
- Coming soon: Synchrophasor Training Video



Synchrophasor Technology Improves Grid Visibility

 **Synchrophasor technology enables high-speed measurements of grid conditions, capturing real-time, detailed data across the transmission system that allow operators to detect and prevent potential problems and maintain reliability.**

Precise System Monitoring
A synchrophasor is a data point that reflects various characteristics of electricity, including voltage and current, frequency, and other important features of the underlying electrical waves.
Phasor measurement units (PMUs) are monitoring devices that collect synchrophasor data and can reveal subtle differences and changes in these characteristics across the bulk electric system. These changes may be undetectable through the traditional supervisory control and data acquisition (SCADA) technology that PJM uses to monitor and control the grid.
Synchrophasor technology compiles data much faster and at a higher resolution than SCADA technology, painting a clearer picture of the grid at any given moment – and over time. This will allow system operators to identify and respond more quickly to potential instability.

PMUs Create Comprehensive, Granular View
While SCADA systems generally take measurements every two to 10 seconds, synchrophasor devices typically record measurements 30 times per second. These snapshots of voltage, current phase angles and frequency are time stamped with clocks that are precision-aligned from GPS satellite signals, allowing the information to be synchronized and combined for a comprehensive, granular view of the transmission system.
PJM Interconnection launched its synchrophasor program in 2011 with a \$14 million stimulus grant from the U.S. Department of Energy. As of 2019, member transmission owners are providing PJM with data from about 400 synchrophasor devices located in more than 125 substations in 10 states. Federally approved updates to the PJM Open Access Transmission Tariff require all new generating facilities of 100 MW or greater to have a PMU installed and streaming data to PJM.

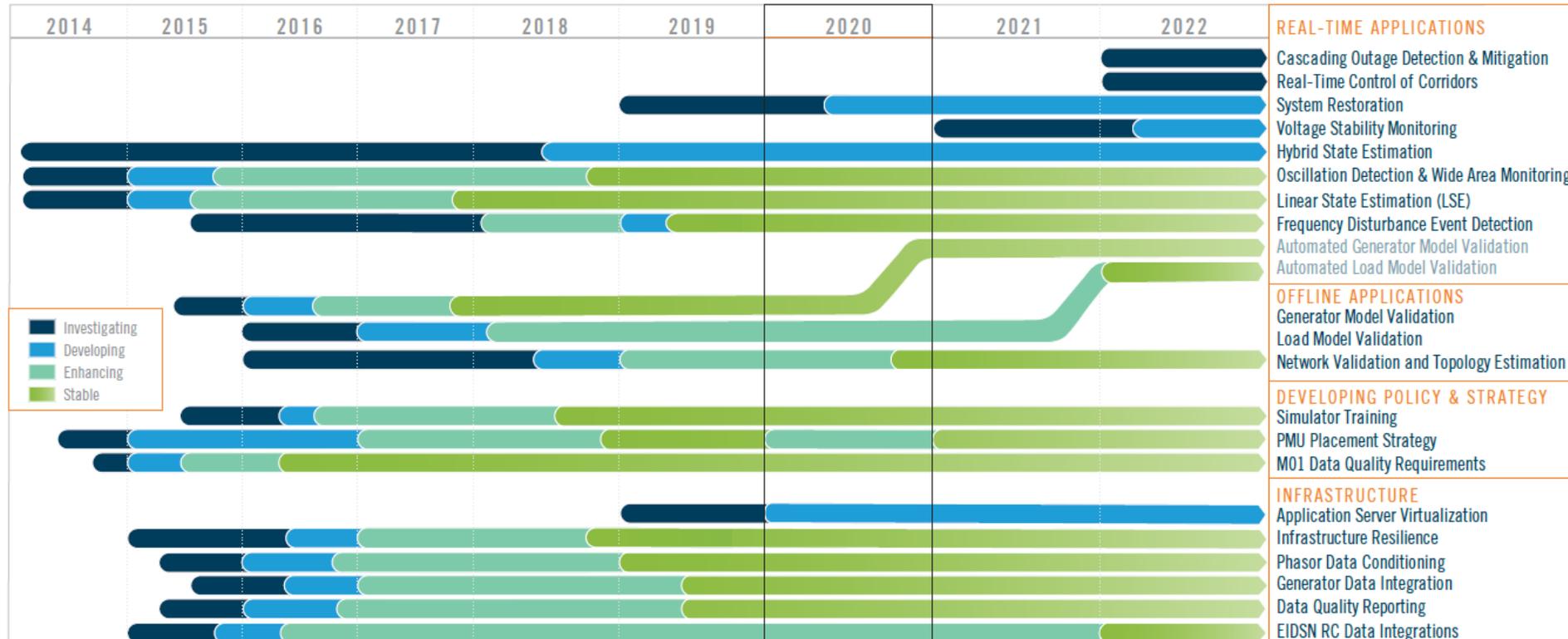
Developing Advanced Monitoring and Modeling
PJM is working with members and leading industry organizations to support research and deployment of synchrophasor technology, which is providing system operators with new insights into the dynamics of the grid. PJM is developing advanced applications of the technology to improve the efficiency, reliability and resilience of the bulk electric system.
Model validation is a key and novel application of synchrophasor technology. Planning, operations and markets rely heavily on models of the bulk electric system. Ensuring that these models accurately represent the physical behavior of the system is critical. PJM is combining synchrophasor technology with advanced analytical software to support better wide-area monitoring, power-system planning and analysis of grid disturbances.

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PJM SYNCHROPHASOR TECHNOLOGY ROADMAP

USED & USEFUL	Year Started	Year Stable
Phasor Data Concentrator	2013	2015
TO DOE Project Data Integration	2013	2016
Post-Event Analysis	2014	2016



BA Neighbor	Target Date
Tennessee Valley Authority (TVA)	Feb. 2020 (complete)
Southern Company	Q2/Q3 2020
Southwest Power Pool (SPP)	Q3/Q4 2020

Data Exchanges to Support:

- RC Situational Awareness
- DOE Oscillation Detection Pilot: Eastern Interconnection Situational Awareness Monitoring System (ESAMS)

[\[1\] Review of 1/11/2019 Oscillation Event](#)

Current

- Oscillation Detection
- Post-Event Analysis
- Generator Model Validation

Future

- Backup IROL Monitoring
- System Island Detection
- Event Detection
- Automated Model Validation
- Backup ACE Monitoring
- Expanded Linear State Estimator

PJM Presented to OC/PC in late 2018 seeking to formalize PMU Placement into the RTEP planning process. PJM is looking to renew this effort in 2020.

Initiate discussion in Planning Committee :

- TSS standard for new substations and major construction projects to include PMU installation for:
 - Bus voltage monitoring
 - Line flow monitoring

RTEP project(s) to install / retrofit PMUs for IROL monitoring:

- (Estimated) 14 PMU Installations
- (Estimated) 4 PMU Modifications
- This will support IROL backup in M01

