PJM/MISO Interregional Transfer Capability Study

Executive Summary

- The MISO-PJM ITCS was designed to identify a confluence of transmission issues (reliability, economic, and transfer capability) along the seam, incorporating future generation and load assumptions
- The RTOs presented study results and MISO solicited stakeholder solution ideas in the first half of 2025
- The next step to realizing solution recommendations is developing a benefits evaluation framework, inclusive of multiple benefits, and RTO-RTO cost allocation methodology
- The RTOs are also in the process of developing long-term planning frameworks, including consideration of 7 transmission benefits outlined in FERC Order 1920
- MISO and PJM will continue to advance coordinated planning by developing an interregional transmission benefits evaluation methodology in the first half of 2026

MISO–PJM Interregional Transfer Capability Study (ITCS)

Timeline and milestones

2024		2025	2026	
Align Assumptions	Identify Issues	Solution Window & Evaluations	Benefit Framework & Cost Allocation	Recommend-ations & Tariff Updates
• Harmonize long-term planning study models - futures (MISO LRTP Future 2A, PJM WPS 2032) • Transparent modeling builds trust with state commissions and stakeholders.	• Joint economic, reliability, and transfer analyses reveal hundreds of seam constraints • Issues mapped indicate constrained corridors or areas of stress for targeted solutions	• (MISO window) Stakeholders submitted conceptual projects through IPSAC • Solution ideas included upgrades/enhancements and new corridors • Solutions that resolve a confluence economic, transfer, and reliability issues proceed to benefits evaluations	• States engaged to validate assumptions and priorities • Interregional cost allocation aligned with regional proportional to benefits, transparent, and Order 1920 compliant • Framework documented as repeatable and durable	• Solutions re-evaluated and advanced through the benefit-cost framework • PSCs and stakeholders review recommendation • Tariff updates codify benefit cost thresholds and enable project advancement

Key considerations joint interregional transmission solution recommendations

- Blended Models reflect the future scenario assumptions with evolving transmission, load, and generation expansion of both regions
- Navigate RTO differences in solution solicitation models: procurement model vs. sponsorship mode
- Define benefits evaluation framework inclusive of multiple benefits and associated RTO-RTO cost allocation

FERC Order 1920 7 Benefits

Order 1920A/B Benefits	Description of Benefit[1]
Avoided/deferred piecemeal transmission investment	Comprehensively planned transmission can reduce the need for incremental reliability upgrades and replacement of aging infrastructure
Reduced LOLP or PRM	Transmission capability reduces system outage risk (LOLP) and need for building generation capacity to manage outages (PRM)
Production Cost savings	Transmission capability enhances market efficiency by reducing congestion and using lower cost generation
Reduced transmission energy loss	Transmission capability reduces energy loss from overly congested grid
Reduced congestion due to transmission outages	An efficiently planned grid faces fewer transmission outages and less congestion from lines being down, and reduces production cost
Mitigation of extreme weather events and unexpected event impact	A proactively planned grid reduces risk of unserved load during extreme weather events and unexpected conditions, and reduces production cost
Reduced capacity cost from reduced peak energy losses	Transmission capability reduces energy losses during peak period and reduces new generation capacity investment

[1] Understanding FERC's Order 1920 - Claire Wayner, RMI

LOLP – Loss of Load Probability

PRM – Planning Reserve Margin

Appendix

Summarized Study Results as presented June 25th, 2025

Overview of Solution Ideas from MISO Stakeholder Conceptual Window

Summary reflects conceptual solution submissions and alternatives MISO recommends for further evaluation

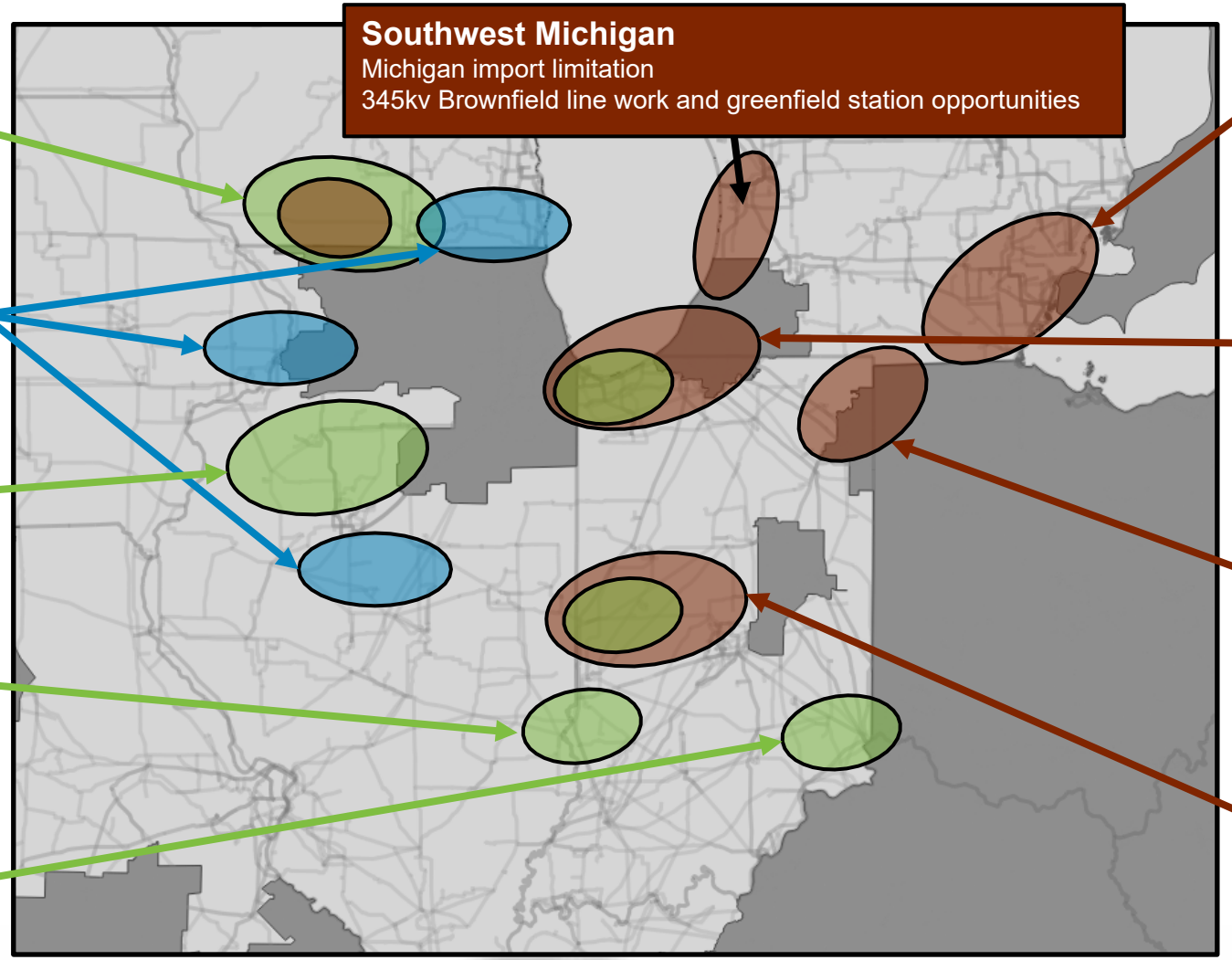
Southwest Wisconsin
Top transfer limitation and reliability driver
345kV greenfield line
138kV rebuild

Illinois & Wisconsin
Approved 345 & 138kV MTEP projects may mitigate top transfer, reliability & economic issues

Central Illinois
Supports reliability and additional transfer capability
Multiple submissions (345kV)

Southern Indiana/Illinois
Top transfer limitation and economic driver
345kV greenfield (~50 mi.)
Monitor: Large load expansion in area

Southeast Indiana/Ohio
Supports transfers in tri-state area
*345kV greenfield line (~40 mi.) and station expansion



Southwest Michigan
Michigan import limitation
345kv Brownfield line work and greenfield station opportunities

Southeast Michigan
Import export limitations
*Sag remediation (MISO/PJM)
345kV Double Circuit Rebuild (4 mi.)

NW Indiana/SE Chicago
Top transfer limitation
Economic & reliability drivers

*138kV rebuild
† 345kV rebuild
*345kV greenfield

***NE Indiana/NW Ohio**
Supports transfer capability in the tri-state area
† 345kV rebuild to double circuit

Central/West Indiana
Top transfer limitation across scenarios
Economic & reliability drivers

*Brownfield submissions; alternatives include greenfield
345kV Substation Expansion
Monitor: Large load expansion in area

ITCS and PJM RTEP/M3 Overlaps (preliminary)

Area	State	RTO	Facility Name	kV	Total Transfers Impacted Red: >10 Yellow: 4-10 Black: 1-3	Transfer Rank	Facility Loading From Reliability Study Red: >150% Yellow: 100% - 150% Black: <100%	Annual Congestion($) Red: > $1M Yellow: $100k - $1M Black: < $100k	Potential Path Forward Under Existing Processes?
FE/ITCT	Pennsylvania (PA) / Michigan (MI)	Tie Line	Lemoyn - Laplaisance 345 kV	345	Yellow	1	Black	Yellow	Yes
CE	Illinois (IL) / Illinois (IL)	PJM	Garden Pl - ESSH71 138 kV	138	Yellow	1	Red	Red	Yes
AEP/DEO&K	Indiana (IN) / Ohio (OH)	PJM	Tanners Creek - Miami Fort 345 kV	345	Yellow	1	Yellow	Red	Yes
AEP/IPL	Indiana (IN) / Indiana (IN)	Tie Line	Fall Creek - Madison County 345 kV	345	Yellow	1	Black	Red	No
AEP/NIPS	Indiana (IN) / Indiana (IN)	Tie Line	Meadow - Reynolds 345 kV	345	Yellow	1	Yellow	Black	Yes
AEP	Indiana (IN) / Indiana (IN)	PJM	Desoto - Fall Creek 345 kV	345	Yellow	1	Black	Black	Yes
CE/AMIL	Illinois (IL) / Illinois (IL)	Tie Line	Austin - Kincaid 345 kV	345	Yellow	1	Yellow	Black	No
AEP/NIPS	Indiana (IN) / Indiana (IN)	Tie Line	Olive - Babcock 345 kV	345	Black	1	Black	Black	Yes
CE	Illinois (IL) / Illinois (IL)	PJM	Goodings - Lockport 345 kV	345	Black	1	Black	Black	No
CE/ALTE	Illinois (IL) / Wisconsin (WI)	Tie Line	Albany (South Desk) - Garden PI 138 kV	138	Red	2	Red	Red	No
AEP/DEI	Indiana (IN) / Indiana (IN)	Tie Line	Eugene - Cayuga Sub 345 kV	345	Yellow	2	Red	Red	Yes
AEP	Michigan (MI) / Michigan (MI)	PJM	Benton Harbor - Segreto 345 kV	345	Yellow	2	Yellow	Red	Yes
AEP/DEI	Indiana (IN) / Indiana (IN)	Tie Line	Dresser - Sullivan 345 kV	345	Yellow	2	Yellow	Black	No
AEP/AMIL	Ohio (OH) / Illinois (IL)	Tie Line	Snyder - Sullivan 345 kV	345	Yellow	3	Yellow	Red	Yes
AEP	Michigan (MI) / Michigan (MI)	PJM	Cook - Segreto 345 kV	345	Yellow	3	Yellow	Black	No
CE/AMIL	Illinois (IL) / Illinois (IL)	Tie Line	Powerton - Towerline 138 kV	138	Black	3	Yellow	Red	Yes
CE	Illinois (IL) / Illinois (IL)	PJM	Lee - Byron 345 kV	345	Black	3	Yellow	Yellow	No
AEP/DEI	Indiana (IN) / Indiana (IN)	Tie Line	Sullivan - Fairbanks 345 kV	345	Black	3	Red	Black	No
AEP	Ohio (OH) / Ohio (OH)	PJM	Hyatt - Malis 345 kV	345	Black	3	Yellow	Black	Yes
CE/ALTW	Illinois (IL) / Iowa (IA)	Tie Line	Quad Cities - Rock Creek (South Desk) 345 kV	345	Black	3	Black	Black	Yes

* Results given ITCS model assumptions reported on slide 5, including PJM 2024 Load Forecast and Workshop Policy Study resource fleet

Analyses

Reliability
Identified thermal overloads resulting from contingency events or the loss system elements

Transfer
Identified transmission facilities which limited the transfer of power between two specified areas as the transfer level is increased

Economic
Simulated full-year marked-based unit commitment and dispatch to identify transmission facilities or areas with significant congestion cost

Extreme Cold Weather Scenarios (Reliability)
Analyze the capability of proposed solutions to mitigate system constraints under increased system stress

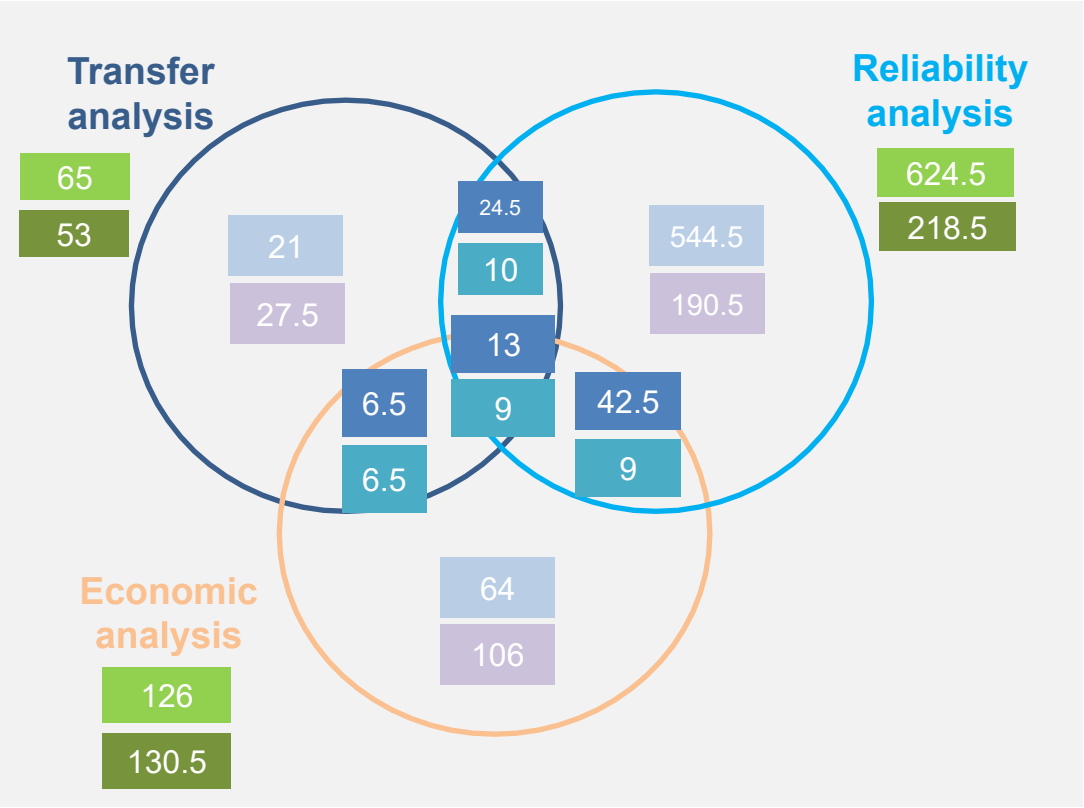
MISO-PJM Study-Developed Transfers analyzed:

Additional Transfers:

General Transfers Between MISO & PJM
MISO Classic <-> PJM

NERC ITCS Transfers Between MISO & PJM
E12: MISO West <-> PJM West
E16: MISO Central <-> PJM West
E22: MISO East <-> PJM West

Summary count of issues by analysis area and footprint



PJM
MISO

Reflects **total** issues by RTO under Reliability, Transfer, and Economic categories

PJM
MISO

Reflects **unique** issues by RTO under only Reliability, Transfer, and Economic categories

PJM
MISO

Reflects **unique** issues by RTO under overlapping Reliability, Transfer, and Economic categories

Notes:

Individual RTO footprint results from the joint study reflect analysis on the blended model

Issue counts represent RTO lines and tie-lines; tie lines are counted with 0.5 weight to avoid double counting at regional level.

Summary of Results and Observations

- Top transfer limits:
  - MISO and PJM results
  - Facilities identified in each RTO as well as tie-lines
  - Voltages
  - Overlaps
  - Details in appendix (Slides 34-36)

Overlapping Reliability, Transfer, and Economic Issues

(Center of the Venn Diagram on Slide 7)

Overlapping Issues Identified in All Analyses, PJM (Top 10 Transfers, Reliability, Economic)

Area	State	RTO	Facility Name	kV	Total Transfers Impacted Red: >10 Yellow: 4-10 Black: 1-3	Facility Loading From Reliability Study Red: >150% Yellow: 100% - 150% Black: <100%	Annual Congestion($) Red: > $1M Yellow: $100k - $1M Black: < $100k
AEP	Ohio (OH)	PJM	Marysville765 kV Reactor (to Sorenson)	765	Yellow	Yellow	Red
AEP	Ohio (OH)	PJM	Marysville765 kV Reactor (To Maliszewski)	765	Yellow	Yellow	Red
AEP	Ohio (OH) / Ohio (OH)	PJM	East Lima - Fostoria Central 345 kV	345	Black	Yellow	Black
AEP	Michigan (MI) / Indiana (IN)	PJM	Benton Harbor - Segreto 345 kV	345	Yellow	Yellow	Red
AEP/AMIL	Indiana (IN) / Illinois (IL)	Tie Line	Eugene - Bunsonville 345 kV Bus 1	345	Yellow	Yellow	Yellow
AEP/AMIL	Ohio (OH) / Illinois (IL)	Tie Line	Snyder - Sullivan 345 kV	345	Red	Yellow	Red
AEP/DEI	Indiana (IN) / Indiana (IN)	Tie Line	Eugene - Cayuga Sub 345 kV	345	Yellow	Red	Red
AEP/DEO&K	Indiana (IN) / Ohio (OH)	PJM	Tanners Creek - Miami Fort 345 kV	345	Red	Yellow	Red
AEP/NIPS	Ohio (OH) / Indiana (IN)	Tie Line	Meadow - Reynolds 345 kV	345	Yellow	Yellow	Black
CE/ALTW	Illinois (IL) / Iowa (IA)	Tie Line	Albany (South Desk) - Garden Pl 138 kV	138	Yellow	Red	Red
CE/AMIL	Illinois (IL) / Illinois (IL)	Tie Line	Austin - Kincaid 345 kV	345	Yellow	Yellow	Black
CE/AMIL	Illinois (IL) / Illinois (IL)	Tie Line	Powerton - Towerline 138 kV	138	Yellow	Yellow	Red
CE	Illinois (IL) / Illinois (IL)	PJM	Lee - Byron 345 kV	345	Yellow	Yellow	Yellow
CE	Illinois (IL) / Illinois (IL)	PJM	Enbridge - DeKalb tap (R) - Waterman 138 kV	138	Yellow	Yellow	Red
CE	Illinois (IL) / Illinois (IL)	PJM	Garden Pl - JESSH71 138 kV	138	Yellow	Red	Red
CE	Illinois (IL) / Illinois (IL)	PJM	Haumesser - Dekalb 138 kV	138	Yellow	Yellow	Red
NIPS/CE	Illinois (IL) / Indiana (IN)	Tie Line	Crete - St. John 345 kV tie line	345	Yellow	Yellow	Red

Overlapping Issues Identified In All Analyses, MISO

Area	State	RTO	Facility Name	kV	Total Transfers Impacted Red: >10 Yellow: 4-10 Black: 1-3	Facility Loading From Reliability Study Red: >150% Yellow: 100% - 150% Black: <100%	Congestion Measure ($) Red: > $200k Yellow: $50k - $200k Black: < $50K
DEI	Indiana (IN) / Indiana (IN)	MISO	Cayuga Sub - Cayuga 345 kV	345	■	■	■
CE/AMIL	Illinois (IL) / Illinois (IL)	Tie Line	Austin - Kincaid 345 kV	345	■	■	■
ALTW/MEC	Iowa (IA) / Iowa (IA)	Tie Line	Morgan Valley - Tiffin 345 kV	345	■	■	■
DEI/IPL	Indiana (IN) / Indiana (IN)	MISO	Whitestown - Guion 345 kV	345	■	■	■
ALTE	Wisconsin (WI) / Wisconsin (WI)	MISO	Albany - Bass Creek 138 kV	138	■	■	■
ALTE	Wisconsin (WI) / Wisconsin (WI)	MISO	Bristol - Elkhorn 138 kV	138	■	■	■
AEP/DEI	Indiana (IN) / Indiana (IN)	Tie Line	Eugene - Cayuga Sub 345 kV	345	■	■	■
ALTE	Wisconsin (WI) / Wisconsin (WI)	MISO	North Monroe - Albany 138 kV	138	■	■	■
AEP/AMIL	Ohio (OH) / Illinois (IL)	Tie Line	Snyder - Sullivan 345 kV	345	■	■	■
DEI	Indiana (IN) / Indiana (IN)	MISO	Cayuga - Nucor Steel 345 kV	345	■	■	■
AMIL	Illinois (IL) / Illinois (IL)	MISO	Casey - Snyder 345 kV	345	■	■	■