



MISO PJM IPSAC

January 20, 2017

- TMEP JOA Filing Update
- FERC EL13-88 Filing Update
- FERC Order No. 1000 Compliance Filing Update
- PJM Proposal Window Update
- MISO Regional Issues Update
- Joint Model Development
- IPSAC Work Schedule

TMEP JOA Filing Update

- Targeted Market Efficiency Projects (TMEP) JOA edits filed December 30, 2016
 - Defines study process, benefits, and interregional cost allocation
 - Regional Tariff filings within 120 days (April 29, 2017)
 - FERC Dockets ER17-718 (PJM), 721 (MISO and MISO TOs), 729 (PJM TOs)
- Regional cost allocation proposals are being finalized for filing when ready
 - In MISO: RECBWG
 - MISO had continued discussion of its regional cost allocation proposal at the January 19 RECBWG meeting
 - In PJM: PJM TOAAC
 - Proposal is near final

- RTOs targeting Q1 2017 regional filings
 - Defining the new TMEP project type
 - Regional cost allocation
- Typical response time from FERC is 60 days unless quicker response is requested
- Pending FERC response, submit projects to Boards at first opportunity
- Five RTO recommended TMEPs (see Appendix)
- No current plans for another TMEP analysis this year, until language is approved

FERC EL13-88 Filing Update

- All directives have been completed

FERC Directed Stakeholder Involvement

Deliverable		Due Dates (2016)				Stakeholder Forum
		20-Jun	19-Aug	18-Oct	15-Dec	
Directive P186	Include Generator Retirement Coordination Procedures in JOA	✓	✓	✓	✓	IPSAC, PSC, PC
Informational P186	Status Reports on Gen Retirement Coordination Language					
Informational P92	Joint Model in Regional Processes			✓		IPSAC, PSC, PC

No FERC Directed Stakeholder Involvement

Deliverable		Due Dates (2016)		Stakeholder Forum (Informational Updates)
		20-Jun	19-Aug	
Directive P57	Formalize Steps and Deadlines in CSP Study	✓		IPSAC, PAC, TEAC
Directive P131	Lower Interregional MEP Thresholds	✓		IPSAC, RECB, TEAC
Directive P132	Remove Interregional B/C Ratio	✓		IPSAC, RECB, TEAC
Directive P133	Revise Benefit Calculation of Interregional MEPs	✓		IPSAC, RECB, TEAC
Directive P185	Include BPM GI Coordination Procedures in JOA	✓		IPSAC, PSC, TEAC
Informational P58	Aligning Interregional, MTEP, and RTEP		✓	IPSAC

- FERC issued Order on Rehearing and Compliance on January 19, 2017
- RTOs are continuing to review the Order, already posted with the meeting materials
- RTOs will summarize and post the directives and important issues from the Order

FERC Order No. 1000 Compliance Filing Update

- Fourth Compliance Filing submitted November 22, 2016
- FERC accepted revisions January 9, 2017
 - No additional compliance filing
 - Concludes Dockets ER13-1943 and ER13-1944

PJM Proposal Window Update

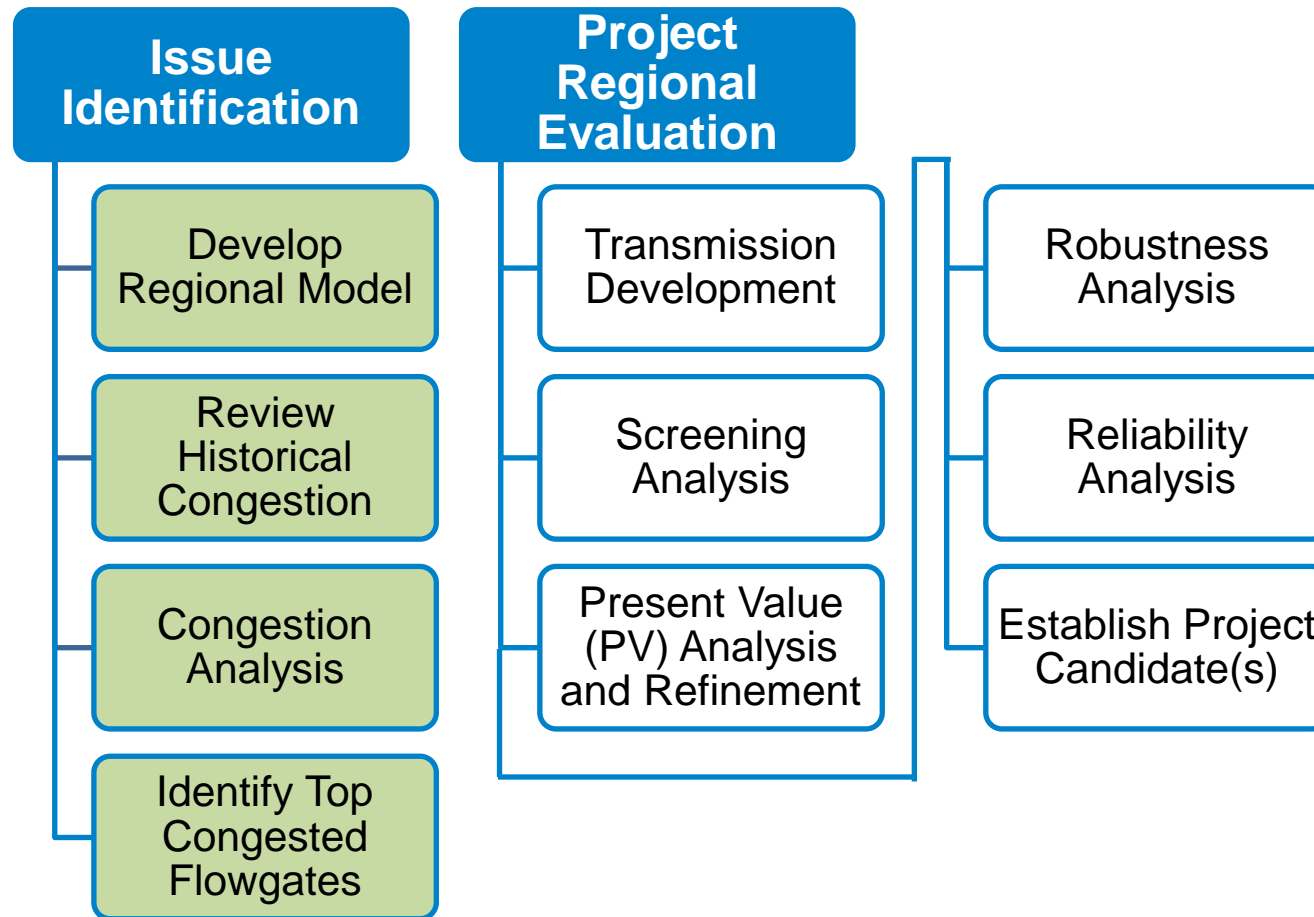
- Problem Statement (issues list) posted
 - <http://www.pjm.com/planning/rtep-development/expansion-plan-process/ferc-order-1000/rtep-proposal-windows.aspx>
- Final regional market efficiency case available (NDA, Ventyx license required):
 - <http://pjm.com/planning/rtep-development/market-efficiency.aspx>
- Window open until February 28, 2017
- If submitting an interregional proposal, must be clearly designate it as such
 - See proposal template for details

PJM Recommended Congestion Drivers

<i>Facilities Recommended for Proposal</i>			<i>2021 Input Assumptions with 2021 Topology</i>		<i>2024 Input Assumptions with 2021 Topology</i>		
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	
Susquehanna 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)*

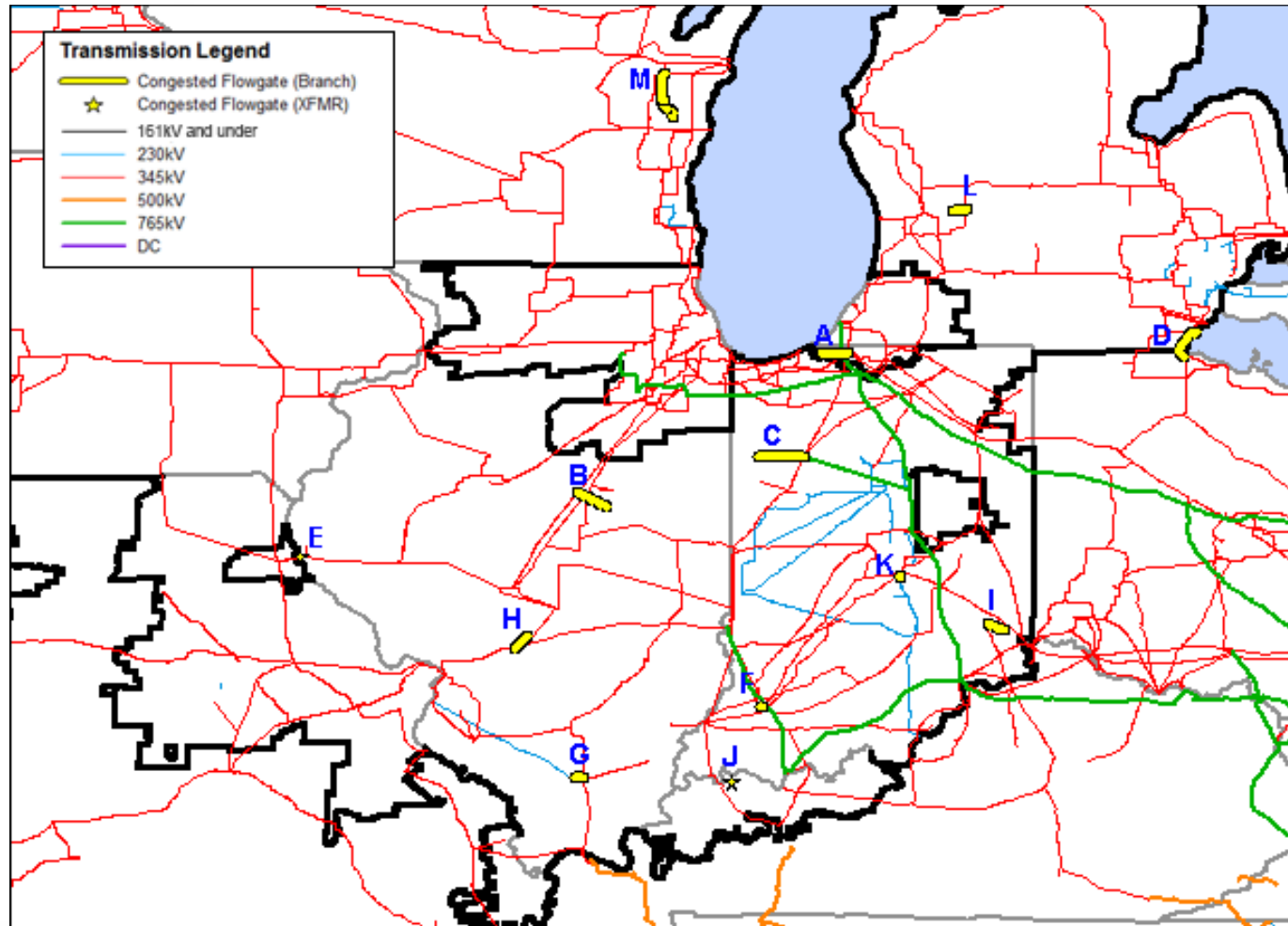
MISO Regional Issues Update



***Color code:**
Green means complete
White means next steps

- The MTEP17 regional models were posted on Nov 30th, 2016; and the updated models were posted on Dec 21st
- Three futures and 3 years (5, 10, and 15-year out) were developed through the MTEP17 regional process:
 - Existing Fleet
 - Policy Regulations
 - Accelerated Alternative Technologies
- Model Update:
 - The latest MISO-PJM Targeted Market Efficiency Projects are included in the base case

- Historic Congestion Analysis
 - MISO - PJM Market to Market (M2M) Congestion
 - MISO Regional historical Day Ahead and Real-time Congestion along the MISO-PJM seam
- Identify and Investigate Top Interregional Congested Flowgates
 - Run PROMOD simulations for 15-year out cases from all 3 futures
 - Identify, investigate and select Top Congested Flowgates for MISO-PJM Interregional MEP evaluation
- Process Refinements
 - Include all consistent MISO-PJM M2M flowgates from the past few years in simulation
 - Rank flowgates both by weighted shadow price (MISO regional approach) and congestion cost and binding hour (PJM regional approach) in order to capture more flowgates that have interregional potential
 - Lower weighted shadow price cutoffs



ID	Monitored Element	From Bus TO	To Bus TO
A	Olive - Bosserman 138 kV	AEP	AEP
B	Brokaw - N Leroy Tap 138 kV	AMIL	AMIL
C	Goodland - Reynolds 138 kV	NIPS	NIPS
D	Marblehead 161/138 kV transformer	AMIL	AMIL
E	Monroe - Lallendorf 345 kV	ATSI	DECO
F	Petesburg - Frank E. Ratts 138 kV	IPL	HE
G	West Frankfort - E. West Frankfort 138 kV	AMIL	AMIL
H	Midway East - Schram City Tap 138 kV (bind both direction) *	AMIL	AMIL
I	Batesville - Hubble 138 kV	DUK-IN	HE
J	Henderson 138/161 kV transformer	BREC	BREC
K	Five Tap - Five Points 138 kV *	IPL	DUK-IN
L	Vergennes - Petis Jct. 138 kV	CONS	CONS
M	Forest Jct. - Elkhart Lk 138 kV	WEC	WEC

* Note: There is a Targeted Appendix A project in MTEP17 increasing the rating on this line.

PROMOD 2031 Simulation Results (1)

ID	Monitored Element (binding is in direction of from bus name → to bus name)	From Bus TO	To Bus TO	Contingency Element(s)	AAT Shadow price (k\$)	EF Shadow Price (k\$)	PR Shadow Price (k\$)	Weighted Shadow Price (k\$)	Weighted Congestion Cost	Weighted Binding Hours
A	Olive - Bosserman 138 kV	AEP	AEP	New Car - Olive 138 kV	642	34	364	334	(\$52,103,613)	338
B	Brokaw - N Leroy Tap 138 kV	AMIL	AMIL	Rising – Goose Creek 345 kV	291	105	149	172	(\$47,107,161)	405
C	Goodland - Reynolds 138 kV	NIPS	NIPS	Sheldon South - Watseka 138 kV	223	74	88	164	(\$39,147,091)	1784
				Goodland - Remington 138 kV	6	50	65			871
D	Marblehead 161/138 kV TX	AMIL	AMIL	Maywood - Herleman 345 kV	237	42	69	104	(\$29,989,263)	151
E	Monroe - Lallendorf 345 kV	ATSI	DECO	Allen - Monroe Co. And LuLu - Monroe 345 kV	161	9	88	83	(\$127,659,009)	561

PROMOD 2031 Simulation Results (2)

ID	Monitored Element (binding is in direction of from bus name → to bus name)	From Bus TO	To Bus TO	Contingency Element(s)	AAT Shadow price (k\$)	EF Shadow Price (k\$)	PR Shadow Price (k\$)	Weighted Shadow Price (k\$)	Weighted Congestion Cost	Weighted Binding Hours
F	Petesburg - Frank E. Ratts 138 kV	IPL	HE	Merom - Worthington 345 kV	39	14	109	72	(\$17,042,823)	375
				No Outage	8	0	20			127
G	West Frankfort - E. West Frankfort 138 kV	AMIL	AMIL	E. West Frankfort - W Mt. Vernon 345 kV	158	16	38	62	(\$19,189,758)	257
H	Midway East - Schram City Tap 138 kV	AMIL	AMIL	Coffeen - Pana 345 kV	25	0	108	53	(\$10,895,296)	42
I	Batesville - Hubble 138 kV	HE	DUK-IN	Tanner - M. Fort 345 kV	96	16	40	47	(\$13,549,954)	48
J	Henderson 138/161 kV transformer	BREC	BREC	Reid – A.B. Brown 345 kV	146	1	5	40	(\$9,044,771)	197
K	Five Tap - Five Points 138 kV	IPL	DUK-IN	Hortonville - Whitestown 345 kV	52	0	8	33	(\$9,953,789)	24
				Noblesville - Durbin 230 kV	28	0	9			17
				Columbus 345/230 kV transformer	8.8	6	2			15
L	Vergennes - Petis Jct. 138 kV	CONS	CONS	Gaines _ Meadow 138 kV	18	1	70	35	(\$10,955,963)	17
M	Forest Jct. - Elkhart Lk 138 kV	WEC	WEC	Granville – SEC 345 kV	19	17	49	32	(\$2,493,122)	36



Joint Model Development &
Interregional Evaluation – Need eliminated due to
FERC Order on EL13-88; slides redacted

IPSAC Work Schedule

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

- January 16, 2017 – MISO regional issues posted
 - January 20, 2017 notice to IPSAC
- January – February 2017 – MISO solution proposals accepted

- RTOs are reviewing regional plans to identify reliability projects which could potentially be replaced by more efficient or cost effective interregional projects
 - Findings will be discussed at JRPC
 - PJM and MISO will summarize reviewed issues and JRPC findings at March IPSAC
 - Stakeholders will then have the opportunity to propose Interregional Reliability Projects
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- Reminder: Interregional Reliability Projects are evaluated and cost allocated based on avoided costs in each RTO
 - Regional issues and proposed solutions must exist in each RTO for evaluation of a Interregional Reliability Project

- January 20, 2017 – Stakeholders notified of scheduled annual issues review for reliability issues
- February 20, 2017 – Stakeholder comments on reliability issues due
- March 24, 2017 – Annual Issues Evaluation – IPSAC
- Next PJM reliability window (TBD) – Stakeholders invited to propose Interregional Reliability Projects to PJM and MISO
- April/May – Anticipate MISO MTEP17 Reliability issues
- May – September – PJM RTEP17 Reliability issues

Open Discussion

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Appendix



RTO Recommended Targeted Market Efficiency Projects

- 50 M2M flowgates investigated
- 13 potential upgrades evaluated
- 5 projects recommended
 - \$ 59 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

- 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

	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%	



	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**

- 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


	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%	

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

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

- 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

	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%	




	Base Case	Project Case
PROMOD Congestion	\$ 9.2 M	\$ 0

- Congestion moved to downstream flowgates: 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**

- 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

	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%	



	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**

- 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 over-dutied breakers)
 - Upgrade to existing facility (4.5M) 525 MVA rate B

	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%	

	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 \text{ 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)

Example TMEP 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

- 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

$$4 \text{ years} * \$ 2.375 \text{ Million} = \$ 9.5 \text{ Million}$$

$$\$ 9.5 \text{ Million} > \$ 2.5 \text{ Million}$$

The project passes the benefit threshold

*All values and project details are for illustrative purposes only

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