MISO PJM IPSAC

December 2, 2016

Revised December 22, 2016

Agenda

- TMEP Final JOA Language
- Recommended TMEPs
- Order No. 1000 Compliance Filing
- Generation Deactivation JOA Language
- PJM Proposal Window Update
- MISO Regional Issues Update
- IPSAC Work Schedule

TMEP JOA Language

TMEP JOA Language

Minor updates have been included in language:

- Point to Tariff language for exact quantification of congestion
- Language supplied by PJM TOs for the cost allocation section to refer back to the planning methods
- Two sets of redlines are included in meeting materials
  - Redline to the October 28th IPSAC version
  - Filing version redlines to JOA effective August 22, 2016

Status

- TMEP study process, benefits, and interregional cost allocation defined
  - Corresponding JOA edits ready to file before year end
- Regional cost allocation proposals are being finalized for filing when ready
  - In MISO:
    - MISO shared its regional cost allocation proposal at the November 17 RECBWG meeting
    - MISO working with TOs to translate proposal into Tariff changes
  - In PJM: PJM TOAAC
    - Proposal is near final

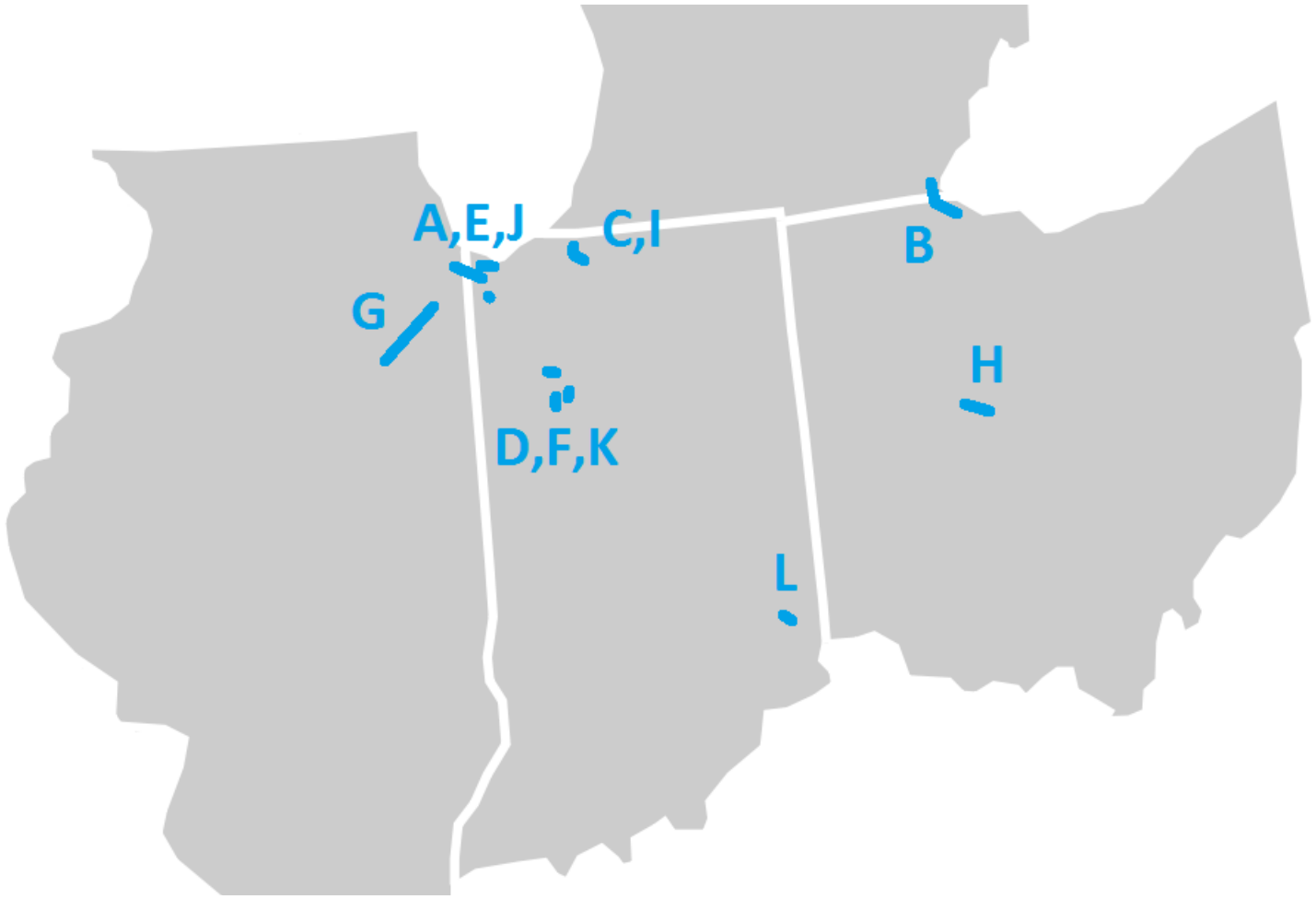
Next Steps

- RTO legal staff will file JOA revisions before year end
  - Preference is to include TO regional filings as well
  - Typical response time from FERC is 60 days unless quicker response is requested
  - Pending FERC response, submit projects to boards in February or at first opportunity

Targeted Market Efficiency Project Study

Potential TMEP Locations

Letter	Flowgate
A	Burnham – Muster 345 kV
B	Bayshore – Monroe 345 kV
C	Michigan City – Bosserman 138 kV
D	Reynolds – Magnetation 138 kV
E	Roxana – Praxair 138 kV
F	Klondike – Purdue 138 kV
G	Braidwood – East Frankfort 345 kV
H	Marysville – Tangy 345 kV
I	Michigan City – Trail Creek 138 kV
J	Munster 345/138 kV
K	Tippecanoe – Lafayette South 138 kV
L	Batesville – Hubble 138 kV



Marysville – Tangy 345kV - Update

- NERC FG ID: 2395
- Ownership: AEP – ATSI
- Outages Impacting: Marysville – Haytop (~5%)
- Planned Upgrades Impacting: s1006 to be completed by end of 2016, increases emergency rating to 1301
- Current Rating: 897/897
- Upgrade Type: Sag mitigation
- Upgraded Rating: 897/1301

Not eligible as TMEP, will continue to monitor for future congestion

TMEP Analysis Summary

- 50 M2M flowgates investigated
- 13 potential upgrades evaluated
- 5 projects recommended
  - $ 57.8 Million in historical congestion (2014 + 2015)
  - $ 99.6 Million TMEP Benefit
  - $ 17.25 Million total Cost
  - 5.8 average B/C ratio

Summary of Recommended TMEPs

Facility	Transmission Owner	TMEP Cost (Million $)	TMEP Benefit (Million $)	Benefit Allocation (%PJM/%MISO)
Burnham - Munster 345kV	CE - NIPS	7	32	88/12
Bayshore - Monroe 345kV	ATSI - ITC	1	17	89/11
Michigan City – Bosserman 138kV	NIPS - AEP	4.6	29.6	90/10
Reynolds-Magnetation 138kV	NIPS	0.15	14.5	41/59
Roxana - Praxair 138kV	NIPS	4.5	6.5	24/76

Generator Deactivation Coordination

Generator Retirement Coordination

- MISO received additional stakeholder feedback following the Oct 28th IPSAC meeting related to the study process, responsibilities for identifying needed reinforcements and review of projects by the JRPC
- Latest proposed JOA language
  - Clarifies the responsibilities of each party in conducting their respective studies and the coordinated sharing of information
  - Retains the treatment of reinforcements required for generation deactivation as regional upgrades and consideration of regional upgrades by JRPC in development of the Coordinated System Plan

Generator Retirement Coordination

- Revised JOA language also includes:
  - Clear distinction between the RTO receiving the deactivation request (Noticed Party) and the neighboring RTO (Other Party)
  - Consolidation of language related to coordination of generator deactivations under Section 9.3.6
  - Timeline for JRPC to act on the results of the generator deactivation study
  - Explanation of process for timely approval of projects by the Boards of each Party

FERC EL13-88 P186 Generator Retirement Coordination

June – July 2016

- Shared work plan with stakeholders
- 1st informational status filing made on June 20
- MISO-PJM to develop proposal on retirement studies coordination

August 2016

- Reviewed Coordination procedure with MISO Stakeholders at August 16 PSC and requested feedback
- 2nd informational status filing made on Aug 19
- Reviewed proposed coordination procedure with stakeholders at Aug 23 JCM meeting

Sept – Oct 2016

- MISO – PJM to finalize coordination procedure and developed draft JOA language
- Share draft JOA language with stakeholders at Oct 18 PSC and Oct 28 IPSAC meetings and seek feedback
- 3rd informational status filing due Oct 18

November 2016

- Share JOA language with stakeholders at Nov 15 JCM meeting

December 2016

- File proposed revisions to JOA with FERC by Dec 15

Order No. 1000 Compliance Filing

Order 1000

- April 5, 2016 FERC conditionally accepted Second Compliance Filings
- June 20, 2016 PJM & MISO filed Third Compliance Filings
- October 28, 2016 FERC conditionally accepted the Third Compliance Filings subject to additional filings within 30 days (November 28)
  - Rehearing requests denied
    - MISO TOs: Approved projects should not be displaced
    - PJM: Interregional Public Policy Projects should not displace regional economic and reliability projects
    - MISO TOs and PJM TOs: Cross-Border Baseline Reliability Projects should not be added back to the JOA in addition to Interregional Reliability Projects

Order 1000 (Cont.)

- Fourth Compliance Filing submitted November 22, 2016
  - RTOs must submit revisions to the JOA to make clear when CBBRP and IRP cost allocation methods will apply
  - RTOs must revise JOA sections 9.4.3.1.2-4 to state that:
    - Reliability projects in the MISO regional process include Multi-Value Projects (MVPs) that meet Criterion 3 of MISO's Tariff
    - Economic projects in MISO's regional process include MVPs that meet Criterion 2 or 3 of MISO's Tariff
    - Public policy projects in MISO's regional process include MVPs that meet Criterion 1 of MISO's Tariff

PJM Window Update

PJM Window

- Problem Statement (issues list) posted
  - http://www.pjm.com/planning/rtep-development/expansion-plan-process/ferc-order-1000/rtep-proposal-windows.aspx

- Final regional market efficiency case available:
  - http://pjm.com/planning/rtep-development/market-efficiency.aspx

Recommended Congestion Drivers

Facilities Recommended for Proposal			*2021 Input Assumptions with 2021 Topology*		*2024 Input Assumptions with 2021 Topology*		
Facility Name	AREA	TYPE	Frequency (Hours)	Market Congestion ($ Millions)	Frequency (Hours)	Market Congestion ($ Millions)	Notes/Potential Upgrade
Conastone to Graceton 230 kV	BGE	LINE	972	$58.3	1,044	$72.1	
Graceton to Bagley 230 kV	BGE	LINE	1,265	$33.0	1,518	$49.6	
Susqeuhanna to Harwood 230 kV	PPL	LINE	166	$4.0	201	$5.6	
Bosserman to Olive 138 kV	AEP	LINE	17	$0.4	71	$2.0	Potential Interregional Constraint

**Criteria (PJM Region - Lower voltage>$1 million for 2021 and 2024, Regional >$10 million for 2021 and 2024, and Frequency > 25 hours*
Interregional - PJM Congestion > $0 for 2021 and 2024, and PJM Frequency > 0 hours)
(updated on 11/09/2016)

MISO Issues Review

Estimated Time-line

MTEP17 models were finalized on Nov 30th 2016

Regional Models

- MTEP17 3 futures and 3 years (5, 10, and 15 year out) models will be used as the starting points

- Three futures were developed through the MTEP17 regional process:
  - Existing Fleet
  - Policy Regulations
  - Accelerated Alternative Technologies

- Model Update:
  - The latest MISO-PJM Targeted Market Efficiency Projects will be included in the base case

Issue Identification

- Transmission Need Identification Process:
  - Historic Congestion Analysis:
    - MISO - PJM Market to Market (M2M) Congestions
    - MISO Regional historical Day Ahead and Real-time Congestions along the MISO-PJM seam (Local Resource Zone 4, 6 and 7)
  - Identify and Validate Top Interregional Congested Flowgates
    - Run PROMOD simulations for out-year cases from all 3 futures
    - Identify, validate and select Top Congested Flowgates for MISO-PJM CSP study

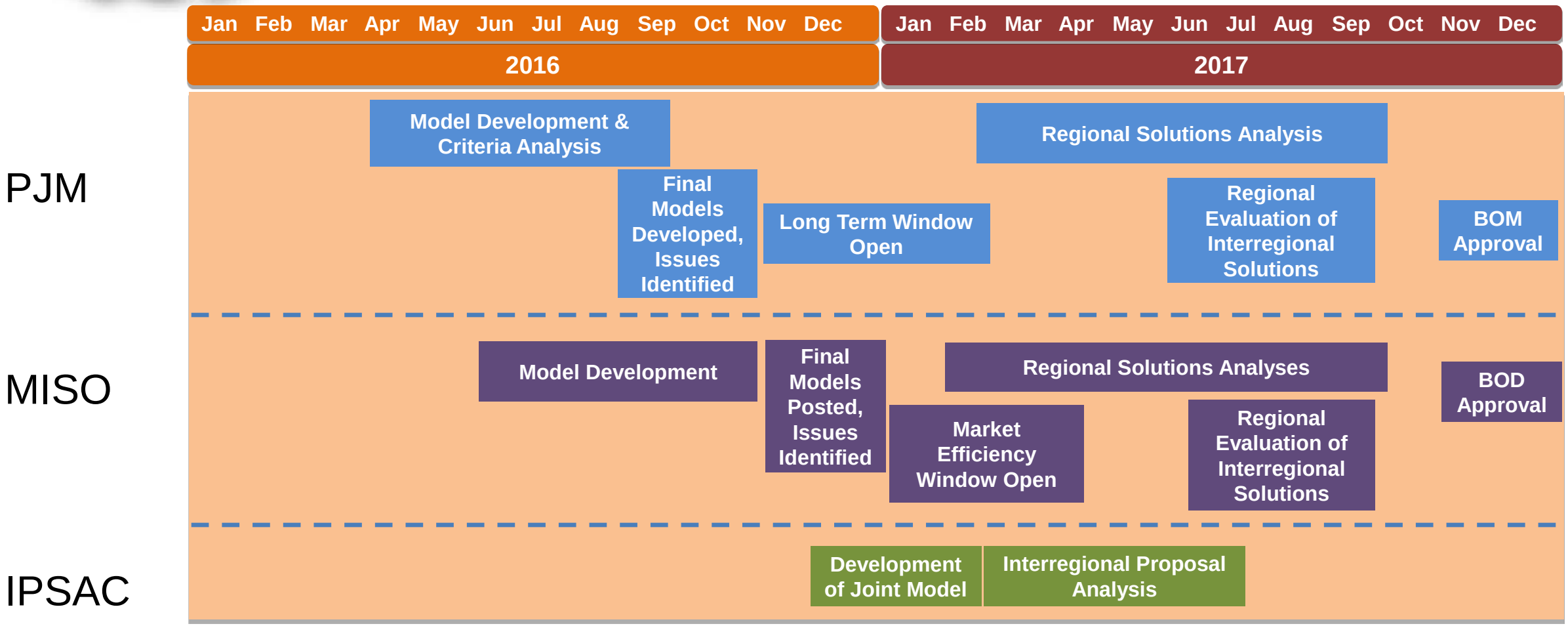
IPSAC Work Schedule

IPSAC Schedule

Q4 2016

- File TMEP language in JOA
- Finalize TMEP analysis and recommend projects as appropriate
- Identify potential longer-term cross-border regional issues from regional processes; accept interregional project proposals from stakeholders in the regional processes
- Begin development of joint PROMOD model for interregional cost allocation of proposed Interregional Market Efficiency Projects

Interregional Market Efficiency Project Timeline



*Interregional proposals must be proposed in each regional window (January & February overlap)

Joint Model Development

FERC's April 21 Ruling on EL13-88 required the RTOs to make substantive changes regarding the MEP evaluation process

- To the JOA:
  - Remove B/C ratio criteria from the interregional analysis
  - Revise benefit calculation to use regional evaluation process (no evaluation on joint model)
- To MISO's Tariff:
  - Removal of 345kV threshold

- PJM and MISO filed in accordance with FERC's directives on June 20
- FERC has not ruled on the RTO's compliance filings
- RTO's must proceed using **currently effective** JOA and Tariff language

Key Dates

- November 1, 2016 – PJM long-term solution proposal window opens
- February 28, 2017 – PJM long-term solution proposal window closes

- December 2016 – IPSAC & notice of December MISO issues review
- January – March 2017 – MISO solution proposals accepted

- Will schedule next IPSAC meeting for end of January, 2017

Appendix 1
TMEPs Unchanged From October IPSAC

Burnham – Munster 345kV

- NERC FG ID: 2286/2205
- Ownership: CE-NIPS
- Outages Impacting: None known
- Planned Upgrades Impacting: None known
- Current Rating: 1195/1195
- Upgrade Type: Upgrade to existing facility
- Upgrade Cost: $7M
- Upgraded Rating: 1201/1441

Additional limitation identified on COMED side – Cost updated (+$500k) to include projects on both sides

Burnham – Munster 345kV

	PJM		MISO	
	2014	2015	2014	2015
Congestion	$ 1,521,147	$ 11,540,968	$ 381,035	$ 2,559,815
M2M Payment	$ 398,485	$ 684,447	$ (398,485)	$ (684,447)
Benefit Split	$ 1,919,632	$ 12,225,415	$ -	$ 1,875,368
Benefit Share	88%		12%	

Burnham – Munster 345kV Analysis

	Base Case	Project Case
PROMOD Congestion	$ 3.3 M	$ 0

- Congestion moved to downstream flowgates: None
- Analysis Results: Project is effective at relieving identified congestion
- TMEP Cost: $7M
- TMEP Benefit: $32 M
- Conclusion: Project Recommended

*Note: TMEP Benefit is the average historical congestion * 4 years. See Appendix B for calculation example

Bayshore – Monroe 345kV

- NERC FG ID: 2647
- Ownership: ATSI – ITC
- Outages Impacting: None known
- Planned Upgrades Impacting: None known
- Current Rating: 1262/1494
- Upgrade Type: Upgrade to existing facility
- Upgrade Cost: $1M
- Upgraded Rating: 1486/1702

Bayshore – Monroe 345kV

	PJM		MISO	
	2014	2015	2014	2015
Congestion	$ 320,517	$ 7,111,623	$ -	$ 2,059,227
M2M Payment	$ 819,770	$ 886,991	$ (819,770)	$ (886,991)
Benefit Split	$ 1,140,287	$ 7,998,614	$ -	$ 1,172,236
Benefit Share	89%		11%	

Bayshore – Monroe 345kV Analysis

	Base Case	Project Case
PROMOD Congestion	$10.4 M	$4.2 M

- Congestion moved to downstream flowgates: None
- Analysis Results: Project relives over 60% of congestion costs
- TMEP Cost: $1M
- TMEP Benefit: $18.9 M * 60% = $11.3 M
- Conclusion: Project Recommended

Base case economic model was modified to bring congestion closer to historical value

Michigan City – Bosserman 138kV

- NERC FG ID: 2427/2540
- Ownership: NIPS – AEP
- Outages Impacting: New Carlisle (~20%)
- Planned Upgrades Impacting: None known
- Current Rating: 156/156
- Upgrade Type: Upgrade to existing facility
- Upgrade Cost: $4.6 M
- Upgraded Rating: 156/221

Michigan City – Bosserman 138kV

	PJM		MISO	
	2014	2015	2014	2015
Congestion	$ 9,885,624	$ 4,424,258	$ 2,073,320	$ 2,106,006
M2M Payment	$ 315,189	$ 1,965,922	$ (315,189)	$ (1,965,922)
Benefit Split	$ 10,200,813	$ 6,390,180	$ 1,758,131	$ 140,084
Benefit Share	90%		10%	

Michigan City – Bosserman 138kV Analysis

	Base Case	Project Case
PROMOD Congestion	$ 9.2 M	$ 0

- Congestion moved to downstream flowagates: Yes, ~$100k total increase on Michigan City – Maple and Michigan City – Trail Creek
- Analysis Results: Project is effective at relieving identified congestion, only ~1% increase on nearby flowgates
- TMEP Cost: $4.6 M
- TMEP Benefit: $37.0 M (-20% for outage) = $29.6 M
- Conclusion: Project Recommended

Reynolds – Magnetation 138kV

- NERC FG ID: 20729/2548/2685
- Ownership: NIPS
- Outages Impacting: None known
- Planned Upgrades Impacting: None known
- Current Rating: 287/287
- Upgrade Type: Upgrade to existing facility
- Upgrade Cost: 150k
- Upgraded Rating: 287/366

Reynolds – Magnetation 138kV

	PJM		MISO	
	2014	2015	2014	2015
Congestion	$ 17,436	$ 1,715,417	$ 216,330	$ 5,302,529
M2M Payment	$ 185,737	$ 1,079,560	$ (185,737)	$ (1,079,560)
Benefit Split	$ 203,173	$ 2,794,977	$ 30,593	$ 4,222,969
Benefit Share	41%		59%	

Reynolds – Magnetation 138kV Analysis

	Base Case	Project Case
PROMOD Congestion	$ 2.43 M	$ 0

- Congestion moved to downstream flowgates: None
- Analysis Results: Project is effective at relieving identified congestion
- TMEP Cost: 150k
- TMEP Benefit: $14.5 M
- Conclusion: Project Recommended

Roxana – Praxair 138kV

- NERC FG ID: 2577/2531
- Ownership: NIPS
- Outages Impacting: None known
- Planned Upgrades Impacting: None known
- Current Rating: 158/158
- Proposed Upgrade:
  - Operate Dune Acres 345/138 normally closed (replace overdutied breakers)
  - Upgrade to existing facility (4.5M) 525 MVA rate B

Roxana – Praxair 138kV

	PJM		MISO	
	2014	2015	2014	2015
Congestion	$ 128,304	$ -	$ 656,246	$ 5,784,337
M2M Payment	$ 541,002	$ 882,612	$ (541,002)	$ (882,612)
Benefit Split	$ 669,306	$ 882,612	$ 115,244	$ 4,901,725
Benefit Share	24%		76%	

Roxana – Praxair 138kV Analysis

	Base Case	Dune Acres XFMR Closed	Dune Acres XFMR Closed + Upgrade to Existing Facility
PROMOD Congestion	$ 1.8 M	$ 0.9 M	$ 0

- Congestion moved to downstream flowgates: None
- Analysis Results: Closing Dune Acres transformer resolves ~50% of congestion, TMEP upgrade relieves the remaining congestion
- TMEP Cost: $4.5 M
- TMEP Benefit: $13.1 M * 50% = $6.5 M
- Conclusion: MISO/NIPSCO upgrades to operate the Dune Acres transformer normally closed are planned; all station upgrades in service by 2022. TMEP Recommended based on benefit of relieving the remaining ~50% of congestion ($6.5 M benefit)

Appendix 2
Example TMEP Benefit Calculation

Example Benefit Calculation

	2014	2015
PJM Congestion	$ 1,000,000	$ 1,500,000
MISO Congestion	$ 1,000,000	$ 1,250,000
PJM M2M Payment	$ 150,000	$ 200,000
MISO M2M Payment	$ (150,000)	$ (200,000)
Total Congestion	$ 2,000,000	$ 2,750,000

Two years of historical values

Note M2M payments are equal and opposite

Sum of both RTOs

*Note: In this example M2M payments are made by PJM to MISO

*All values and project details are for illustrative purposes only

Example Benefit Calculation (cont.)

- Proposed upgrade is replacement of breakers and associated CTs and relays
  - Total cost $2.5 Million
- Analysis shows project eliminates congestion issue

Annual benefit is average of Total Unhedged Congestion:

	2014	2015
Total Unhedged Congestion	$ 2,000,000	$ 2,750,000

→ $ 2,375,000

Four years of benefits exceeds the installed cost

4 years * $ 2.375 Million = $ 9.5 Million $ 9.5 Million **>** $ 2.5 Million

The project passes the benefit threshold

*All values and project details are for illustrative purposes only

Inter-RTO Cost Allocation

PJM Total Benefit:	$	2,500,000
MISO Total Benefit:	$	2,250,000
PJM Total M2M Payments	$	350,000
MISO Total M2M Payments	$	(350,000)
PJM Adjusted Benefit:	$	2,850,000
MISO Adjusted Benefit:	$	1,900,000
PJM pays:		60%
MISO pays:		40%

Sum of congestion for two historical years

Sum for two historical years

Total Benefit plus M2M Payments

Share of Adjusted Benefits

*All values and project details are for illustrative purposes only