

Book 3 Policy Landscape

2016

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Policy Landscape Overview

The MISO generation fleet continues to evolve. Driven by both economics and environmental regulations, the MISO region as a whole is transitioning from a primarily coal-fueled fleet to a balance of coal, natural gas and renewables.

While the evolution of the fleet is generally accepted across the industry, the rate at which the transition will occur is uncertain. In the past 10 years, MISO has seen a significant increase in wind generation as well as coal retirements. Largely driven by compliance with the Mercury and Air Toxics Standards, which went into effect on April 16, 2015, approximately 10 GW of coal capacity in MISO has recently retired or converted fuel. Retired capacity has partially been replaced by natural gas and wind units; however, capacity additions have not kept pace with reductions. In the past five years, planning reserve margins¹ have dropped from 23 percent and above to 18 percent (Section 6.2).

Geographic diversity, policies (both existing and pending) as well as economics impact different areas of the footprint to different degrees. The MISO North and Central regions' fleet, which is primarily coal-based, continues to receive pressure from environmental regulations, competition from natural gas and age. Currently, the average age of the MISO North and Central regions' coal fleet is 40 years old. Analysis shows that coal plants typically retire at 65 years, meaning approximately 8 GW of currently unannounced coal retirements are expected in the next 15 years. That value could potentially triple depending on carbon regulations (Section 7.1).

The MISO North and Central Regions continue to see a large potential for increased wind on the system. As of June 2016, approximately 16 GW of wind currently operates in the MISO footprint and another 30 GW is currently in the Generator Interconnection Queue, 10 GW of the queued wind is in Iowa. MISO's South Region is primarily fueled by natural gas units so fuel prices, age, and demand and energy growth rates are the significant factors that affect the southern fleet. Approximately 12 GW of MISO South Region natural gas and oil units are at risk of age-related retirement within the next 15 years. While the current Generator Interconnection Queue indicates that most of the aging natural gas units will be replaced with newer natural gas units, it's also expected that demand-side resources as well as solar will play a greater role in the fleet into the future.

As MISO looks forward, it expects the trends towards a lower carbon fleet to be driven by potential carbon regulations, age, sustained low natural gas prices, declining construction costs of renewables and renewable tax credits. While currently the EPA's Clean Power Plan is stayed, multiple states and companies have stated they will continue to pursue carbon reductions. Should the Clean Power Plan or equivalent regulation become active, MISO's Clean Power Plan analysis shows that approximately 16 GW of additional coal capacity is at risk of retirement (Section 7.1). The replacement plan for retired capacity includes a combination of renewables, natural gas and demand-side technologies.

Even without carbon regulations, MISO expects economics to drive the continued trends towards more renewables. The capital cost for onshore wind is projected to decline annually by approximately 0.4 percent and by approximately 3 percent for PV solar units. In addition, the Production Tax Credit extension and Investment Tax Credit are projected to make renewables more economically competitive with thermal units (especially under scenarios where carbon reduction targets are assumed). To date, renewables have been built in the anticipated locations that utilize the outlet provided by MISO's Multi-

¹ As a percentage of installed capacity

Value Project Portfolio. However, as the footprint gains additional wind above and beyond Renewable Portfolio Standards, and as hub heights increase there is greater potential that wind generation will be developed in areas outside of the traditional corridors, such as in the MISO South Region. Solar also continues to increase in economic viability.

In addition to generation fleet changes, demand response and energy efficiency are projected to play a more significant role in the future resource adequacy. Currently, approximately 5 GW of demand response participates in the MISO market. Driven by economics, public policy and new technologies, there is a potential for 8 to 11 GW of demand response by 2031 in the footprint (Section 6.4), which is dependent on out-year demand and energy levels as well as public policy. In addition, energy efficiency is projected to decrease annual energy by 12,000 to 38,000 GWh in 2031.

MISO continues to monitor trends in emerging alternative technologies such as storage and distributed generation to both understand and plan for the potential that these technologies will impact the transmission system.

MISO currently has one utility-scale battery on the system with two additional installations totaling an additional 50 MW in the Generator Interconnection Queue. MISO continues to work with the Organization of MISO States to better understand the potential and impacts of higher penetrations of demand-side alternatives.

The following sections detail studies designed to understand and integrate both current and potential public policies. Section 7.1 explores how changing regulations from the U.S. Environmental Protection Agency may impact the electric system going forward, while section 7.2 examines the value of the Multi-Value Projects under current planning assumptions. Both of these sections look at how changing economic and policy conditions impact the electric system to provide insight into the risks and value created by these changes.

Chapter 7

Regional

Studies

2016

- 7.1 EPA Regulations
- 7.2 MVP Limited Review

7.1 EPA Regulations

The energy landscape in the MISO footprint has changed in recent years due to a combination of economic, regulatory and policy drivers. These drivers are affecting generation mix, reserve margins, grid reliability, dispatch and operations. These effects are expected to continue, fundamentally transforming the electric utility industry over the coming decades.

Some of the main regulatory drivers are developed by the U.S. Environmental Protection Agency (EPA) and include the Mercury and Air Toxics Standards (MATS), the National Ambient Air Quality Standards (NAAQS), the Clean Power Plan² (CPP) and the Cross-State Air Pollution Rule (CSAPR). This year, MISO analyzed the effects of two of these regulations: the CPP and the proposed CSAPR update.

MISO's Clean Power Plan Analysis

Purpose of MISO's CPP Analysis

The EPA designed its CPP to regulate carbon dioxide (CO₂) emissions from the electric power sector, with a goal of a 32 percent reduction in CO₂ emissions from 2005 by 2030. This rule could affect the industry in a number of significant ways. Advised by input from its stakeholders, MISO analyzed the CPP in order to provide its member states and asset owners with independently derived technical data and other objective information they may wish to consider in preparing their CPP implementation plans.

By design, MISO's stakeholder-informed analysis also examined how industry trends and drivers other than the CPP — such as low natural gas prices and an increasing penetration of renewable generation — cause the region's resource portfolio to evolve. MISO expects that these non-CPP policy and economic drivers will continue to reshape the electricity industry regardless of whether the CPP survives the legal challenges it currently faces. These non-CPP drivers figured prominently in MISO's analysis, effectively making it a study about the broader drivers of the evolving resource portfolio.

The observations in this section are not recommendations for complying with the CPP or addressing the non-CPP factors contributing to the region's evolving resource portfolio. Instead, these observations are intended to help MISO's stakeholders better understand how the CPP and the non-CPP drivers could impact the MISO system. States, utilities and other entities should consider these observations within the broader context of their CPP compliance objectives, policy goals and views about their desired future resource mixes.

The U.S. Supreme Court Stay and Ongoing CPP Litigation

On Feb. 9, 2016, the U.S. Supreme Court stayed the CPP until the litigation challenging it runs its full course. Because of the stay, some MISO-member states scaled back or stopped working on CPP-related matters.

At the time of the stay, MISO had largely finished its CPP analysis, although some of the study's findings had not been released. Since then, MISO has worked closely with its stakeholders to determine how potential CO₂-reduction initiatives will be reflected in MISO's transmission-planning efforts going forward.

² [For the Clean Power Plan Final Rule Study full report](#)

Study Focus and Key Observations

Near-Term Analysis

All of the key observations cited are derived from the “Near-Term” phase of MISO’s analysis, which focused on assessing the impacts of complying with the CO₂-reduction targets in the CPP rule itself. This phase was conducted using scenario-based evaluation on static resource mixes that allowed for detailed observations in some areas, but limited the ability to make observations with regard to the most cost-effective resource build-out to achieve compliance.

One primary focus of this analysis is to compare and contrast potential impacts associated with two different approaches to CPP compliance: (1) rate-based compliance, and (2) mass-based compliance³ on a regional MISO-wide level, as well as on a state-by-state basis.

On the regional level, the analysis yielded the following key observations about the rate/mass compliance options and other related matters:

- Regionally, mass-based compliance is less expensive than rate-based compliance, with the gap between the two approaches increasing over time, unless the construction of non-CO₂-emitting resources can keep pace with the demand for emission rate credits (ERCs) needed by existing fossil-fueled resources to continue compliant operation.
- Early compliance targets can be met through existing renewable portfolio standards and coal-to-gas re-dispatch, but comprehensive planning would need to start expeditiously to meet increasingly stringent compliance targets in the mid-2020s.
- Under the CPP, the coal fleet faces increased risks of decreased generation and operating hours, along with increased cycling.
- A robust build-out of new, non-CO₂-emitting resources would be needed to mitigate CO₂ price increases under rate-based compliance.
- System dispatch faces relatively less change under mass-based compliance, and thus may require less capital investment.
- Regional, trading-ready compliance approaches yield lower-cost compliance than state-by-state compliance options.

MISO also analyzed how individual states in the MISO region could be affected by choosing either the rate-based or the mass-based compliance option. From this part of the analysis, MISO made the following key observations:

- Generation will likely rise/fall in similar locations under both rate and mass compliance approaches. Transmission expansion, if needed, will likely be similar under both.
- Mass-based compliance produces a more balanced mix of buyers and sellers within MISO.
- Most states see a mass-based compliance advantage unless a regional heavy penetration of renewables and energy efficiency is achieved. Because MISO assumed a static resource mix, the ERCs created by renewables and energy efficiency are assumed to be available for use in compliance. If, however, these resources fail to generate the ERCs necessary for cost-effective rate-based compliance, there is a risk that costs will increase far beyond costs of mass-based compliance. Rate-based states may consider the need to mitigate this risk should it come to fruition.

³ Rate-based compliance entails limiting how much CO₂ is emitted per every megawatt-hour of energy produced in a given state or region, while mass-based compliance entails limiting how much total CO₂ is emitted in a state or region over a set amount of time, such as a one-year period.

- Under a “patchwork” mix of both rate and mass compliance, states with a rate advantage may lose that benefit if other states go mass.

Overall, MISO’s analysis shows that flexibility in compliance options leads to lower compliance costs. Individual states and regions derive different benefits from pursuing different options, but working together as a region allows each state to share this diversity in a way that benefits the entire region. MISO as a regional system operator and transmission planner provides the flexibility needed to integrate these preferred compliance options while maintaining reliability and keeping costs low.

Mid-Term Analysis

MISO also conducted a “Mid-Term” phase of analysis that looked more broadly at how the region’s generation assets could be impacted by various CO₂-reduction scenarios that are not based specifically on the CPP, but rather on the non-CPP policy and economic drivers that cause the resource portfolio to evolve. This phase aimed to identify the optimal resource expansion and retirements using mass-based compliance under several CO₂ reduction strategies. MISO’s analysis produced two primary results: (1) potential coal retirements in the region, and (2) the potential to build out the region’s renewable energy resources. This phase modeled the study region into the year 2035, with emission reduction targets continuing through the entirety of the study period.

Coal retirements: MISO analyzed how much of the region’s existing coal-fired generation may likely retire for economic reasons under the CPP rule as written, as well as two hypothetical CO₂-reduction targets:

- The Partial CPP Future: Assumes that the region’s power-sector CO₂ emissions will decline by 17 percent by 2030 compared to a 2005 baseline. This future models how the region could be impacted if states and generators begin to comply with the CPP, but full compliance is slowed or halted due to legal or political challenges to the rule (Note: This future, like all of the others in MISO’s analysis, was developed before the U.S. Supreme Court stayed the CPP).
- The Accelerated CPP Future: Assumes that the region’s power-sector CO₂ emissions will decline by 43 percent by 2030 compared to a 2005 baseline, driven by low natural gas prices and decisions by states and generators to aggressively build out renewables and demand-side resources. The 43 percent figure is based on more aggressive CO₂-reduction plans, such as the midterm compliance point of the Waxman-Markey climate change bill that the U.S. House of Representatives passed in 2009. This future also helps to illustrate how things may change if the EPA tightens the CPP targets during a rule review at some future date.

Using these scenarios, MISO modeled how much — or how little — each of the region’s existing coal units would run to help the MISO system as a whole to meet the different CO₂-reduction targets.

MISO’s key observations regarding coal retirements: MISO’s analysis indicates that retiring coal units from service could cause total system costs⁴ to decline for each future studied. For example, total system costs for the Partial CPP Future reach their lowest range when 8 to 11 GW of coal is retired, climbing to 24 to 30 GW for the Accelerated CPP Future. Under the CPP rule itself, MISO’s analysis indicates that total system costs would reach their lowest point with 16 to 21 GW of coal retirements. Given the similar costs within this range, 16 GW of coal retirements is seen as a likely outcome.

Notably, MISO’s analysis also indicates that total system costs in all three scenarios start to climb again at a certain level of coal generation retirements. At this level, the costs of building and operating new gas-fired and renewable resources start to exceed the costs of continuing to operate existing coal units.

⁴ As used here, the term “total system costs” includes the following: (1) generation production costs, (2) generation capital costs and (3) generation annual fixed operations and maintenance (O&M) costs. It does not include sunk costs of retired coal units nor electric transmission or natural gas transportation costs.

Build-out of renewables: MISO’s analysis indicates that a near-equal mix of wind and combined-cycle plants would likely replace coal units as they retire under the CPP. When greater CO₂ reductions are examined, the proportion of wind (compared to combined cycle) replacing coal increases, and solar resources become more viable. This renewable generation is in addition to what would be built without a national CO₂-reduction policy. This leads to the need to understand where this additional renewable generation would likely be sited and constructed. A separate effort was undertaken to analyze where these new wind and solar resources would likely be sited. This effort looked at levels that are more stringent than those of the CPP, in part because MISO wanted to understand the “upper bounds” of viable levels of wind and solar in the region.

MISO’s key observations regarding build-out of renewables: MISO’s analysis indicates that much of the additional wind would likely first be built in areas that currently experience high levels of wind buildout such as Iowa, Minnesota and Michigan. Significantly larger amounts of new wind and solar capacity would need to be built if far more aggressive CO₂ reductions of 50 percent or 80 percent are pursued in the region. The analysis indicates that the optimal locations for building this new wind power would be concentrated in eastern Montana, the Dakotas and the Great Lakes region, given the higher wind potential in those areas. Notably, these areas are not particularly close to MISO’s biggest load centers. However, if the objective is to reduce CO₂ emissions aggressively in the region, MISO’s analysis indicates that it would still be cost-effective to site new wind power in these relatively remote areas and build new transmission to deliver the energy to the rest of the MISO footprint.⁵

Conclusion

MISO’s analysis of the CPP, along with industry trends and other studies, indicates that the future will bring significant change to the power sector. The CPP accelerates this change by driving increased levels of renewable and energy efficiency deployment, and by pushing up the retirement timelines for coal assets. This study looks at a range of compliance options and impacts to the generation and transmission assets within the MISO footprint. Compliance costs are found to vary greatly with the price of natural gas along with the economic and technical potential of both renewable and energy efficiency deployment throughout the study period. Going forward, analysis (including interregional analysis) is required to assess the transmission and natural gas infrastructure needs associated with this industry-wide shift. Future analysis will also require more consideration of energy efficiency as a compliance mechanism, as it can prove a viable means of ERC-creation under rate-based compliance. The results of this study will be used to inform our strategic transmission assessment starting in the fall of 2016. It is crucial that planning efforts continue given the long lead time needed to plan, approve and build the infrastructure necessary to enable the cost-effective and reliable evolution of the electric system.

MISO’s Analysis of the EPA’s Proposed CSAPR Update

On November 16, 2015, the EPA proposed the CSAPR Update Rule to address interstate transport of air pollution under the 2008 ozone NAAQS. Effective beginning in 2017, the proposal reduces seasonal (May 1-September 30) nitrogen oxides (NO_x) emissions from power plants in 23 eastern states, 11 of which are in the MISO footprint.

MISO analyzed the proposed CSAPR Update Rule to understand near and long-term impacts to generating resources in the MISO. The primary focus was to evaluate the ability of affected states to meet their updated seasonal NO_x budget limits with and without trading of allowances, particularly in 2017. Key observations of the analysis are:

⁵ For the full report on MISO’s study on the build-out of renewables, see <https://www.misoenergy.org/Events/Pages/MTEP17Futures20160428.aspx> “MTEP17 Futures Development Workshop Vibrant Clean Energy Report and Documentation.”

- The more stringent targets of the CSAPR Update Rule can be met through system re-dispatch with or without trading in 2017 and beyond, though regional energy and emission trading eases implementation in MISO
- Generation shifts in the fuel mix indicate coal-to-gas re-dispatch, though in aggregate, these shifts are small even in 2017
- Total generation in MISO states increases, including in those states not covered under the CSAPR Update Rule, to balance decreases elsewhere in the Eastern Interconnection
- MISO states in sum perform better than the combined emissions target when each covered state participates in emissions allowance trading

MISO also analyzed the proposed CSAPR Update Rule under 2030 assumptions to evaluate its interaction with a full implementation of the CPP. Results indicate the additional constraint of the proposed CSAPR Update Rule does not significantly alter how MISO performs under CPP compliance. Generation trends continue with coal-to-gas re-dispatch and the CO₂ price is relatively unaffected with the more stringent seasonal NO_x emission constraint.

The EPA issued the final CSAPR Update Rule on September 7, 2016. MISO's analysis occurred prior to this date, and thus focused on the proposed CSAPR Update Rule. In the final rule, total allowable emissions are greater than in the proposed rule update, but this can vary from state to state.

7.2 MTEP16 MVP Limited Review

The MTEP16 Multi-Value Project (MVP) Limited Review provides an updated view into the projected congestion and fuel savings of the MVP Portfolio. The MTEP16 MVP Limited Review's business case is on par with the review of the original business case in MTEP11. Consistent with previous reviews, the MTEP16 Limited Review provides evidence that the MVP criteria and methodology works as expected. The MTEP16 analysis shows that projected MISO North and Central region benefits provided by the MVP Portfolio are comparable to MTEP11, the analysis from which the portfolio's business case was approved.

The MTEP16 results demonstrate that the MVP Portfolio:

- Provides benefits in excess of its costs, with its benefit-to-cost ratio ranging from 2.0 to 2.7; consistent with the 1.9 to 2.8 range calculated in MTEP15
- Creates \$10.5 to \$35.8 billion in net benefits (using MTEP14 benefits for all categories besides congestion and fuel savings) over the next 20 to 40 years, an increase of up to 26 percent from MTEP15

Increased benefits related to the congestion and fuel savings are largely driven by natural gas price assumptions and wind energy modeling.

The MTEP16 MVP Limited Review Business Case will be posted under the Multi-Value Project Portfolio Analysis section of the MISO website.

The fundamental goal of MISO's planning process is to develop a comprehensive expansion plan that meets the reliability, policy and economic needs of the system. Implementation of a value-based planning process creates a consolidated transmission plan that delivers regional value while meeting near-term system needs. Regional transmission solutions, or MVPs, meet one or more of three goals:

- Reliably and economically enable regional public policy needs
- Provide multiple types of regional economic value
- Provide a combination of regional reliability and economic value

MISO conducted its second limited MVP Portfolio review, per tariff requirement, for MTEP16. The MVP Review has no impact on the existing MVP Portfolio's cost allocation. MTEP16 Review analysis is performed solely for informational purposes. The intent of the MVP Review is to use the review process and results to identify potential modifications to the MVP methodology and its implementation for projects to be approved at a future date.

The MVP Review uses stakeholder-vetted MTEP16 models and makes every effort to follow procedures and assumptions consistent with the MTEP15 analysis. Consistent with previous MTEP MVP Reviews, the MTEP16 MVP Review assesses the benefits of the entire MVP Portfolio and does not differentiate between facilities currently in service and those still being planned. Because the MVP Portfolio's costs are

The MVP Limited Review has no impact on the existing MVP portfolio's cost allocation. The intent of the MVP Review is to identify potential modifications to the MVP methodology for projects to be approved at a future date.

allocated solely to the MISO North and Central regions, only MISO North and Central Region benefits are included in the MTEP16 MVP Limited Review.

Economic Benefits

MTEP16 analysis shows the MVP Portfolio creates \$21 to \$57.3 billion in total benefits⁶ to the MISO North and Central Region members (Figure 7.2-1). Total portfolio costs have slightly increased from \$6.46 billion in MTEP15 to \$6.47 billion in MTEP16. With the increased portfolio cost estimates and increased gas prices and wind energy from MTEP15, MVP Portfolio benefit-to-cost ratios remain comparable to the original business case studied in MTEP11.

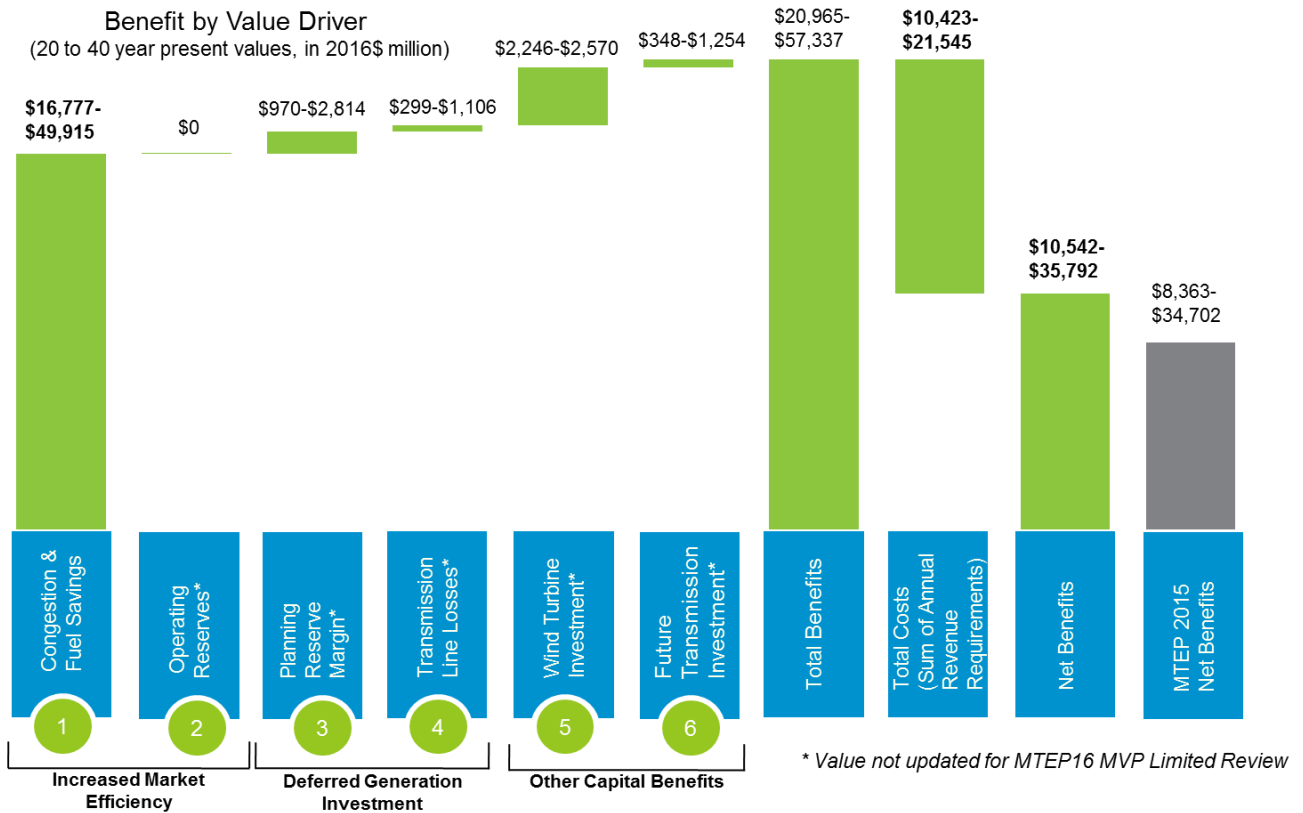


Figure 7.2-1: MVP portfolio economic benefits from MTEP16 MVP Limited Review with values from MTEP14 MVP Triennial Review

The bulk of the increase in benefits is due to an increase in the assumed natural gas price forecast in MTEP16 compared to MTEP15 and wind energy increase due to the new wind in the model for MTEP16. In addition, the MTEP17 natural gas assumptions, which will be used in the MTEP17 MVP Portfolio Triennial Review, were studied and are comparable to the MTEP16 forecast. Under each of the natural gas price assumption sensitivities, the MVP Portfolio is projected to provide economic benefits in excess of costs (Table 7.2-1).

⁶ Benefits 2 through 6 are from the MTEP14 MVP Triennial Review. The next MVP Triennial Review will occur with MTEP17.

Natural Gas Forecast Assumption	Total Net Present Value Portfolio Benefits (\$M-2015)	Total Portfolio Benefit-to-Cost Ratio
MTEP16 – MVP Limited Review	\$20,965 – \$57,337	2.0 – 2.7
MTEP15 – MVP Limited Review	\$19,998 – \$55,585	1.9 – 2.6
MTEP17	\$19,205 – \$52,868	1.8 – 2.5

Table 7.2-1: MVP Portfolio Economic Benefits and Natural Gas Price Sensitivities⁷

Increased Market Efficiency

The MVP Portfolio allows for a more efficient dispatch of generation resources, opening markets to competition and spreading the benefits of low-cost generation throughout the MISO footprint. The MVP Review estimates that the MVP Portfolio will yield \$17 to \$50 billion in 20- to 40-year present value adjusted production cost benefits to MISO’s North and Central regions — an increase of up to 21 percent from the MTEP14 net present value.

An increase in the natural gas price escalation rate and addition of new wind in the model increases congestion and fuel savings benefits by approximately 17 percent in MTEP16 compared to MTEP15

The increase in congestion and fuel savings benefits relative to MTEP15 is primarily due to an increase in the out-year natural gas price forecast assumptions and wind energy increase (Figure 7.2-2). The increased escalation rate causes the assumed natural gas price to be higher in MTEP16 compared to MTEP15 in years 2025 and 2030 — the two years from which the congestion and fuel savings results are based.

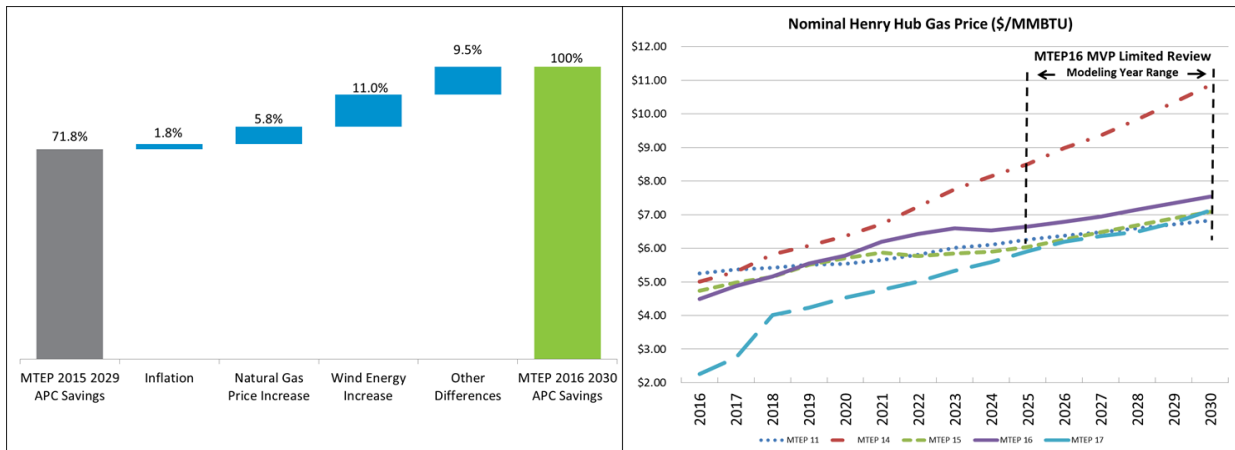


Figure 7.2-2: Breakdown of congestion and fuel savings increase from MTEP15 to MTEP16

The MVP Portfolio allows access to wind units with a nearly \$0/MWh production cost and primarily replaces natural gas units in the dispatch, which makes the MVP Portfolio’s fuel savings benefit projection directly related to the natural gas price assumption. A sensitivity applying the MTEP15 Business as Usual

⁷ Sensitivity performed applying MTEP15 and MTEP17 natural gas prices to the MTEP16 congestion and fuel savings model.

(BAU) gas prices assumption to the MTEP16 MVP Limited Review model showed a 6 percent decrease in the annual year 2030 MTEP16 congestion and fuel savings benefits (Figure 7.2-2).

Post MTEP14 natural gas price forecast assumptions are more closely aligned with those in the original business case of MTEP11. A sensitivity applying the MTEP17 BAU natural gas prices to the MTEP16 analysis shows just a slight decrease in year 2030 MTEP16 adjusted production cost savings.

The MVP Portfolio is solely located in the MISO North and Central regions and therefore, the inclusion of the MISO South Region to the MISO dispatch pool have little effect on MVP-related production cost savings.

Distribution of Economic Benefits

The MVP Portfolio provides benefits across the MISO footprint in a manner that is roughly equivalent to costs allocated to each local resource zone (Figure 7.2-3). The MVP Portfolio’s benefits are at least 1.6 to 2.0 times the cost allocated to each zone.

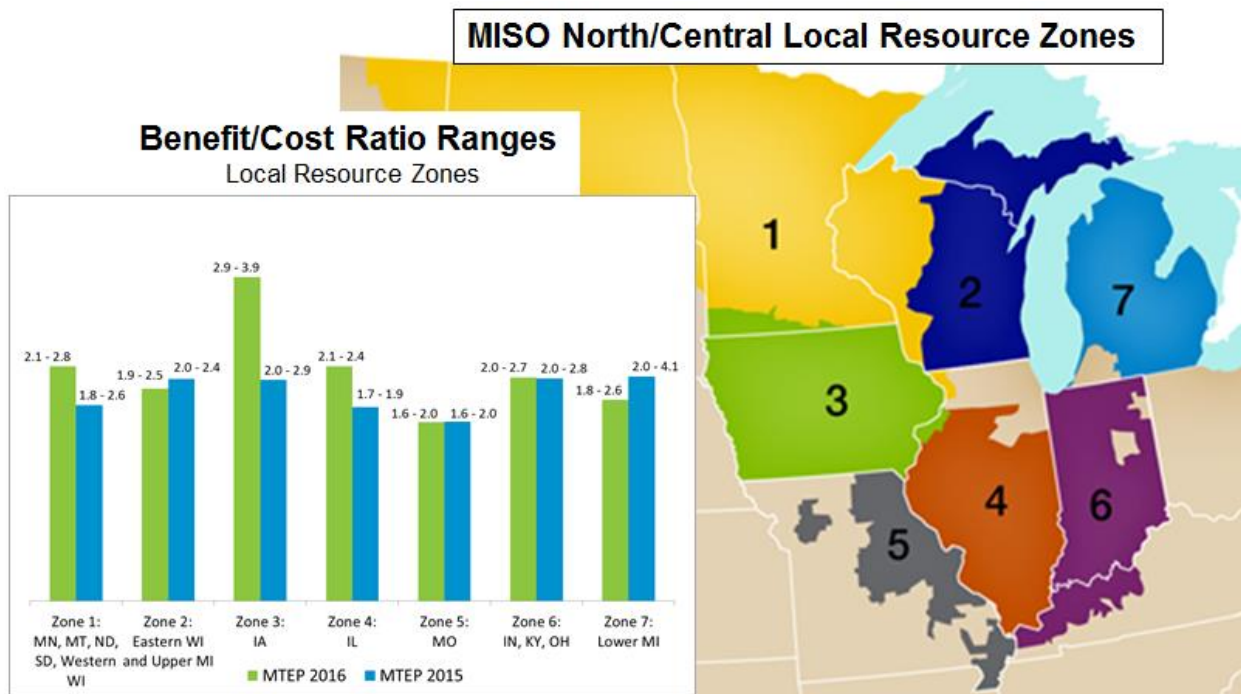


Figure 7.2-3: MVP portfolio total benefit distribution

Going Forward

MTEP16 will feature the full Triennial Review of the MVP Portfolio benefits. Beginning in MTEP17, in addition to the Full Triennial Review, MISO will perform an assessment of the congestion costs, energy prices, fuel costs, planning reserve margin requirements, resource interconnections and energy supply consumption based on historical data.

Chapter 8

Interregional

Studies

2016

- 8.1 PJM Interregional Study
- 8.2 SPP Interregional Study
- 8.3 MISO ERCOT Study
- 8.4 Southeastern Regional Transmission Planning

8.1 PJM Interregional Study

As in 2015, MISO and PJM Interconnection, a Pennsylvania-based regional transmission operator (RTO) that shares borders with MISO, agreed to focus their 2016 joint study efforts on targeted area studies, a targeted Market-to-Market congestion study, FERC Order compliance, and continuation of the interregional process enhancement review in the Interregional Planning Stakeholder Advisory Committee (IPSAC). PJM performs a similar report to MTEP, which it calls the Regional Transmission Expansion Plan (RTEP).

Targeted Area Studies

Continuing on the 2015 Quick Hits work (detailed in the MTEP15 Report), MISO and PJM completed two smaller, targeted area studies in early 2016 that address seams issues. One was in Southwest Michigan and Northern Indiana; the other was in the Quad Cities area of Iowa and Illinois.

In the Michigan/Indiana area, MISO and PJM proposed to evaluate the MTEP and RTEP projects to determine whether the historical congestion, seen in the Quick Hits analysis, would be fully mitigated. This analysis also evaluated the effect of expected operational reconfigurations on the performance of planned projects and whether additional solutions were needed.

MISO and PJM coordinated assumptions to benchmark production cost models to reflect the historical conditions causing issues in the Southwest Michigan and Northern Indiana area. Upon analysis, the production cost models showed little to no future congestion in Southwest Michigan. Sensitivity analyses showed the two major drivers for the reduction in congestion were significant reductions in Michigan imports and the addition of Segreto station interconnection facilities related to the Covert generator moving from the MISO to PJM market. The heavy Michigan imports are not expected to return. The production cost analysis showed similar Northern Indiana congestion as the Quick Hits, primarily on 138 kV facilities. MISO and PJM decided not to pursue project solutions in this area due to the recent Bosserman substation addition and reassessment of flows in the area.

The Quad Cities study was reliability driven to determine if there were projects to supplement or replace three MTEP Appendix B projects (P8842-4) on the Iowa and Illinois border. MISO and PJM built a joint 2020 summer peak powerflow model for analysis. The flows in the joint model were lower than the MTEP14 and MTEP15 models where the reliability drivers had been identified. The joint model was then redispached to more closely approximate operations.

Contingency analysis on the updated model showed no constraints in the Quad Cities area. MISO and PJM therefore did not pursue interregional solutions to displace or supplement the existing MTEP Appendix B projects. However, the joint model building will help inform the regional process on better MISO-PJM interchange modeling.

Targeted Market-to-Market Congestion Study

Due to appreciable levels of market-to-market congestion, MISO and PJM decided to continue their annual focus on resolving historical congestion while helping to inform future metric and process enhancements. This near-term study evaluates historical market-to-market congestion to find small but important fixes, and was initially dubbed Quick Hits.

For the 2016 study, MISO and PJM analyzed historically congested market-to-market flowgates. Flowgates with significant congestion — day-ahead plus excess congestion fund — in 2015 were

considered initially. MISO and PJM worked to identify valuable projects on the seam. A valuable project would relieve known market-to-market issues; be completed in a relatively short time frame; have a quick payback on investment; and not be a greenfield project. MISO and PJM coordinated with facility owners to identify the limiting equipment and potential upgrades. Limited reliability and production cost analyses were used to confirm the projects' effectiveness in relieving congestion. Potential projects are expected to be recommended to the MTEP and PJM's RTEP by year's end or Q1 2017, pending the filing of the new Targeted Market Efficiency Project (TMEP) type (discussed in the IPSAC section).

As of November 15, 2016, MISO and PJM have narrowed down the potential upgrades (Table 8.1-1). Due to confidentiality concerns, the specific upgrade details will be shared with stakeholders after MISO/PJM board approval. The Market-to-Market flowgates are identified with preliminary project cost, expected project benefits, and RTO cost share. These are preliminary results and may be subject to change before final project recommendation.

Facility	Transmission Owner(s)	TMEP Cost	TMEP Benefit	Benefit Allocation (%PJM/%MISO)
Burnham – Munster 345 kV	CE, NIPS	\$7,000,000	\$32,000,000	88/12
Bayshore – Monroe 345 kV	ATSI, ITC	\$1,000,000	\$17,000,000	89/11
Michigan City – Bosserman 138kV	NIPS, AEP	\$4,600,000	\$29,600,000	90/10
Reynolds – Magnetation 138 kV	NIPS	\$150,000	\$14,500,000	41/59
Roxana – Praxair 138 kV	NIPS	\$4,500,000	\$6,500,000	24/76
Marysville – Tangy 345 kV	AEP, ATSI	TBD	\$12,000,000	98/2

Table 8.1-1: MISO-PJM Market Efficiency Projects

FERC Order 1000

FERC issued an Order on Rehearing and Compliance on April 5, 2016, for MISO and PJM's Order 1000 interregional docket. After a 30-day response window and 45-day extension, MISO and its filing partners submitted a compliance filing on June 20, 2016. The compliance filing addressed all six directives from the April 5 Order. Notably, MISO and PJM were directed to add Cross Border Baseline Reliability Projects back into the Joint Operating Agreement (JOA) in addition to the Interregional Reliability Project type. Also, FERC directed the RTOs to consider all projects in the regional transmission plan for Interregional Reliability Project or Interregional Public Policy Project displacement.

The MISO Transmission Owners filed a request for rehearing of the April 5 Order. PJM and their Transmission Owners have filed a request for clarification on the April 5 Order. As of the publishing date, FERC has yet to rule on these motions.

FERC Order EL13-88

Following an initial September 11, 2013, "206" complaint by Northern Indiana Public Service Co. (NIPSCO) on how MISO and PJM perform interregional transmission planning, and subsequent June 15, 2015, FERC technical conference, FERC issued an Order on Complaint and Technical Conference in Docket EL13-88 (NIPSCO Order) on April 21, 2016. MISO and its filing partners submitted the first five directives and one status update from the NIPSCO Order on June 20, 2016.

Those directives included:

- Formalize the steps and deadlines of the Coordinated System Plan study in the JOA
- Lower the Interregional Market Efficiency Project (IMEP) thresholds: MISO made changes to Attachment FF to allow IMEPs above 100 kV and no-cost threshold to qualify as MISO Market Efficiency Projects (MEP)
- Remove the interregional benefit-to-cost ratio
- Revise the benefit calculation of IMEPs: FERC directed the RTOs to use their regional benefit metrics to determine their share of project benefits and, thus, interregional cost allocation
- Include existing business practice manual language on generation interconnection coordination procedures in the JOA

MISO and PJM jointly submitted an informational filing and one status update from the NIPSCO Order on August 19, 2016. This informational filing explored whether and how the RTOs could implement a common timeline between the interregional and regional transmission expansion plans.

MISO and PJM are expecting timely filings of the following outstanding directives:

- Informational filing: How could a joint model be implemented between the RTOs' regional processes? Due October 18, 2016.
- Include generation retirement coordination procedures in the JOA. Due December 15, 2016.

Numerous requests for clarification and/or rehearing were requested from FERC on this docket, including how the benefit calculation of IMEPs will determine the RTOs' cost allocation. FERC will address these in a subsequent order.

IPSAC

The MISO-PJM Interregional Planning Stakeholder Advisory Committee (IPSAC) has continued to be committed to interregional metric and process enhancements. In this effort, MISO and PJM have worked with stakeholders to identify changes to lower or remove undue hurdles to approve interregional projects.

MISO and PJM presented a new interregional project type in draft redlines of the JOA at the March 7 IPSAC. The new project type, Targeted Market Efficiency Project, gives more definition around the benefits and approval of projects found in the Targeted Market-to-Market Congestion or Targeted Area interregional studies. In the proposal, projects approved as Targeted Market Efficiency Projects by the Joint RTO Planning Committee (JRPC) would go directly to the RTOs' Boards for approval, obviating the need for separate regional analyses. MISO and PJM are still developing the benefit calculations for the new project type and are expecting to file JOA changes with FERC in the fourth quarter of 2016.

Consistent with finding and removing undue hurdles, MISO and PJM proposed two JOA changes in the IPSAC. The first was the removal of the \$20 million interregional cost threshold on Cross-Border Market Efficiency Projects. This elimination was filed in December 2015 and accepted by FERC in February 2016.

The second was a proposal to remedy the three approvals needed for interregional projects. The RTOs had suggested that the 1.25 benefit-to-cost ratio threshold in the interregional analysis be replaced with a screening process. The interregional process would still determine the RTO split of benefits and filter potential interregional projects to pass to the regional processes for regional benefit calculation and approval. This proposal by MISO and PJM was superseded by FERC's directive to remove the 1.25 interregional benefit-to-cost ratio in the NIPSCO Order.

8.2 Southwest Power Pool Interregional Coordination

MISO and Arkansas-based Southwest Power Pool (SPP) formally initiated a Coordinated System Plan (CSP) study on May 31, 2016, when the Joint Planning Committee voted in favor of performing a 2016 CSP Study. For the study, MISO and SPP will jointly evaluate seams transmission issues and identify transmission solutions that efficiently address the identified issues to mutual benefit.

The Joint Planning Committee based its decision upon the recommendation of the SPP and MISO portions of the Interregional Planning Stakeholder Advisory Committee⁸ (IPSAC), which both voted to commence a joint study in 2016.

While the MISO-SPP Joint Operating Agreement allows up to 18 months to complete the study, MISO and SPP staff committed to a completion date of the first quarter in 2017. This timeline allows the opportunity to initiate another CSP beginning in 2017. The scope for the CSP was reviewed by the IPSAC and approved by SPP-MISO Joint Planning Committee.

Study Purpose And Scope

The MISO-SPP CSP study will consist of an economic evaluation and reliability assessment of seams transmission issues previously identified in MISO and SPP regional planning processes. This will be accomplished by leveraging transmission needs identified in the MTEP16 process and the SPP Integrated Transmission Planning (ITP) studies (2017 ITP10). This will determine if interregional transmission solutions exist that are more efficient and cost-effective than what each RTO could do regionally.

Additionally, MISO's and SPP's generation portfolios are changing in response to increased environmental regulations and economic factors. The RTOs' respective resource mixes are forecasted to change even more rapidly over the next 10 to 20 years. The Midwestern U.S. is witnessing the retirement of a large amount of the conventional generation fleet. Thus, MISO and SPP have the opportunity to optimize the remaining resources while accommodating new resources that can meet electricity demands in compliance with state and federal public policies.

To optimize the new generation and transmission needs in the most cost-effective way, MISO and SPP should seize the opportunity to invest efforts in actionable long-term joint planning that encompasses the changes that are occurring in the electric industry. The 2016 CSP study will serve as a foundational study to inform a broader, longer-term joint and coordinated study effort beginning in 2017.

Consistent with FERC Order No. 1000, the longer-term study should ultimately facilitate the review, approval and ultimate construction of the most efficient or cost-effective transmission solutions to satisfy the needs of both MISO and SPP to relieve congestion, account for public policy considerations, and address reliability issues. Parallel with this 2016 CSP study, MISO and SPP will develop a longer-term study scope to develop a transmission expansion overlay plan that addresses these emerging issues. MISO and SPP will also consider if solutions identified in the 2016 CSP study are beneficial in the short-term and need to be approved prior to the completion of the longer-term study.

⁸ The MISO portion of the IPSAC is made up of the voting sectors of the Planning Advisory Committee (PAC) and SPP's portion of the IPSAC is made up of the Seams Steering Committee (SSC) and TOs interconnected with MISO.

The Joint Planning Committee, through the IPSAC, will provide stakeholders an open and transparent forum to provide input and review results during the 2016 MISO-SPP CSP study.

Drivers

The FERC-approved MISO-SPP Joint Operating Agreement requires that the regions, in a non-CSP year, meet and determine whether a joint transmission study should be performed. The IPSAC met on March 9, 2016, for the annual issues review meeting. At this meeting, stakeholders provided feedback on issues they would like to see evaluated in a potential 2016 MISO-SPP CSP. A broad range of issues were proposed including:

- EPA Clean Power Plan (CPP) Impacts
- Settlement Transfer Limits and Contract Path
- Market-to-Market (M2M) Flowgate Congestion
- Interregional Criteria and Benefits,
- Congestion
- Integrated System (IS) Seam

The Joint Planning Committee considered the feedback provided by the IPSAC, as well as a targeted completion date and resource availability, when developing the 2016 MISO-SPP CSP scope.

FERC Order 1000

MISO and SPP received an Order from FERC related to the August 18, 2015, compliance filing on February 2, 2016. MISO and SPP complied with nine out of the 11 directives. However, that Order required MISO and SPP to submit further compliance on two minor issues. On March 1, 2016, MISO and SPP submitted further compliance addressing the two minor issues, which was accepted by FERC on April 6, 2016. With FERC's acceptance, Docket No. ER13-1938 was concluded.

8.3 MISO/ERCOT Study

A collaborative effort between MISO and the Electric Reliability Council of Texas (ERCOT) is in progress with the purpose of understanding each system's transmission issues along the seam and exploring potential unique opportunities created by joint planning.

Currently, the detailed scope of the collaborative effort is in a preliminary development stage. The study resulting from this effort will primarily be an economic evaluation, aimed at identifying solutions that will benefit both the MISO and ERCOT systems. The study will investigate various issues and identify solutions that can efficiently address them. The issues include but not limited to:

- Congestions
- Real-time operational issues
- Load pockets in both systems
- Public policy impact

In 2015 and 2016, MISO and ERCOT successfully established data exchange and communication protocols, which laid a foundation for further collaboration. In addition, MISO and ERCOT planning teams have met in person to better understand each other's planning process.

8.4 Southeastern Regional Transmission Planning

The Southeastern Regional Transmission Planning (SERTP) Region consists of the following FERC-jurisdictional sponsors:

- Duke Energy (Duke Energy Carolinas LLC and Duke Energy Progress Inc.)
- Louisville Gas and Electric Co. and Kentucky Utilities Co. (LG&E/KU)
- Ohio Valley Electric Corp. (OVEC), including its wholly owned subsidiary Indiana-Kentucky Electric Corp.
- Southern Co. Services Inc. (Southern)
- Dalton Utilities
- Georgia Transmission Corp. (GTC)
- Municipal Electric Authority of Georgia (MEAG)
- PowerSouth
- Associated Electric Cooperative Inc. (AECI)
- Tennessee Valley Authority (TVA)

Throughout 2016, MISO and SERTP received final acceptance from FERC on the MISO-SERTP Order 1000 interregional transmission planning compliance filing. MISO and SERTP also continued interregional coordination and data exchange in 2016. Section X of MISO's Attachment FF describes the coordination procedures for interregional transmission coordination with SERTP.

FERC Order 1000

On March 22, 2016, FERC accepted the MISO-SERTP FERC Order 1000 interregional transmission planning compliance filing. This concluded Docket No. ER13-1923 and no further compliance was required.

Interregional Coordination

MISO and SERTP have tariff requirements requiring interregional transmission coordination as described in Section X of Attachment FF of MISO's Tariff. This includes at least one meeting per year to facilitate interregional coordination procedures.

MISO and the SERTP exchange their most current regional transmission plans on an annual basis. This exchange includes powerflow models and associated data used in the regional transmission planning processes.

At least biennially, MISO and the SERTP meet to review the respective regional transmission plans. Such plans include each region's transmission needs as prescribed by each region's planning process. MISO and the SERTP sponsors met on April 7, 2016, at the MISO offices in Metairie, La., to discuss each other's regional transmission plans and to determine if there may be interregional transmission projects that are more cost-effective or efficient than regional projects. If, through this review, MISO and SERTP identify a potential interregional transmission project that may be more efficient or cost-effective than regional transmission projects, the Transmission Provider and the SERTP will jointly evaluate the potential interregional transmission project pursuant to Section X.C.4 of Attachment FF of MISO's Tariff.