



# Synchrophasor Project Update

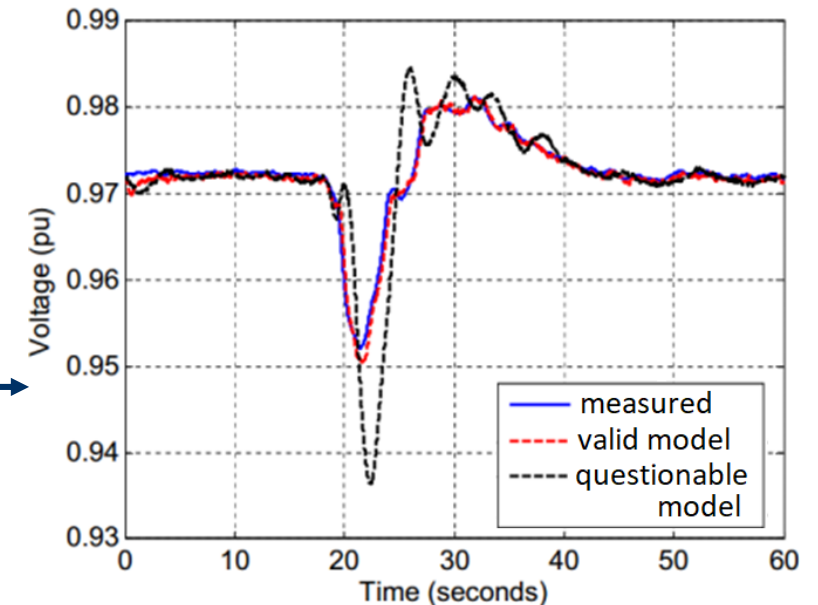
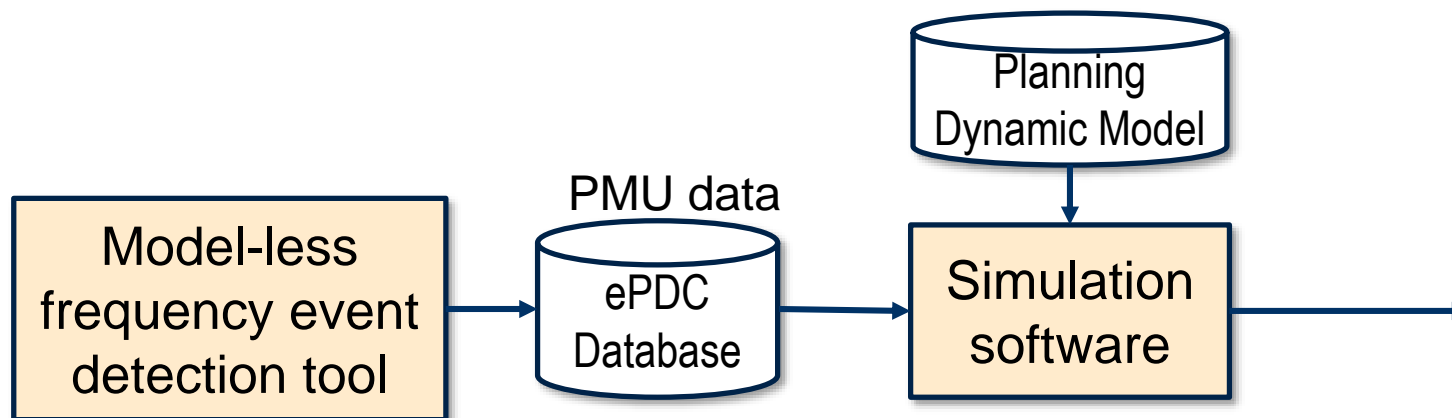
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PJM Operating Committee  
April 8, 2021

## 2021 Application Development Work

- Automated Generator Model Validation (AGMV)
- Eastern Interconnection Situational Awareness Monitoring System (ESAMS)
- Real Time Dynamics Monitoring System (RTDMS) 2020
- Linear State Estimator (LSE)<sup>1</sup>

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

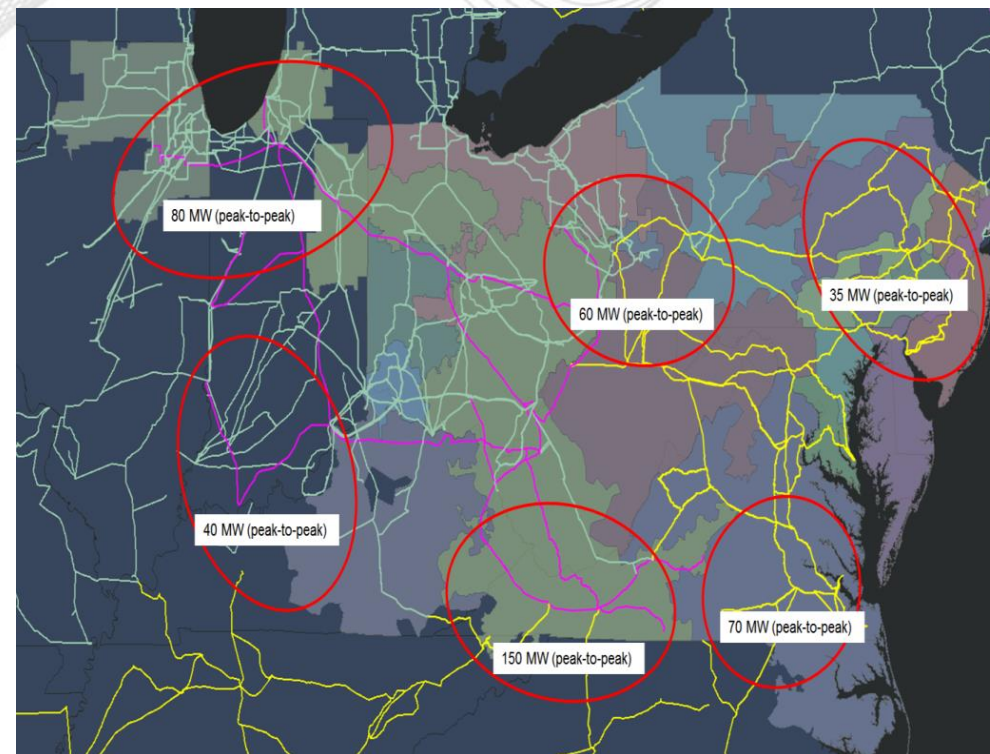
- Model-less frequency event detection tool developed to detect, triangulate and estimate the amplitude of generator and load center trips.
- NERC standard MOD 032/033: PJM uses a manual process for generator dynamic model validation using Synchrophasor data.
- AGMV improves process consistency and builds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



## Eastern Interconnection Situational Awareness Monitoring System (ESAMS)

### Motivation

- Reliability events can affect the behavior of an entire interconnection.
- Yet, while operators have excellent visibility within their footprints, they have limited visibility of wide-area oscillations outside their footprints.



A forced oscillation event on 1/11/2019 was observed across the Eastern Interconnection.

## 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.

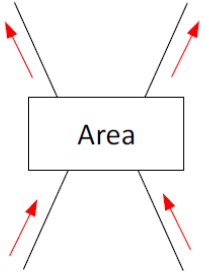
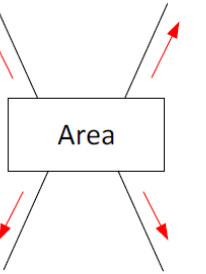
### Key Elements of the initial high-level view will include:

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.

- New version of the Real Time Dynamics Monitoring System (RTDMS) released earlier this year.
- Release includes many usability and bug-fix enhancements.
- PJM Transmission Owner remote visualization access is still available.
- Notable new feature: Oscillation Source Localization algorithm using the Dissipating Energy flow concept. Uses PMU power flow signals to identify the source area for a power system oscillation.

|  |  |  |
|--|--|--|
| <b>DE Flow Pattern</b>                 |  |  |
| <b>DE Flow Directions on Interties</b> | In/Out of the area   | Out of the area  |
| <b>Source Interpretation</b>           | <b>Outside the Area</b>  | <b>Inside the Area</b>   |

Look for DE flow patterns inside the Area to identify source

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