

External Capacity Update

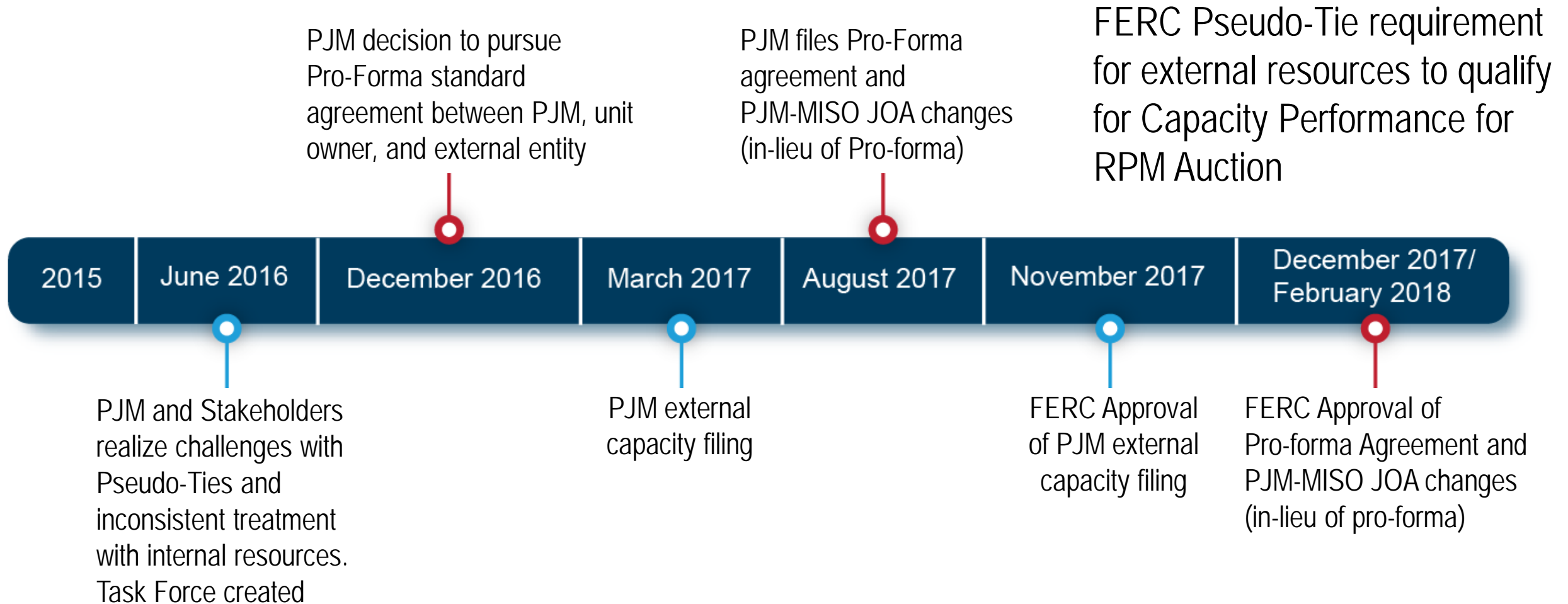
Joint Stakeholder Meeting
April 2, 2018

PJM External Capacity Rules

Types of Transactions Into PJM

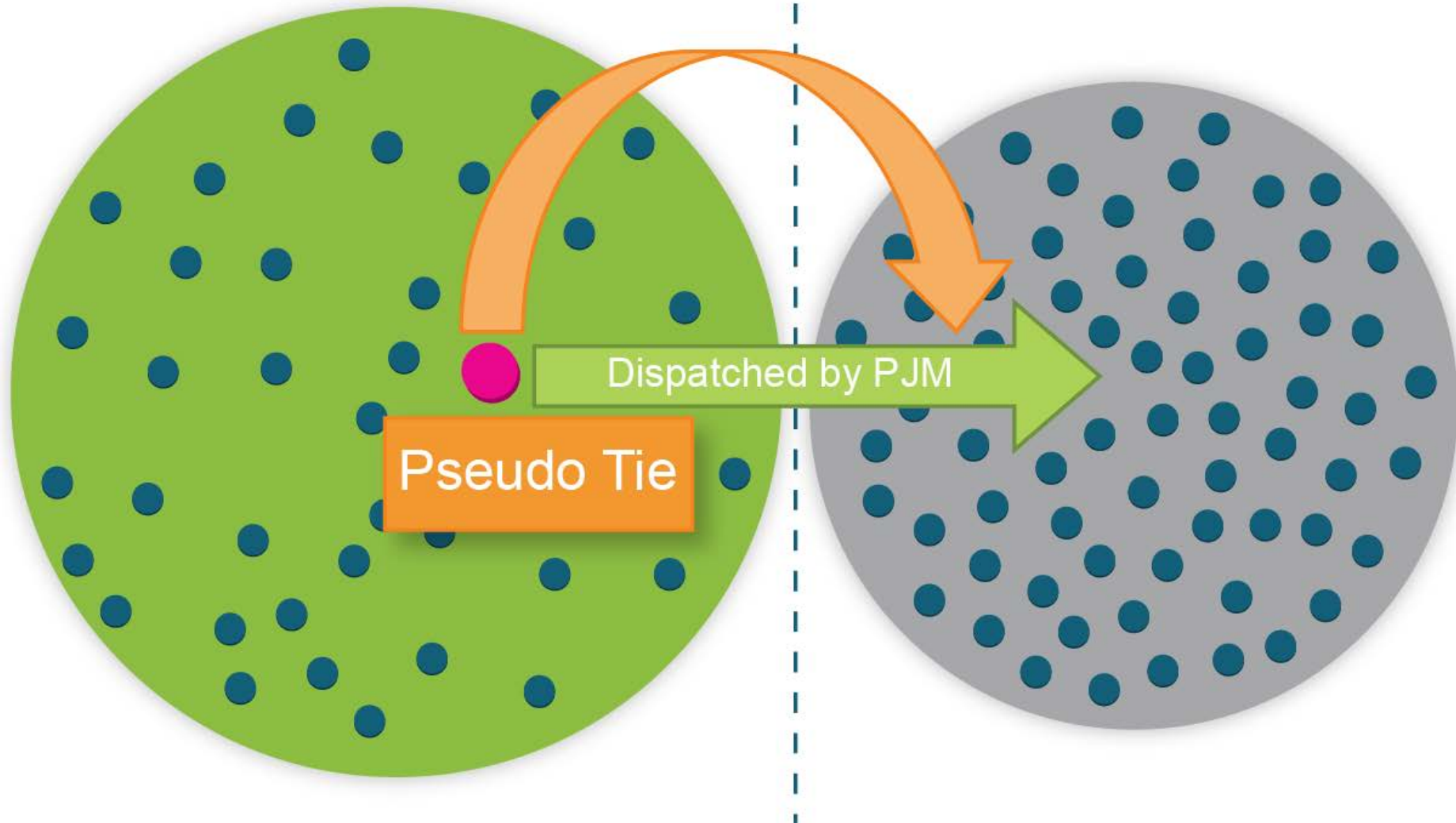
Type of transaction	Tag?	Granularity	Similar to an internal generator?	Subject to tag curtailments?	Eligible for Capacity Performance?
Dynamic Schedules	Yes	Dynamic	No	Yes	No
Pseudo-ties	No	Dynamic	Yes	No	Yes

PJM Pseudo-Tie Initiatives Timeline



External System

PJM



External Capacity: Pseudo-Ties

PJM only allows pseudo-ties in its external capacity construct because



They are unit specific



They do not require tags



They are dispatched by PJM

Pseudo-Ties into PJM

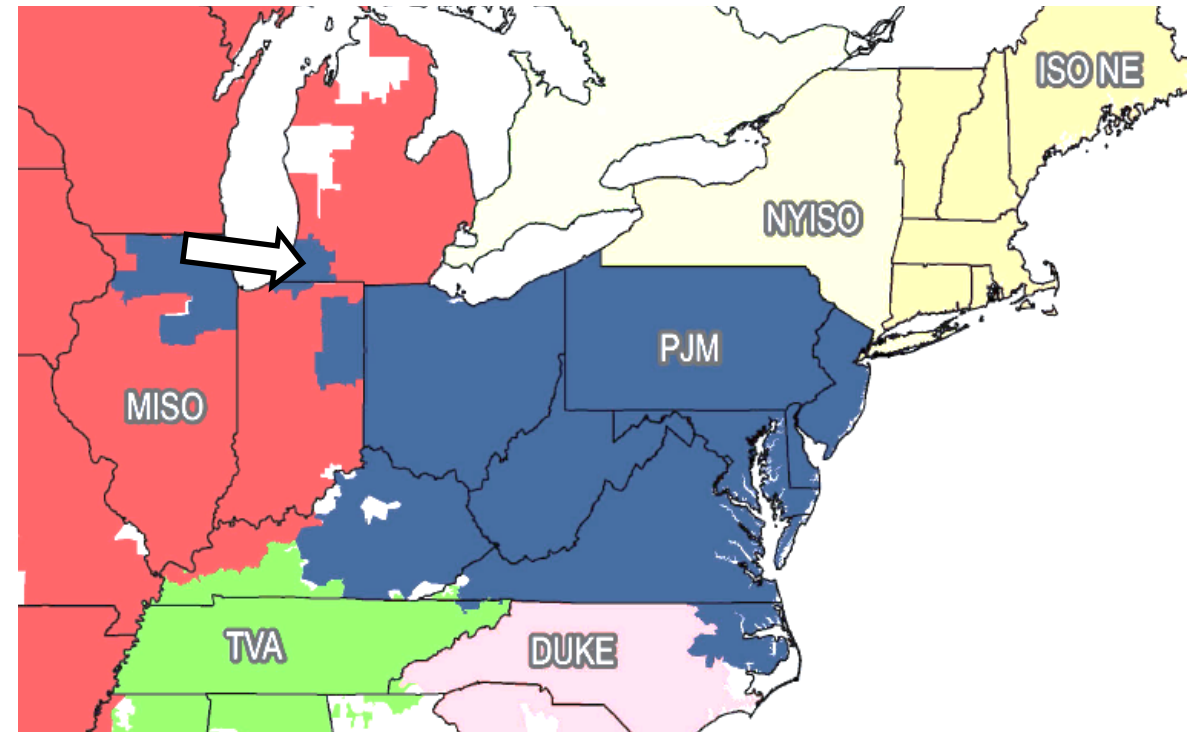
Prior to External Capacity filing

- 5,132 MWs (36 Units) Implemented
- 2,251 MWs (18 Units) Queued

After External Capacity Filing (Effective 6/1/22)*

- 2,672 MWs (19 Units)

*Number are preliminary as we continue to evaluate each pseudo-tie per new criteria



PJM Pseudo-Tie Challenges That Resulted in New Rules

- Network Model Expansions - EMS and markets modeling challenges
- Congestion Management - Local and regional external system congestion management challenges
- Planning Analysis - External entity planning analysis lacking unit specific delivery studies

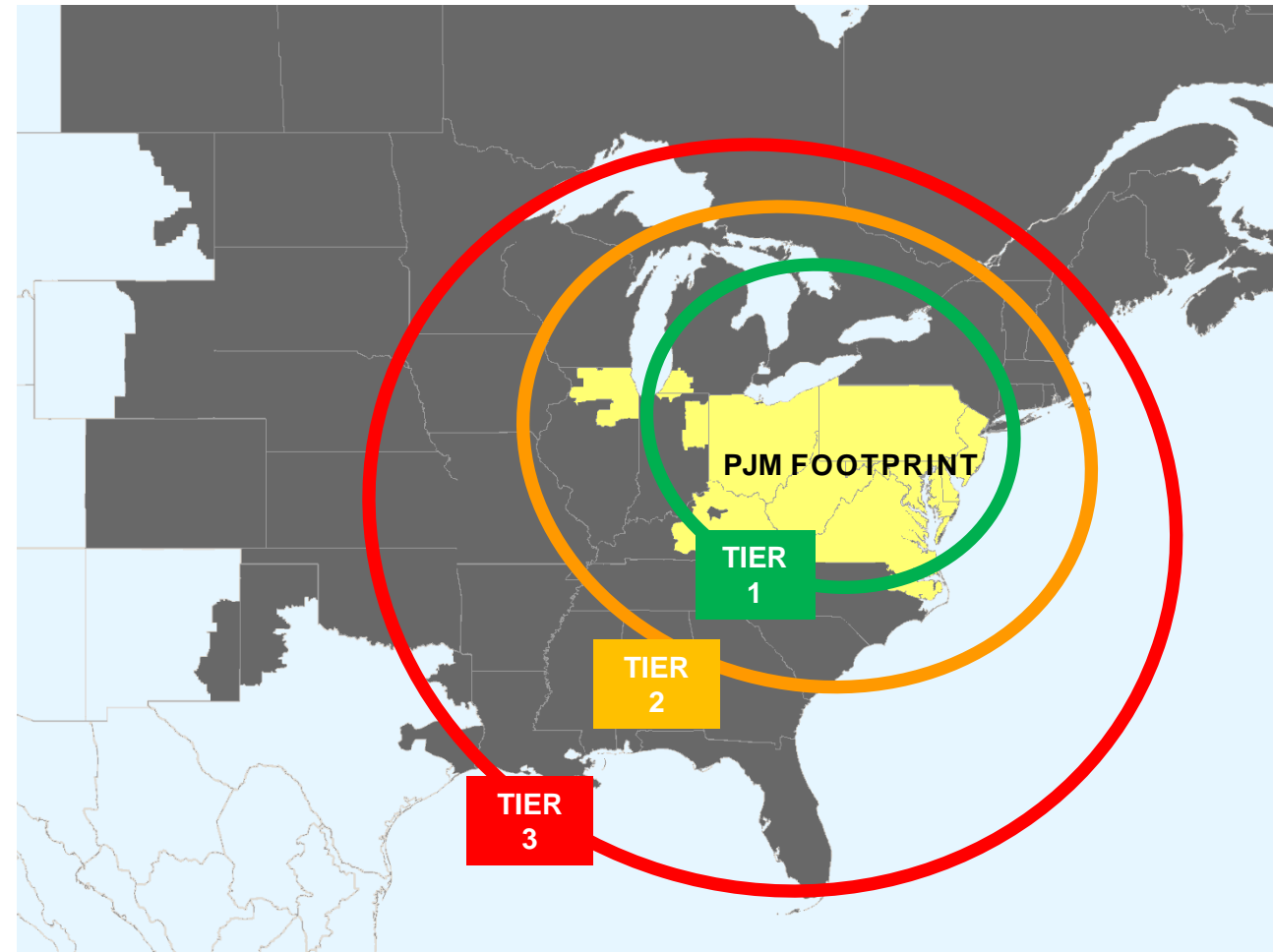
Network Modeling Challenges

As the electrical distance from the PJM footprint increases

- Level of detail in the PJM EMS model decreases
- Number of telemetry links/amount of telemetry decreases
- Requirements and frequency for communication of BES configuration changes decrease

Requirements

- Pseudo-tie not allowed if impedance between unit and PJM is greater than 0.065
- Models for PJM and External Area need to be within 2 percent accuracy for potential coordinated flowgates



Congestion Management

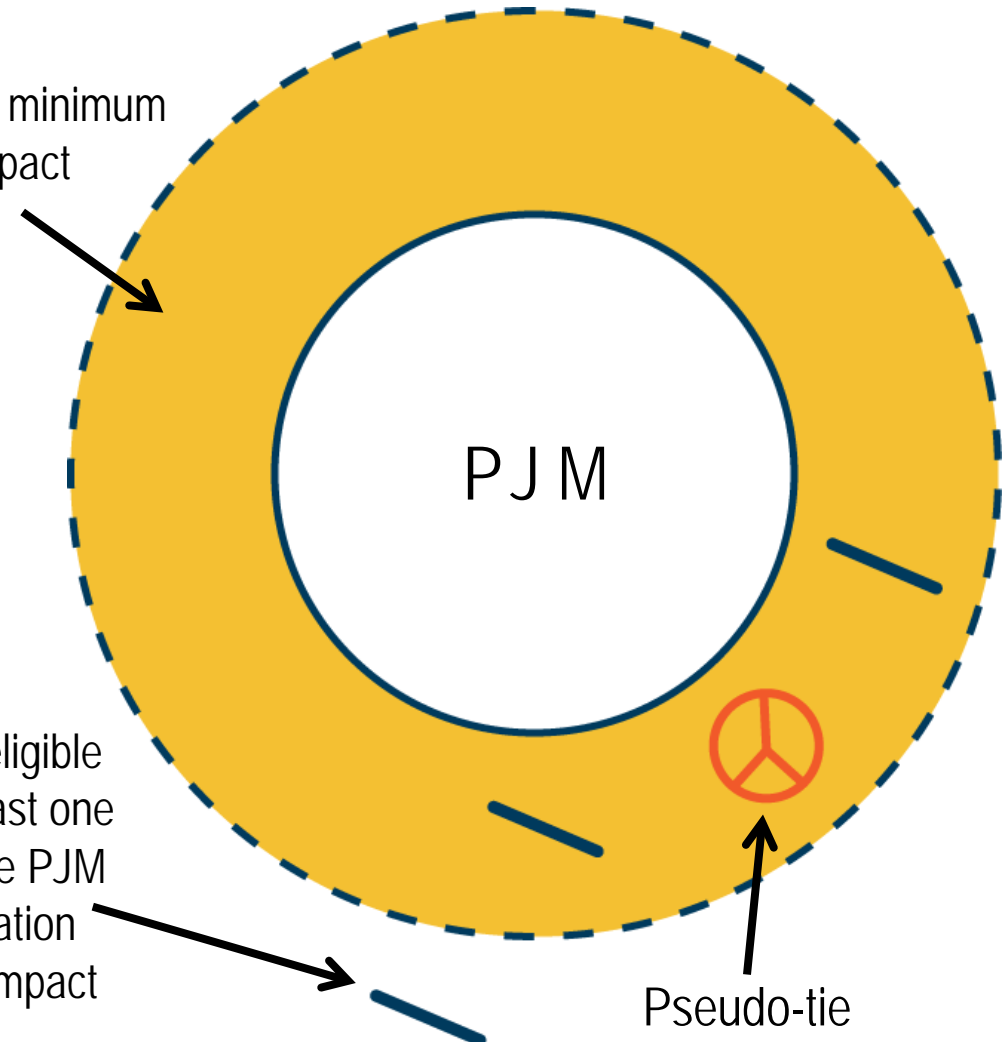
M2M Congestion Management
Coordination should not result in less than optimal dispatch in which there are not enough resources to efficiently control for the external flowgate

Requirement

- If there is no PJM generation absent the pseudo-tie with at least a 1.5 percent impact on potential new flowgates then PJM considers this less than optimal dispatch and ineligible for pseudo-tie

Area where PJM generation has a minimum of 1.5 percent impact

Pseudo-tie ineligible because at least one flowgate where PJM internal generation >1.5 percent impact



Planning Challenges

- External system deliverability criteria is different for the evaluation of firm transmission service associated with pseudo-ties
- If external systems are not evaluating PJM's pseudo-ties in a manner consistent with PJM's planning process then, although external systems grant firm point to point service, PJM pseudo-ties are not reliably equivalent to internal PJM generators.
- Requirement: Pseudo-tie capacity resources must have firm transmission service that was studied using the standards that PJM applies for internal resources. PJM to review and verify study results. On-going requirement.

Summary: PJM Pseudo-Tie Rules

Model

- Pseudo-tie not allowed if impedance between unit and PJM is greater than 0.065
- Models for PJM and external area need to be within 2 percent accuracy for potential coordinated flowgates

Congestion Management

- There must be at least one flexible internal PJM generator with at least 1.5 percent impact on any new potential FG added as a result of the pseudo-tie

Planning Analysis

- Pseudo-tie capacity resources must have firm transmission service, or equivalent, that was studied using the standards that PJM applies for internal resources. PJM to review and verify study results. On-going requirement

Pro-Forma Agreement

Agreement between PJM, pseudo-tie owner and external entities that ensures

- Compliance with all NERC and FERC requirements, i.e. no tagging
- All parties involved know who is responsible for ACE, telemetry, operational control and re-dispatch
- Uniformity among the pseudo-tie and dynamic schedule requirements
- Increased awareness, transparency and efficiency

PJM and MISO added additional JOA language in lieu of MISO signing pro-forma agreement