# MISO Transmission Expansion Plan: MTEP21 Addendum - LRTP Tranche 1 Report Overview

Planning Advisory Committee (PAC)

April 13, 2022

# Purpose & Key Takeaways

## Purpose:

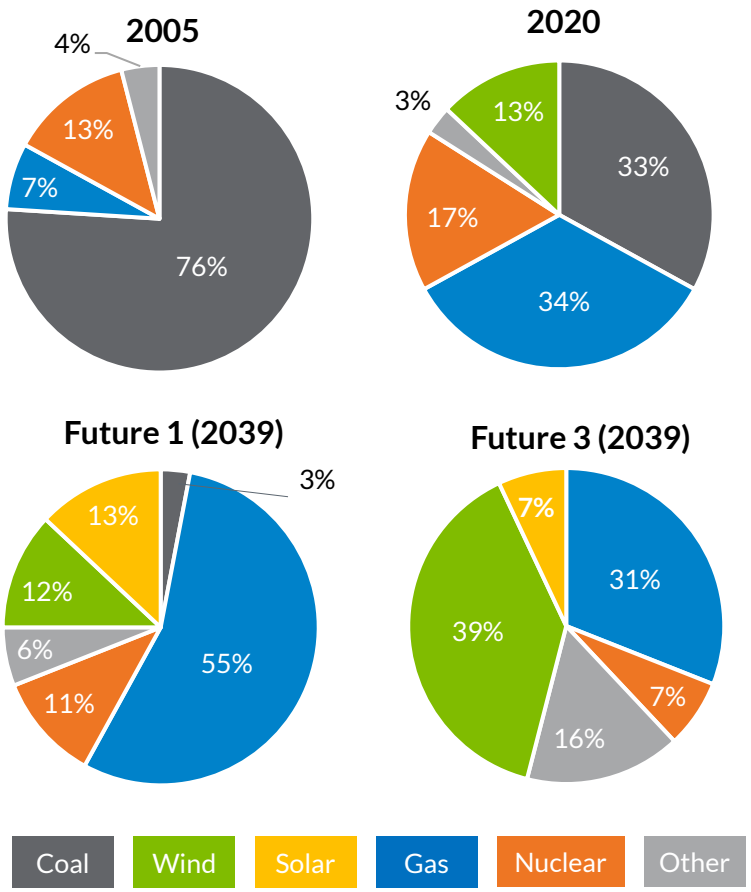
Provide status on the MTEP21 Report Addendum and review next steps

## Key Takeaways:

- Long Range Transmission Planning (LRTP) addresses the future challenges of the resource fleet evolution
- LRTP Tranche 1 Portfolio addresses needs across the entirety of the MISO Midwest Subregion
- The LRTP Detailed Business Case summarizes the analysis of the reliability and economic benefits and supports recommendation of Tranche 1 Portfolio, with a total 20-year present value benefit to cost ratio of at least 2.6
- Substantive feedback window is open from April 13th to May 12th
- LRTP workshop will be held on April 29th

# MISO's actions, as part of the Reliability Imperative, address emerging operational needs on the system

## GENERATOR ENERGY MIX




## MISO FORWARD



## RELIABILITY IMPERATIVE

| |
|---|
| Market Redefinition |
| **Long-Range Transmission Planning** |
| Operations of the Future |
| Market System Enhancement |

*List is not representative of all efforts*

MISO is actively pursuing multiple workstreams to ensure ongoing reliability and value creation



*MISO's Response to the Reliability Imperative*

# MISO's planning process ensures the reliable operation of the transmission system while supporting policy requirements and enabling a competitive electricity market

## Market access

Provide access to electricity at the lowest total electric system cost

## Planning criteria

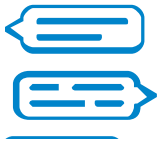
Meet policy and transmission owner planning criteria while safeguarding local and regional reliability

## Policy alignment

Align planning for changing resources with state and federal policy

## Cost allocation

Ensure project costs are commensurate with planned benefits



## Information exchange

Analyze system scenarios and share with policy makers and stakeholders

## Regional coordination

Plan with neighbors to eliminate barriers

# The objective of Long Range Transmission Planning is to provide an orderly and timely transmission expansion effort that supports key goals

**Reliable System**

Maintain robust and reliable performance in future conditions with greater uncertainty and variability in supply

**Cost Efficient**

Enable access to lower-cost energy production

**Accessible Resources**

Provide cost-effective solutions allowing the future resource fleet to serve load across the footprint

**Flexible Resources**

Allow more flexibility in the fuel mix for customer choice

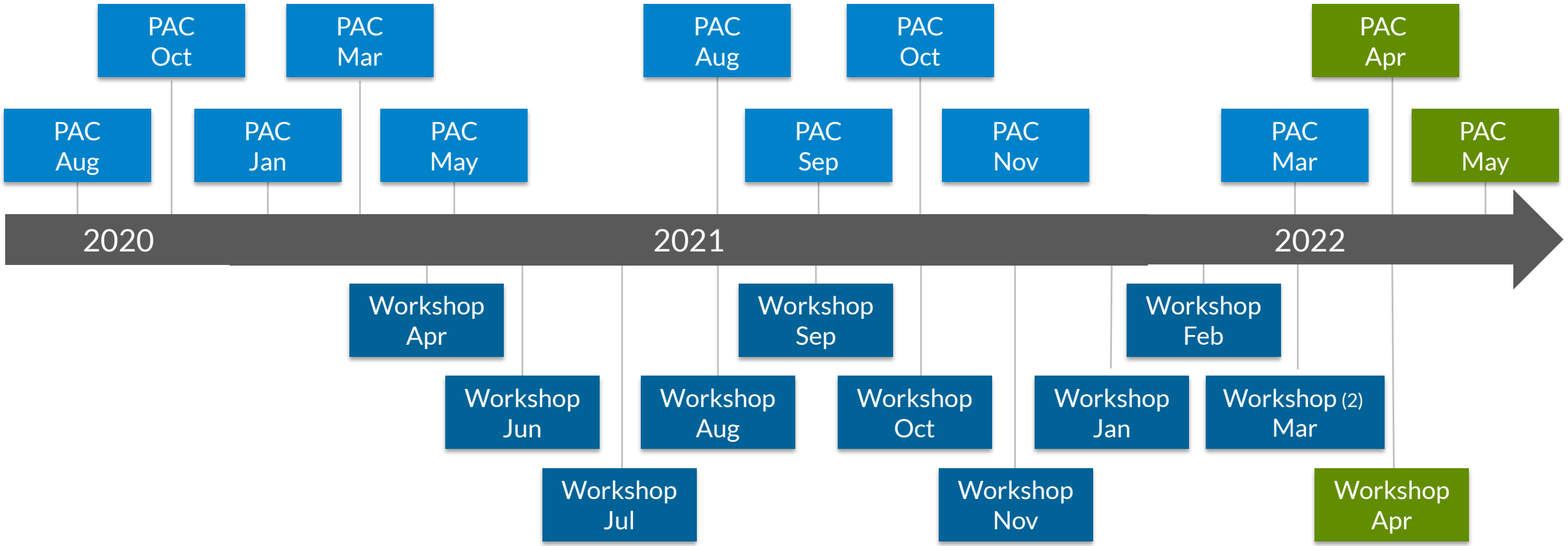
# There are conditions precedent for longer-term transmission plans to be approved and successfully developed


Consensus that transmission is required to address the subregional and collective needs of the footprint


Analysis of subregional issues and solutions compatible with regional reliability and market operations needs

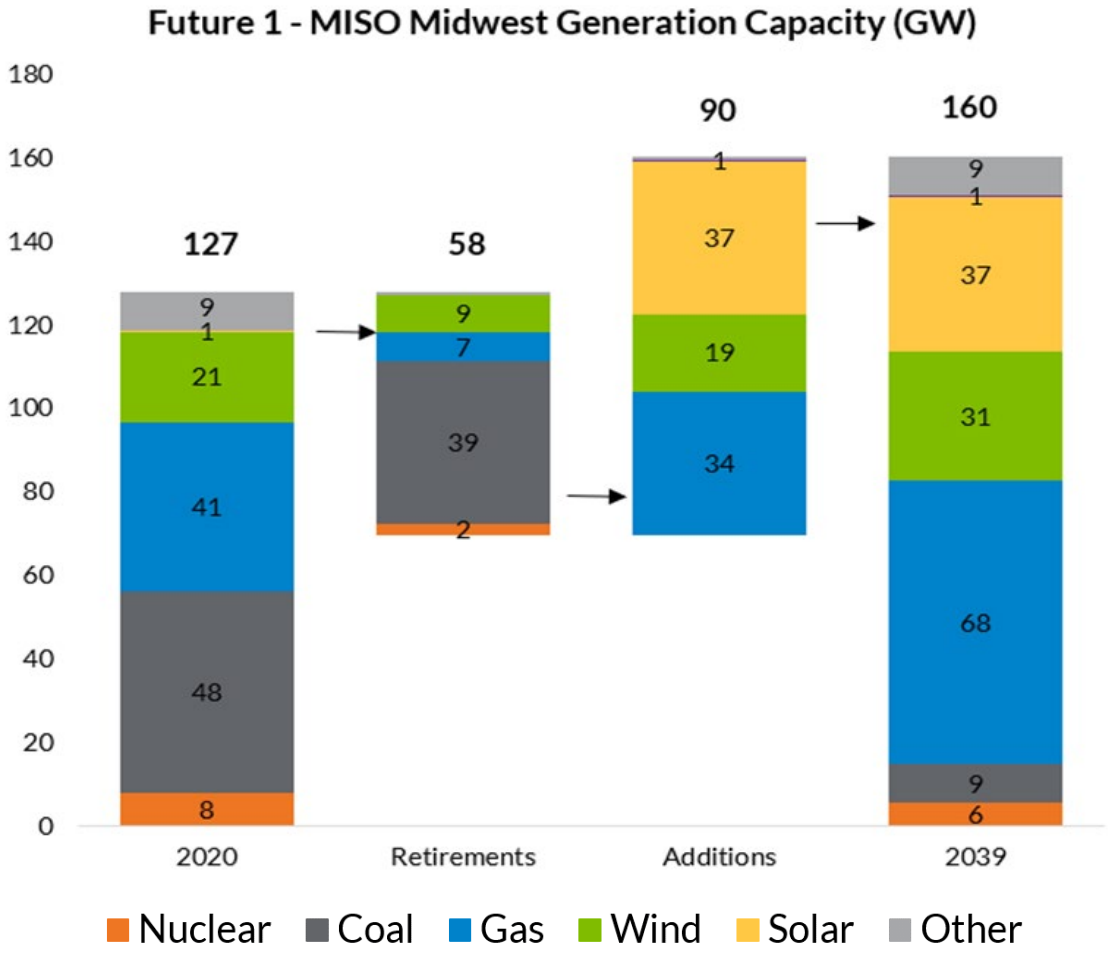

Costs assigned roughly commensurate with benefits to each area

# Stakeholder engagement is critical to the LRTP process and success



# The need to develop transmission is urgent as the resource portfolio rapidly evolves and LRTP's Tranche 1 focuses on meeting the needs of Future 1

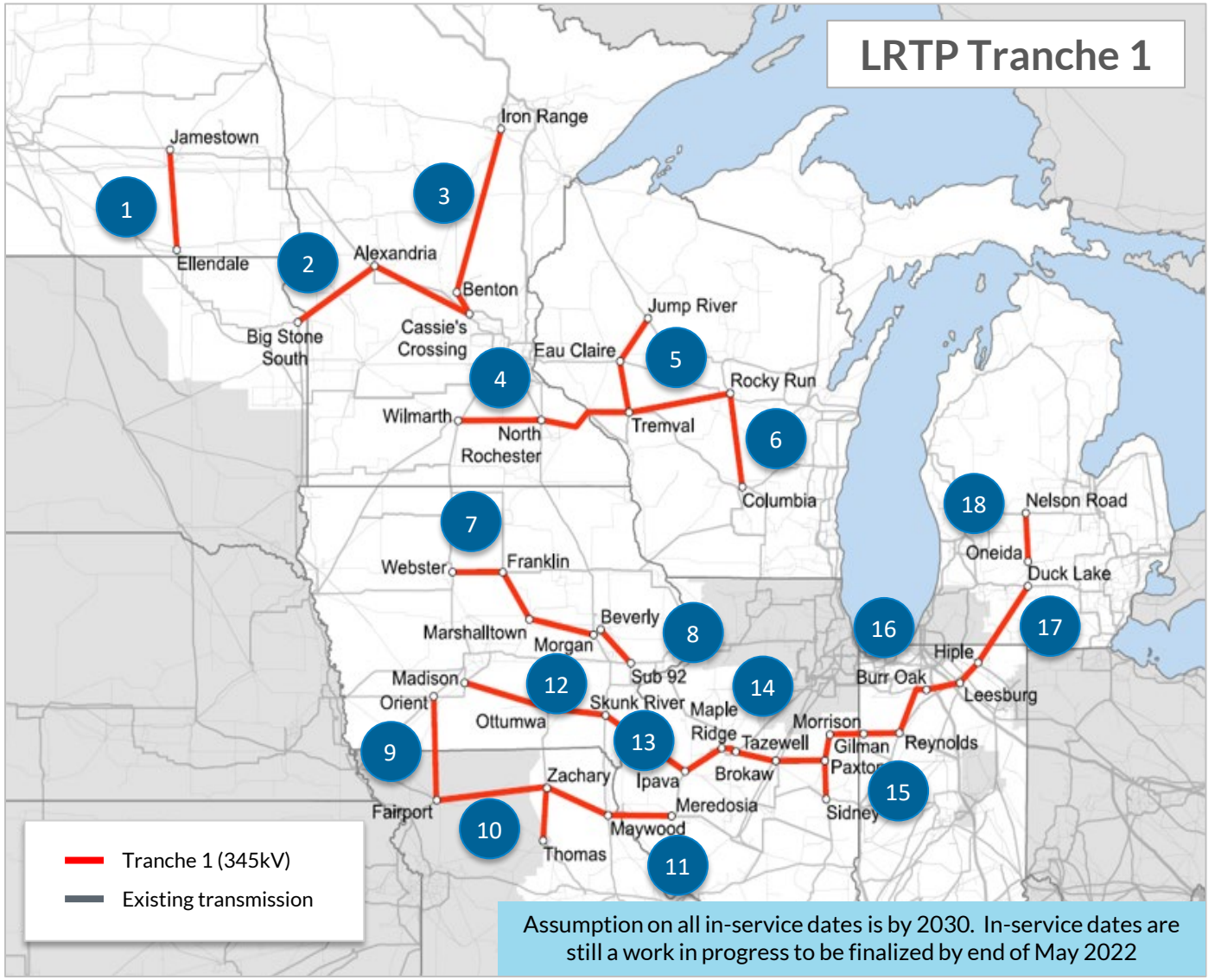
- The footprint develops in line with 100% of utility IRPs and 85% of utility announcements, state mandates, goals, or preferences
- Emissions decline as an outcome of utility plans
- Load growth consistent with current trends



# Preliminary project cost estimates for LRTP Tranche 1 is $10.4 B for projects located across the MISO Midwest subregion

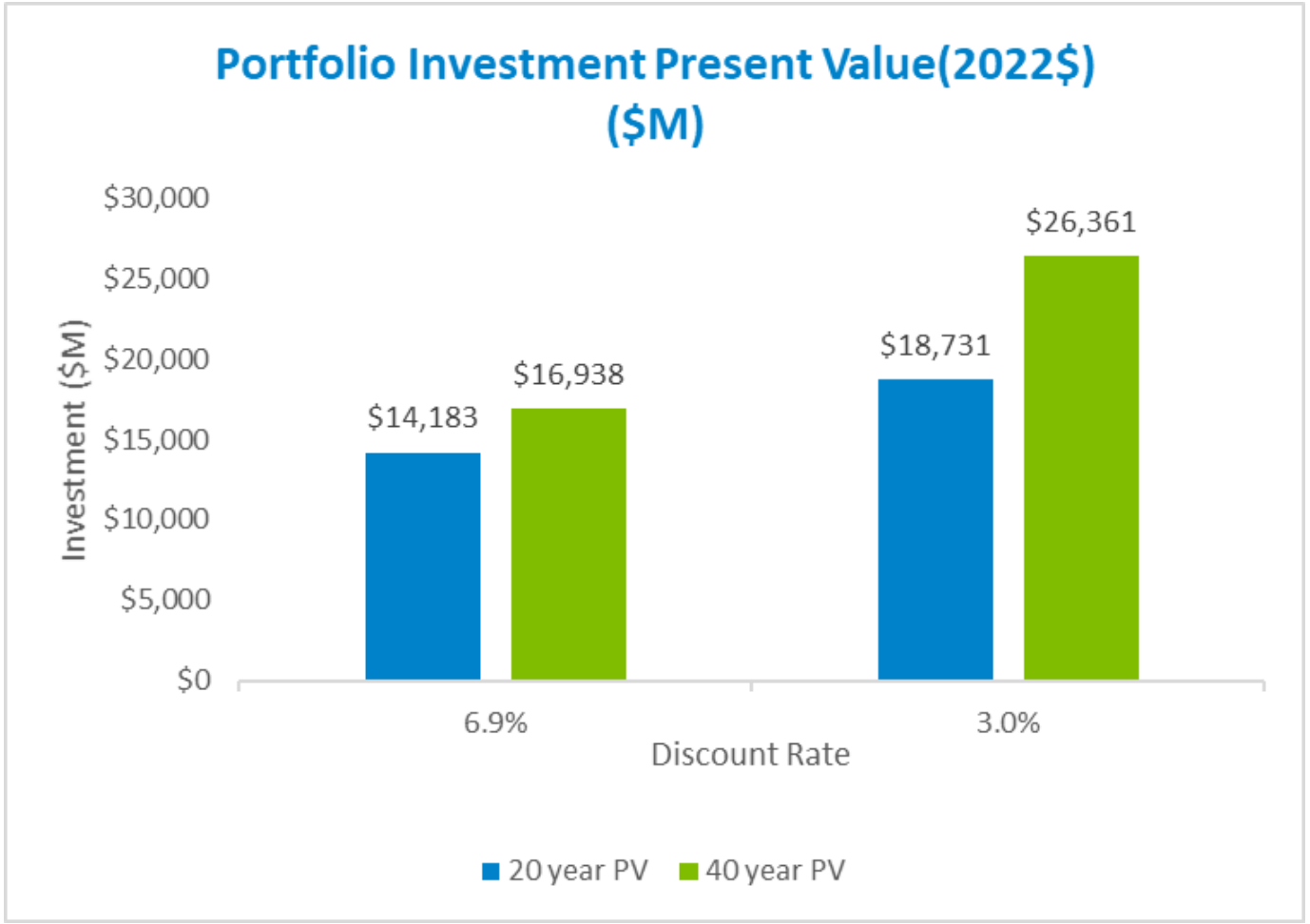
| ID | Project Description | Est. Cost ($M, 2022) |
|---|---|---|
| 1 | Jamestown – Ellendale | $420M |
| 2 | Big Stone South – Alexandria – Cassie's Crossing | $595M |
| 3 | Iron Range – Benton County – Cassie's Crossing | $853M |
| 4 | Wilmarth – North Rochester – Tremval | $718M |
| 5 | Tremval – Eau Clair – Jump River | $575M |
| 6 | Tremval – Rocky Run – Columbia | $673M |
| 7 | Webster – Franklin – Marshalltown – Morgan Valley | $716M |
| 8 | Beverly – Sub 92 | $178M |
| 9 | Orient – Denny - Fairport | $561M |
| 10 | Denny – Zachary – Thomas Hill – Maywood | $1,115M |
| 11 | Maywood – Meredosia | $356M |
| 12 | Madison – Ottumwa – Skunk River | $683M |
| 13 | Skunk River – Ipava | $600M |
| 14 | Ipava – Maple Ridge – Tazewell – Brokaw – Paxton East | $640M |
| 15 | Sidney – Paxson East – Gilman South – Morrison Ditch | $533M |
| 16 | Morrison Ditch – Reynolds – Burr Oak – Leesburg – Hiple | $374M |
| 17 | Hiple – Duck Lake | $488M |
| 18 | Oneida – Nelson Rd. | $302M |
| | **Total Project Portfolio Cost** | **$10,380** |

Costs as of 4/6/2022, and are subject to change
(costs represent "overnight" costs)



# The LRTP Tranche 1 portfolio cost (20-year and 40-year present value at 6.9% and 3.0% discount rate)

- The total capital cost of LRTP Tranche 1 portfolio is estimated at $10.4B
- The 20–40-year Present Value (in 2022 dollars) of the portfolio total revenue requirement is expected to be in the range of $14.2B - $16.9B*




*6.9% Discount Rate

# LRTP Projects must meet one of three MVP criteria defined in the MISO Tariff

**MISO Tariff - Attachment FF, II.C.2...**

A. **Criterion 1**. A Multi-Value Project must be developed through the transmission expansion planning process for the purpose of enabling the Transmission System to reliably and economically deliver energy in support of documented energy policy mandates or laws that have been enacted or adopted through state or federal legislation or regulatory requirement that directly or indirectly govern the minimum or maximum amount of energy that can be generated by specific types of generation. The MVP must be shown to enable the transmission system to deliver such energy in a manner that is more reliable and/or more economic than it otherwise would be without the transmission upgrade

B. **Criterion 2.** A Multi-Value Project must provide multiple types of economic value across multiple pricing zones with a Total MVP Benefit-to-Cost ratio of 1.0 or higher where the Total MVP Benefit -to-Cost ratio is described in Section II.C.7 of this Attachment FF. The reduction of production costs and the associated reduction of LMPs resulting from a transmission congestion relief project are not additive and are considered a single type of economic value.

C. **Criterion 3. A Multi-Value Project must address at least one Transmission Issue associated with a projected violation of a NERC or Regional Entity standard and at least one economic-based Transmission Issue that provides economic value across multiple pricing zones. The project must generate total financially quantifiable benefits, including quantifiable reliability benefits, in excess of the total project costs based on the definition of financial benefits and Project Costs provided in Section II.C.7 of Attachment FF.**



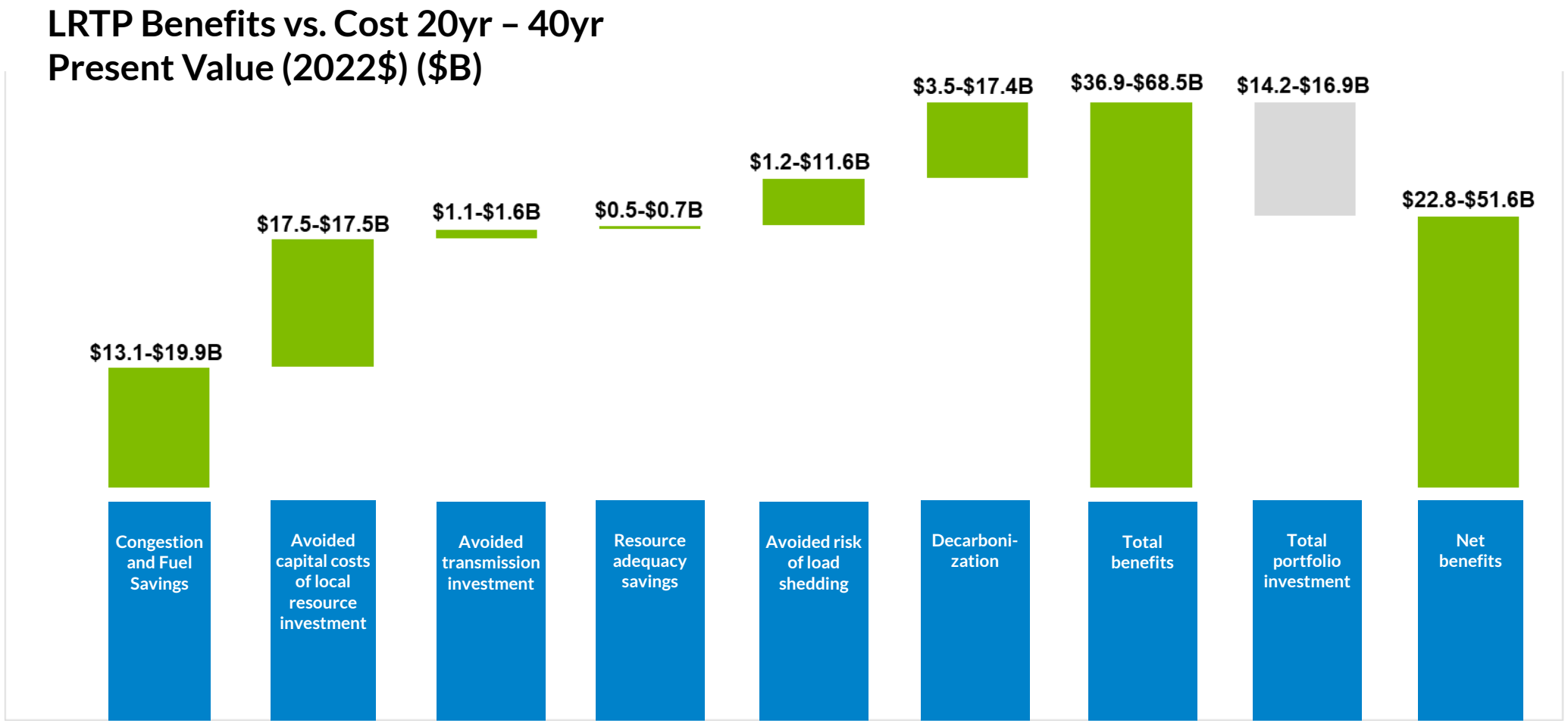
Bold = MVP Criterion used for LRTP Tranche 1 Portfolio.

# The scope of LRTP business case analysis includes quantifying the reliability and economic benefits which are provided at scale, compared to more localized benefits reflected from incremental planning

## Benefits

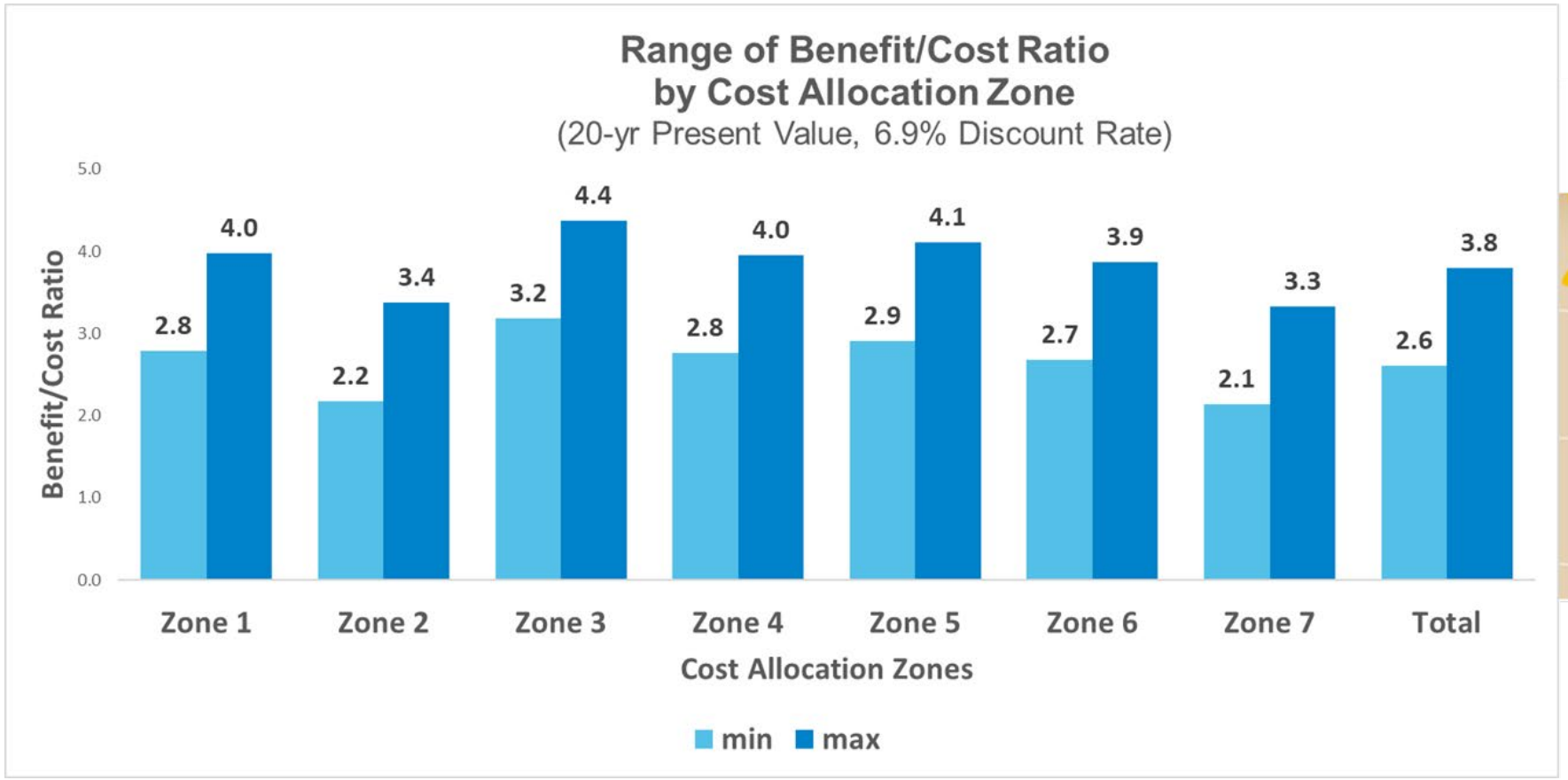
- Resolution of reliability issues
- Congestion and fuel savings
- Avoided capital costs of local resource investments
- Avoided transmission investment
- Reduced resource adequacy requirements
- Avoided risk of load loss / shedding
- Decarbonization goals achieved
- Other qualitative and indirect benefits

# The preliminary analysis indicates total economic benefits significantly exceed cost of the Tranche 1 LRTP portfolio



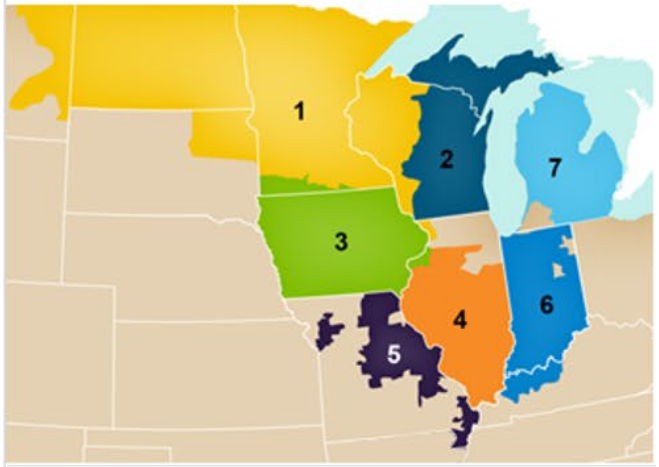

Values as of 4/6/2022
*6.9% Discount Rate

# Tranche 1 provides broad distribution of benefits across the Midwest subregion and delivers a benefit to cost ratio at least 2.1 for all zones




Values as of 4/6/2022

**Map of Midwest Cost Allocation Zone Boundaries***

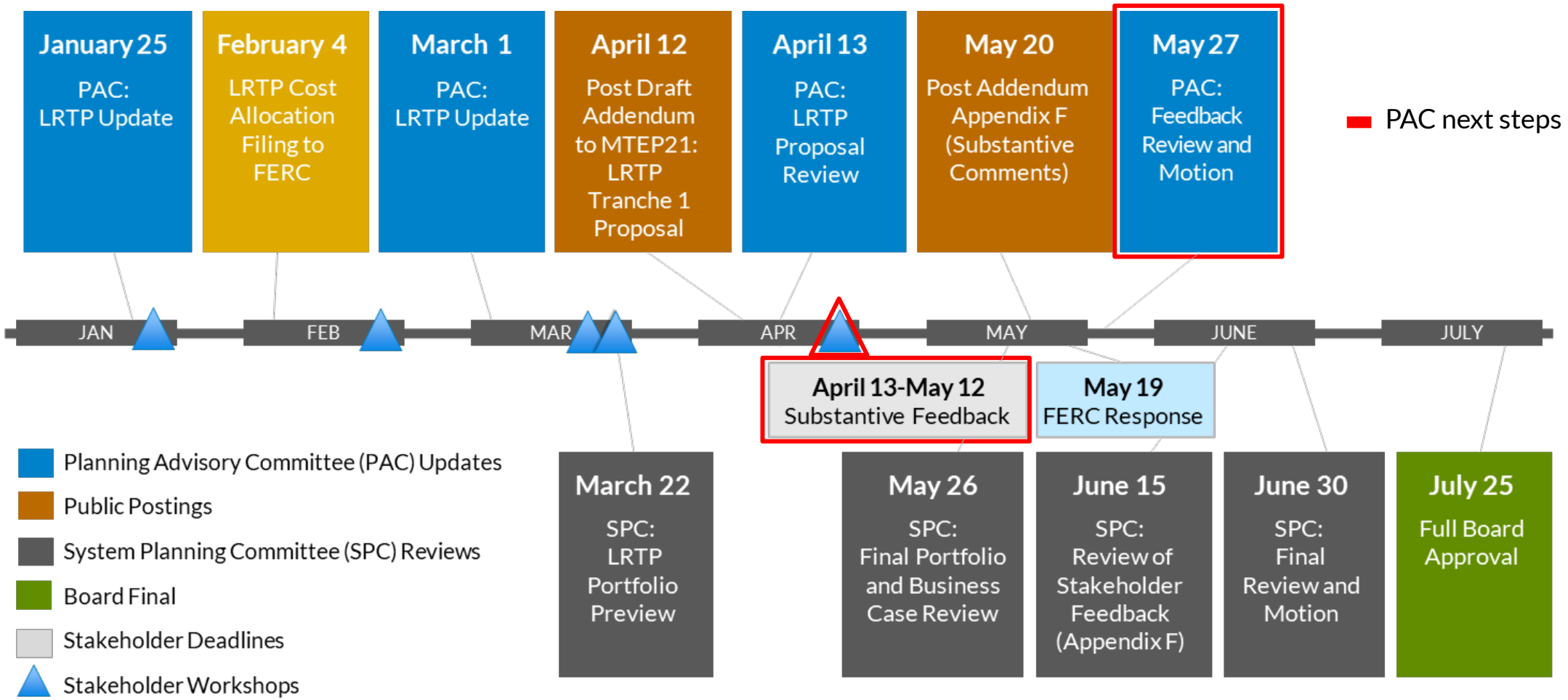



*MISO Tariff, Attachment WW

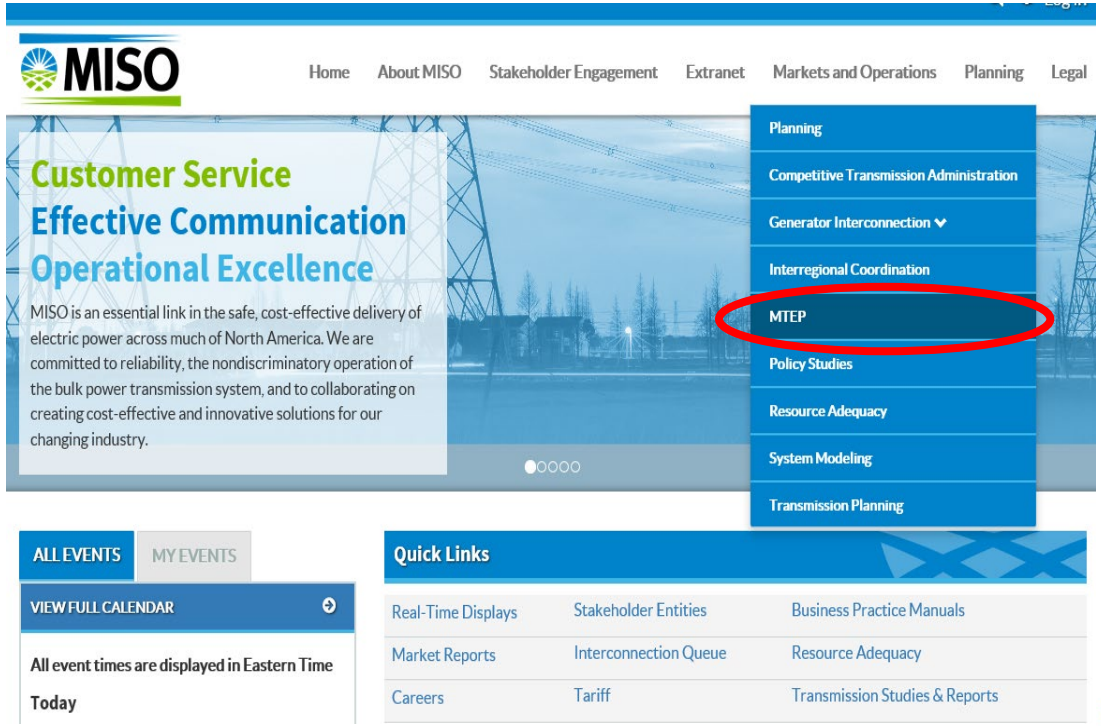


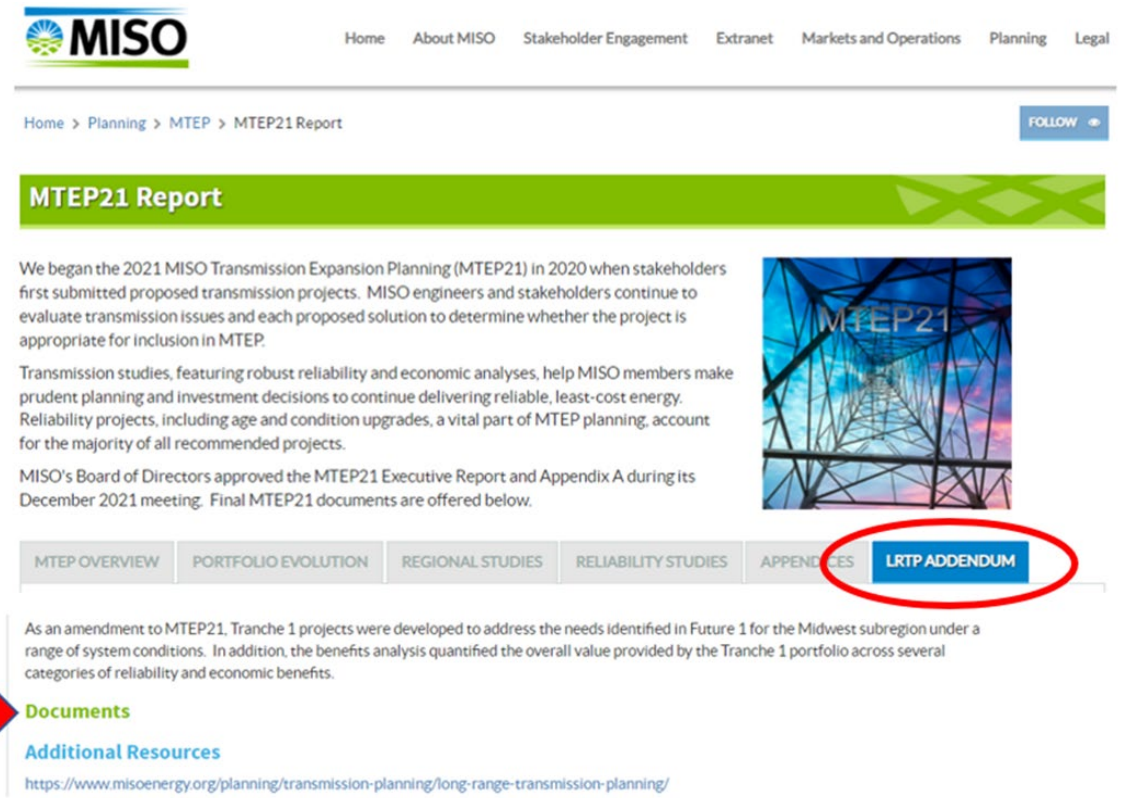
See pages 27 & 28 for more details on CAZ benefits and costs break-down.

# Tranche 1 approval will be delayed until July 2022 to facilitate more stakeholder review and engagement



# The MTEP21 report and LRTP addendum are on MISO's website




[Click here for the MTEP21 Report]

[Click here for the LRTP Addendum]

# MISO seeks stakeholder feedback to the LRTP Tranche 1 report

**MISO is requesting substantive feedback on the MTEP21 Draft LRTP Addendum, posted on the MTEP21 public webpage**

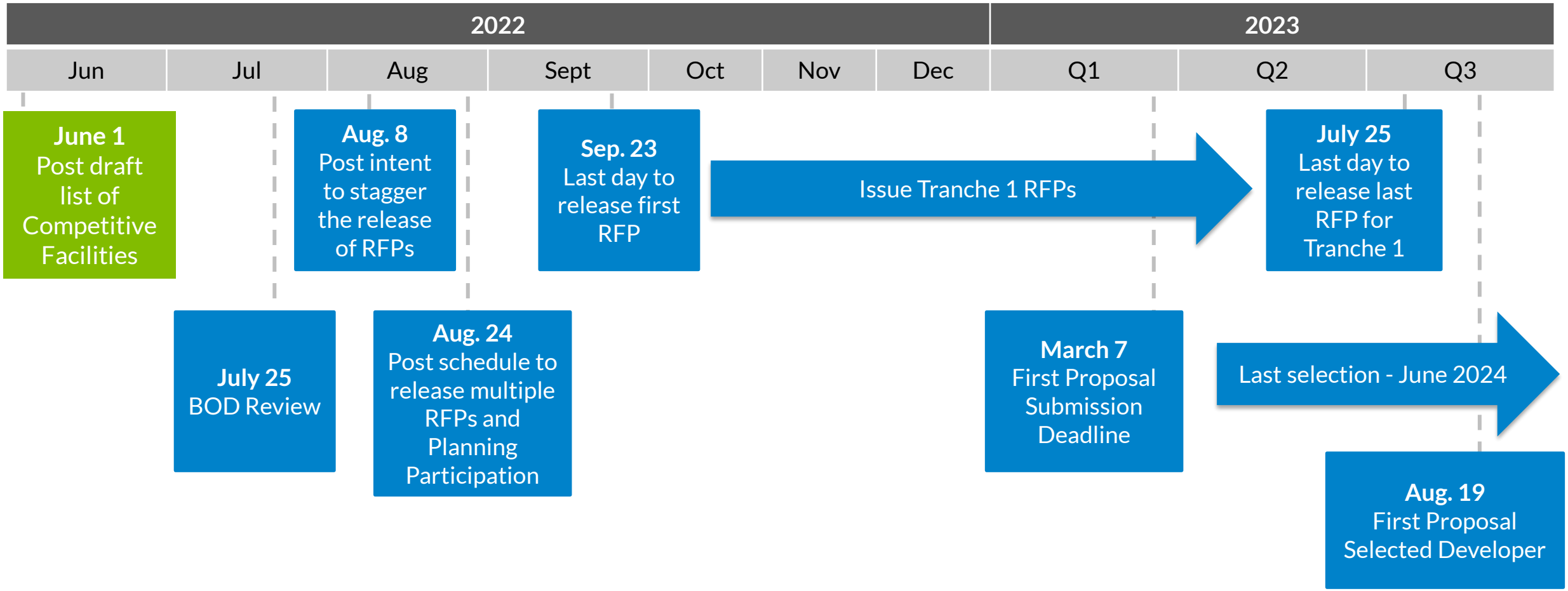

**April 13 – May 12**

Feedback requests and responses are managed through the Feedback Tool on the MISO website: https://www.misoenergy.org/stakeholder-engagement/stakeholder-feedback/

'Substantive Feedback' are comments intended for Board of Director review and will be posted along with a MISO response as Addendum Appendix F to the MTEP21 Report (not soliciting editorial feedback for this addendum).

# Competitive Transmission Process – MTEP 21 Tranche 1

# Inclusion of the Tranche 1 projects in MTEP by the Board of Directors triggers the competitive transmission process




Dates subject to change and assumes last day of Tariff or Business Practices Manual requirement

# Competitive Transmission Process Communication Protocols

- **Communications to be Coordinated**: MISO aims to coordinate all communications with interested stakeholders regarding facility eligibility, RFPs, the evaluation process, selection reports, and variance analysis. Please refer all questions regarding the Competitive Transmission Process to TDQS@misoenergy.org, and not to individual MISO personnel.
- **Questions will be Answered Transparently**: MISO will publicly post all questions it receives and vetted answers on the Competitive Transmission Administration webpage.
- **Project Specific Questions to be Directed to MISO**: Once an RFP is issued for a Competitive Project and until the Selection Report is issued, all questions regarding that project / RFP must be directed to MISO and not to interconnecting incumbent transmission owners. MISO will process these questions in accordance with BPM-027.
- **Project Information Kept Confidential:** Information deemed confidential under the Tariff related to competitive projects will be treated as commercially / competitively sensitive.
- **Variance Analysis Information Kept Confidential:** The Tariff contains confidentiality rules specific to Variance Analysis that limits public disclosure and discussion of specific instances of Variance Analysis.

# Competitive Transmission Process Information

| Resource and Link | Link Location |
|---|---|
| Eligible Projects and States with Right of First Refusal statutes | misoenergy.org > Planning > MTEP > Eligible Projects |
| Tariff - Section VIII Competitive Transmission Process and Appendix 1 Selected Developer Agreement in Attachment FF Transmission Expansion Planning Protocol | misoenergy.org > Legal > Tariff > Attachments |
| Business Practices Manual 027 - Competitive Transmission Process | misoenergy.org > Legal > Business Practices Manuals |
| Competitive Transmission Administration web page | misoenergy.org > Planning > Competitive Transmission Administration |
| Example Request for Proposal Package | misoenergy.org > Planning > Competitive Transmission Administration > Competitive Developer Selection Process |

# Questions

LRTP@misoenergy.org

# Appendix

# LRTP Data, Presentation Links and Contact Information

- Models and results (requires UNDA/CEII):
  https://misoenergy.sharefile.com/home/shared/fof89d75-4353-4393-bcd2-f543bb3ce5f1

- Long Range Transmission Planning Webpage
  https://www.misoenergy.org/planning/transmission-planning/long-range-transmission-planning/

- March 2022 LRTP Workshops
  March 25 LRTP Workshop
  March 29 LRTP Workshop

- LRTP email address: LRTP@misoenergy.org

# LRTP business case analysis uses a range of variables

- LRTP benefits examine value over the 20- to 40-year period from the in-service date (All projects assumed in service by 2030)
  - Benefit/cost calculations are evaluated on a 20-year time horizon
  - Additional benefits are shown for the 40-year horizon to align with assumed life of the assets
- LRTP benefits are evaluated for a range of discount rates from 3.0 – 6.9%
  - The social discount rate of 3.0% represents the value a ratepayer would typically receive on their risk-adjusted investment
  - The Weighted Average Cost of Capital (WACC) of 6.9% is the gross-plant weighted average of the Transmission Owners' cost of capital and represents the minimum return required on their transmission investments

# The MISO MVP Tariff further defines the 'specific types of economic value' which may be included

**MISO Tariff - Attachment FF, II.C.5...**

A. Production cost savings where production costs include generator startup, hourly generator no-load, generator energy and generator Operating Reserve costs. Production cost savings can be realized through reductions in both transmission congestion and transmission energy losses. Productions cost savings can also be realized through reductions in Operating Reserve requirements within Reserve Zones and, in some cases, reductions in overall Operating Reserve requirements for the Transmission Provider.

B. Capacity losses savings where capacity losses represent the amount of capacity required to serve transmission losses during the system peak hour including associated planning reserve.

C. Capacity savings due to reductions in the overall Planning Reserve Margins resulting from transmission expansion.

D. Long-term cost savings realized by Transmission Customers by accelerating a long-term project start date in lieu of implementing a short-term project in the interim and/or long-term cost savings realized by Transmission Customers by deferring or eliminating the need to perform one or more projects in the future.

E. Any other financially quantifiable benefit to Transmission Customers resulting from an enhancement to the transmission system and related to the provisions of Transmission Service.

# For the lower range of quantifiable benefits, benefit to cost ratio for the cost allocation zones is at least 2.1 where VOLL=$3,500 and with a carbon price of $12.55 per metric ton

| Footprint Benefits (minimum)- 20 Year NPV, 6.9%, 2022$ | | ($M) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Benefit Metric | CAZ Allocation Method | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 | Zone 7 | Total |
| **Congestion and Fuel Savings** | Derived directly from PROMOD results | $3,169 | $1,049 | $2,195 | $1,352 | $1,471 | $2,884 | $1,006 | **$13,125** |
| **Avoided Capital Cost of Local Resource Investment** | Based on load share ratio | $3,481 | $2,358 | $1,864 | $1,707 | $1,351 | $3,280 | $3,460 | **$17,501** |
| **Avoided Transmission Investment** | Based on the zonal location of upgrade | $271 | $125 | $244 | $303 | $3 | $59 | $74 | **$1,079** |
| **Resource Adequacy Savings** | Based on zonal capacity savings | $0 | $0 | $0 | $0 | $0 | $0 | $515 | **$515** |
| **Avoided Risk of Load Loss*** | Based on load ratio share | $248 | $168 | $133 | $121 | $96 | $233 | $246 | **$1,246** |
| **Decarbonization**** | Based on load ratio share | $691 | $468 | $370 | $339 | $268 | $651 | $687 | **$3,473** |
| | | | | | | | | | |
| Total Benefits | | $7,861 | $4,168 | $4,805 | $3,821 | $3,189 | $7,107 | $5,988 | **$36,940** |
| Total Costs | | $2,821 | $1,911 | $1,510 | $1,383 | $1,095 | $2,658 | $2,804 | **$14,183** |
| B/C | | **2.8** | **2.2** | **3.2** | **2.8** | **2.9** | **2.7** | **2.1** | **2.6** |



*VOLL=$3,500
**Carbon Price=$12.55 /metric ton

Values as of 4/6/2022

# For the upper range of quantifiable benefits, benefit to cost ratio for the cost allocation zones is at least 3.3 where VOLL=$23,000 and with a carbon price of $47.80 per metric ton

| Footprint Benefits (maximum)- 20 Year NPV, 6.9%, 2022$ | | ($M) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Benefit Metric | CAZ Allocation Method | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 | Zone 7 | Total |
| **Congestion and Fuel Savings** | Derived directly from PROMOD results | $3,169 | $1,049 | $2,195 | $1,352 | $1,471 | $2,884 | $1,006 | **$13,125** |
| **Avoided Capital Cost of Local Resource Investment** | Based on load share ratio | $3,481 | $2,358 | $1,864 | $1,707 | $1,351 | $3,280 | $3,460 | **$17,501** |
| **Avoided Transmission Investment** | Based on the zonal location of upgrade | $271 | $125 | $244 | $303 | $3 | $59 | $74 | **$1,079** |
| **Resource Adequacy Savings** | Based on zonal capacity savings | $0 | $0 | $0 | $0 | $0 | $0 | $515 | **$515** |
| **Avoided Risk of Load Loss*** | Based on load ratio share | $1,629 | $1,103 | $872 | $798 | $632 | $1,534 | $1,618 | **$8,186** |
| **Decarbonization**** | Based on load ratio share | $2,673 | $1,811 | $1,431 | $1,311 | $1,037 | $2,519 | $2,656 | **$13,438** |
| | | | | | | | | | |
| Total Benefits | | $11,224 | $6,446 | $6,606 | $5,470 | $4,494 | $10,276 | $9,330 | **$53,845** |
| Total Costs | | $2,821 | $1,911 | $1,510 | $1,383 | $1,095 | $2,658 | $2,804 | **$14,183** |
| B/C | | 4.0 | 3.4 | 4.4 | 4.0 | 4.1 | 3.9 | 3.3 | 3.8 |

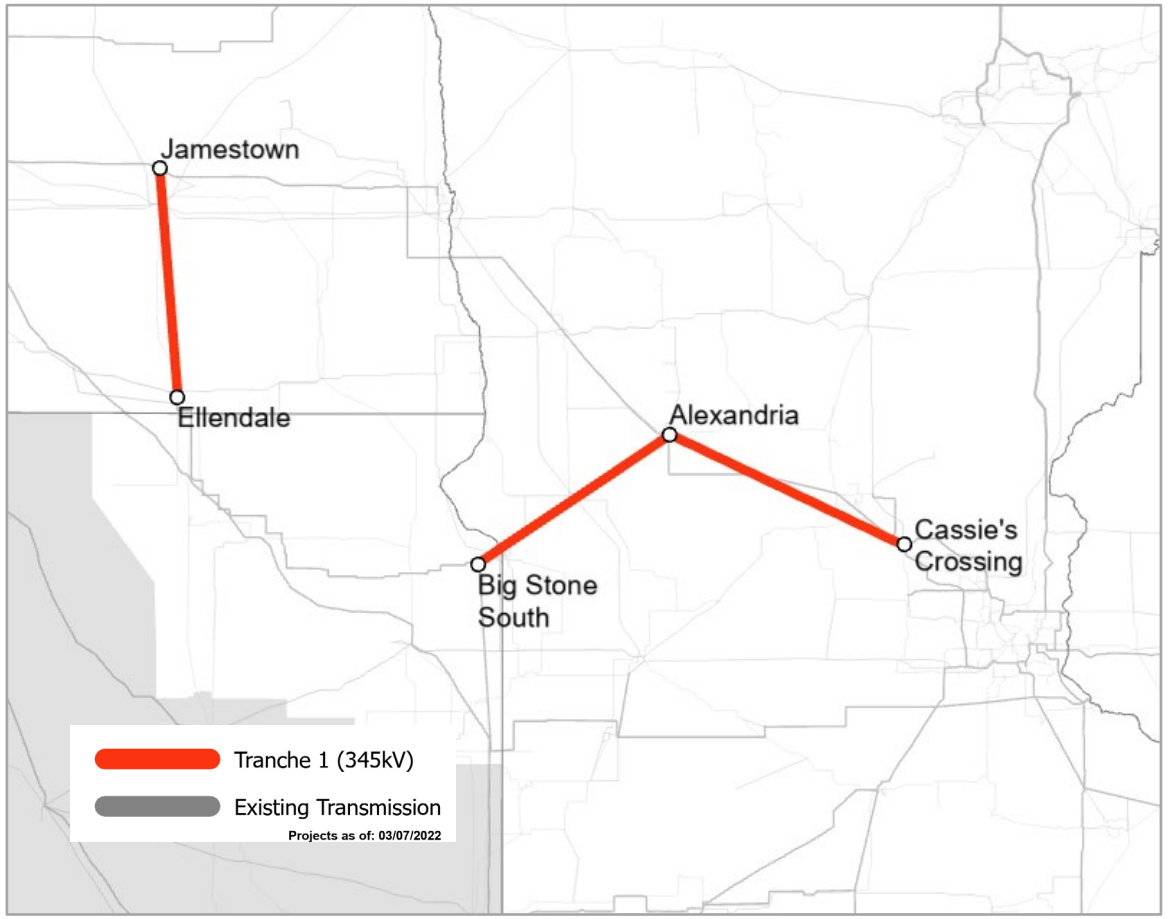


*VOLL=$23,000
**Carbon Price=$47.80 /metric ton

Values as of 4/6/2022

# Reliability issues addressed by LRTP Tranche 1

# Minnesota-Dakotas




As of March 7, 2022

## Solution

- Jamestown - Ellendale 345kV
- Big Stone South – Cassie's Crossing 345kV

- Assists in transport of energy out of Dakotas toward central MN and Twin Cities area
- Strengthens the existing weak 230kV system to improve connections between 345kV systems to improve long distance movement of power
- Relieves 83 elements with severe overloads observed in the Dakotas and Western MN
- Performs better than other six alternatives removing almost all existing congestion with only minimal new congestion

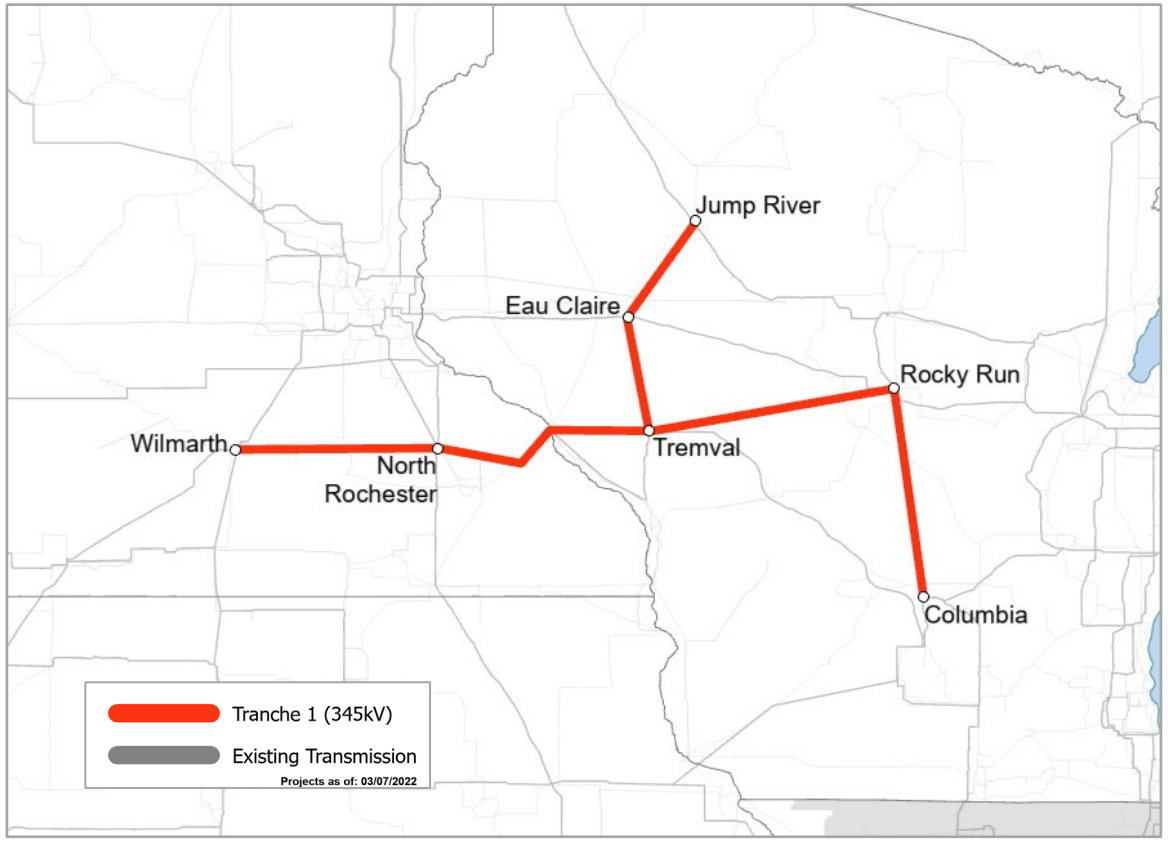
# Minnesota-Dakotas


## Solution

- Iron Range - Benton County – Cassie's Crossing 345kV

  - Provides low impedance path from Northern to Central Minnesota, improving Voltage stability and transfer performance with >10% increase in Manitoba Import limit, performing better with higher capacity and lower cost than the four other alternatives
  - Relieves 30 elements with excessive overloads in the Dakotas and Northern MN area

# Minnesota-Wisconsin



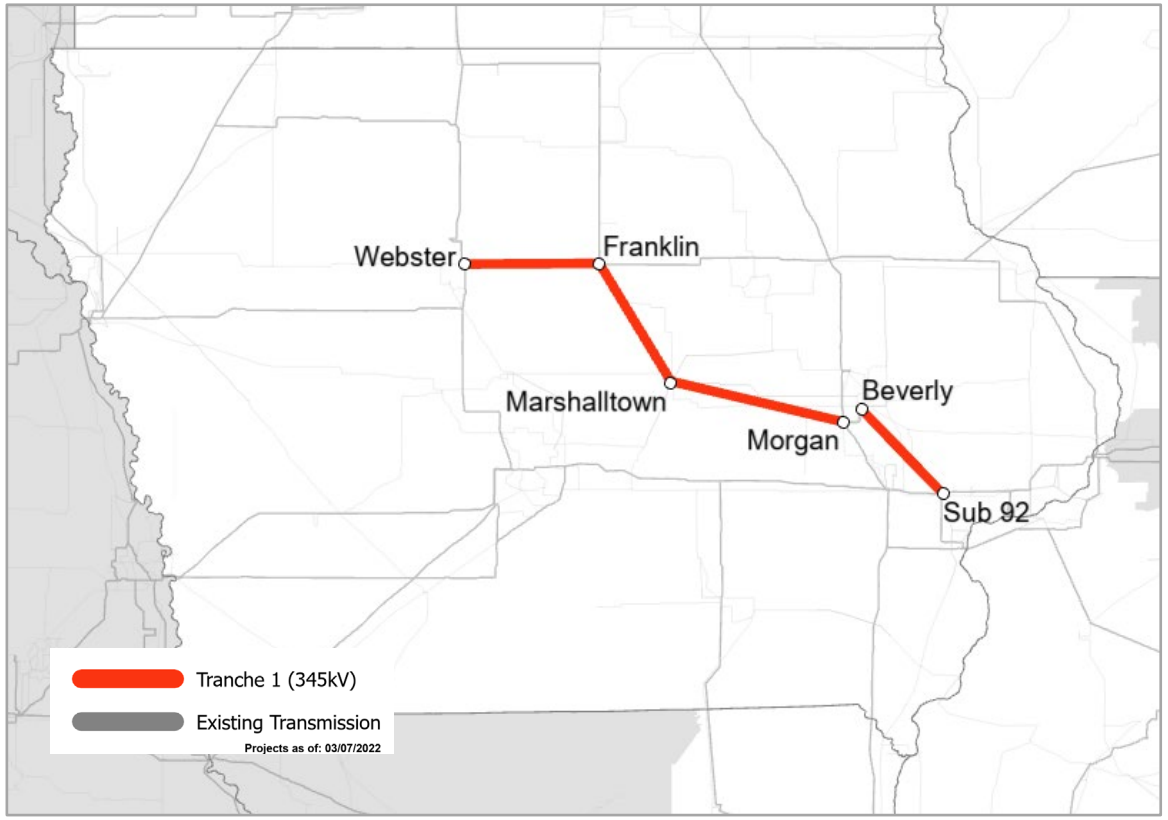

As of March 7, 2022

## Solution

- Wilmarth - N. Rochester – Tremval - Eau Claire - Jump River
- Tremval – Rocky Run – Columbia 345kV

- Provides outlet for renewables located in Minnesota
- Congestion relief and raises stability limit by 250MW to increase transfer capability on the MN-WI interface
- Improves connectivity to serve load centers
- Relieves 40 elements with N-1 heavy loading and severe overloads in MN and WI and 97 elements for N-1-1 contingencies

# Central Iowa



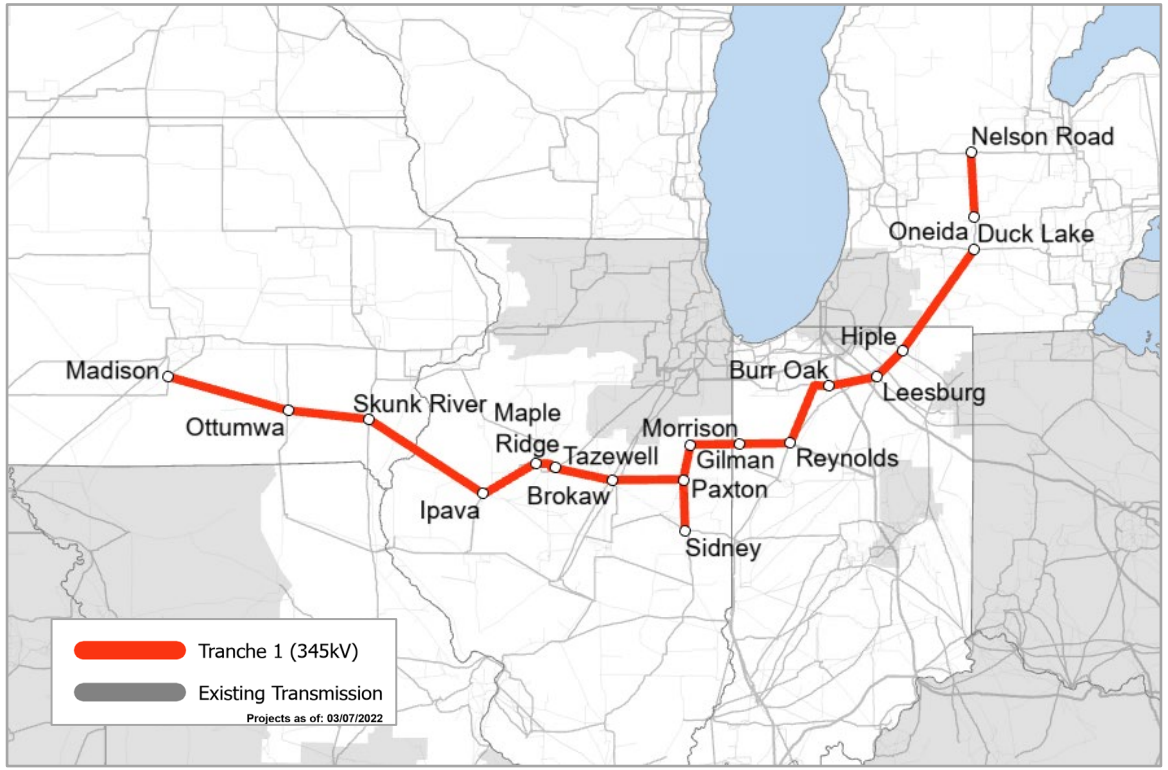

As of March 7, 2022

## Solution

- Webster-Franklin-Marshalltown-Morgan 345kV
- Beverly-Sub92 345kV

- Provides outlet for renewables located in IA and SW Minnesota
- Provides corridor for delivery of energy to load centers in central portions of MISO
- Addresses 21 elements with N-1 heavy thermal loading and severe overloads in Iowa and 34 elements for N-1-1 contingencies

# Iowa, Illinois, Indiana, Michigan



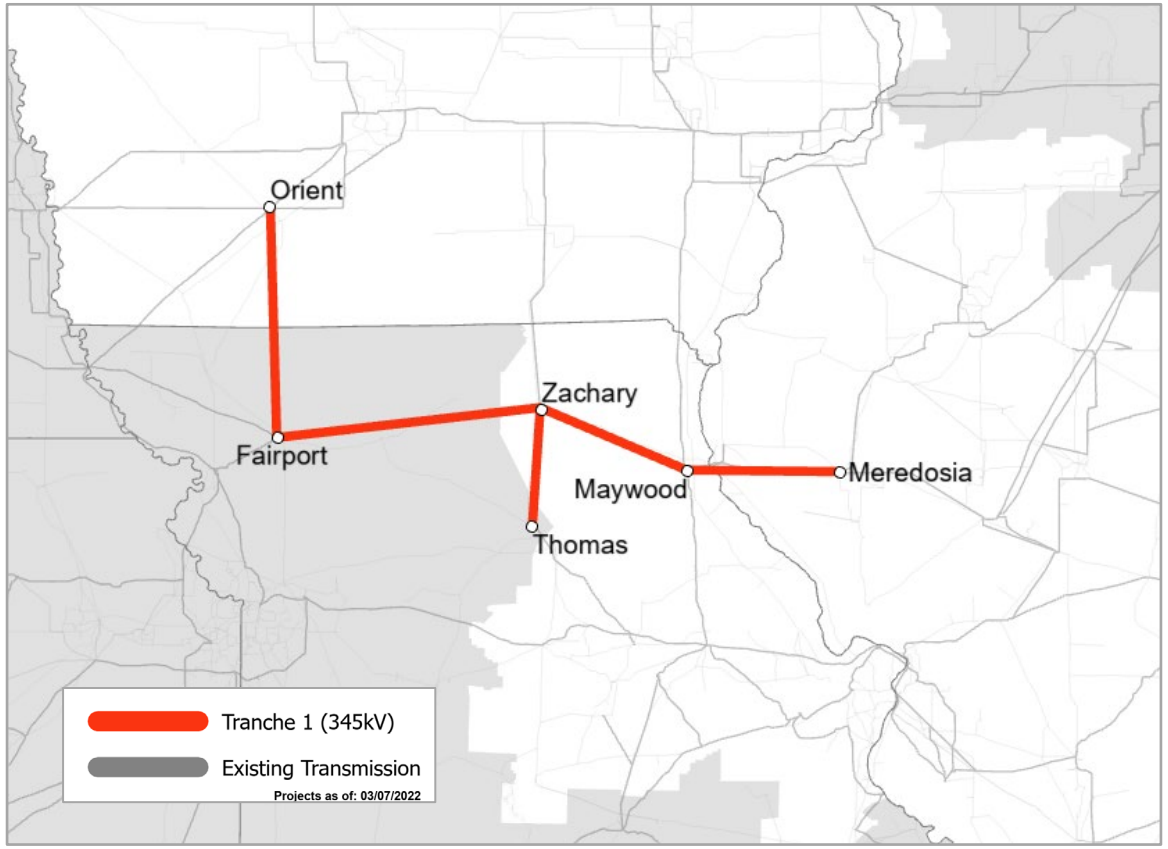

As of March 7, 2022

## Solution

- Madison – Ottumwa – Skunk River – Ipava – Maple Ridge 345kV
- Tazewell – Brokaw - Paxton – Gilman – Morrison – Reynolds – Hiple – Duck Lake 345kV
- Paxton – Sidney 345kV
- Oneida – Nelson Road 345kV

- Delivers significant increase in transfer capability to support generation deficient areas due to unexpected decrease in renewable output
- Mitigates 28 thermal overloads in Michigan, 16 thermal overload in Indiana, 19 thermal overloads in Missouri and Illinois, 14 thermal overloads in Iowa
- Provides more robust performance under large shifts in dispatch of generation across the region

# Missouri




As of March 7, 2022

## Solution

- Orient – Fairport – Zachary – Maywood – Meredosia 345kV
- Zachary – Thomas Hill 345kV

- Provides increased transfer capability of 250MW West-to-East and 438MW MISO-to-Michigan to address voltage collapse conditions in Missouri
- Mitigates heavy loading and severe overloads on 19 elements for N-1 and N-1-1 contingencies
- Provides more robust performance under large shifts in dispatch of generation across the region addressing 14 thermal overloads