Executive Summary

The Long-Range Transmission Planning (LRTP) effort is a key piece of MISO's Reliability Imperative, which is the shared responsibility between MISO, our members, and states to maintain reliability throughout the resource transition. The ongoing shift in the resource fleet and the substantial projected increase in load pose significant challenges to the design of the transmission system in the MISO region. LRTP is designed to reliably and efficiently enable the resource plans of MISO members, by creating a "least-regrets" regional transmission backbone.

One key piece of the LRTP process is the development of a business case which quantifies benefits accruing from the portfolio. The Tranche 2.1 business case was developed using the Tranche 1 business case process as a starting point, with discussions on process revisions for Tranche 2.1 business case metrics beginning in January 2023. Over the next 18 months MISO engaged stakeholders on the methodology development for each benefit metric.[1]

On July 15th the Independent Market Monitor (IMM) provided feedback on the LRTP methodologies outlined into 8 recommendations, which aligned with previous IMM recommendations such as the 2023 State of the Market report.

MISO appreciates this input and summarizes our responses to each of the IMM's 8 recommendations below.

	IMM Description	MISO Assessment	LRTP Process Resolution	Remaining Difference
1	MISO should develop a reference case with modified siting assumptions that reflect the effects of not building the Tranche 2 transmission projects	MISO agrees that Tranche 2.1 can send market price signals that influence resource entry and siting decisions. MISO disagrees with developing a reference case which diverges from Future 1A and 2A. MISO is not a resource planner, and this approach would create a scenario that diverges from member resource plans and inputs gathered through the stakeholder process.	MISO Future scenarios were defined with member input, including both the inclusion of planned resources from resource planners and MISO member review of tool generated resources and siting selections.	Creation of a 'but for' case to reflect a different resource mix if the LRTP transmission is not built.

[1] Link to LRTP Workshop meeting materials: Long Range Transmission Planning (LRTP) Workshop (misoenergy.org)

	IMM Description	MISO Assessment	LRTP Process Resolution	Remaining Difference
2	Divide the portfolio into groupings of projects that address separate issues to validate that each grouping passes a benefit-cost test.	MISO agrees that the LRTP analysis must ensure that all projects in the portfolio have value. MISO disagrees that a sub portfolio-specific benefit cost ratio would capture the true benefits of that project. Economic analysis of a subset of projects does not reflect their value in a portfolio, nor does it fully capture other benefits such as reliability value. Additionally, sub portfolio-specific benefit cost ratios do not fully capture the additive benefits of the portfolio.	LRTP analyses include project specific analysis and the evaluation of alternatives, with a focus on reliability, generation enabled, and congestion relieved.	Inclusion of a benefit-cost ratio in sub portfolio analysis
3	Adopt a sensitivity case similar to IMM-2A, which has more dispatchable/ storage/hybrid resources than MISO's Future 1A.	MISO agrees that resource attributes such as dispatchability are critical to maintaining system reliability. MISO disagrees that Future 1A and Future 2A have insufficient dispatchable resources. Additionally, MISO is not a resource planner, and the creation of a new sensitivity case would create a scenario that diverges from member resource plans and inputs gathered through the stakeholder process. MISO Future scenarios were defined with member input, including both the inclusion of planned resources from resource planners and MISO member review of tool generated resources and siting selections.	MISO conducted multiple resource expansions, varying key assumptions between each of those based on questions received from stakeholders. Future 1A and Future 2A were shown to best bookend the potential resource mix. The prevalence of storage or hybrid resources did not increase substantially in any of those expansions. Additionally, MISO conducted analysis on both Future 1A and Future 2A to ensure sufficient dispatchable resources are available to serve energy needs throughout the year. As a result of this analysis, MISO added additional dispatchable resources to the Future 2A models. No additional dispatchable resources were required for Future 1A.	Whether to conduct business case analysis on a sensitivity case that includes more storage, hybrid renewable, and dispatchable resources.

	IMM Description	MISO Assessment	LRTP Process Resolution	Remaining Difference
4	Fully include the impacts of: a) required ambient adjusted and emergency ratings for all transmission facilities, and b) storage resources that are well-suited to mitigate the peak transmission flows caused by peaks in intermittent output.	MISO agrees that storage and ambient adjusted ratings can serve as viable non-transmission alternatives in some situations (e.g. near term or localized constraints). MISO also agrees with the use of emergency ratings under contingent conditions. MISO disagrees that storage resources and ambient adjusted ratings are viable solutions to forward-looking, large-scale, and regional projects, or that such projects could materially reduce the congestion and fuel savings.	MISO's models include storage and hybrid resources, which are optimized to utilize excess energy for charging and meet daily energy needs. MISO utilizes emergency ratings to mitigate constraints under contingent conditions in planning models. Historically, production cost simulations have understated congestion savings, as planning models cannot include all contingencies which occur in real time operations. While this is partially captured in the Reduced Transmission Outage cost, we anticipate that real time congestion will continue to benchmark higher than planning projections.	Use of ambient adjusted ratings in LRTP analysis Re-siting and dispatching storage to mitigate transmission build

	IMM Description	MISO Assessment	LRTP Process Resolution	Remaining Difference
5	We recommend that MISO eliminate the Avoided Capacity Cost benefits or to modify the benefit calculation to focus on the costs of the likely shifts in resource siting that would occur without Tranche 2.	MISO agrees that Tranche 2 can send market price signals that influence resource entry and siting decisions. MISO disagrees with eliminating the metric. Transmission provides optionality relative to the location of load. As long as loads in different locations peak at different times (which is always the case in practice), less generation will be required with transmission than without. MISO also disagrees with adapting this metric based on the cost of moving resources. This diverges from the resource plan of our members, who provided insight on what resources and where they should be located.	The Avoided Capacity Cost metric assesses the change in Loss of Load Expectation (LOLE) given the LRTP portfolio.	Consideration of transmission limitations in resource adequacy: - IMM: Generation would shift to meet changing resource needs; Impacts would only be local not regional - MISO: Increased transfer capacity enables a lower PRM by enabling load diversity and minimizing binding
6	Quantify the decarbonization benefit based solely on the PTC and remove this value from the congestion and fuel savings.	MISO agrees on ensuring no overlap exists with the decarbonization metric and congestion and fuel savings. MISO disagrees on focusing on a single value to represent the cost of carbon.	MISO's process ensures that the Production Tax Credit (PTC) value is removed from the final congestion and fuel savings. The values assigned to decarbonization were informed by discussions in the MISO stakeholder process; the range of values in the business case are reflective of input received.	Valuation of decarbonization - IMM: PTC value is the most valid assumption for decision-making purposes. - MISO: Utilize federal and MN PUC values to calculate range of decarbonization benefits.

	IMM Description	MISO Assessment	LRTP Process Resolution	Remaining Difference
7	Eliminate Mitigation of Reliability Issues as a separate class of benefits or quantify it based on the congestion from modeling a thermal proxy or the costs of voltage support equipment.	MISO agrees that this metric should apply in circumstances where routine operational procedures are insufficient (e.g. planning for the next contingency and applying redispatch). MISO disagrees with eliminating the metric as it appropriately captures the avoided reliability risk accruing from the LRTP portfolio.	This business case metric captures the monetary value of reduced load shed risk on a subset of identified constraints that are resolved by Tranche 2.1 projects and are not mitigated by other routine methods. This method was defined and reviewed by stakeholders at LRTP workshops.	Application of VOLL versus remediation cost to calculate the benefits of mitigating the reliability issues
8	Include only avoided age and condition related investments in the Avoided Transmission Investments.	MISO agrees.	This business case metric will only consider age and condition investments.	None

MISO's Response to IMM's Concerns and Recommendations for the Tranche 2.1 Benefit Methodologies

The Long-Range Transmission Planning (LRTP) effort is a key piece of MISO's Reliability Imperative, which is the shared responsibility between MISO, our members, and states to maintain reliability throughout the resource transition. The ongoing shift in the resource fleet and the substantial projected increase in load pose significant challenges to the transmission system in the MISO region. LRTP is designed to reliably and efficiently enable the resource plans of MISO members, by creating a "least-regrets" regional transmission backbone.

LRTP's goal is to identify key transmission projects which require near-term approval due to their lead time, while not recommending transmission which is wholly dependent on specific load and generation locations. To manage the inherent uncertainty in planning for needs 20+ years in the future, MISO's comprehensive planning processes includes:

- Evaluating multiple resource scenarios to demonstrate that Future 1A and Future 2A adequately bounds the resource expansion under different policies, accreditation, and load growth.
- Creating a framework and fostering stakeholder discussions to consider multiple approaches to building regional transmission, including 345 kV, 765 kV, and HVDC.
- Using multiple models and transfer scenarios to determine regional issues caused by the changing resource mix, and to rule out issues which only apply in a single dispatch pattern or due to specific generator or load.
- Evaluating MISO proposed and stakeholder developed transmission solutions as alternatives against these needs.
- Performing robustness testing to ensure solutions are not redundant with other transmission projects under development.
- Developing a range of benefits as part of the business case analysis to show the risk-adjusted value of potential transmission projects over the 20 years.

Tranche 2.1 Business Case Process Development and Stakeholder Review

The Tranche 2.1 business case was developed using the Tranche 1 business case process as a starting point, with discussions on process revisions for Tranche 2.1 business case metrics beginning in January 2023. Over the next 18 months, MISO engaged stakeholders on the methodology development for each benefit metric.[2]

MISO adjusted the benefit metric methodology based on stakeholder feedback, including the comments captured in the IMM 2022 State of the Market Report. Stakeholder comments requested additional resource scenarios, sought to focus the business case on only transmission instead of varying generation in the reference case, noted the potential for overlap or the overstatements metrics, and recommended methods to capture additional value. Adjustments based on these comments include:

1) Using an additional Future scenario (Future 1A), which reflects a 20-year resource expansion that is 93% aligned with resources identified in MISO member plans.
2) Utilizing equivalent resources in the reference and changes cases used for congestion and fuel savings metric.

[2] Link to LRTP Workshop meeting materials: Long Range Transmission Planning (LRTP) Workshop (misoenergy.org)

3) Eliminating the resource adequacy metric to avoid metric overlap.
4) Enhancing the reduced risks from extreme weather impacts metric to include probabilistic analysis of events.
5) Incorporating additional benefits such as reduced transmission outage costs, energy savings from reduced losses, capacity savings from reduced losses, and mitigation of reliability issues.

The final nine benefit metrics for the Tranche 2.1 business case analysis are shown below.

Benefit Metric	Description
1) Congestion and fuel savings	Enhances market efficiency and provides access to low-cost generation
2) Reduced transmission outage costs[1]	Reduced transmission congestion during forced and planning transmission outages
3) Energy Savings from Reduced Losses[1]	Lower production costs to serve load with transmission facilities that reduce system losses
4) Decarbonization[2]	Enables the economical dispatch of renewable resources to help reduce the carbon footprint
5) Avoided capacity costs	Avoids capital costs for local resource builds versus regional expansions defined in Futures
6) Capacity Savings from Reduced Losses[1]	Value of reducing transmission losses during peak capacity periods
7) Avoided transmission investments	Avoids the need for facility replacement due to age 1and condition
8) Reduced risks from extreme weather events	Increases grid resilience and decreases the probability of major service interruptions
9) Mitigation of reliability issues[1,2]	Value of alleviating reliability issues that unresolved introduce a risk of unserved load

1 – benefit metric not calculated for Tranche 1
2 – benefit metric not one of the 7 included in FERC's Order 1920

IMM's Recommendations:

On July 15th, the Independent Market Monitor (IMM) provided feedback on the LRTP process outlined into 8 recommendations, which aligned with previous IMM recommendations such as the 2023 State of the Market report. MISO's responses to these recommendations are summarized in the chart at the start of this memo, with additional detail as follows.

Recommendations related to generation siting:

> **IMM Recommendation 1:** To address that members will shift resources without a regional transmission plan, we recommend MISO develop a reference case with modified siting assumptions that reflect the effects of not building the Tranche 2 transmission projects.
>
> **IMM Recommendation 3:** Adopt a sensitivity case like IMM-2A, which has more dispatchable, storage, and hybrid resources than MISO's Future 1A.
>
> **IMM Recommendation 5:** We recommend that MISO eliminate the Avoided Capacity Cost benefits to address the invalid assumptions underlying this metric.

MISO's Response to Recommendations 1, 3, and 5:

MISO agrees that cases without the Tranche 2.1 investments can send market price signals that on the margin can influence resource entry and siting decisions. This is especially true when and if Cost of New Entry (CONE) values are reached in the system or a Local Resource Zone because of resource deficiency. These market signals are then incorporated into the resource plans of MISO members.

Specifically, the MISO footprint is primarily made up of Vertically Integrated Utilities, and these utilities have the fiduciary and regulatory responsibility to serve their load obligations. MISO respects the rights of state and load serving entities, including MISO utilities, towards resource adequacy and recognizes their role as the resource planner for their respective areas. In essence, MISO plans transmission given the generation fleet defined by MISO utilities / resource planners.

As such, MISO disagrees with actions that would require modifying member resource plans or the resource expansion which was developed in the MISO stakeholder process with the opportunity for MISO resource planner and member input. This position extends to the original Future 1A and Future 2A resource plans, the siting of resources within those Futures, and the base and change cases of business case metrics. MISO disagrees with creating a new reference case, adopting a sensitivity case, or eliminating the Avoided Capacity Cost metric due to the same rationale.

MISO Future Scenarios Overview

As stated above, MISO is not a resource planner and does not have authority over generation planning decisions or resource procurement. Member and state plans are used as the foundation for MISO transmission planning, but they may not define resource plans in all conditions across the 20+ year planning horizon, especially under scenarios with increasing load growth. MISO supplements these plans through resource expansion analysis, including intensive stakeholder review, to create forward-looking models.

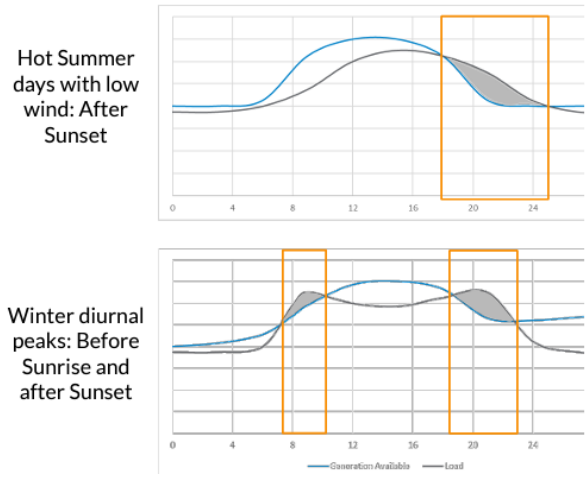
This resource expansion analysis creates planning scenarios called the MISO Futures, which seek to find resource buildouts that minimize the overall system resource cost while meeting reliability and policy requirements. Key inputs that drive the composition of these Futures include:

- Retirement and repowering assumptions
- Load growth assumptions, including electrification
- Public policies goal, including emission, decarbonization, and Renewable Portfolio Standard
- Resource capital and implementation costs, including impacts from the Inflation Reduction Act

Energy Adequacy Analysis

While developing these Futures for Tranche 2.1, MISO performed an energy validation of the resource expansion results. PROMOD, a production cost modeling tool, provided hourly chronological security-constrained unit commitment and economic dispatch, to identify any energy adequacy shortfall needs that may not have been captured in the expansion results. Generation shortfalls were identified for 3-4 hours per day during twilight hours (before sunrise or at sunset) in up to 26 days of the modeled year for Future 2A, with a maximum shortfall of 29 GW in a single hour. Resources were added to the model to mitigate these shortfalls and ensure sufficient dispatchable capacity for those hours.

Supplemental capacity additions are needed to ensure no energy shortfall in Future 2A, especially for twilight hours with low wind output



- PROMOD chronological simulations identified off-peak hours requiring additional capacity
- 26 – 29 GW in Future 2A 2042 in MISO
  - 13-26 Unserved Energy days per year
  - 3-4 hours per Unserved Energy day
  - Battery charging behavior may shift risks
- Flexible Attribute Units were added to the Futures to ensure adequacy during these hours

Resource Siting

A key part of the Future creation process is stakeholder review of the resource expansions and the location of these resources. These resource locations are initially sited by MISO staff, considering the physical characteristics of the transmission system, local resource requirements (e.g. Local Clearing Requirements) and Generation Interconnection Queue information. Stakeholders then had the opportunity to review and provide feedback on the resource sites, submitting over 500 recommended changes. MISO reviewed this feedback and created a final siting for the Futures. The resulting generation sites spanned the entire MISO footprint, as shown below.

Future 1A: Total Expansion

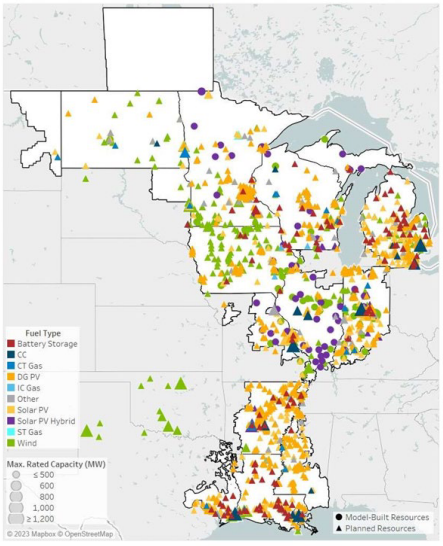


Figure 67: MISO Future 1A Non-EGEAS and EGEAS Expansion Siting

Future 2A: Total Expansion

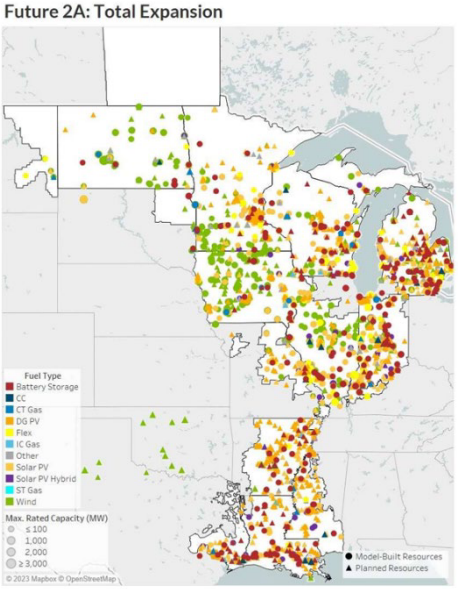
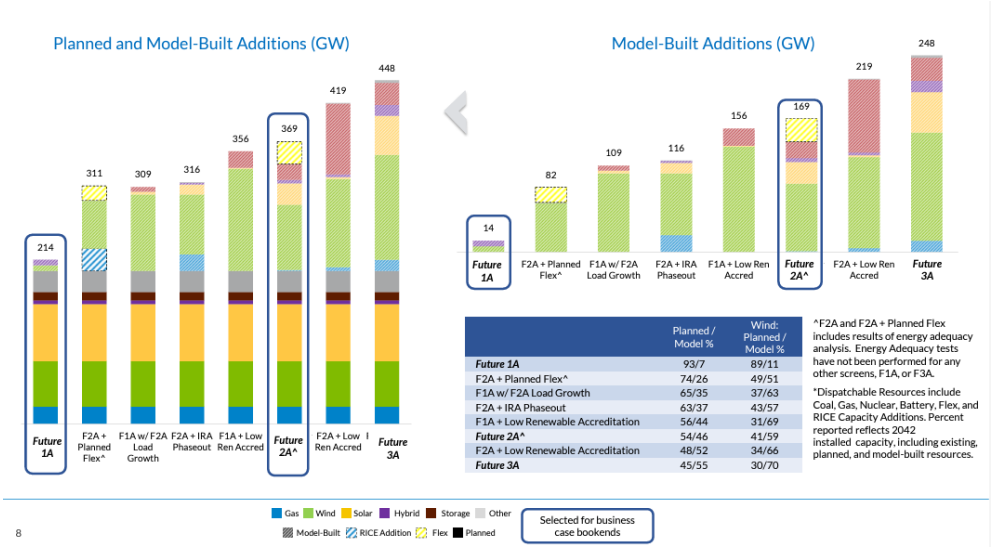


Figure 83: MISO Future 2A Non-EGEAS and EGEAS Expansion Siting

Robustness of MISO's Future Scenarios

As part of the LRTP process, MISO conducted analyses to determine the robustness of these resource expansions by varying input assumptions. The goal of this analysis was to ensure that the LRTP Tranche 2.1 transmission plans would be sufficiently robust – that the transmission was being tested against resource mixes which truly bound potential future resource mixes, while still being based in the same foundational analysis which creates all MISO Futures. Ultimately, Future 1A and Future 2A were selected to represent 'bookends' of potential resource plans; other scenarios fell within the range of those two generation scenarios.



Of note, 93% of the resource needs in Future 1A were met by resources in member plans. Future 2A built upon this resource set to meet additional load growth, with 54% of the resources being sourced directly from member plans and the additional resource expansion resulting from the MISO Futures analytical framework and undergoing stakeholder review prior to being included in modeling.

Inclusion of dispatchable resources

It is important to note that, as mentioned in the IMM comments, dispatchable resources are important. In particular, and as mentioned above, the initial Future 2A resource expansions did not have sufficient dispatchable resources to meet energy needs in low-wind, twilight hours, and additional dispatchable resources were added to the model to meet system needs. Additionally, the Future 2A expansion included storage and hybrid, and the total dispatchable resources in Future 2A exceeded 100 GW, with such resources distributed across the footprint.

Type	Future 2A Expansion (GW)*
Gas/Flex	67.1
Solar	112
Wind	161.7
Hybrid	9.8
Battery	31.2
Total	**471**

Calculation of the Avoided Capacity Cost Benefit

The Futures are created with consideration of both regional (Planning Reserve Margin, or PRMR) and local (Local Clearing Requirements, or LCR) resource requirements. These requirements include calculation based on the relative resource risk, and the metric captures how transmission can reduce the total resource requirement. MISO disagrees with the IMM that transmission would be unable to reduce the system-wide capacity needs, as shown in the simplified example below.

Below is a simple example with two zones and two hours, ignoring resource risk (e.g. generator outages). If there's no transmission, 250 MW of capacity in Zone A and 300 MW of capacity in Zone B would need to be built, for a total of 550 MW of capacity. If 100 MW of transmission is constructed, only 500 MW of capacity must be built, as capacity in Zone A can be used to serve Zone B's peak load (and vice versa).

Hour	Zone A Load (MW)	Zone B Load (MW)
1	200	300
2	250	200

Variations between MISO and IMM expansions

The IMM recommended an alternative resource expansion, as an alternative to MISO's Future 1A and Future 2A. This expansion focused on additional dispatchable resources, namely storage and hybrid, and it was developed with a different interpretation of renewable energy requirements. These differences are expanded upon below.

One important assumption in the creation of forward-looking resource expansion is the treatment of renewable energy goals by the states and members within MISO. These goals are summarized in the table below:

State Clean Energy Goals & RPS[11] (source linked)	State	Utility	Utility Decarbonization Goals (2005 Baseline)[6]	Utility Renewable Energy Goals
RPS: 15% RE by 2021 (IOUs)	Missouri	Ameren Missouri	60% by 2030, 85% by 2040, Net Zero by 2045	15% by 2021
		Columbia Missouri Water and Light Department	-	30% by 2029
		Missouri River Energy Services	-	22% by 2027
100% Clean Energy by 2050 RPS: 25% by 2025, 50% by 2042, 100% by 2050	Illinois	Ameren Illinois	Carbon Free by 2050[12]	100% by 2050[12]
		Springfield Illinois – City Water Light & Power	Carbon Free by 2050[12]	100% by 2050[12]
		Southern Illinois Power Co-operative	Carbon Free by 2050[12]	100% by 2050[12]
RPS: 105 MW (completed 2007)	Iowa	MidAmerican Energy	7% of MEC's load subject to Illinois state bill SB 2408 which requires 100% clean energy by 2050.[12]	97% by 2025
		Cedar Falls Utilities	45% by 2030 (2010 Baseline) .Net Zero by 2050	-
		Alliant Energy	50% by 2030. Carbon Free by 2050	30% by 2030
Carbon Free by 2050 (Governor) RPS: 10% by 2020	Wisconsin	Dairyland Power	50% by 2030	12% by 2026
		WEC Energy Group	Carbon Neutral by 2050	10% by 2020
		Madison Gas & Electric	80% by 2030. Net Zero by 2050	30% by 2030. 40% by 2050
Carbon Neutral by 2050 (Executive Goal) RPS: 15% by 2021 (standard), 35% by 2025 (goal, including EE & DR), 50% by 2030 (MI Healthy Climate Plan)	Michigan	Consumers Energy	Net Zero by 2040	15% by 2021
		DTE Energy	80% by 2040	15% by 2021
		Michigan Upper Peninsula	Carbon Neutral by 2050	15% by 2021. 35% by 2025
		Upper Peninsula Power	Net Zero by 2050	50% by 2025
Voluntary clean energy RPS, 10% RE by 2025	Indiana	Duke Energy	50% by 2030. Net Zero by 2050	-
		Hoosier Energy	-	10% by 2025
		Southern Indiana Gas & Electric	Net Zero by 2035	-
		Wabash Valley Power Association	50% by 2031. 70% by 2040. Net Zero by 2050	-
		NIPSCO	90% by 2030	-
Carbon Free by 2040[13] RPS: 25% by 2025, 55% by 2035	Minnesota	Xcel Energy	80% Reduction by 2030. Carbon Free by 2050	60% by 2030
		SMMPA	90% by 2030	75% by 2030
		Minnesota Power	Carbon Free by 2050	70% by 2030
		Otter Tail Power Company	80% by 2042	35% by 2023
		Great River Energy	80% by 2050	50% by 2030
	Montana	Montana Dakota Utilities Co.	45% by 2030	-
Net Zero GHG by 2050 (Governor) RPS: 80% by 2050 (Executive Order)	Louisiana	CLECO	37.8% by 2030. Net Zero by 2050. (2011 Baseline)	-
		Entergy	50% by 2030. Net Zero by 2050. (2000 baseline)	-
City Clean Energy Goals & RPS[5][F] (source linked)	City			
RPS: 70% by 2025, 100% by 2040	New Orleans			

Table 1: Modeled State & Utility Goals - Service Area Overlay

Both the MISO and IMM scenarios tracked these goals and removed overlap between state and utility goals. However, the IMM scenarios treated the Renewable Energy Credits (RECs) for utilities without a state goal as fungible; MISO assumed that those goals were additive to other state goals.

For example, Montana does not have state clean energy goals, however Montana Dakota Utility (MDU) does. The IMM expansion assumed that MDU would sell their renewable energy credits to a utility in a state with a renewable goal; MISO assumed that MDU's renewable energy would not be designated for another utility. In general, this leads to a larger renewable expansion in MISO's Future 2A than in the IMM expansion.

The other key difference between the IMM and MISO expansion is on the inclusion of storage and hybrid resources. The IMM's expansion included a greater percentage of storage and hybrid resources, as compared to MISO's expansion. This increased inclusion of storage reflects the energy and ancillary service value of storage, gas, hybrid, and batteries. MISO's resource expansions, including Future 1A, Future 2A, and all additional scenarios, did include storage, gas, hybrids, and batteries, but such resources did not dominate any scenario. In short, MISO's expansions found that, due to the impact of the Investment and Production Tax Credits in the Inflation Reduction Act, wind and solar resources were more economically viable.

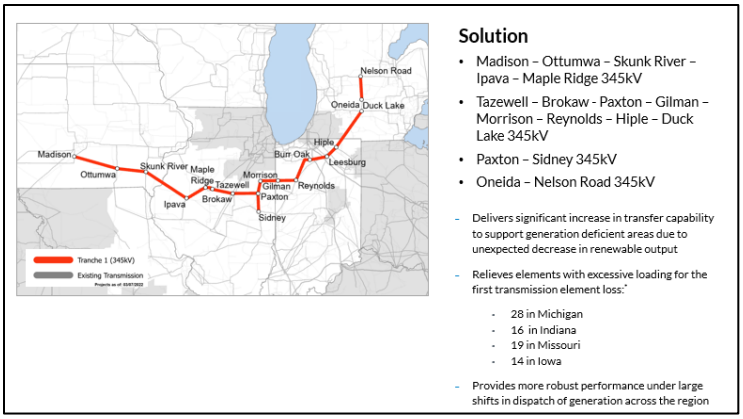
IMM Recommendation 2:

> Divide the portfolio into groupings of projects that address separate issues to validate that each grouping passes a benefit-cost test.

MISO's Response to Recommendation 2:

MISO agrees that it is critical to ensure that each project within the portfolio provides value. This is foundational to our LRTP analysis and the foundation of our alternatives assessment. Our processes reinforce this through the review of project specific performance, with a focus on issues identified through multiple models. Additionally, MISO's review removes identified transmission if it is only addressing an issue identified to support a specific resource location or load growth site. This project specific performance becomes a key piece of support for state regulatory proceedings.

An example of a project-specific justification from Tranche 1 is shown below for reference.



However, such project-specific performance does not and should not include project-specific benefit cost ratio, as such ratios for individual projects would be misleading. Like trying to evaluate the value of a highway by looking solely at a stretch of road between two towns, valuing the portfolio on a piece-by-piece basis would drastically undervalue the network benefits of a regional transmission portfolio.

IMM Recommendation 4:

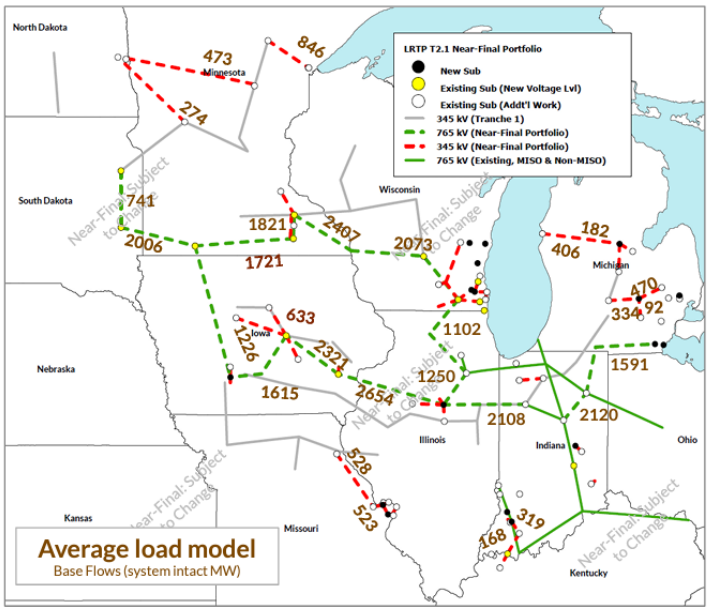
> Fully include the impacts of: a) required ambient-adjusted and emergency ratings for all transmission facilities, and b) storage resources that are well-suited to mitigate the peak transmission flows caused by peaks in intermittent output.

MISO's Response to Recommendation 4: MISO agrees that storage and ambient-adjusted transmission ratings can be economic alternatives to some types of transmission. As noted above, MISO's Future resource plans do include storage and hybrid resources. Our economic and reliability models optimize the use of these resources to efficiently use surplus energy. Emergency ratings are applied in our LRTP models under contingent conditions.

MISO's experience is that storage is better suited to address local term issues, and ambient adjusted ratings are ideally suited to use in the operational time horizon. The identification of a robust regional transmission system serves as a compliment to such near term and local transmission solutions.

For example, MISO believes that storage works as a transmission alternative when the transmission issue has a localized impact and the areas also has predictable load profiles / lower load factors. Storage may be implemented as a Transmission Only Asset (SATOA) to identified transmission planning issues. MISO also notes that the implementation of Order 881 will bring the utilization of ambient-adjusted ratings into the operational horizon, better enabling its use in the transmission planning horizon as its real-time application is tracked.

However, for Tranche 2.1, the power transfers in Future 2A are extremely high, and utilizing storage or ambient adjusted ratings to mitigate those transfers would be infeasible. Transfer results under a system-intact, average load model from July analysis are shown below. These transfers would increase under contingency and in different scenarios.



The near-final Tranche 2.1 portfolio shows strong base case flows on 765 kV and 345 kV facilities

Near-Final Tranche 2.1
Portfolio as 7/12/2024

Base flows show strong utilization of superhighway across the Midwest Subregion; impact is greater after considering contingencies (outages), enabling efficient regional transfer of power

Additionally, the lines which comprise the LRTP portfolio are evaluated and selected due to project-specific benefits under multiple scenarios, as shown below. The ability of storage or ambient ratings to mitigate all the scenarios is unlikely.

The reliability scope included multiple core models and transfer scenario models for the 2032 and 2042 timeframes

2032	2042	Transfer Scenarios 2042
Average Load	Average Load	Twilight summer
Summer peak	Summer peak	Winter low renewable
Light load	Light load	Average east to west (subregional)
Winter peak	Winter peak	Average lower to uppers (subregional)

Contingencies included to date*: P0, P1, P2, P4, P5 and P7 – generally system intact, single element and single right of way outages

7

Non-converged contingencies are also considered in this assessment
*There are very few contingencies that will be appended to the results once the contingency is developed and analyzed

IMM Recommendation 6:

> Quantify the decarbonization benefit based solely on the PTC and remove this value from the congestion and fuel savings.

MISO's Response to Recommendation 6:

MISO agrees that there should be no overlap with the application of the decarbonization benefit in the congestion and fuel savings and the stand-alone business case metric. Our congestion and fuel savings only include the Production Tax Credits to optimize the dispatch; the PTC value is removed from the final congestion and fuel savings benefit value.

MISO acknowledges that there are varying opinions on how to value decarbonization; this drives MISO to disagree with the use of a single value. MISO developed our process to value decarbonization in Tranche 1; this process was then duplicated with more recent information for Tranche 2 and reviewed with stakeholders in LRTP workshops. MISO believes that we should include this range of potential decarbonization value, based both on federal support values and state values, as reviewed with stakeholders. MISO is continuing to evaluate the appropriate value to use for the low end of this range.

IMM Recommendation 7:

> Eliminate Mitigation of Reliability Issues as a separate class of benefits or quantify it based on the congestion from modeling a thermal proxy or the costs of voltage support equipment.

MISO's Response to Recommendation 7:

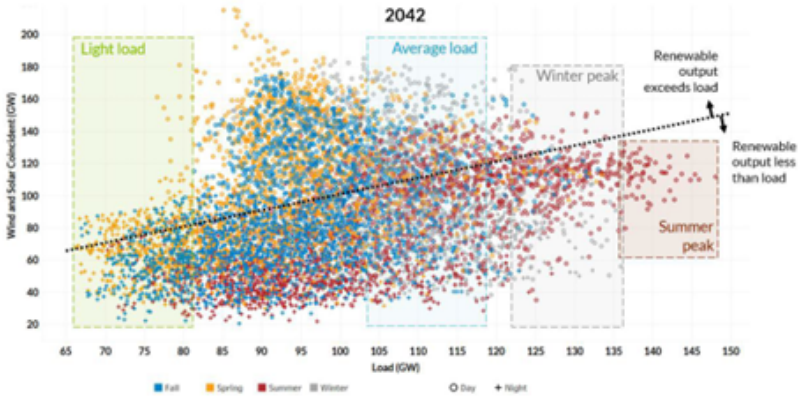
MISO disagrees. This metric is intended to capture the monetary value of addressing reliability issues. More specifically, it focuses on a subset of commonly occurring issues that meet three criteria, and it applies them for only a subset of hours where a scenario could have load risk.

1. They must occur under single element or common structure contingencies in normal operations
2. They cannot be resolved through redispatch, and
3. They must be resolved by the inclusion of the LRTP Tranche 2.1 portfolio

Monetizing the reliability value of transmission has been a long-standing industry challenge that can result in significantly undervaluing the economic value of transmission if left unaccounted for. MISO's approach to this risk is conservative, with a focus on key criteria and select hours, as shown in the illustrative graphic below.

Hours of unserved load are determined by examining the dispatch and load distribution associated with each model scenario

- Model scenarios represent a subset of annual conditions
- Load shedding risk hours correspond to hours represented by the study scenario in the annual load distribution



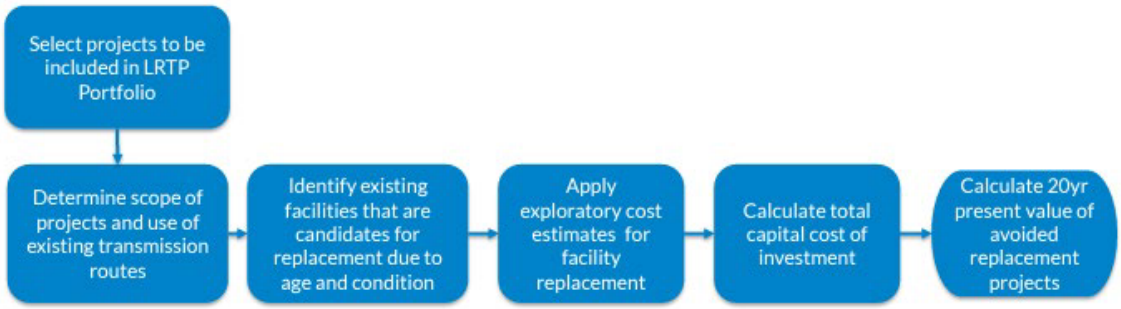
It is appropriate to use Value of Lost Load (VOLL) in this instance, rather than a thermal proxy, as this represents the residual risk which MISO is attempting to mitigate – that is a simple constraint which cannot be redispatched around, which only occurs in a specific set of hours. This valuation is further supported using redispatch, and the focus on single element outages. This metric appropriately captures the avoided risk, not the cost of inefficient operations.

IMM Recommendation #8:

> Include only avoided age and condition related investments in the Avoided Transmission Investments.

MISO's Response to Recommendation 8:

MISO agrees. This metric focuses on age and condition, as shown below.



Other IMM Comments on Specific Metrics:

IMM Comment on Reduced Transmission Outage Costs:

MISO should adopt a conservative approach to estimating this benefit that reflects the historical effects of outages.

MISO Comment:

MISO agrees. The metric is applied based on the historical rates shown below.

			MISO North	MISO Central	MISO East	MISO South
Forced	Lines	EHV	0.0019	0.0033	0.0012	0.0029
		230kV	0.0036	0.0035	0.0033	0.0018
	Xfs	EHV	0.0028	0.0021	0.0008	0.0034
		230kV	0.0010	0.0139	0.0020	0.0060
Planned	Lines	EHV	0.0051	0.0141	0.0142	0.0072
		230kV	0.0087	0.0100	0.0189	0.0068
	Xfs	EHV	0.0043	0.0061	0.0056	0.0046
		230kV	0.0051	0.0106	0.0330	0.0041

IMM Comment on Reduced Risks from Extreme Weather Events:

MISO should ensure that it does not implicitly increase the probability of extreme weather events in calculating the benefits.

MISO Comments:

MISO agrees. This metric is focused on the worst 10% of events in a Loss of Load Expectation model.