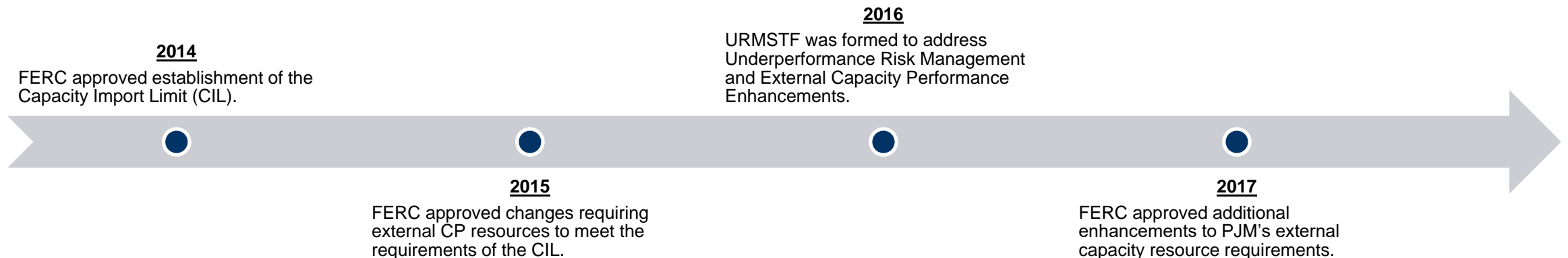




HVDC Senior Task Force: Pseudo-Tie Education

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- External generation capacity resources have offered and cleared in PJM's capacity auctions for as long as PJM has had such auctions.
- External generation participating in PJM's capacity market revealed challenges in the areas of operations, markets, planning and external coordination that needed to be addressed.
- Additionally, PJM aimed to ensure equivalent requirements for internal and external capacity resources to ensure fairness for market participants.
- Below is a high level timeline showing the progression of how these challenges were addressed.



2014: FERC approved a PJM proposal establishing limits on the amount of capacity from external generation resources, Capacity Import Limit (CIL), that can be reliably committed in the PJM capacity auctions. To obtain a CIL exception, a generation resource had to meet three conditions:

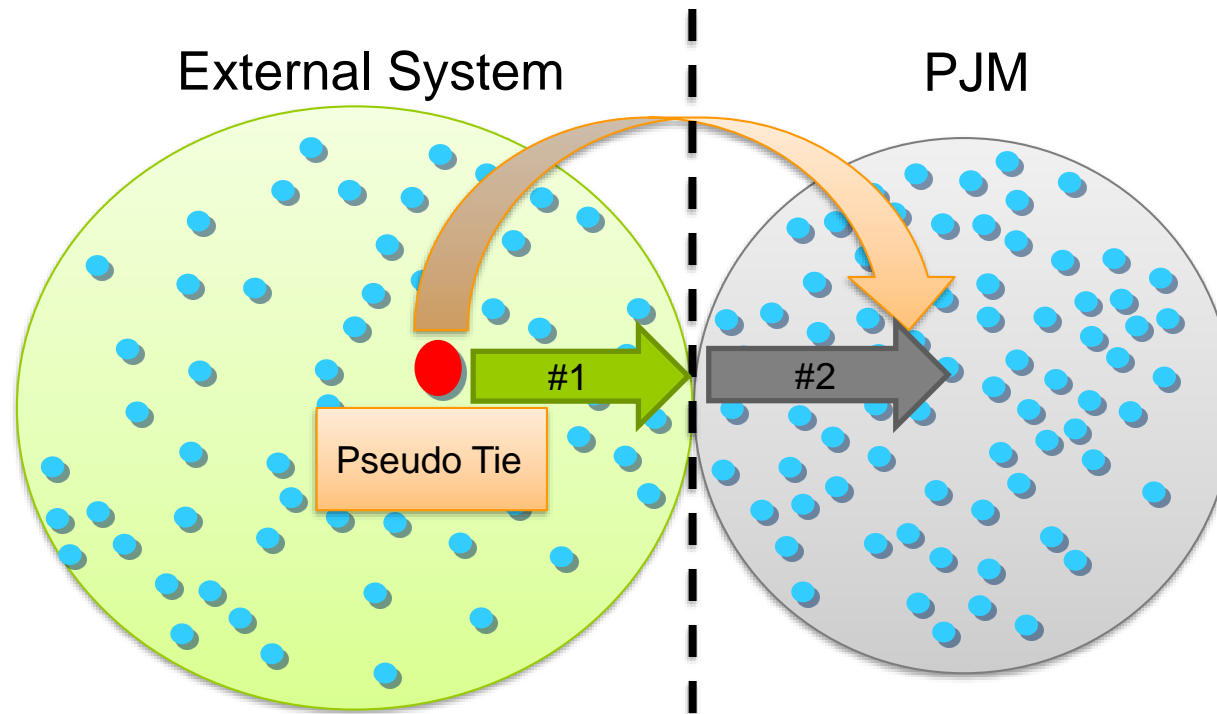
- It must be committed to being a pseudo-tied generation resource prior to the start of the delivery year.
- It must have long-term firm transmission service confirmed on the complete path from such resource into PJM.
- It must agree to be subject to the same capacity must-offer requirement as PJM's internal generation resources.

2015: FERC approved a PJM proposal that, in order to qualify as a Capacity Performance Resource, an external generation resource must meet the conditions for obtaining a CIL exception.

The FERC approved 2014 and 2015 changes to PJM's rules on external generation capacity resources collectively:

- recognized external transmission constraints on capacity deliverability similar to the internal constraints recognized in PJM's locational capacity construct,
- required all resources seeking to offer as capacity performance resources in PJM to be pseudo-tied into PJM, thus avoiding NERC tagging requirements and enabling unit-specific performance evaluation and
- ensured that external capacity resources met all applicable requirements to be treated as equivalent to PJM Region internal generation.

A Pseudo-Tie occurs when a generating resource within a balancing authority (BA) electrically transfers its output to another BA, effectively becoming a part of that BA and, in turn, is treated as an internal resource.



2016: Underperformance Risk Management Senior Task Force (URMSTF) was formed at PJM to address two problem statements:

- Underperformance Risk Management - addressed the concern that capacity performance rules at that time did not provide adequate options to manage the risk of underperformance during capacity performance hour(s).
- External Capacity Performance Enhancements (ECPE) – addressed various internal and external operational, markets, planning and seams coordination challenges associated with the integration of external Capacity Performance (CP) resources into PJM.

2017: FERC approved additional enhancements to PJM's external capacity resource requirements including assessing the feasibility of establishing a requested Pseudo-Tie.

- Planning Eligibility Criteria
- Modeling Eligibility Criteria
 - Electrical Distance Test
 - Seams Coordination Model Consistency
- Markets Eligibility Criteria
 - Market-to-Market Flowgate Test
 - Transfer of Firm Allocation Eligibility

Planning Eligibility Criteria

- Purpose: Allows PJM to determine if generation seeking to Pseudo-Tie into PJM is deliverable and similar in its deliverability when comparing to the generation directly connected to the PJM footprint.
- Criterion: On an ongoing basis, the deliverability study based on applicable standards must be reviewed and approved by PJM for the portion of the study on the external system. Deliverability requirements are published in PJM Manuals 14A and 14B.

Modeling Eligibility Criteria

- Electrical Distance Test
 - Purpose: Assesses the feasibility of upgrading the PJM Energy Management System (EMS) to explicitly model the potential Pseudo-Tie resource.
 - Criterion: The impedance from the highest connected voltage at the resource's substation, or within one substation from the resource, to the PJM border must be ≤ 0.065 p.u.

- Seams Coordination Model Consistency
 - Purpose: The EMS models for PJM and external BAs where the external resource impacts may require PJM to coordinate on flowgates need to be aligned for effective operation of the requested Pseudo-Tie.
 - Criterion: Shift factors of coordinated flowgates must be within ± 2 percent of each other's models.

Markets Eligibility Criteria

- Market-to-Market Flowgate Test
 - Purpose: Ensures that all flowgates impacted by Pseudo-Ties have some level of controllability with PJM internal resources to help ensure reliability and avoid excess congestion costs on external facilities.
 - Criterion: There must be at least one dispatchable internal PJM generator with at least a ± 1.5 percent impact on any eligible coordinated flowgate resulting from the potential Pseudo-Tie.

- Transfer of Firm Allocation Eligibility
 - Purpose: Ensure that the impacts of the requested Pseudo-Tie are eligible to be included as part of PJM's firm flows in the Day-Ahead Market on all coordinated flowgates applicable to the Pseudo-Tie.
 - Criterion: Firm allocations associated with coordinated flowgates applicable to the requested Pseudo-Tie must transfer to PJM from the external entities.



General Pseudo-Tie Requirements

System Modification Cost Reimbursement Agreement

- Pseudo-Tie resource owner agrees to pay an administrative fee to cover PJM's costs to complete the review of its models and other systems necessary to evaluate the Pseudo-Tie request.
- Pseudo-Tie resource owner agrees to incur the cost of effectuating any modifications to the models and any other systems needed to accommodate the Pseudo-Tie.

Pseudo-Tie Agreement (FERC approved pro forma)

- Signed by all parties affected by the establishment of the Pseudo-Tie including the Native BA, Native TO, Native/Third Party RC, Pseudo-Tie owner and PJM and describes the operational and technical details for establishing and operating the Pseudo-Tie.

Markets Requirement

- The Pseudo-Tie must adhere to all CP resource requirements including the Day-Ahead Must Offer requirement.

Transmission Service Requirement

- Firm Network External Designated Service (NEDS) with rollover rights (unit specific)

NERC Tagging

- Capacity resources cannot be tagged (tagged transactions could be curtailed via the NERC TLR process negating PJM's control of the resources).

Redundant Path Telemetry Requirement

- Requires two independent sources for Real-Time External Telemetry