

PMU Placement Strategy

June 19, 2018

Dave Hislop

Mgr, Outage Analysis Technologies

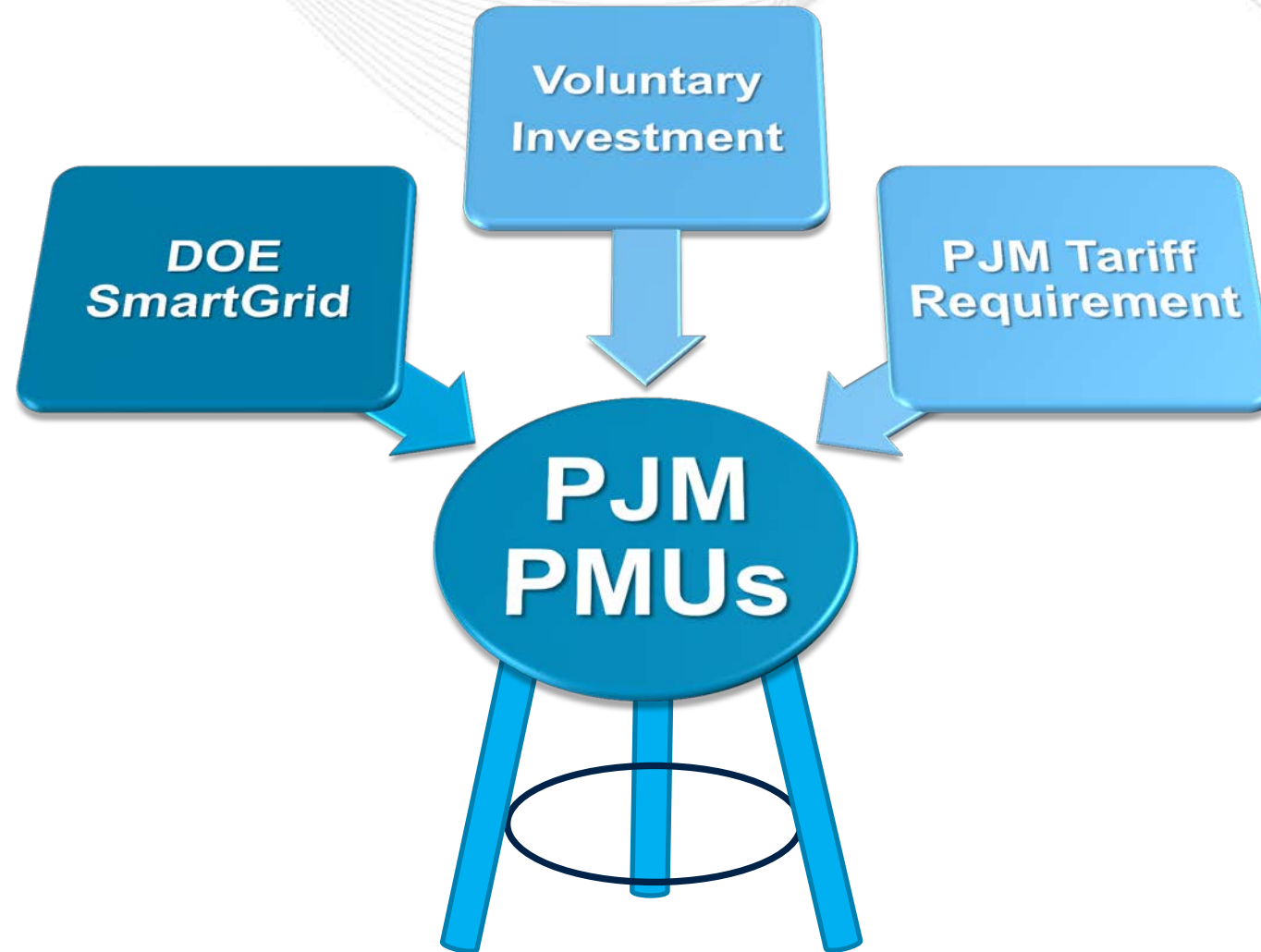
PJM Interconnection

“We are looking to install [X] PMU’s over the next few years.

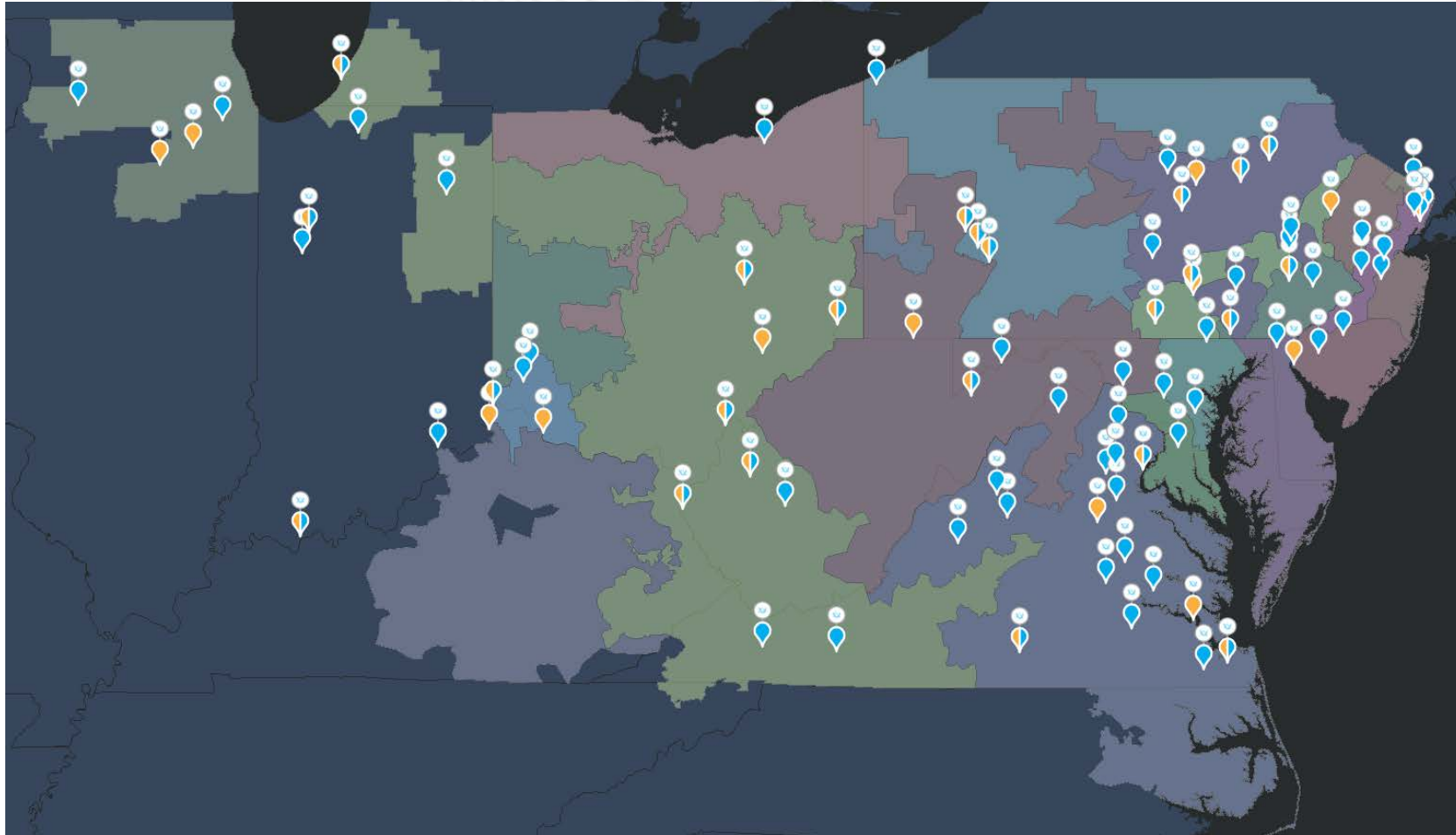
Where would PJM most need them?”

“We are looking at putting in PMU’s at station [X], [Y] or [Z].

Which would PJM most value?”



- 2009 Smart Grid Investment Grant
 - 301 PMUs at 85 substations
- 2018
 - 470+ PMUs at 120+ substations
 - 22 PMUs at 8 *PJM Tariff Required* substations
- Planned
 - Dominion: 300
 - ComEd: 500



- Area with a known stability concern
 - Any station within the Eastern Interconnection with defined stability concerns, limitations, or restrictions
- IROL Measurement
 - Any station which is defined as part of a PJM Reactive Transfer Interface upon which an Interconnection Reliability Operating Limit is calculated.

- Expanded Observability
 - EHV Network
 - Oscillatory behavior
- Model Accuracy
 - Large Conforming Load
 - Large Non-conforming Load
 - Dynamic Reactive Resource
 - HVDC resource

- Transmission lines part of IROL interface (M03) +20 points
- Area with known stability concern +16 points
- Generators >1000 MW (GSU) +12 points
- IROL-related substation +5 points
- Stability-related substation +4 points
- Large generator substation +3 points
- Dynamic Reactive Resource, Large Conforming / Non-conforming Load, HVDC substation +2 points
- Observable substation +1 point

1. Identified potential locations for PMU Placement are shared with the equipment owners only. (Full list is deemed CEII and not shared beyond PJM.)
2. PJM's PMU Contacts are not always the decision makers with respect to siting new PMUs.
3. For equipment owners with NO current PMUs, identifying the correct contact is a bigger challenge.
4. Is the conversation around PMU placement better aligned with system Planning rather than Operations?

- <https://www.pjm.com/-/media/markets-ops/ops-analysis/synchrophasor-tech/pmu-placement-strategy.ashx?la=en>
- **PJM.com > Markets & Operations > System Operations > Synchrophasor Technology**

Operational Data | Data Directory | Interregional Data Map | PJM Tools | Energy Market | Capacity Market (RPM) | Financial Transmission Rights | Ancillary Services | Demand Response | Billing, Settlements & Credit | System Operations | Gas-Electric Coordination | Operations Summary Data | **Synchrophasor Technology** | Advanced Technology | Pilot Program

Home • Markets & Operations • System Operations • Synchrophasor Technology

Synchrophasor Technology

PJM is working with its members and leading industry organizations to support research and deployment of synchrophasor technology, which is allowing system operators to monitor and study the electric grid in new and deeper ways.

Background

Synchrophasor technology uses monitoring devices, called phasor measurement units, which take high-speed measurements of phase angles, voltage and frequency that are time stamped with high-precision clocks. The high-speed measurements, typically taken 30 times a second, can reveal system changes undetectable through traditional monitoring systems used in the industry. This makes valuable new energy management applications possible, including electric model validation, wide area network monitoring, and oscillation and islanding detection.

PJM collects data from nearly 400 phasor measurement units from a growing list of equipment owners, including Transmission Owners and Generation Owners. PJM is steadily integrating applications based on synchrophasor technology into its regular operations. It is also partnering with equipment owners to facilitate the technology and install new Phasor Measurement Units (PMU) in the most effective manner.

PJM shares real-time synchrophasor data with neighboring grid operators within the Eastern interconnection as well as contributes to industry organizations active in developing synchrophasor technology and standards.

PMU Registry [XLS](#)
 PMU Placement Strategy [PDF](#)
 Synchrophasor Technical Guidelines [PDF](#)
 Synchrophasor Technology Roadmap [PDF](#)

Phasor Measurement Units (PMU) Locations