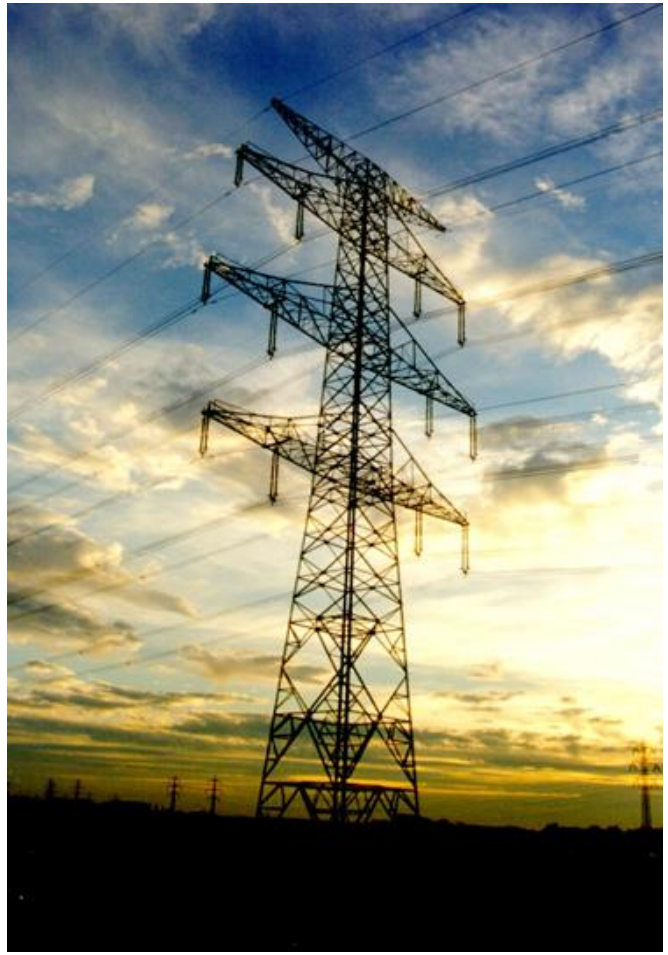
MISO PJM IPSAC

April 19, 2019

Agenda

- Coordinated System Plan
- IMEP Proposals & Study Status
- JOA Changes Update
- IPSAC Work Schedule



Coordinated System Plan

Annual Issues Review Process (JOA §9.3.7.2)

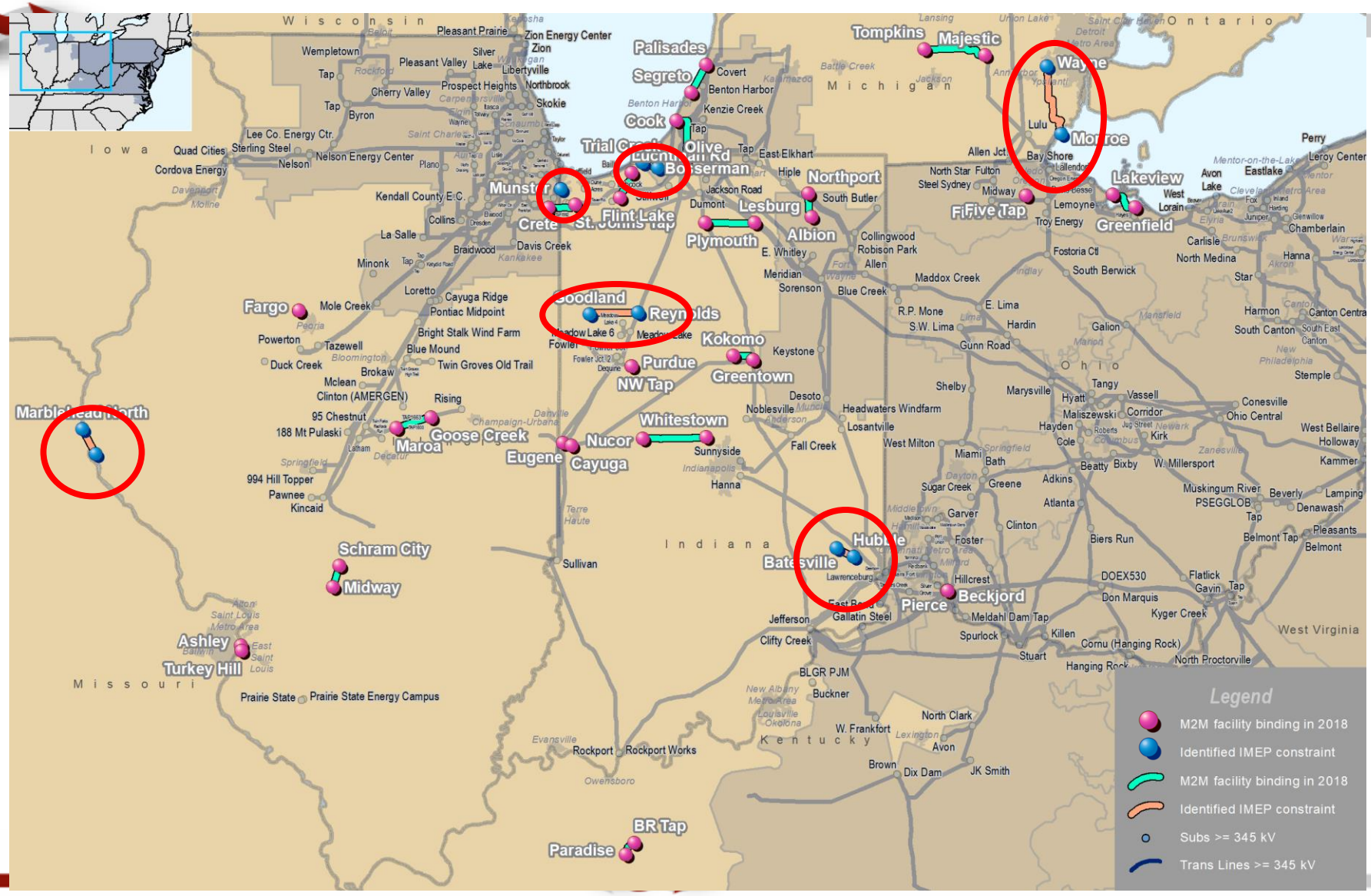
- In the 4th quarter, RTOs exchange (completed in December 2017):
  - Regional issues and newly approved projects near the seam
  - New regional issues
  - Interconnection requests under coordination
  - M2M historical congestion
- RTOs jointly review above in January
- Receive Third Party issues in first quarter, but no less than 30 days before Issues Review IPSAC
- Issues Review IPSAC –
  - Held in the first quarter of each year
  - Must provide 60 calendar day notice of scheduled date
  - Stakeholder feedback due 30 days prior to IPSAC
- Within 45 calendar days after the Issues Review IPSAC the JRPC shall determine the need for a Coordinated System Plan study
- JRPC notifies the IPSAC of its decision within 5 business days

IMEP Study

- PJM and MISO are conducting a two year Interregional Market Efficiency Project (IMEP) study in 2018/2019
- The 2019 CSP includes the completion of this study

- RTOs will not conduct a TMEP study under the 2019 CSP
  - Only one new year of historical information
  - Many constraints evaluated last year
  - Coordination between TMEP and IMEP processes

IMEP Constraints & Potential TMEP Drivers



Ad Hoc Study

- No ad hoc studies are currently planned under the 2019 CSP

18/19 Interregional Market Efficiency Project Study

Study Status

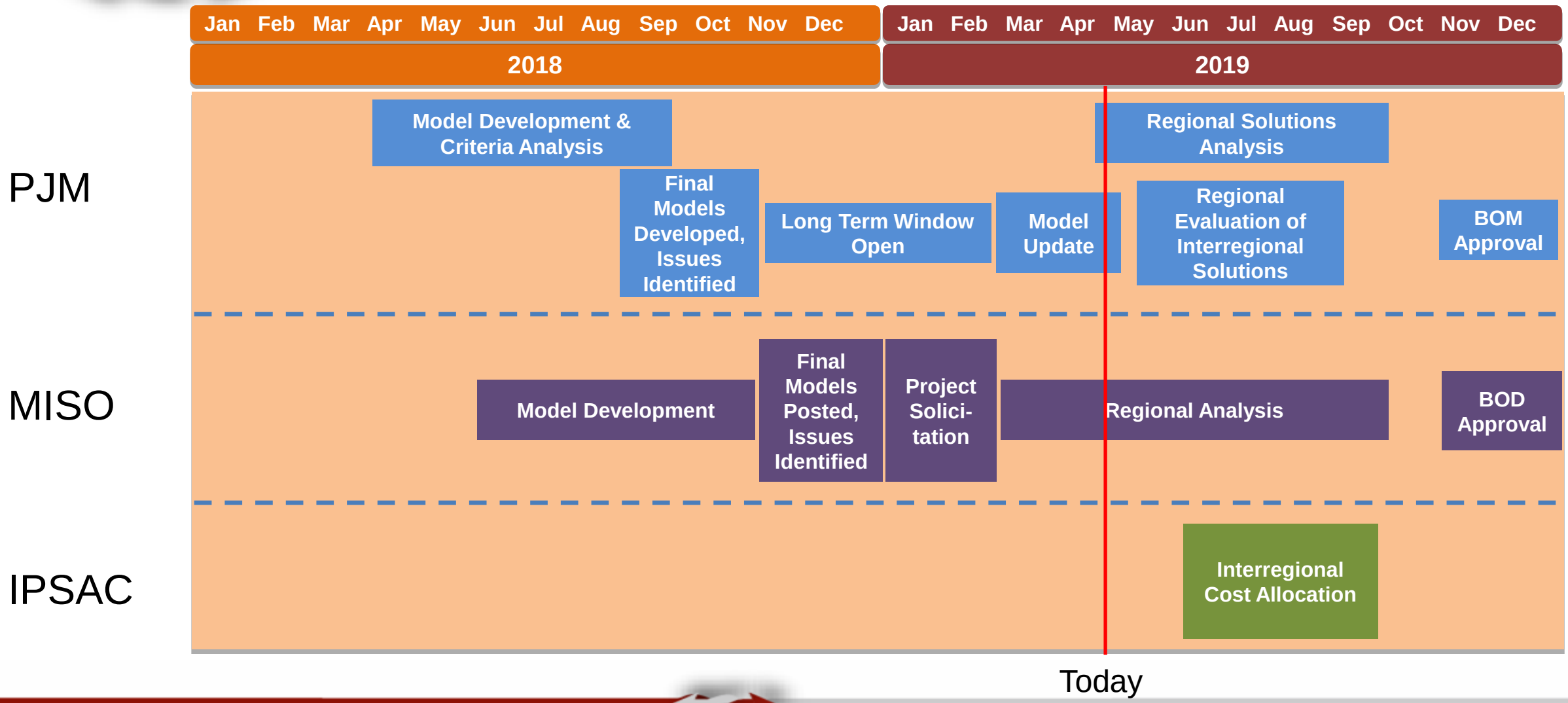
IMEP Study

- PJM and MISO are conducting a two-year Interregional Market Efficiency Project (IMEP) study in 2018/2019

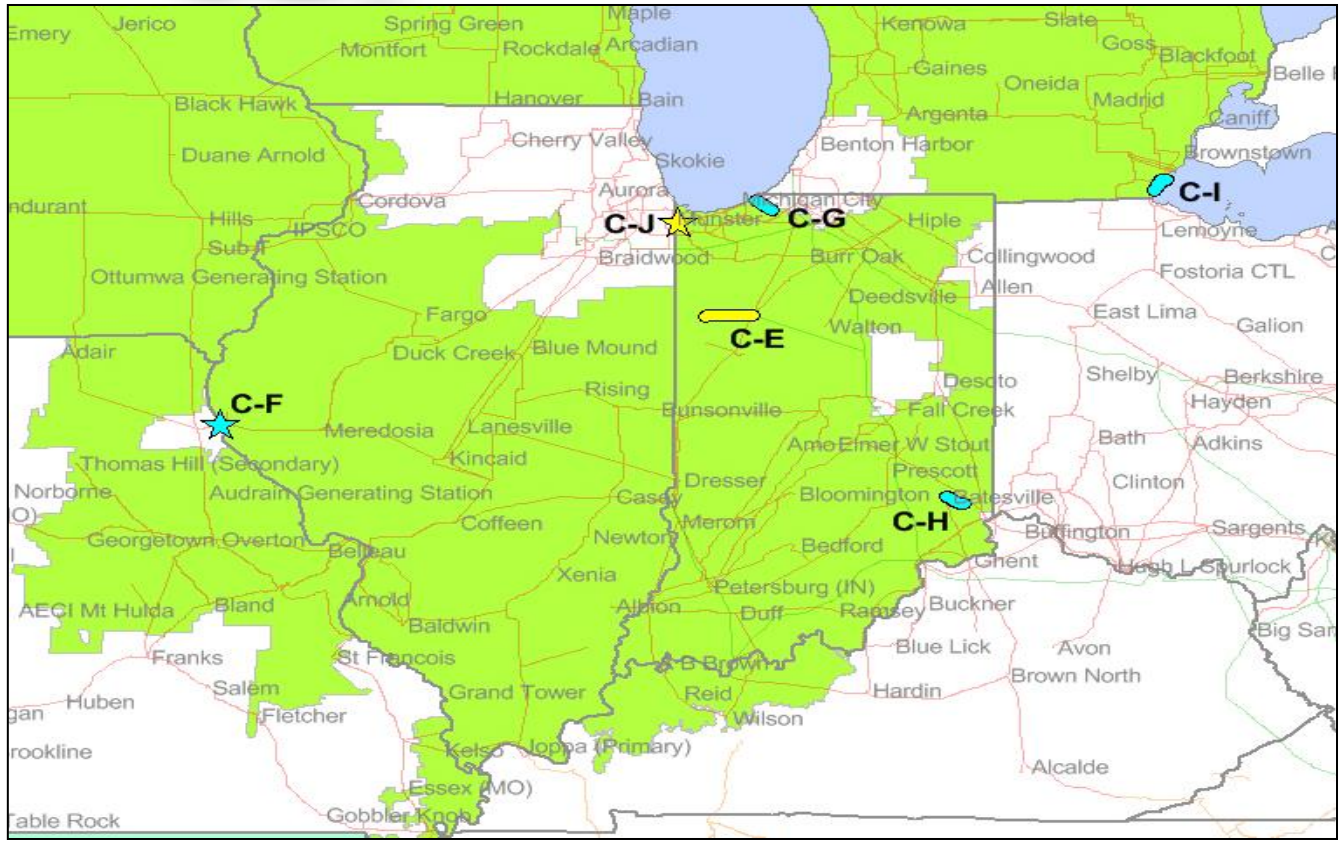
- Issues identification and benefit determination conducted in each regional process consistent with current effective JOA

- Interregional proposals must:
  - Address at least one identified issue in each region (could be same issue if identified by both RTOs)
  - Be submitted to both regional processes

IMEP Estimated Timeline



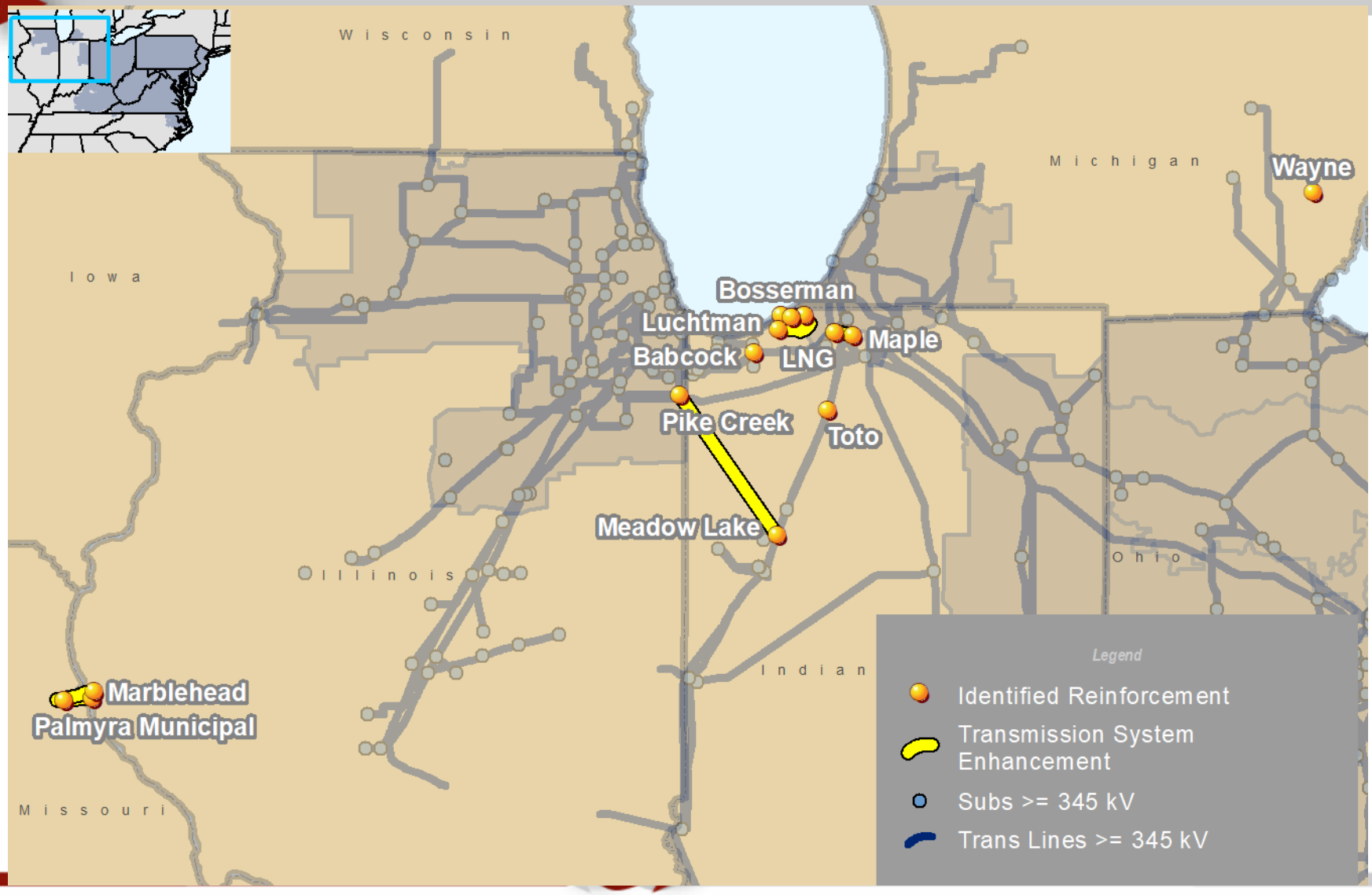
Interregional Congestion Drivers



Proposals were received for three interregional congestion drivers:

- **Flowgate C-F/ME-6: Marble Head N Transformer 161/138kV**
- **Flowgate C-G/ME-7: Bosserman – Trail Creek 138kV**
- **Flowgate C-I&ME-2: Lallendorf – Monroe 345kV,Monroe 1&2 –Wayne 345kV**

IMEP Proposals



Bosserman-Trail Creek 138 kV (M2M)

MISO ID	PJM ID	Proposal Description	Greenfield/ Upgrade	Project Cost (In-Service $M)	In-Service Year
NC-19	398	New Meadow Lake-Pike Creek 345kV line.	Greenfield	$266.44	2023
NC-05	249	A 50 MW 4-hour battery at Trail Creek 138 kV station.	Greenfield	$45.40	2022
NC-50	129	New Kuchar station cutting into Bosserman–Liquid Carbonics 138 kV line. New Kutchar-Luchtman 138kV line.	Greenfield	$27.62	2023
NC-21	436	New Toto 345kV station interconnecting Olive-Reynolds #1, Olive-Reynolds #2, and Schahfer-Burr Oak 345kV lines.	Greenfield	$19.31	2023
NC-12	207*	Loop in University Park-Olive 345 kV line into Babcock 345 kV substation. Reconductor Michigan City-Trail Creek-Bosserman 138 kV and Maple-LNG 138 kV circuits.	Upgrade	$17.50	2023
NC-11	481	Reconductor Michigan City-Trail Creek-Bosserman 138 kV and Maple-LNG 138 kV circuits.	Upgrade	$14.10	2023

*Note: The proposing entity has requested to withdraw this proposal from interregional consideration

Marblehead Transformer (M2M)

MISO ID	PJM ID	Proposal Description	Greenfield/ Upgrade	Project Cost (In-Service $M)	In-Service Date
NC-48	506	Rebuild Palmyra-Marblehead 161 kV and Marblehead-Herleman 138 kV lines. New Maywood-Palmyra 345 kV line.	Greenfield	$36.02	2023
NC-49	322	Rebuild Palmyra-Marblehead 161 kV and Marblehead-Herleman 138 kV lines. New 345 kV ring bus at the Palmyra substation.	Upgrade	$35.95	2023

Monroe 1&2 - Wayne 345 kV (M2M)

MISO ID	PJM ID	Proposal Description	Greenfield /Upgrade	Project Cost (In-Service $M)	In-Service Date
NC-51	782	Upgrade Monroe-Wayne 345 kV line rating by replacing switches at the 345kV Wayne station.	Upgrade	$0.46	2023

2018/19 PJM RTEP Window Posted Congestion Drivers

2018/19 RTEP Market Efficiency Window Eligible Congestion Drivers*				Simulated Annual Congestion ($M)		Hours Binding				
FG#	Constraint	From Area	To Area	2023 Simulated Year	2026 Simulated Year	2023 Simulated Year	2026 Simulated Year	Line is conductor limited?	Comment	Potential Upgrades
ME-1	Hunterstown to Lincoln 115 kV	METED	METED	$20.77	$29.62	1720	1832	Yes	Internal Flowgate	
ME-2	Monroe to Wayne 345 kV	MISOE	MISOE	$1.44	$0.61	45	30	MISO	M2M	
ME-6	Marblehead 161/138 kV	MISOC	MISOC	$1.41	$1.18	195	138	MISO	M2M	A PJM/MISO TMEP has been approved for this facility.
ME-7	Bosserman to Trail Creek 138 kV	AEP	MISOE	$1.47	$1.69	66	89	Yes	M2M	

* Market Efficiency Base Case witout FSA/Susp ISA units

Note: In February 2019, Eligible Congestion Drivers were updated due to FERC Order, issued on February 12, 2019, accepting PJM's filed revisions to exclude from its Market Efficiency assumptions, with exceptions, generation with an executed Facilities Study Agreement (FSA) or an executed Interconnection Service Agreement (ISA) under suspension.

Summary of Received PJM Proposals

- 22 proposals addressing Hunterstown - Lincoln 115 kV
  - 19 Greenfields
    - $5M - $291M
  - 3 Upgrades
    - $7M - $137M
- 9 proposals on interregional congestion drivers
  - 5 Greenfields
    - $19M - $266M
  - 4 Upgrades
    - $0.5M - $36M
- 2 proposals not addressing PJM-identified congestion drivers
- 10 Proposing entities (including 1 joint proposal)
- 6 battery proposals and 1 Smart Wire proposal

PJM Analysis Timeline

• Data Validation	Mar-Apr 2019
• Independent review of cost and ability to build	Apr-Nov 2019
• Finalize Mid-cycle base case	May 2019
• Analysis of proposed solutions*	May-Oct 2019
• Review of Analysis with TEAC	Jun-Nov 2019
• Determination of Final Projects	Dec 2019

* Due to the need to coordinate with MISO, interregional proposals will be analyzed first.

PJM Data Validation

- Kick-off conference calls held with all proposing entities
  - High-level preview of the proposals
  - Verified consistency of modelling data with the project description: IDV, CON/MON files
  - Follow-up subsequent calls will be set as needed
- Preliminary review of received costs
  - Checked component costs against project total cost
  - Checked completeness of cost structure
- If deficiency found, contacted the proposer

PJM Mid-Cycle Update

- Mid-cycle update of major assumptions Apr – May 2019
  - Demand Forecast (completed)
  - Generation Expansion (completed)
  - Fuel/Emission Prices
  - Topology Updates
  - Con/Mon Updates
- Only updating the most significant changes, not a full update
- Base Case including mid-cycle update will be posted by May 2019

MTEP19 MCPS Meeting Schedule

Meeting	Date	Location	Region	Focus Areas	Topics
SPM1	12/7/2018	Eagan, MN	North/Central**	North/Central; MISO-PJM & MISO-SPP	-Scope & schedule -Needs identification -Open solution submission window (window closes 3/1/19)
	12/18/2018	Metairie, LA	South	South & MISO-SPP	
SPM2	5/31/2019	Eagan, MN	North/Central**	North/Central; MISO-PJM & MISO-SPP	-Solution screening results -Identification of project candidates -Solicitation of sensitivities
	5/29/2019	Metairie, LA	South	South & MISO-SPP	
MCPS TSTF*	7/25/2019	Webex	All	All	-Robustness & sensitivity analysis results -Reliability no harm testing results -Further project iterations and sensitivities
SPM3	8/22/2019	Eagan, MN	North/Central**	North/Central; MISO-PJM & MISO-SPP	-Final project results -MISO recommendations
	8/29/2019	Little Rock, AR	South	South & MISO-SPP	

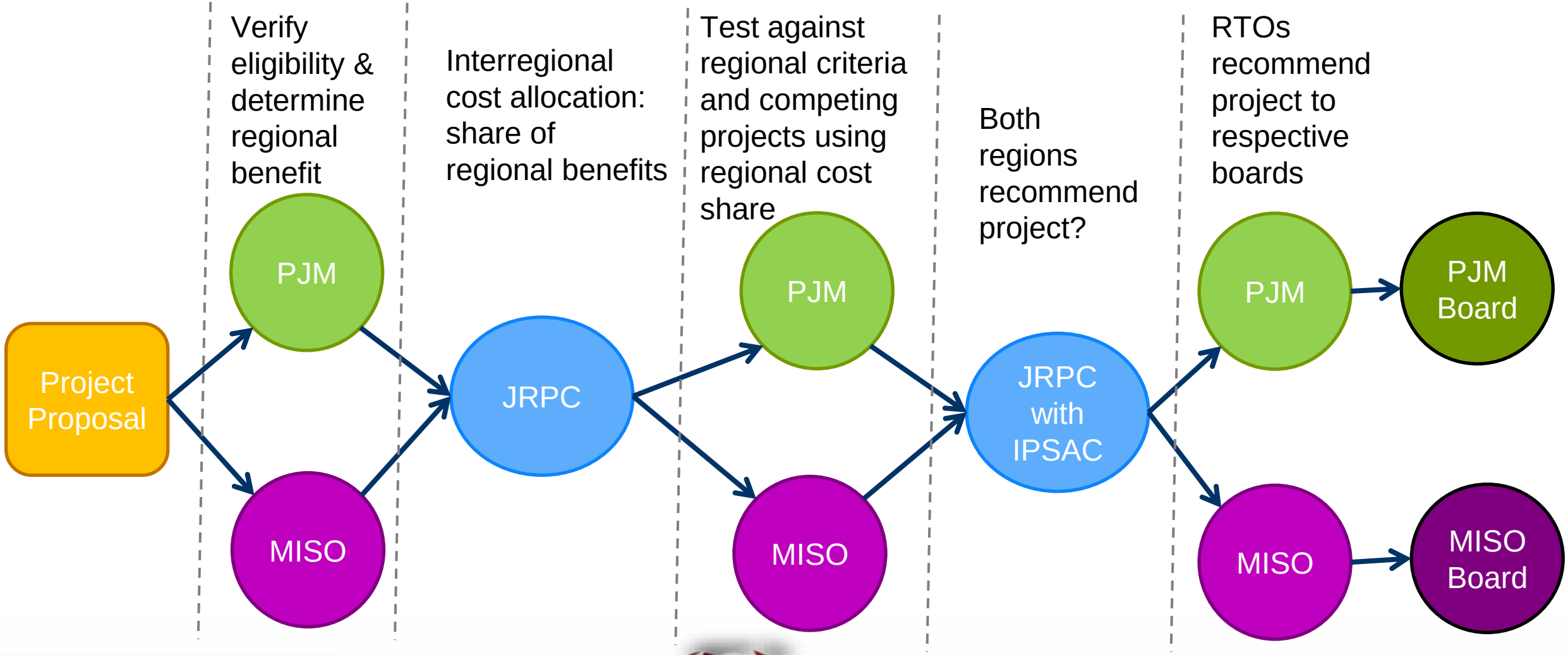
*SPMs and MCPS TSTF are open-public meetings

**North/Central focus area issues will presented as part of West Region SPMs and updates will be provided at East and Central SPMs

Interregional Evaluation Process

- Benefits to each RTO are determined by that RTO using their respective regional process and metrics (tariff)
  - Note inconsistent study years and discount rates
- Costs are allocated interregionally based on pro rata share of benefits, as determined above
- Interregional projects must meet the B/C criteria in each RTO (based on allocated costs), qualify as an MEP under both the MISO and PJM process, and be approved by each RTO's board

IMEP Study Process



Proposed Changes to Article IX of the PJM/MISO JOA

IPSAC Work Schedule

Upcoming

- File JOA Article IX updates at FERC
- Ongoing coordination of IMEP proposal evaluation

Open Discussion

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Revision History

- April 16,2019
  - Original version posted
- April 17, 2019
  - Added map on slide 13
  - Updated slide 14