

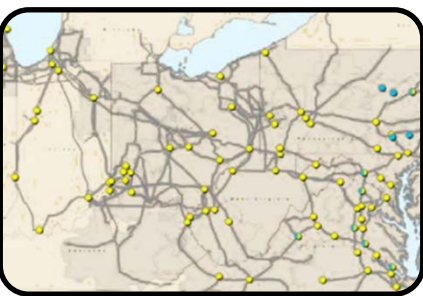
# PMU Placement Strategy & New Generator PMUs

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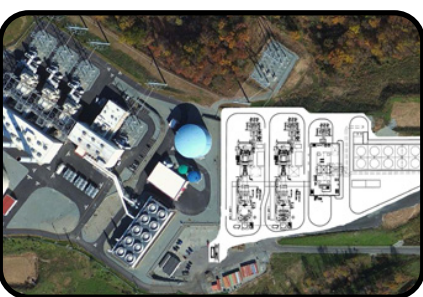
## 2009 DOE Smart Grid Investment

- 301 PMU Installations @ 85 Substations
- Transmission Level Installations



## Continued TO Voluntary Expansion

- 386 PMU Installations @ 123 Substations
- Transmission Level Installations



## Generator Requirement

- 0 PMU Installations @ 0 Substations
- York 2 (12/1/2016 sync) anticipated to be first

## February 2014

- FERC accepted a change to PJM's Open Access Transmission Tariff
- Required PMU Installation for any interconnection of a new Generator  $\geq 100$  MW for all new facilities entering the interconnection queue on or after October 1, 2012 that have not yet entered into an Interconnection Service Agreement.



# PMU Generator Upcoming Installations

Name	MW	ETA	Zone	Notes
Brunswick (VEPC)	1551	9/30/2016	DOM	<u>Voluntary</u>
York 2 (Calpine)	760	5/1/2017	PECO	Initial Synch 12/1/2016
Winfall (Timbermill)	300	10/31/2017	DOM	Windfarm
Hummel	381	12/31/2017	PPL	PMU on Steam portion only.

NOTE: Five additional installations anticipated in 2018. One additional installation anticipated in 2019.

## Reasoning for a PJM PMU Placement Strategy

- Address gaps from the DOE Smart Grid Grant, Voluntary Expansion, and GSU Requirements.
- To directly assist with Member questions around where PMU placement would be desired from PJM's perspective.
- To avoid missed opportunities for voluntary expansion.





## PJM PMU Strategy:

- GO/TO guided expansion where company evaluates PMU placement for the following criteria:
  - New BES substation;
  - Relay modifications at an existing BES substation;
  - PJM Proposed PMU Installation Sites:
    - Area of known Stability concern;
    - Substation included in, or as a proxy to, IROL Measurement;
    - EHV substation which significantly expands PJM's LSE;
    - System / Generator / Load Model Validation\*
- GO mandatory requirement for new units/stations  $\geq 100\text{MW}$ .

\* Large load, dynamic VAR resource, HVDC resource, automatic control resource including RAS/SPS.

- 60 Substations Identified meeting the criteria (Stability, IROL, EHV Expansion, and/or System/Load Modeling) :
  - 12 Substations which already have PMUs installations at the Transmission level, but looking for GSU installation.
  - 23 GSU & transmission substation combined installation level proposals. (i.e., PMU on high & low side)
  - 25 Transmission substation only level proposals.
  - Info as a whole is CEII. Non-CEII version of strategy posted.
  - Presented at SOS, OC, PC.
  - <https://cera.pjm.com/otcs/cs.exe?func=ll&objaction=overview&objid=13347332>

- Share proposed locations with each substation owner.
- Work with owners on identifying timeline and/or proxy installation location.
- Incorporate PMU installation question as part of any NEW BES substation installations. (i.e., *Will you be installing a PMU at this location? Y/N*)
- Incorporate PMU installation question as part of any relay modification work at existing substations.
- Evolve strategy through engagement within the NERC Synchronized Measurement Subcommittee, which operates under the NERC Planning Committee.



