

Targeted Market Efficiency Project Type

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System Planning Modeling and Support

Market Efficiency Process Enhancement
Task Force

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- Significant historical border (market to market) congestion not captured in future PROMOD models
 - Topology changes
 - Generation changes
 - Outage patterns
 - Modeled transfer flows
- Identified many low cost upgrades (facilities not conductor limited)



- Small, low cost, short lead time projects
- Targeted at specific, historical congestion issues
- Simple method for benefit determination
- Avoid complicated analysis which would delay implementation



Targeted Market Efficiency Projects

- “Backward looking”
- Specific historical congestion
- Benefit based on relief of historical congestion
- Small, quick implementation projects only



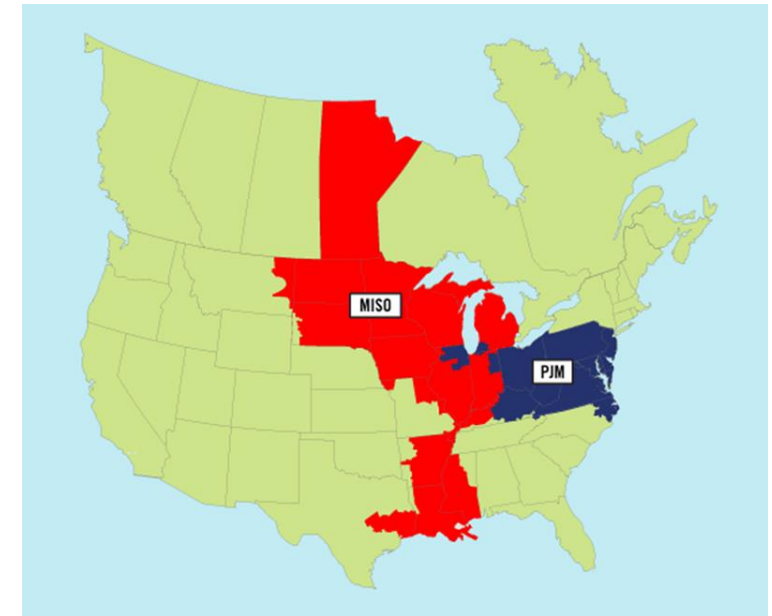
Market Efficiency Projects

- “Forward looking”
- Projected future congestion
- Benefit based on projected load cost (and production cost) savings
- Can include large, longer lead time projects

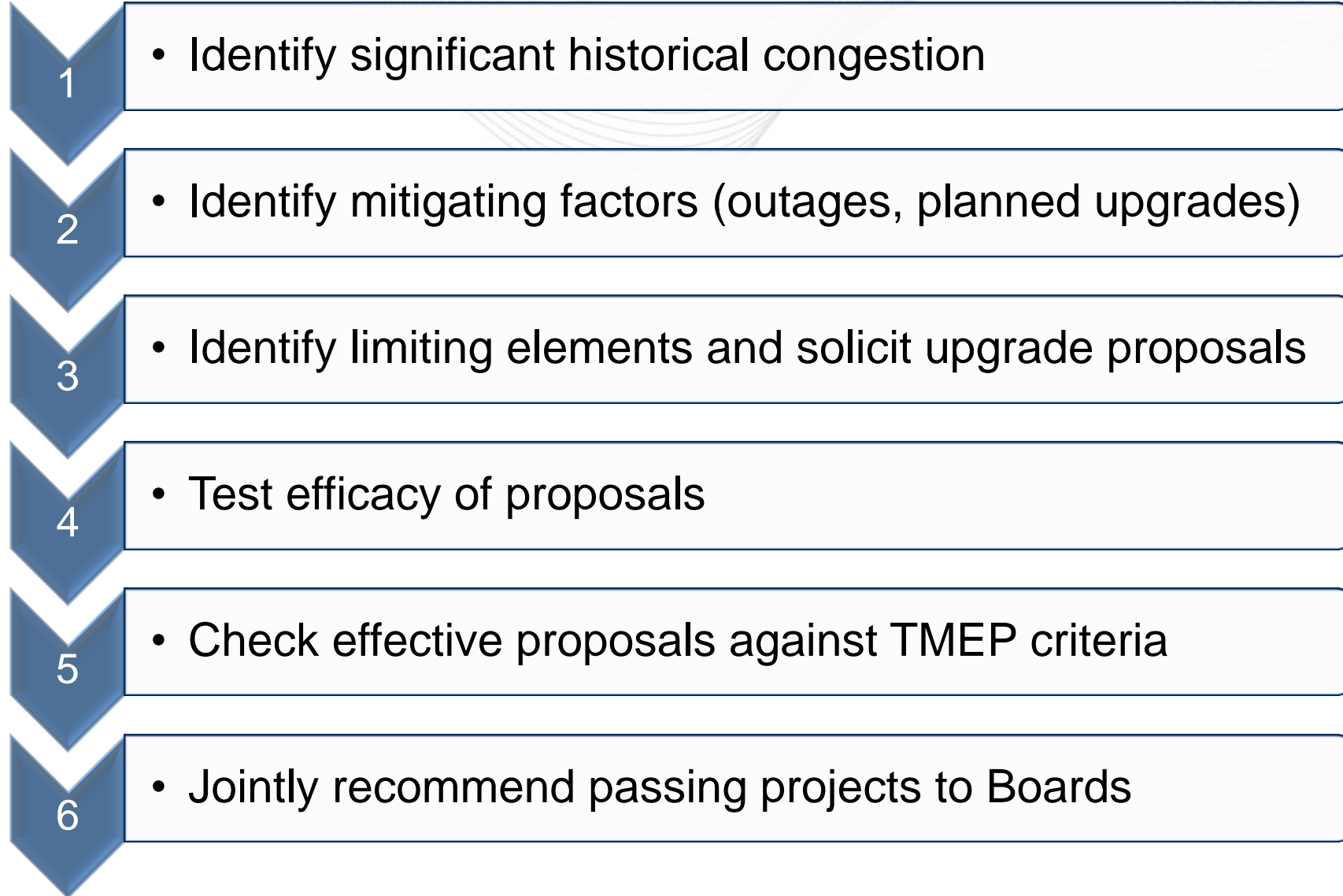


- Current TMEP process applies only to M2M flowgates with MISO
- Codified in:
 - PJM/MISO JOA Article 9.3 & 9.4
 - Study and approval process
 - Interregional cost allocation
 - Regional OATTs
 - Regional cost allocation
 - FERC Docket: ER17-718

Slides 6 - 14 discuss the details of the approved interregional TMEP process; NOT a specific regional TMEP proposal



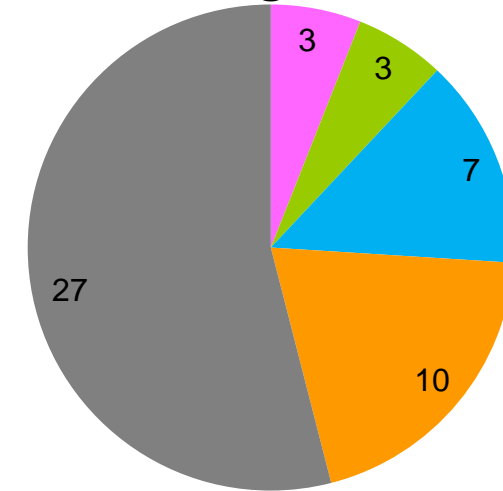
- TMEP study conducted throughout 2016
- Stakeholder interaction through IPSAC
- Five TMEPs recommended for board approval
- FERC accepted TMEP process subject to conditions on October 3, 2017
 - Minor JOA compliance filing November 2
- Projects approved by PJM and MISO Boards in December 2017
 - Combined cost: \$20 million
 - Combined benefit: \$100 million



- Will the congestion continue?
 - Was congestion outage driven?
 - Operator knowledge
 - PROMOD simulation
 - Will a future transmission project impact congestion?
 - Planner knowledge
 - PROMOD simulation

- Will the upgrade resolve congestion?
 - PROMOD simulation

**Breakdown of 50 Evaluated Flowgates
(2016 Interregional Study)**



- No TMEP type upgrade available
- Outage driven
- B/C criteria not met
- TMEP Recommended
- Upgrade already planned

- Limited to historically binding M2M flowgates
- Projects must be in service by 3rd summer peak
- Projects with capital cost over \$20 million not eligible
 - must go through MEP process
- Benefits based on relieving average of past 2 years of historical congestion (Day Ahead + Balancing)
- Four years worth of benefits must completely cover project's installed capital cost
- Discount/inflation rate not necessary as all projects are near term
- Interregional cost allocation based on congestion relief in each RTO
 - Adjusted by M2M payments



Example TMEP (1/5) Historical Congestion

	2016	2017
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

- Identify outages that drove congestion
 - No impact identified
- Identify planned upgrades that may relieve congestion
 - One potential upgrade identified
 - PROMOD analysis shows project will not have significant impact
- Identify limiting equipment and potential upgrades
 - Limiting element is a disconnect switch, followed by CTs and relays
 - Equipment could be replaced within 18 months for \$2.5 million
 - Rating increases from 250/250 to 250/300 MVA
- PROMOD analysis
 - Shows the increased rating relieves congestion

- Projects must be in service by 3rd summer peak
 - 18 month timeline meets this criteria
- Projects over \$20 million not eligible
 - \$2.5 million is well below \$20 million cap
- Four years of benefits (relieved historical congestion) must cover capital costs
 - Criteria met (see next slide)

- Proposed upgrade is replacement of terminal equipment
 - Total cost \$2.5 million
- Analysis shows project eliminates congestion issue

Annual benefit is average of Total Congestion:

	2016	2017
Total Congestion	\$ 2,000,000	\$ 2,750,000



\$ 2,375,000

Four years of benefits exceeds the installed cost

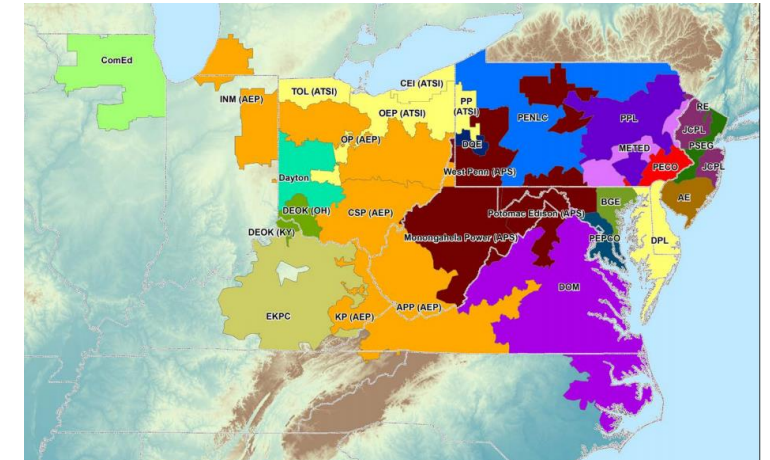
$$4 \text{ years} * \$ 2.375 \text{ million} = \$ 9.5 \text{ million}$$

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

The project passes the benefit threshold

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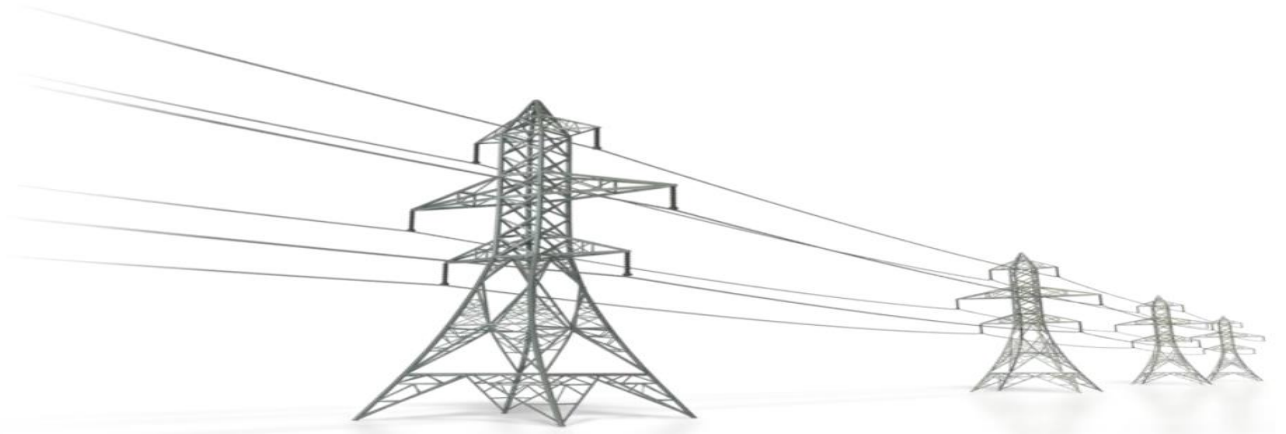
- Cost allocation determined by TOs
- Interregional cost allocation
 - JOA §9.4.4.1.5
 - Based on share of regional congestion relief
- PJM regional cost allocation
 - OATT Schedule 12
 - Based on allocation of the historical M2M congestion to load buses
 - Uses two historical years, consistent with benefit determination



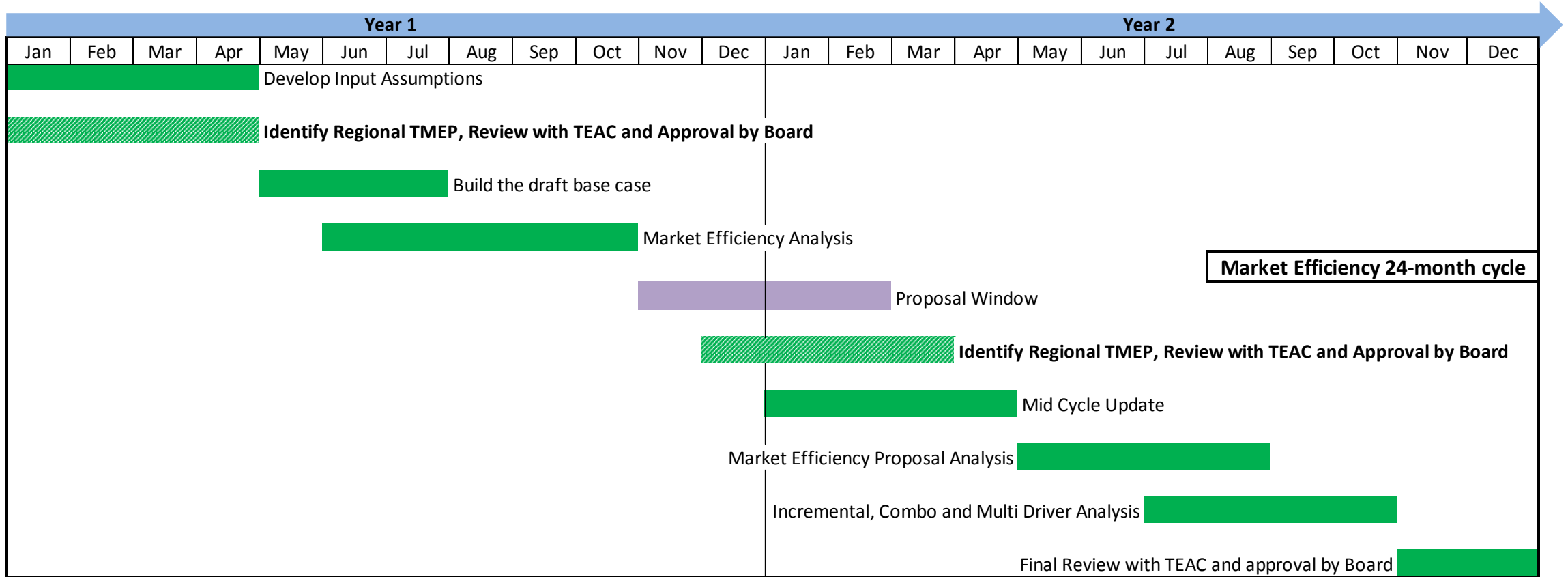
Recommend project along with interregional and regional cost allocations to Boards for approval

- Complementary to Market Efficiency Projects, not a replacement
 - Look ‘backward’, while MEPs look ‘forward’
- Potential solution to observed market issues
- Focus on small, quick implementation projects which bring significant congestion reduction

PJM and MISO are currently conducting an Interregional TMEP study. Please join us at the IPSAC to learn more.



- General support for concept
- Matrix developed with 7 design components
 - Largely mirrors interregional process
- 4 solution options developed
 - Different benefit calculations
 - Different periods used for B/C test
- Concerns about how project type fits into Order 1000 competitive process



* Based on current Market Efficiency 24-month cycle.



Past Approved MEP/TMEP Candidates

PJM-Identified Constraint		Safe Harbor to Graceton 230 kV Line	Brunner Island to Yorkana 230 kV Line	Worcester to Ocean Pines 69 kV Line
Description		Reconductor two spans of the graceton-Safe Harbor 230kV transmission line. Includes termination point upgrades.	Reconductor three spans limiting the Brunner Island-Yorkana 230kV line, add 2 breakers to Brunner Island switchyard, upgrade associated terminal equipment.	Rebuild Worcester-Ocean Pine 69 kV ckt 1 to 1400A capability summer emergency.
PJM Window Project ID		201415_1-2A	201415_1-2B	201415_1-13E
Area		PPL/BGE	ME/PPL	DPL
Historical Congestion (\$M)		\$4.90	\$2.50	\$5.40
Project Cost (\$M)		\$1.10	\$3.10	\$2.40
B/C Ratio		17.82	3.23	9.00
TMEP Criteria	Is Upgrade	Yes	Yes	Yes
	Costs \$20M or less	Yes	Yes	Yes
	Has historical congestion	Yes	Yes	Yes
	Cost is recovered in 4 years	Yes	Yes	Yes
	Will be in-service by third summer season	Assuming these upgrades could have been completed in 3 years.		

- Benefit calculation consistent with principles?
- Upgrades limited to substation equipment?
- Is a short proposal window justified?
 - Could a window fit in schedule?
 - What data/models would be required?