

PJM Synchrophasor Project Update

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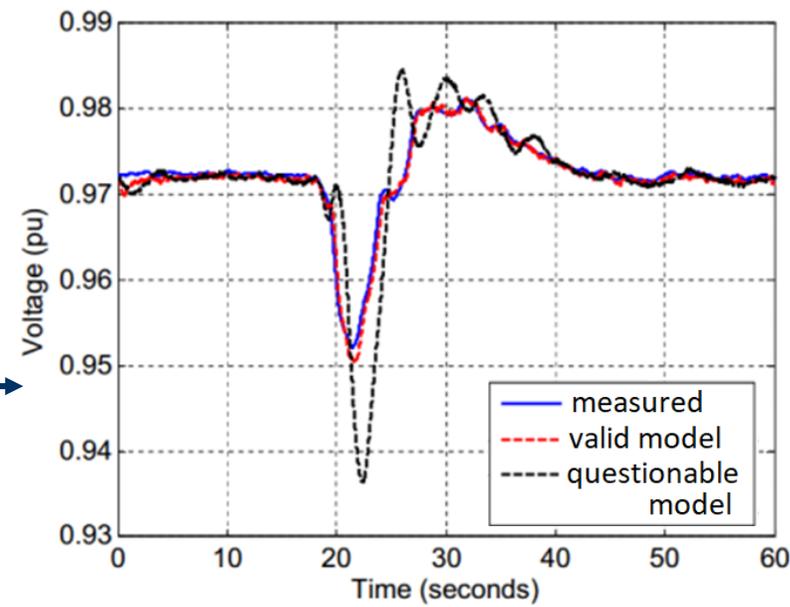
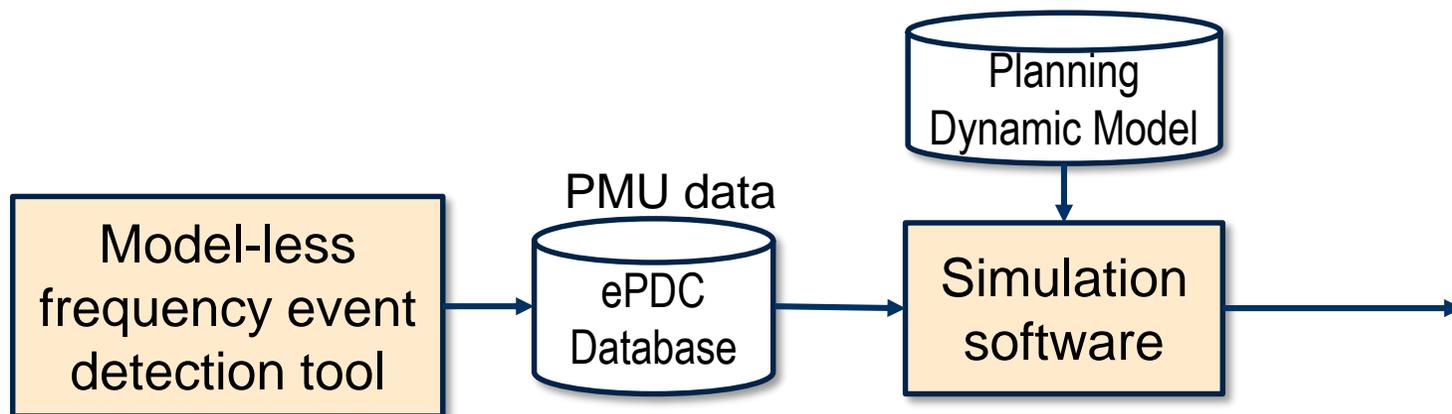
2021 Application Updates

- Automated Generator Model Validation (AGMV)
- Eastern Interconnection Situational Awareness Monitoring System (ESAMS)
- Synchrophasor List (New posting)
- Linear State Estimator (LSE)¹

[1] <https://pjm.com/-/media/committees-groups/committees/pc/2020/20200526-special/20200526-item-02-linear-state-sstimation.ashx>

Automated Generator Model Validation

- Model-less frequency event detection tool developed to detect, triangulate and estimate the amplitude of generator and load center trips.
- NERC standard MOD 032/033: PJM uses a manual process for generator dynamic model validation using Synchrophasor data.
- AGMV improves process consistency and builds a library of model validation events for each monitored generator.



Overall Project Objective

To introduce a common, high-level interconnection-wide view based on synchrophasor information in order to foster discussion within and among Eastern Interconnection operating entities.

Key Elements of the initial high-level view will include:

1. Detect and identify forced and natural oscillations.
2. Monitor phase angle pairs and identify when values are outside of normal operating ranges.
3. Detect atypical behavior from an ensemble of measurements and identify which ones are contributing to the atypicality.

Information Delivery Method: Emailed reports (daily, weekly, monthly)

Desired Outcome: Interconnection-wide oscillation detection tool developed and transferred to the Eastern Interconnection Data Sharing Network (EIDSN), or similar interconnection scale information system. Perhaps ESAMS monitoring could be performed as a rotating monitoring responsibility, similar to eastern interconnection time error correction monitoring.

Synchrophasor List

Manual 1: Control Center and Data Exchange Requirements

3.6.2 Required Synchrophasor Data

For substations with three or more non-radial transmission lines at 200 kV or above, and four or more non-radial transmission lines between 100 kV and 200 kV, Synchrophasor measurements are required for the following equipment types (see the applicability of requirements below). All measurement points must be in the form of positive sequence values.

- Voltages for busses at 100 kV and above
- Line-terminal voltages and currents (both ends) for transmission lines at 100 kV and above
- High-side/low-side voltage and current values for transformers with a rated low side voltage of 100 kV or greater
- Dynamic reactive device power output (SVCs, STATCOMs, Synchronous condensers, etc.)

Note:

These Synchrophasor data requirements shall only apply to new Regional Transmission Expansion Plan (RTEP) projects, other than network upgrades for the purpose of interconnecting a new generator, presented to the Transmission Expansion Advisory Committee (TEAC) and/or the Sub Regional RTEP Committees (SRRTEP) for inclusion or integration in the RTEP on or after June 1, 2021. PMUs will increase the level of observability allowing PJM to better perform its reliability obligations, and facilitate compliance with the applicable NERC reliability standards as the grid continues to evolve. In situations where the installation of a Synchrophasor device causes technical challenges resulting in unusually high installation costs, PJM may, on a case-by-case basis, waive the requirement or approve an alternative Synchrophasor device installation plan proposed by the Transmission Owner or Designated Entity. Supporting equipment (PDC, GPS clock, etc.) installed per this requirement shall include necessary design and configuration to make the device 'CIP ready'. PJM will evaluate the effectiveness of the Synchrophasor measurement requirements on a periodic basis and work with PJM stakeholders to modify such requirements as necessary.

	Zone	Station	Station Long Name	Max kV	# of Non_Radial Lines	PMU Needed?	PMU Installed?
PJM	ABC	OPQ	OPQRST	115	2	N	N
PJM	ABC	OPQ	OPQRST	230	3	Y	N
PJM	ABC	OPQ	OPQRST	230	4	Y	N
PJM	ABC	OPQ	OPQRST	115	2	N	N
PJM	ABC	OPQ	OPQRST	115	2	N	N
PJM	ABC	OPQ	OPQRST	138	2	N	N
PJM	ABC	OPQ	OPQRST	230	0	N	N
PJM	ABC	OPQ	OPQRST	230	2	N	N
PJM	ABC	OPQ	OPQRST	230	2	N	N

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PJM Synchrophasor Project



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