This FAQs document is for MISO stakeholders to reference when questions arise related to MISO’s Long Range Transmission Plan with detailed information on Tranche 2. For more information, or if a question is not answered here, please refer to the following sources.

- Long-Range Transmission Planning on the MISO website
  - LRTP Tranche 2 Reliability Study Whitepaper
  - MISO Economic Planning Model Series 1A Battery Modeling Whitepaper
  - Series 1A Futures Report
  - Business Case Metrics Methodology Whitepaper
- LRTP-related Knowledge Articles on the MISO Help Center

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Why is MISO performing Long Range Transmission Planning (LRTP)?

The Reliability Imperative is the term MISO uses to describe the shared responsibility that MISO, its members, and states have to address the urgent and complex challenges to electric system reliability in the MISO region. MISO’s response to the Reliability Imperative consists of a host of interconnected initiatives that aim to address the region’s challenges in a comprehensive and prioritized fashion. These initiatives are organized into four primary pillars and LRTP is a key component of the Transmission Evolution pillar.

LRTP is needed to determine how transmission can help ensure a reliable future system as the resource portfolio shifts, extreme weather events become more frequent and demand for power increases.

The need for LRTP is urgent, given the resource changes already happening, the speed of portfolio change desired by many of MISO’s members, and the length of time it takes a transmission project to go from concept to reality. Not only is there an increased urgency to identify future transmission solutions, but these solutions must also holistically address the needs of the MISO region.

Tackling these future energy needs requires a larger regional approach. LRTP looks comprehensively at MISO’s region and is very much a collaborative effort with stakeholders.

Why did MISO develop a hypothesis map and how will it be used during the study effort?

In developing LRTP Tranche 1, MISO began with an initial roadmap of potential transmission solutions, including solutions required to enable Future 3. These potential lines were adjusted, added, removed, and improved throughout the study process. In the same manner, the hypothesis map initially shared in December 2022 provides a starting point for Tranche 2 studies and includes ideas for potential solutions that address issues in the Midwest Subregion. The map does not represent final projects or a final portfolio. Qualitative considerations created a framework for the hypothesis, including:

- **Resource fleet evolution**
  - Deliver future remote renewable resource output to load
  - Facilitate conventional generation resource retirements

- **Operational considerations**
  - Internal transfer capability to enhance operating flexibility
  - External transfer capability for mutual support during extreme weather and events

- **Demand side requirements**
  - Demand and energy growth driven by electrification
The hypothesis map was then created based on knowledge gained from:

- Prior Futures siting results
- LRTP Tranche 1 analysis, including projects discussed but not included in Tranche 1
- Stakeholder discussions throughout and since LRTP Tranche 1
- Consideration of long-term LRTP vision

The map will continue to evolve as MISO engages with stakeholders, performs analysis, assesses new issues and analyzes substitute alternatives as needed.

How is MISO considering interregional coordination in Tranche 2?

As with the LRTP Tranche 1, MISO will coordinate with neighboring Regional Transmission Operators (RTO) and Transmission Owners (TO) to ensure awareness of projects as needed and to address underbuild or other needs that impact the feasibility of Tranche 2 projects.

How will the anticipated FERC Order, based on the 2022 Transmission Planning Notice of Proposed Rulemaking (NOPR), affect Tranche 2 and other tranches?

MISO continues to evaluate the potential requirements in FERC’s NOPR. MISO believes its processes are generally aligned with the Commission’s overall goals regarding the need for robust long-term transmission planning. MISO will update stakeholders on any impacts to the LRTP process if and/or when a rulemaking is released by FERC.

How many LRTP Tranches does MISO expect to pursue?

LRTP solutions are being developed in tranches or phases of effort, allowing solutions to be targeted to specific subregional needs before building potential region-wide portfolios. Tranches 1 and 2 are focused on the Midwest Subregion. Tranche 3 will focus on the South, and Tranche 4 will address the North/South interface limit. In July 2022, the MISO Board of Directors (BOD) approved Tranche 1 projects as an addendum to MTEP21. Tranche 2 planning is underway and the timing for Tranches 3 and 4 will be determined as Tranche 2 approaches completion.

Longer-term, MISO envisions that regional planning will become an embedded part of MTEP processes. This may result in additional tranches based on system needs, although MISO does not envision that every analysis will result in a recommended transmission portfolio.
What process does MISO use for developing its LRTP portfolio?

MISO follows a 7-Step Process to perform its top-down transmission planning process, including LRTP.

1. Develop scenario-based Futures with load forecast, generation forecast, and siting results.*
2. Develop models utilizing Futures and test system performance.
3. Identify potential transmission issues.
4. Propose solutions to issues.
5. Develop models with proposed solutions and evaluate the effectiveness of various solutions.
6. Recommend preferred solutions for MTEP implementation.
7. Apply appropriate cost allocation.

*Prior to producing siting from EGEAS expansion results, the Futures and Economics teams work through a feedback loop to validate energy adequacy of EGEAS expansion in PROMOD. This is an improvement from the Tranche 1 process to save time in later steps of the model building process.
Long Range Transmission Planning (LRTP)  
Tranche 2 – Frequently Asked Questions

Schedule

When will the MISO Board of Directors approve the Tranche 2 portfolio?
The Tranche 2 effort commenced during the fourth quarter of 2022 and is expected to be finalized with MISO Board of Directors approval in 2024.

When will models and analysis be ready for stakeholder review?
MISO has completed building both economic (production cost-based) and reliability (powerflow) models for Tranche 2 with stakeholder engagement. MISO has also performed initial issues identification. Tranche 2 modeling and analysis data are posted on Sharefile. To access MISO’s Sharefile site for transmission planning data and information, see Data Access section of this FAQs.

How does the portfolio review and approval process work and when does MISO anticipate having a Tranche 2 draft portfolio available for stakeholder review?
As with Tranche 1, Tranche 2 will follow the MISO Transmission Expansion Plan (MTEP) approval process, which includes stakeholder review steps leading up to the MISO Board of Directors (BOD) approval. The process will begin with review, feedback, and recommendation by the MISO Planning Advisory Committee (PAC), then moves to the System Planning Committee of the MISO BOD and is followed by final approval by MISO’s full BOD. Workshops will be held throughout the planning process to facilitate technical discussions and provide a forum for stakeholders to share ideas and feedback. MISO posted its initial draft proposal on Monday, March 4.
Stakeholder Engagement

How will stakeholders be able to engage in the LRTP process?

A series of Tranche 2 workshops will provide opportunities for stakeholders to provide feedback and ask questions, and MISO PAC meetings will include LRTP activity updates primarily through the MISO Liaison Reports. The workshops will be posted as they are scheduled. MISO will also provide periodic updates to the MISO BOD and its System Planning Committee.

MISO’s Feedback Tool and LRTP email address will be used for stakeholder feedback. MISO will utilize formal feedback requests to facilitate stakeholder feedback related to specific needs during the process. The Feedback Tool will also be used to submit informal feedback regarding topics such as process, policy or other types of information and inquiries not specifically asked for in a formal request. The LRTP email (LRTP@misoenergy.org) will be used strictly for detailed technical/engineering feedback related to modeling and analysis.

Are workshops open forums or do I have to be a MISO market participant or member to participate?

All MISO LRTP workshops are open forums. As with all MISO stakeholder forums, when asking questions, participants are required to identify themselves and who they represent.

How will information differ between LRTP workshops, PAC meetings and BOD meetings?

LRTP workshops will be the primary focus for discussions on process and analysis for the draft LRTP portfolio prior to approval. These workshops will provide stakeholders the opportunity to ask questions and participate in detailed discussions on high level and technical aspects of planning methodology, model building and study results. PAC meetings will provide policy discussions, as needed, on the LRTP process and facilitate discussion of the recommended portfolio prior to its potential approval. MISO BOD meetings will focus on major goals and milestones.
What are Futures and what purpose do they serve?

Futures are forward-looking planning scenarios used to understand what generation fleet and load landscapes could look like twenty years into the future. They allow MISO to bookend the uncertainty of the future generation and load portfolio by defining a range of potential plausible outcomes based on resource plans announced by member utilities and states. The Futures development process considers economic, policy and technological changes over time to model economic generation capacity expansion. They allow for multiple rates of change for load growth, generator retirements, fuel prices, decarbonization, renewable energy levels and other factors.

Because all transmission planning at MISO is dependent upon the type, location and quantity of future generation, Futures are an essential component in MISO planning processes, including MTEP and LRTP.

Developed with stakeholder input, MISO has three Futures that can serve as the foundation of reliability and economic models to see the transmission issues that arise in the base case and to assess potential solutions in the change case studies. Futures 1, 2 and 3 reflect different decarbonization goals, generation mixes, load growth, and levels of achieving state and utility announcements. Tranche 1 focused on Future 1, and Tranche 2 will focus on Future 2A (a refreshed Future 2) and business case analysis for Future 1A.

How are Futures named?

Cohorts of Futures are referred to by series. The Series 1 MISO Futures were created in 2019-20, culminating an 18-month collaboration between MISO and stakeholders. The development of Series 1A began in 2022, with a focus on refreshing input data while maintaining the number and definition of Futures established in Series 1. Series 1A and subsequent Futures Series will continue to capture transformation within the MISO footprint, reflecting updates and serving as the foundation for forthcoming MISO initiatives. Iterations of Futures are a product of continued collaboration between MISO and its stakeholders.

What changed in the Futures refresh?

For Series 1A, MISO began a process to update or refresh the Futures in Summer 2022 to account for changes in legislation and energy goals among MISO utilities and states. Clean energy investment and decarbonization from passage of the Inflation Reduction Act (IRA) and the Illinois Climate & Equitable Jobs Act (CEJA), as well as renewable goals in Integrated Resource Plans (IRP) and the scale of renewable applications in the Generator Interconnection Queue (GIQ) all indicate a more rapid transition to renewables than what the Series 1 Futures anticipated. The refresh captures these updates without completely overhauling Series 1. The updated, Series 1A scenarios are named Future 1A, Future 2A and Future 3A (F1A, F2A and F3A for short).
Long Range Transmission Planning (LRTP)

Tranche 2 – Frequently Asked Questions

When will the Futures refresh be finalized?

The Series 1A Futures have proceeded in several phases. The preliminary Future 2A expansion was completed in November 2022 and presented at the November 2022 PAC meeting. Stakeholder feedback was requested and as a result, additional scope was added to validate the expansion. The non-chronological expansion was spot tested in a chronological analysis to validate energy sufficiency. As a result of the chronological energy adequacy validation, approximately 29 GW of flexible attribute units were added to the final F2A expansion and siting. This work was completed in April 2023 and presented at the April 2023 LRTP Workshop.

Series 1A has concluded with the publication of the Series 1A MISO Futures Report, which includes the results of all three refreshed Futures, including Futures 1A and 3A.

Where can I get more information on Futures?

Navigate to MISO’s website to find the following:

- Future Planning Scenarios webpage
- Long Range Transmission Planning (LRTP) Workshop meeting materials
- Planning Advisory Committee (PAC) meeting materials

The MISO Futures Report from 2021 provides more background and detail on the original Futures. Also, in response to questions about what has remained constant and what has changed in the refreshed Futures, MISO has produced a Futures Refresh Assumptions Book. Finally, Futures refresh results have been posted in a Series 1A MISO Futures Report.
What information does MISO include in PROMOD models?

Base PROMOD models are first developed without applying the MTEP Futures information and assumptions ("PROMOD No Futures"). These models include the following base information:

- **ABB Hitachi PROMOD Release sourced:**
  - Fall 2021 – generator updates and economic data
  - Spring 2022 – coal price updates
  - 11.5 engine with plans to update to 11.5.1 when released

- **Resource Utilization:**
  - Includes generators with signed Generator Interconnection Agreement additions

- **MTEP22 Year 2032 Summer Peak powerflow topology (with some known updates):**
  - PROMOD models will include LRTP Tranche 1 projects

- **Study years (three individual models):**
  - 2032, 2037, 2042 (Year 10, Year 15, Year 20)

Once finalized, the MTEP Futures expansion and generation siting information as well as Gas Pipeline Competition Model (GPCM) natural gas forecasts are then applied to each PROMOD model. Note that each MTEP Future requires a separate suite of PROMOD models.

Are PROMOD models available for stakeholder review and feedback?

Yes, the models were first posted in August 2023 for stakeholders with the appropriate non-disclosure agreements and a verified PROMOD license to view. MISO requested stakeholder feedback and incorporated applicable feedback before final models were posted in February 2024.
Will MISO be posting updated Economic Models during the Tranche 2 study process with Tranche 2 solutions included?

No. MISO uses in-house developed post processing tools to add transmission topology additions to the PROMOD output files (.PFF and .EVE), bypassing the PROMOD GUI (Graphic User Interface). As a result, MISO does not publish a PROMOD model containing topology additions or projects under study. All necessary project files (e.g., .IDV files) and information will be made available for stakeholders to recreate the analysis.

MISO requests that any technical questions regarding PROMOD software, functionality, or troubleshooting be directed to Hitachi/ABB rather than MISO staff.

What information does MISO include in powerflow models?

In Tranche 2, the powerflow core models were built from the MTEP22 topology (including LRTP Tranche 1 approved projects) with load, generation, and siting information from Future 2A. Powerflow modeling reflects a snapshot in time. Each model is built to represent a specific condition and generation is dispatched to meet load levels within that condition.

Powerflow core models were developed for summer peak, winter peak, light load, and average load conditions for both the 10-year and 20-year futures. Each Future studied requires a separate set of powerflow core models. Additional scenarios of interest will be incorporated into powerflow core models during the analysis phase of the study.

What assumptions does MISO use to develop the LRTP powerflow models?

MISO published and updated a LRTP Tranche 2 Reliability Study Whitepaper on powerflow modeling with details on assumptions and methodology for the LRTP powerflow models.

What powerflow model information was posted for stakeholders?

All powerflow core models and related input data and files were first posted in August 2023 for stakeholder review. MISO has received feedback on the modeling throughout the process and has and will continue to post updated models as applicable.
Analytics

What types of analysis will MISO perform in LRTP Tranche 2?

MISO plans to perform thermal and voltage steady state analysis (powerflow) along with transfer capability analysis, voltage stability, angular stability, and production cost analyses for Tranche 2. MISO may include additional studies as issues are identified throughout the planning process. Initial issues identification has been posted to Sharefile for stakeholders with the appropriate non-disclosure agreements in place. See direct links under Transmission Solution Idea Submissions section of this FAQ.

What type of considerations go into selecting a best project?

The objective of the LRTP projects is to ensure the reliable and economic delivery of energy as the resource portfolio shifts. In addition to solving identified issues, a project in LRTP may be considered the best alternative due to relative cost impacts, use of existing infrastructure, available ROW and other benefit savings.

How will MISO treat JTIQ projects in Tranche 2, and will they be included in the base models?

Tranche 2 will include all MTEP projects approved as of MTEP22. The Joint Targeted Interconnection Queue (JTIQ) portfolio is anticipated to be approved during the Tranche 2 study process; its impact on the LRTP portfolio will be determined after approval.
Transmission Solution Idea Submissions

What is the Transmission Solution Window?

The Transmission Solution Window is a construct implemented as a solution to meet the requirements of FERC Order 1000 and serves two purposes.

- Specifically, it provides a formal platform for all transmission development entities to submit transmission solutions to MISO and receive five percentage points for Planning Participation in the competitive transmission bidding process.
- It is an opportunity for MISO to receive additional thoughts on solution ideas to address identified transmission issues. This can come from any stakeholder regardless of intent to participate in a competitive transmission bidding process.

To meet the participation requirements the process requires:

- Transmission solutions be submitted during the prescribed window of dates published by MISO,
- A submission form must be fully completed along with all required information, and
- The solution idea must be provided for the particular MISO study in progress for which MISO is soliciting such solutions. Former transmission studies that have been completed or other in-progress studies not subject to the solution window are not applicable.

When will MISO open a Transmission Solution Idea Submission Window for Tranche 2? Once opened, what is the process for stakeholders to submit their ideas?

MISO has opened the Transmission Solution Idea Submission Window as of the January 26, 2024 LRTP workshop. **MISO closed that window on Friday, April 5, 2024.**

For future reference, to submit a solution idea, go to the MISO website on the Long Range Transmission Planning webpage and fill out Submission Forms Part 1 and Part 2 under related documents. Once forms are fully completed, submit them to the LRTP email address at LRTP@misoenergy.org.

Tranche 2 modeling and analysis data are posted onto MISO's Sharefile site, linked below. MISO will notify stakeholders as new analysis is performed and posted. To access MISO's Sharefile site, see Data Access section of this FAQs.

- Economic [Study Models and Analysis](#)
- Reliability [Study Models and Analysis](#)
- [MISO LRTP Transmission Solution Idea Submission Form Part 1](#)
- [MISO LRTP Transmission Solution Idea Submission Form Part 2](#)
What solutions are MISO looking for from stakeholders for LRTP?

In the context of the Transmission Solution Window, the terms ‘solutions’ and ‘alternatives’ are often used interchangeably. Regardless of the term, in essence, MISO is looking for stakeholder-driven ideas to identified transmission issues. MISO is developing its potential transmission solutions while also looking to stakeholders for their ideas. Through the open and transparent stakeholder process, MISO will consider these various potential solutions to arrive at a reliable and value-driven transmission grid expansion. For further guidance, refer to the Tranche 2 Portfolio section in this document.

For stakeholders interested in participating in this process, transmission models and input files are provided for both reliability and economics, notwithstanding appropriate UNDA/CEII requirements. MISO does not limit or specify what such potential solutions or alternatives can be. New transmission lines or substations, upgrades to existing facilities, reactive power support devices, non-transmission alternatives, etc., are all viable ideas for consideration.

How will MISO use the submitted solutions?

MISO is considering submitted solution ideas from stakeholders that were received in the recently closed Transmission Solution Idea submission window. MISO may combine components of multiple submitted solution ideas together to create different solution ideas or may combine components of multiple submitted solutions ideas together including MISO developed solution ideas.

MISO will exercise engineering judgment in determining which solution ideas or portions thereof to consider as additional transmission and/or as alternatives to currently proposed solutions. MISO may test certain solution ideas as submitted or modified and will not necessarily test all submitted solution ideas.

Who can participate and submit potential solutions?

All stakeholders were welcome to participate in this process. To obtain the 5% Planning Participation, the solution form needed to be fully completed with all required information included in the submission. For those not interested in the 5% Planning Participation, as much information and detail as possible should have been submitted to help MISO timely and efficiently process potential solutions. MISO strongly encouraged entities to run their own analysis to compare with MISO’s results and potential solutions. MISO also encouraged active dialogue through its stakeholder process, which for LRTP is conducted through a series of workshops. It is only through this dialogue that an ultimate set of solutions, or portfolio, can be achieved.
LRTP Robustness Testing

What is “Tranche 2 robustness testing?”

Tranche 2 robustness testing refers to a process for reviewing the impact of system changes. Some other terms are used interchangeably, such as sensitivity assessment. Each key project is analyzed in detail by looking at the relevant system conditions and contingencies with and without key projects. Performance of projects, effectiveness in resolving identified needs, or any new criteria violations is documented during the testing process. This will ensure detailed impact and review in a similar way to the MTEP and generator interconnection processes. These documented processes within MISO’s Tariff capture appropriate levels of certainty to minimize the level of restudy.

In principle, the robustness testing process for the purpose of LRTP Tranche 2 is similar to the Out-of-Cycle Review of Transmission Owner Plans described in Attachment FF of MISO’s Tariff or the Expedited Project Review often presented at MISO Planning Advisory Committee meetings, and described in BPM 020, Section 4.1.4.

Which projects are eligible for robustness testing?

In Tranche 2, the powerflow core models were built from the MTEP22 topology (including LRTP Tranche 1 approved projects) with load, generation, and siting information from Future 2A. After much collaboration and engagement with stakeholders, powerflow models were finalized in October 2023. These models used best-known information at the time of completion. Key projects will be selected from the following categories for robustness testing:

- MISO’s Board approved the MTEP23 portfolio of projects in December 2023
- The Transmission Construction Agreement (TCA) for the Grain Belt Express (GBX) Merchant HVDC project was accepted by FERC in February 2024
- MISO is in the process of reviewing transmission investments for the MTEP24 cycle with expected MISO Board approval in December 2024
- Joint Targeted Interconnection Queue (JTIQ) projects are finalized, subject to FERC approval and MISO Board approval

It is important to highlight that if any of the key projects from MTEP23, MTEP24, JTIQ, or Grain Belt Express, have a material impact on the anticipated Tranche 2 portfolio, that impact will be detected in the robustness testing. Information will be shared with stakeholders via MISO’s Sharefile site.

Which models are being used for robustness testing?

MISO’s initial screening will use the LRTP 20-year out average load model, developed for Tranche 2 reliability assessment with Future 2A assumptions. This model has 100% renewable penetration, where all MISO load is served by renewables, and is the most severe case due to the required
transfers of generation across a large distance to serve load. To better assess the impact of key projects, MISO will run all single initiating events, i.e., contingencies, on the following 4 scenarios:

1. The 2042 LRTP Average load case (i.e., most stressed LRTP case)
2. The 2042 LRTP Average load case + LRTP T2 anticipated portfolio of projects
3. The 2042 LRTP Average load case + key projects
4. The 2042 LRTP Average load case + key projects + LRTP T2 anticipated portfolio

Depending on the outcome of the robustness testing, additional testing may be conducted utilizing some or all of the other seven (7) core reliability cases and additional transfer scenarios that represent various system conditions and dispatch patterns to better understand the impacts of all projects and system changes. Models are described in the Reliability Study Whitepaper.

What is the timeline for robustness testing and alternatives submitted by stakeholders?

Robustness testing on the proposed LRTP Tranche 2 portfolio is being conducted in parallel with the project alternatives that were provided by stakeholders; the window for alternatives closed on April 5, 2024. MISO will share the results and conclusions with stakeholders, with results anticipated as early as June 2024. An outcome of this process may result in MISO modifying, adding to, or removing transmission facilities shown on the initial proposed portfolio map that MISO posted on March 4, 2024. The goal of these analyses is to ensure that a robust portfolio of projects is identified.

What is a Transmission Connection Agreement (TCA)?

A Transmission Connection Agreement (TCA) serves as a contractual framework governing the relationship between MISO and entities seeking to connect to its transmission system, ensuring compliance with applicable FERC regulations, standards, and operating practices. The pro forma TCA is attached as Appendix 2 of the Merchant HVDC Transmission Connection Procedures (Attachment GGG), which can be located on MISO’s website. Any effective TCA in the MISO footprint would also be posted on the MISO website under the Interconnection Agreement tab of MISO Legal’s Service Agreement page.

A TCA includes provisions related to upgrades with specified in-service dates required to facilitate the connection of Merchant HVDC lines to the MISO transmission system. These upgrades could involve enhancements to the existing transmission infrastructure, such as the installation of new transmission lines, transformers, switchgear, or other equipment, to ensure the system stays reliable and able to accommodate additional injection or withdraw resulting in changes in electricity flow resulting from the new connection.

For more information visit MISO Generator Interconnection Queue (misoenergy.org).

Grain Belt Express with projects as identified in TCAs are posted on MISO’s website here.

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1 Key projects shared at the May 13, 2024 LRTP workshop
How will the Tranche 2 portfolio complement the Tranche 1 portfolio?

MISO is committed to the reliability of the system which is a significant driver for both the Tranche 1 and Tranche 2 portfolios. The refreshed Futures (A series) indicate a more rapid shift in timing and magnitude of the resource change and evolution, reinforcing what MISO anticipated in Tranche 1. The Tranche 2 analysis accounts for Tranche 1 projects and will continue to resolve additional drivers (reliability, economic) shown in the Futures Series A. As MISO has stated, 765kV is a strong consideration for the Tranche 2 portfolio. The 345kV solutions that were approved in Tranche 1 will provide and further strengthen the backbone and enable 765kV additions.

Will a Tranche 2 portfolio resolve all the issues in Future 2A?

As with Tranche 1, Tranche 2 does not resolve all identified issues. Instead, the Tranche 2 transmission lines focus on creating a logical next step in the development of a regional backbone (e.g., highway system), balancing needs with benefits and cost. MISO’s existing processes will support future resource and load additions as they become more certain (e.g., local roads).

MISO’s other planning processes, such as annual MTEP reliability and generator interconnection processes, will identify the transmission needed to address local issues not resolved by Tranche 2. MISO will continue to work with stakeholders in those processes to identify these local transmission needs, which will build-off the regional transmission highway identified in Tranche 2.

Why is 765 kV being considered?

The needs identified in the LRTP Tranche 2 studies, which are based on the F2A Future, are not incremental, thus 765 kV is a more cost-effective solution. 765 kV is selected since the cost per mile for a double-circuit 345 kV line is less and HVDC is best suited for long distances beyond 300 miles.

The capacity of a 765 kV line is nearly three times the capacity of a double-circuit 345 kV line. The cost per MW-mile for 765 kV is less than one-third the cost per MW-mile of 345 kV. It is important to note that LRTP Tranche 2 also includes 345 kV upgrades to facilitate on/off ramps to the 765 kV system, but the bulk regional lines being proposed to establish the transmission superhighway in LRTP Tranche 2 are 765 kV.

HVDC is best suited for long distance transmission because of the ability to maintain a rating equal to its thermal limit, where the capabilities of the AC transmission line can fall well below their thermal limits for long transmission lines lengths. As a line’s length decreases, the cost advantage of 765 kV over HVDC increases; and as a line length increases, the cost advantage of 765 kV over HVDC decreases. Based on the Transmission Cost Estimating Guide for MTEP 23, the breakeven
distance is greater than 300 miles. The average length of the 765 kV lines being considered in Tranche 2 is 130 miles, with the longest line being below 300 miles.

What is the impact of a 765 kV contingency?

One issue being considered is the contingency impact of 765 kV to ensure it is mitigated by both existing and proposed 345 and 765 facilities. The impact of a 765 kV contingency could be more severe if there are fewer 765 kV circuits to makeup the 765 kV backbone. For example, if only two 765 kV circuits were installed, an N-1 contingency would result in loss of half the 765 kV system and an N-2 contingency would result in the loss of the entire 765 kV system. The anticipated portfolio has multiple 765 kV transmission line circuits and numerous 765-345 kV transformer banks. Under an N-2 contingency, most of the 765 kV backbone would remain intact. Care must be taken to consider the local impacts of nearby 765 kV contingencies, and the existence of an underlying 345 kV system to support and provide backup to the 765 kV system helps mitigate the impacts of 765 kV contingencies.

Does MISO still have an “All Things Considered” philosophy regarding the consideration of legacy voltage levels vs. 765 kV vs. HVDC?

Yes. The 345 kV supporting facilities that exist today remain needed and valuable for supporting local and contingency operation of the 765 kV. They also ensure strong connections between the 765 kV system and the underlying transmission system. The regional 765 kV backbone will assist in enabling the new resource mix while addressing load growth, dispatch volatility and extreme weather situations. The anticipated transmission plan for Tranche 2 does not eliminate opportunities to continue consideration of HVDC, 345 kV or 765 kV for future needs.

There are related materials posted for the March 8, 2023, Planning Advisory Committee meeting. These materials can be accessed via the MISO calendar.

Did MISO consider the use of Grid Enhancing Technologies for LRTP Tranche 2?

With such a high percentage of facilities overloaded, including legacy EHV 345 kV facilities, Grid Enhancing Technologies would not be sufficient to solve the issues identified in Tranche 2. A key benefit of Grid Enhancing Technologies is their ability to capitalize on opportunities in the operations time frame. MISO is open to incorporating such technologies into identified solutions at the discretion of the Transmission Owner to provide increased operational flexibility in the operating horizon.
What portions of the final Tranche 2 portfolio will be competitively bid?

Once MISO’s Board of Directors approves a Tranche 2 portfolio, MISO will follow its Tariff defined Competitive Developer Selection Process to determine which transmission and substation facilities are Competitive Transmission Facilities. All identified Competitive Transmission Facilities will be part of one or more Request For Proposal and evaluated by MISO to determine the Selected Developer.

Cost Allocation

What cost allocation mechanism will MISO use for Tranche 2?

MISO will continue to focus on solutions in Tranche 2 that provide a variety of benefits for the region. As with Tranche 1, MISO anticipates the Tranche 2 portfolio will deliver sufficient benefits to qualify under the current Multi-Value Project (MVP) cost allocation mechanism, with costs allocated only to the subregion where benefits are spread to ensure a roughly commensurate “beneficiaries pay” cost allocation that meets the requirements of MISO’s Tariff.

Are new cost allocation mechanisms being discussed at MISO?

Discussions with stakeholders are ongoing to consider alternative cost allocation mechanisms for Tranches 3 and 4.

How can I get involved in cost allocation discussions?

Stakeholders may engage in ongoing cost allocation discussions through participation in MISO’s Regional Expansion Criteria and Benefits Working Group (RECBWG).

Where can I find more information on cost allocation?

Existing Tariff provisions for Multi-Value Project cost allocation can be found in Attachment FF to the MISO Tariff.
Data Access

How can I see and review models and input data for LRTP?

MISO uses Sharefile to post models and input data. See Sharefile Access & Use article on the MISO Help Center for access: [https://help.misoenergy.org/knowledgebase/article/KA-01377/en-us](https://help.misoenergy.org/knowledgebase/article/KA-01377/en-us)

How can I access the economic model PROMOD engine version?

MISO utilizes PROMOD engine 11.5.1 for LRTP Tranche 2 economic analysis, which was released March 2023. To access this engine and receive general PROMOD help, please email the PROMOD vendor, Hitachi Energy, at PB_Support.PGES@hitachi-powergrids.com.

How do I know if I have access to LRTP data? How can I get access if I don’t have it?

LRTP models and input data are in Sharefile. Only authorized individuals designated by certified MISO stakeholders can access this information. If an authorized individual does not have access, a completed Request Access to Restricted Content form should be submitted in the [MISO Help Center](https://help.misoenergy.org/knowledgebase/article/KA-01377/en-us).

If you’re not sure that you’re an authorized individual, please view MISO’s [Non-Disclosure Agreement Types and Instructions](https://help.misoenergy.org/knowledgebase/article/KA-01377/en-us) or open a new case on the [MISO Help Center](https://help.misoenergy.org/knowledgebase/article/KA-01377/en-us). Only authorized individuals designated by certified MISO Members, Market Participants, and Authorized Agencies are eligible to execute these agreements.

For forms and additional information, please navigate to MISO’s website under [Client Services and Readiness](https://help.misoenergy.org/knowledgebase/article/KA-01377/en-us).
Sources related to LRTP Tranche 2

Renewable Integration Impact Assessment (RIIA)

Navigate to the RIIA page on the MISO website:
MISO Homepage > Planning > Policy Studies > Renewable Integration Impact Assessment

**RIIA One Pager**

- Overview of the need for the RIIA and what the analysis looks at
- Brief description of the Five Risks determined by the RIIA

**RIIA Summary Report**

- Details on the need for RIIA and risks determined
- Applying identified risks to key focus areas: Resource Adequacy, Energy Adequacy, and Operating Reliability
- Identifying key threats to specific focus areas
- Summary of Technical Assumptions used in the study

Multi-Value Projects

Navigate to the Multi-Value Projects (MVPs) page on the MISO website which defines MVP transmission projects and provides an overview of the annual review process:
MISO Homepage > Planning > MTEP > Multi-Value Projects (MVPs)

**BPM-020 Transmission Planning > Multi-Value Projects (Section 7.5)**
Download full BPM zip file here: Business Practices Manuals

- Details the three different criteria a project can meet to be an MVP:
  - Delivers energy more reliably and/or economically than without the upgrade
  - Provides Benefit-to-Cost ratio of 1.0 or higher across multiple pricing zones
  - Addresses at least one Transmission Issue associated with a projected violation of NERC or Regional Entity reliability standard and provides economic value across multiple pricing zones
- Details conditions all MVPs must meet
- Details Economic Benefits considered when qualifying a project as an MVP
- Details Facility qualifications required for Cost-Sharing
- General overview of Cost Allocation and MVP Usage Charge
LRTP Tranche 1
Navigate to the Long Range Transmission Planning page on the MISO website:
MISO Homepage > Planning > Long Range Transmission Planning > Tranche 1 tab

**Detailed Business Case**
- Timeline of LRTP development
- Details on MVP criteria and how LRTP meets those
- Identifies objective of LRTP and scope of the business case
- Overview of the present value of LRTP portfolio
- Details assumptions in reference and change cases for each set of benefits metrics
- Discussions on natural gas price sensitivities considered
- Overview of cost allocation methods

**Detailed Business Case Analysis**
- Detailed business case assumptions (i.e., inflation, discount rate etc.)
- Detailed calculations on individual benefits, NPV of benefits and cost allocation (CAZ)
- Benefits detailed include congestions and fuel savings, avoided capital cost of local resource investment, avoided transmission investment, resource adequacy savings, avoided risk of load loss, decarbonization

Navigate to the Previous MTEP Reports page on the MISO website to view the MTEP 21 LRTP Addendum for Tranche 1:
MISO Homepage > Planning > MTEP > Documents > MTEP Reports > LRTP Tranche 1 Addendum

**MTEP 21 LRTP Tranche 1 Portfolio Zip Folder**
- MTEP 21 Addendum LRTP Tranche 1 Portfolio Exec Summary and Report
  - Overview of the LRTP Process
  - Background information on Futures 1, 2, & 3
  - Details on Study Inputs and Futures Used
  - Background on individual projects and issues they address
  - Breakdown of LRTP Portfolio Benefits
- LRTP Tranche 1 Appendix A-3 Schedule 26A Indicative
  - In-Service Date Projections by Project
  - Project Gross Cost in 2022 $
  - Indicative Annual MVP Charges by LBA
- MTEP 21 LRTP Addendum Appendix A
  - List of Projects including geographic locations (state, TO, region), ISD Projection, description, system need, estimated cost, cost allocation, max/min voltage
  - List of individual Facilities including geographic locations (substations, state, TO, region), description, estimated cost, max/min voltage, emergency facility rating, miles upgrade/new