

MISO's Tranche 2.1 Transmission and the MISO IMM

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Several recent articles have discussed criticism by MISO and some stakeholders of the MISO Independent Market Monitor (IMM) for questioning the benefit analysis MISO relied on to justify classifying over \$21 billion of transmission projects (Tranche 2.1) as Multi-Value Projects in MISO's 2024 Transmission Expansion plan.² Moreover, the MISO Board has questioned the IMM's performance and voted to hire a consultant to examine the market monitoring performance of the IMM. However, none of the discussion in the articles or by the MISO board has addressed the substance and validity of the IMM's concerns. In reality, MISO's benefit analysis that the IMM questioned was not just flawed: it was ridiculous. The analysis was so absurd that failing to raise these questions would have been an egregious failure on the IMM's part.

Rather than questioning the actions of the IMM, FERC (and stakeholders) should be asking 1) how MISO, an INDEPENDENT system operator, formulated and came to rely on such a ridiculous analysis of Tranche 2.1 benefits, 2) why MISO management did not review and withdraw this analysis when the IMM pointed out its numerous shortcomings, and 3) why MISO management did not withdraw and correct this analysis after Dr. Hogan confirmed the IMM's assessment that MISO's cost benefit analysis was to say the least deeply flawed.³

If there is anything that needs to be investigated it is the actions of MISO management and the board. Why hasn't the board held MISO management accountable for the poor quality of the cost benefit analysis it presented to

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² The classification of the Tranche 2.1 transmission projects as Multi-Value Projects would allow the cost of the Tranche 2.1 transmission projects to be socialized across the north region of the MISO.

³ Dr. Hogan's testimony was part of the complaint filing in Docket EL 25-109. Dr. Hogan is a senior adviser with FTI Consulting.

market participants and used to justify its classification of the Tranche 2.1 transaction projects as qualifying for a broad allocation of transmission expansion costs among MISO transmission customers throughout MISO North?

I will focus on two elements of the MISO benefits analysis that the IMM, Dr. Patton, questioned and Dr. Hogan showed to be deeply flawed - - the reliability benefits and the avoided capacity benefits. If anything, Drs Patton and Hogan were much too kind in discussing these analyses.

Reliability Benefits

The most absurd benefits are the “reliability benefits.” The “low end” MISO estimate of these benefits is \$14.8 billion out of the MISO “low end” estimate on total benefits of \$51.657 billion.⁴ According to MISO, these reliability benefits arise when there would be transmission overloads in its model when meeting load in its transmission model without the Tranche 2.1 Expansion. However, the only reason these violations occur in MISO’s model is because in the model MISO restricted the dispatch of thermal generation to prevent it from being used to eliminate the transmission overloads due to high levels of renewable output in particular hours. Hence, in the MISO model there are reliability issues simply because MISO did not allow thermal generation to be dispatched up to resolve overloads if there was excess renewable output in the MISO models. Similarly the “flex generation” MISO introduced into its models, as discussed below, was not allowed to be dispatched up to resolve overloads whether or not there was excess renewable output in the MISO models.⁵ This assumption that MISO would shed load rather than dispatching up thermal generation is ridiculous, but it is the source of the asserted MISO reliability benefit.

MISO’s “reliability benefit” exists only because MISO assumes in its model that it would shed load rather than dispatch thermal generation to replace (back down)

⁴ See Hogan Figure 2, in Testimony of William Hogan, Docket EL25-109 calculated from MISO excel “LRTP Tranche 2.1 Detailed Business Case Analysis F2A final portfolio excel spreadsheet.”

⁵ See LRTP Tranche 2 Business Case Metrics, Methodology Whitepaper September 23, 2024 section 4.9 Table “Generation Dispatch Rules,” and the discussion under step 2 (the document is not paginated); similarly, MISO LRTP Tranche 2 Benefit Metrics Development April 26, 2024, slide 20, and Testimony of William Hogan, Docket EL25-109 p. 33-35.

intermittent resource output that the model shows would overload a constraint. It is appalling that MISO management would use this kind of analysis to cost justify the Tranche 2.1 transmission projects. No US system operator (including MISO) would shed load to avoid dispatching thermal generation to relieve a transmission constraint. MISO's security constrained economic dispatch software would automatically dispatch thermal and other generation up and down to resolve pre and post contingency transmission overloads.

Moreover, this assumption was not needed to account for carbon emission costs as the MISO benefit analysis also includes a separately calculated \$7.2 billion in explicit decarbonization benefits based on reducing emissions using a \$85 cost of carbon. Hence, the emissions cost of dispatching thermal generation are already accounted for in the MISO benefit calculation.⁶

Further, the MISO benefit study apparently only assumes this load shedding would occur when elimination of the Tranche 2.1 transmission would require dispatching down intermittent generation. MISO modelers apparently saw no need to shed load when dispatching thermal generation up and intermittent generation down in the model with Tranche 2.1 transmission. Perhaps because modeling the load shedding with the Tranche 2.1 transmission would have resulted in such large load shedding costs that the absurdity of the MISO modeling would have become even more apparent. This assumption that MISO would shed load rather than dispatching thermal generation to relieve overloads is so detached from reality that it is hard not to infer that this assumption was manufactured to create additional "benefits" for transmission projects whose benefits would otherwise be far below their cost. Manufacturing benefits to justify costly transmission investment not what an INDEPENDENT system operator should be doing. I do not understand how anyone can reasonably assert that it was inappropriate for the IMM to point out the egregious errors in this component of the MISO benefit analysis.

Avoided Capacity Benefits

⁶ See Hogan Figure 2, in Testimony of William Hogan, Docket EL25-109 calculated from MISO excel "LRTP Tranche 2.1 Detailed Business Case Analysis F2A final portfolio excel spreadsheet."

The second set of manufactured “benefits” were the \$18.128 billion of capacity savings.⁷ While there are several questionable elements to these calculations, there are two egregious errors. Both involve treating generation investments that would need to be made with the Tranche 2.1 transmission as sunk and excluding these generation costs from the cost benefit analysis, while including as benefits the cost of generation investments that MISO concludes would not be needed with the Tranche 2.1 transmission.

The basis of the benefits calculation is that MISO developed what it called the Future 2A generation portfolio, using a capacity expansion model that uses capacity values to evaluate the ability of the generation to meet load. While this model considered generation costs, it did not consider the cost of transmission needed to deliver the output of this generation to load.⁸ This failure to consider transmission costs was a critical mistake.

The Tranche 2.1 transmission projects were then developed to deliver the output of this new generation capacity to load. Next, MISO calculated the amount of additional generating capacity that would be needed to meet capacity requirements in the MISO planning model if the Tranche 2.1 transmission was not built. This amounted to 22.8GW of generation. Ninety percent (90%) of the cost of this generation was \$16.271 billion in 2024 dollars and allocated to the category MISO called avoided capacity benefits.⁹ MISO called the other part of the savings from avoiding the cost of building the 22.8GW of generation located closer to load reduced losses in meeting load with the future 2A generation. This benefit was allocated the other 10% of the cost of the extra 22.8GW of generation.¹⁰

⁷ See Hogan Figure 2, in Testimony of William Hogan, Docket EL25- calculated from MISO excel “LRTP Tranche 2.1 Detailed Business Case Analysis F2A final portfolio excel spreadsheet.” The \$18.128 billion of cooked benefits are the sum of the avoided capacity benefits (\$16.271 billion) and the capacity savings from reduced losses (\$1.857 billion).

⁸ See MTEP Report p. 25 and Figure 2.2, LRTP Tranche 2.1 Business Case Metrics, Methodology Whitepaper, September 23, 2024 Section 4.1; Hogan Testimony, p. 16 lines 11-15, p. 23 lines 1-5.

⁹ See LRTP Tranche 2.1 Detailed Business Case Analysis F2A final portfolio excel spreadsheet and LRTP Tranche 2 Business Case Metrics, Methodology Whitepaper, September 23, 2024, pp. 5-16. See also Hogan Testimony, p. 25 lines 13-18 and footnote 20. And lines 1-5 on page 26.

¹⁰ *ibid.*

The first obvious error in this analysis is that the MISO did not estimate how much of the simulated Future 2A generation would not be needed, and its cost avoided, if the additional 22.8 GW of generation was built closer to load. This not complicated, the Future 2A generation has not yet been built, has not been contracted, in many cases it is just a hypothetical resource in the MISO EGEAS model. If 22.8 GW of additional generation was built, at least some and probably a lot of this Future 2A generation would not be needed to meet MISO resource adequacy requirements in the EGEAS model.

All MISO had to do, at least as a first step, was to rerun the original generation expansion EGEAS model with the additional 22.8 GW generation in place to see how much of the Future 2A generation would still be needed to meet the capacity requirement. If the MISO did not realize the need to do this initially, there was plenty of time to carry out such an analysis after the IMM pointed out the error.¹¹ If MISO has carried out such an analysis, the results have not been made public.

It is possible there might have been some capacity cost savings from the Tranche 2.1 transmission if the Future 2A generation was cheaper to build than some of the 22.8GW of generation located closer to load.¹² We do not know, MISO either never carried out, or never reported the results of such an analysis. This is a material issue as it is unclear if there would have been any generation capacity cost savings at all. Analysis by the IMM indicates that the Future 2A generation mix was itself uneconomically high cost.¹³ If this is the case, a proper cost benefit analysis that did not treat the Future 2A generation costs as sunk might have found negative capacity cost benefits.

¹¹ See David Patton, "IMM Discussion of MISO Futures and Long-Range Transmission Planning, August 31, 2023; Potomac Economics, 2023 State of the Market Report for the MISO Electricity Markets, June 2024 pp.13-27.

¹² For example, suppose the remote generation delivered using the Tranche 2.1 transmission would have been 10% cheaper than the 22.8 GW of replacement generation, that could potentially have provided a benefit of \$1.63 billion. This would be far lower than the asserted avoided capacity benefit, but not necessarily zero.

¹³ The IMM concluded that the Future 2A generation mix was not optimal, including too much wind generation requiring transmission and too little storage that would make better use of existing transmission. The IMM's alternative investment mix used different capacity values for wind and solar generation, and included more storage and gas fired generation. The IMM's analysis suggested that the Future 2A generation was more expensive than generation located closer to load with more storage would have been. See "MISO IMM Comments on LRTP Trance 2 Benefit Analysis," October 30, 2024 p. 4 and 2023 State of the Market Report for the MISO Electricity Markets pp. 15-16.

There is a second, even deeper problem with the avoided capacity benefit calculations. The Future 2A generation was developed in the MISO EGEAS model based on then current MISO resource adequacy capacity values, not actual dispatch simulations using that generation to meet load. The then current capacity values used by the MISO to develop the Future 2A generation portfolio were overstated relative to actual future capacity values as pointed out by the IMM.¹⁴ When MISO ran PLEXOS simulations using the Future 2A generation and Tranche 2.1 transmission, MISO determined that another 29.8 GW of dispatchable generation (called Flex generation by MISO), in addition to the Tranche 2.1 transmission and the Future 2A generation, was needed to meet load. Because this additional generation was modeled as dispatchable gas fired generation and some storage, it did not need to be located remote from load and could be sited where it did not depend on the Tranche 2.1 transmission.

This gave rise to two additional egregious mistakes in the MISO benefit analysis. First, MISO never reevaluated how much of the Future 2A generation and Tranche 2.1 transmission would not be needed with this additional 29.8 GW of generation located close to load. The entire Future 2A generation portfolio developed by MISO using the EGEAS model was invalid because it did not account for the costs of the extra 29.8 GW of generation that the Future 2A portfolio would require. Second, MISO did not recalculate how much of the extra 22.8 GW of generation that was the basis for the avoided capacity benefit was still needed if the Tranche 2.1 transmission was not built, but the extra 29.8 GW of generation was built. These are obvious and critical analyses that MISO should have carried out in calculating benefits. In addition, Tranche 2.1 transmission projects should have been reevaluated and scaled back to reflect reduced needs with the 29.8 GW of generation sited closer to load and some of the Future 2A generation not built. If any of these analyses were carried out by the MISO, they were not reported.

The root cause of these mistakes was at least in part the original modeling decisions involving use of inflated capacity values for intermittent resources and not taking account of transmission costs in determining the Future 2A generation

¹⁴ Potomac Economics, 2023 State of the Market Report for the MISO Electricity Markets, June 2024 p. 15.

mix and location. These errors caused the modeling analysis to unwind when the MISO considered alternative generation mixes located closer to load using actual capacity values. There might even be negative capacity benefits to the Future 2A generation and Tranche 2.1 Transmission projects because the original Future 2A generation mix was so inefficient. This is consistent with the findings of the IMM.¹⁵

The original modeling error might have been an innocent mistake. But the IMM started pointing out the mistakes in MISO modeling in 2023.¹⁶ There was time to rerun models and even to switch to a better approach for determining the Future 2A generation mix and location, and for better modeling of transmission needs. But the MISO did not reevaluate anything, or at least did not report the results of that reevaluation. That is a big problem. These omissions convey the impression that Tranche 2.1 transmission was preordained and MISO was focused on contriving a justification for the Tranche 2.1 transmission, not evaluating its actual economics.

Overall Benefits

Importantly, the present value of the sum of manufactured benefits was \$32.949 billion out of the total of \$51.657 billion of “low end” benefits estimated by MISO; over 60% of the benefits were ‘cooked.’ Without those manufactured benefits, the present value of the remaining benefits, taken at face value, were only \$18.708 billion¹⁷ (and over \$7 billion of these were decarbonization benefits which would not reduce ratepayer costs), compared to the projected transmission project cost of \$28.575 billion. Hence, the benefits were well below the associated costs! Moreover, the economics are likely even worse because of the flawed methodology for determining the Future 2A generation. The capacity “benefits” could actually be a large negative number, if the Future 2A generation is itself uneconomic as suggested by the IMM’s analysis. It could even turn out

¹⁵ Potomac Economics, 2023 State of the Market Report for the MISO Electricity Markets, June 2024 pp.15-16.

¹⁶ See David Patton, “IMM Discussion of MISO Futures and Long-Range Transmission Planning, August 31, 2023;

¹⁷ See Hogan Figure 2, Hogan Testimony, pp. 40-41. The MISO calculated costs and benefits based on the present value in 2024 dollars.

that all of the costs of Tranche 2.1 transmission would have to be recovered in additional rate increases.

The MISO also calculated a “high end” set of benefits that totaled \$100.99 billion. However, all but \$0.7 million (Reduced risk from extreme weather) of the additional benefits were due to using a \$10,000/MW cost to dispatching emitting generation to avoid overloads (instead of \$3500 in the “low end” case) and raising the \$85 cost of carbon to \$248.67 metric ton. The MISO would dispatch thermal generation to eliminate transmission overloads rather than shedding load whether the VOLL is set at \$3500 or at \$10,000, so there are no additional “high end” reliability benefits. It is noteworthy that with the manufactured avoided capacity and reliability benefits eliminated, the Tranche 2.1 transmission was still uneconomic with an assumed carbon cost of \$248.67 per metric ton

There are reasons for some stakeholders to support these transmission expansion projects. The problem is that they are unlikely to be the parties that would have to pay for the bulk of this transmission. There is a lot of lip service given to affordability, and affordability is what this controversy is about. David Patton, Dr. Hogan, and several state commissions are concerned that MISO plans to socialize the cost of more than \$28 billion of transmission costs that will at best deliver around 65 cents on the dollar of benefits. From this perspective the expectation would be that these transmission investments would require almost \$10 billion in rate hikes. In addition, since \$7 billion of the benefits estimated by MISO are future decarbonization benefits, not rate savings, there would be another \$7 billion in rate hikes (in \$2024 dollars) needed to cover the transmission costs. And this assumes that the transmission projects come in on budget and ignores the likelihood that the Future 2A generation mix and location is itself uneconomic. Investments like these will inherently raise consumer rates.

Choosing very high cost methods of reducing CO2 emissions is not a good long-run strategy for achieving emission reduction objectives, it exacerbates conflicts between achieving those goals and affordability.

What is going on?

Rather than investigating Dr. Patton, the MISO board should question why MISO management relied on a cost benefit analysis that does not pass the laugh test to justify the allocation of Tranche 2.1 transmission costs. In light of Dr. Patton's analysis and testimony provided by Dr. Hogan, the Board and FERC should question whether MISO management is truly independent.

It seems to me that we are at that point where the buck stops at FERC. And for FERC, it is not just stakeholders in MISO that are watching. Stakeholders and regulators of utilities in the southeast that are not part of an ISO are watching what FERC will do about an ISO management that ceases to be independent and takes actions that inflate the cost of meeting load with the added cost borne by ratepayers. Similarly, stakeholders and regulators of utilities in the west that are part of the CAISO Western EIM or SPP WEIS, but not part of an ISO, are also watching. Is what happened in MISO what stakeholders can expect if their utilities join an ISO? Should they expect that FERC will do nothing about cost benefit analyses that do not pass the laugh test and would saddle rate payers with hundreds of millions or billions dollars of transmission costs with low or even non-existent benefits. Should they expect that FERC will allow the independent market monitor to be silenced or punished for pointing this out?