MANITOBA HYDRO 2023/24 & 2024/25 GENERAL RATE APPLICATION

ASSEMBLY OF MANITOBA CHIEFS

DAYMARK INFORMATION REQUESTS

AMC I-1 Reference: Daymark Evidence, page 10

Preamble: MH operations are extremely complex and much of the knowledge necessary to make appropriate trade-offs during adverse water conditions appears to reside in the minds of its many experts.

Request:

1. Can Daymark provide concrete recommendations on what MH needs to do to formalize knowledge regarding the trade-offs MH must make during drought conditions.

Response:

As discussed in PUB/DAYMARK I-13, determining what actions MH could or should take to better support internal decision making through knowledge capture is a project all to itself. We would recommend that, to the extent MH has not already engaged in this activity, that they engage in an internal project to review their operational and management functions. This can be a time consuming effort, but in our experience almost always leads to important findings and recommendations to strengthen and improve processes.

AMC I-2 Reference: Daymark Evidence, page 13

Preamble: In addition to these materials, Daymark reviewed the Interim Rate Application materials and IRs submitted in that proceeding. We also reviewed materials from the 2017/18 & 2018/19 GRA proceeding, including our report and summary presentation. We also conducted independent research and analysis of MISO market conditions and energy and natural gas market prices.

Request:

1. Please provide any materials related to the independent research and analysis of MISO market conditions and energy and natural gas market prices undertaken by Daymark.

Response:

Daymark relied on the following publicly-available documents. For convenience, we have provided hyperlinks to the resources:

2017 State of the Market Report for the MISO Electricity Markets. Potomac Economics, June 2018. Available at: https://www.potomaceconomics.com/wp-content/uploads/2018/07/2017-MISO-SOM_Report_6-26_Final.pdf

2020 State of the Market Report for the MISO Electricity Markets. Potomac Economics, May 2021. Available at: https://www.potomaceconomics.com/wp-content/uploads/2021/05/2020-MISO-SOM_Report_Body_Compiled_Final_rev-6-1-21.pdf

2021 State of the Market Report for the MISO Electricity Markets. Potomac Economics, June 2022. Available at: https://www.potomaceconomics.com/wp-content/uploads/2022/06/2021-MISO-SOM_Report_Body_Final.pdf

2022 Regional Resource Assessment. MISO, November 2022. Available at: https://cdn.misoenergy.org/2022%20Regional%20Resource%20Assessment%20Report627163.pdf

2022 Regional Resource Assessment: LRZ-level Assumptions and Results. MISO, November 2022. Available at: https://cdn.misoenergy.org/2022%20RRA%20LRZ-level%20Assumptions%20and%20Results626061.pdf

MISO Futures Report. MISO, Published April 2021, updated December 2021. Available at: https://cdn.misoenergy.org/MISO%20Futures%20Report538224.pdf

2022 Long-Term Reliability Assessment. NERC, December 2022. Available at: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf

In addition to these documents, Daymark reviewed historical electric and natural gas pricing data, as well as natural gas forward prices. This information was viewed on the S&P Global data portal, which is available by subscription only.

AMC I-3 **Reference: Daymark Evidence, page 22**

Preamble: Daymark regularly conducts business with clients in MISO or who have interests in MISO and is engaged in monitoring, forecasting, and advising clients regarding MISO markets. To supplement our general expertise in the region, Daymark conducted research on the MISO market conditions and trends related to these items and we summarize the points most relevant to the GRA filing in the following sections.

Request:

1. Please provide a list of recent engagements in the MISO market and any reports completed as part of the engagements.

Response:

Daymark has considered MISO market issues and issued reports related to such matters multiple times before the Manitoba PUB. In addition, we are engaged in multiple efforts to support other clients in MISO or who do business in MISO. Many of these engagements are with private renewable energy and transmission developers and therefore do not produce public reports. In addition to those efforts, we are currently engaged by several rural cooperatives in Louisiana to assist them with a procurement of all requirements power for their members. We also assist and advise the General Staff of the Arkansas Public Service Commission on many energy related matters, some of which involve MISO.

Recent dockets in which Daymark personnel have provided testimony and that addressed certain elements of the MISO market are listed below.

Arkansas Public Service Commission
https://apps.apsc.arkansas.gov/olsv2/docket_search.asp

- 10-011-U
- 20-052-U
- 20-067-U
- 19-091-U
- 20-049-U

Louisiana Public Service Commission

https://lpscpubvalence.lpsc.louisiana.gov/portal/lpsc-web-portal

- U-36514
- U-36515
- U-36516

AMC I-4 **Reference: Daymark Evidence, page 33**

Preamble: The RRA concluded that after considering forecasted load growth, announced plans for generation retirements, and announced plans for new additions, the net effect is that LRZ 1 will have a capacity shortfall in just a few years. In Figure 13, below, the existing resources net of announced retirements is the dark blue bar, and the planned additions is represented by the light blue bar. The analysis assumes that the retirements and additions occur on schedule. To meet load plus reserve margin (the black line), the RRA model built additional new resources, represented by the light grey bar. These are theoretical projects, rather than specific projects actually in development. This indicates that northern MISO could have a capacity shortage in the near-term as the market responds to load growth and retirements.

Request:

1. MH assumes – and Daymark appears to confirm – that future pricing in the MISO market will be lower than current levels. This – along with the end of fixed price contract – is expected to reduce export revenues. But Daymark's analysis on the MISO market, particularly the area bordering Manitoba, shows that the region will experience a capacity and potential energy shortfall in the near-term. Please comment on the apparent contradiction that energy prices are expected to fall while the region will be experiencing a capacity and energy deficit and will, presumably, be dispatching its highest marginal cost units to meet demand.

Response:

The decline in average market energy prices is primarily driven by an expectation that the MISO region will continue to add mostly renewable resources to the supply mix over time. Rather than a contradiction, the potential shortfall in capacity is actually likely to exacerbate the market energy price decline. In order to meet capacity requirements, the region is likely to add even more renewable resources because the capacity value of each megawatt of renewable resources is expected to decline as penetrations grow. This is the typical result when capacity accreditation is based on the Effective Load Carrying Capability (ELCC) method.

Since the capacity equivalence of renewable resources is significantly lower than nameplate ratings, there is a large amount of zero cost energy that enters the market when a capacity need is met with new renewable energy generation. As a result, the market supply curve will flatten, meaning that the most expensive resource in use today will be used *less* often in the future.

Lastly, the impact of a capacity shortfall on energy prices depends in large part on the full portfolio of resources will be that will be added to meet the capacity need. As an example, if storage resources are added as firm, dispatchable resources, they might contribute to lower energy prices because they are typically charged with low-cost

resources (e.g. renewables), and can discharge at a low cost, rather than burning fuels that are subject to price volatility.

AMC I-5 Reference: Daymark Evidence, page 37

Preamble: MH has expressed uncertainty that there will be a continued premium for its energy over and above MISO spot market prices, and has concern whether there will be a market for its capacity resources. In discussing the clean, fixed-price attributes of its export supply, MH noted that "at this time there is no apparent reason for customers to pay a premium above the energy price forecast to Manitoba Hydro for such attributes."34 In general, the factors identified by MH include

On average, the increased development of renewable resources in MISO is lowering energy market prices;

- With increased development of renewable and storage projects backed by tax incentives, U.S. utilities have multiple options for long-term contracts and clean capacity;
- Shifting load patterns may make some areas in MISO winter-peaking, lowering the value of MH's surplus summer capacity and reducing the options for seasonal diversity contracts.

Despite these uncertainties, it is important to acknowledge the potential market changes that could lead to a continued, or even expanded, value of MH products. MISO participants are evolving as the capacity and transmission systems transition in support of a zero-carbon future. Customers are increasingly seeking more clean energy, with many large corporations seeking 24/7 emission-free supply arrangements. It is possible if not likely that the Manitoba Hydro system will be able to provide some of the products that arise out of those needs.

Request:

1. Can Daymark comment on the value of a firm, flexible resource such as MH's hydro assets in a market with high penetration of intermittent resources?
2. Does Daymark believe that a firm, flexible resource will be highly valued in a market with a high penetration of intermittent resources?
    a. If so, please provide comments on MH's assumption that the value of its energy exports will decline over the next decade.

Response:

As noted in the section of Daymark's report reproduced in the Preamble, and as discussed more fully throughout Section III of the Daymark Report, Daymark believes that there will be continued, or even expanded value for MH's hydro assets as the MISO system adds more renewable resources. However, as the markets will continue to evolve to reliably integrate more renewable resources, it is difficult to know precisely what mechanism may be used to value these important attributes.

Daymark believes that the ability to deliver firm, dispatchable, emission-free energy and capacity will be increasingly valuable as the MISO market evolves. But aside from uncertainties related to market products or compensation mechanisms, it is also unclear to what extent competition from other resources (such as battery storage) might impact the value of MH's assets. See further discussion of this topic in Daymark's responses to PUB/DAYMARK I-1 and I-2.

Lastly, it is important to note that there are multiple drivers of the forecasted decline in value of MH exports, including expiring long-term contracts, lower forecasted MISO market prices, and increasing domestic load resulting in lower volumes available for export.

AMC I-6 Reference: Daymark Evidence, page 42

Preamble: This method of developing low and high price forecasts is not considered "fundamentals-based." A fundamentals-based forecast would develop an internally consistent price forecast by modifying key pricing drivers that would plausibly lead to a lower or higher price forecast. MH's approach essentially modifies a base forecast by using low/high factors developed from forecasts for a different time period. The advantage of this approach is that it is often significantly less costly and still provides a reasonable range for the high and low uncertainty of resulting energy prices.

Request:

1. Does Daymark believe a fundamentals-based approach is more appropriate for MH, given its export revenues play a key role in setting domestic rates?

Response:

To be clear, the reference forecasts that MH purchases are "fundamentals-based". These are the starting point for all of MH's price forecasting and, in our view, important and necessary that they do so. As the question alludes to, that reference case plays a key role in setting domestic rates. We believe it is entirely appropriate and important to maintain fundamentals-based forecasting for the key input into estimated net export revenues.

For high and low price outlooks, however, the need for such rigorous forecasting is less compelling. Our understanding is that MH predominantly uses the high and low forecasts as boundary conditions to illustrate potential uncertainty in the energy market. The simple (and therefore significantly cheaper) approach used by MH is, in our opinion, a reasonable compromise between complexity of forecasting approach and cost to MH (and ultimately to customers).

AMC I-7 Reference: Daymark Evidence, page 46

Preamble: There are some limitations to this approach of using the base case implied heat rate to develop the low and high price forecasts. First, similar to the short-term forecast, the low and high sensitivities are not "fundamentals-based" forecasts, and this methodology does not consider the impact that persistent high or low natural gas prices might have on the system implied heat rate. The calculated long-term implied heat rate is a function of the MISO resource portfolio being modeled, and it is reasonable to conclude that if the region faced persistent high natural gas prices, the total MISO regional resource portfolio would be likely to change over time to respond to those price signals. By assuming the implied heat rate does not change in those low and high price futures, MH's methodology assumes no market response.

Request:

1. Does Daymark believe MH should take a different approach? If so, please describe what that approach might look like.

Response:

As discussed in AMC I-6, we believe that MH's approach to determining high and low cases is appropriate given the current limited uses of those cases. Should MH need to use non-reference price forecasts for more rigorous analysis (such as might occur in other planning decisions, such as a review of potential new construction) then we would recommend reconsideration of the approach to developing high and low price cases.

What that approach would look like would be to produce separately modeled futures that allow for the feedback mechanisms that a fundamentals-based forecasts process include. For instance, with higher natural gas prices might come different retirement and new build decisions, changes in congestion, and other responses to the changing prices. Electric load might vary in response to these changing dynamics as well. A fundamentals-based forecast accounts for those feedbacks and produces final energy and capacity prices that are inclusive of those other market forces.

AMC I-8 Reference: Daymark Evidence, page 55

Preamble: Beyond the firm contracts, MH's export forecast included in the GRA does not assume any revenue from future capacity sales. MH provided several explanations for this approach. First, the Company noted that the amount of surplus capacity is forecasted to decline over the next seven years, and that there will be a capacity deficit starting in the 2030/31 planning year.

Request:

1. Does Daymark believe it is reasonable to assume there will be no opportunity for future capacity sales given the increased penetration of low capacity value intermittent resources across the MISO wholesale market? If so, please describe any methodology that could be used to incorporate some level of future capacity sales.

Response:

Daymark believes that MISO will need capacity in the coming years for a variety of reasons, including the increased penetration of low capacity value intermittent resources. As discussed in PUB/DAYMARK I-1 and I-2, the question for MH is whether the changing needs and rules in MISO will continue to align with what products MH is able to provide and whether that alignment will lead to opportunities to profitably offer those products into the market. It is unknown how the market will respond to the changing capacity rules, and there is a possibility that utilities will pursue more conservative options to meet capacity need, rather than seeking imports. We believe that there is sufficient uncertainty in the timing and scope of those changes that, combined with MH's coming shortage in capacity, makes the assumption of no new sales reasonable, even though it is conservative.

AMC I-9 Reference: Daymark Evidence, page 58

Preamble: The MISO region is not yet a winter peaking system, and there is a shortage of capacity that led to high PRA clearing prices in 2022. Given that MH is forecasted to have a summer surplus of 492 MW in 2023/24, and that the surplus is forecasted to grow to 1,636 MW in 2030/31 without new capacity sales, we would recommend that MH take steps to pursue monetization of that capacity. This summer surplus may be even higher if MH adds new resources to meet the winter capacity deficit.

Request:

1. Does Daymark believe MH should include some level of summer-based capacity sales in its future revenue forecast? If so, what level would be appropriate?

Response:

Daymark believes it would be speculative to include any future summer-based capacity sales in MH's future revenue forecast at this time. This opinion is based on the current level of uncertainty regarding MISO rules, US federal incentives, and MH load and capacity forecasts. We also believe that this is a dynamic question that should be reviewed frequently and that MH should be engaged in stakeholder discussions to attempt to advocate for rules and opportunities that allow it to monetize the available capacity (and other products) that it has available for export in the future. Our understanding is that MH does regularly engage in those stakeholder discussions. See additional discussion in response to PUB/DAYMARK I-2.

AMC I-10 Reference: Daymark Evidence, page 63

Preamble: The Daymark Scope of Work includes the direction to "Confirm whether Manitoba Hydro has included uncontracted capacity and long-term firm sales revenue in its forecasts and whether such assumptions are supported." As discussed in Section VII, MH has not included any assumptions regarding the renewal of existing contracts or the addition of any new or replacement contracts. All uncontracted energy is assumed to be valued at the market energy price and uncontracted capacity is assumed to produce no revenue. This issue was previously discussed in Section III. It is likely that as the MISO market evolves, there will be some method for generating a premium price for MH's clean, dispatchable resources. However, at this time it is highly uncertain what those mechanisms will be, or what the monetary value will be. Additionally, as discussed in Section III, it is unclear whether the MISO market changes will produce opportunities that align with MH capabilities. Thus, for the purposes of the GRA, it is reasonable to assume that surplus energy is valued at the market price, rather than a premium price under a long-term contract

Lastly, we reiterate the discussion presented in Section III above regarding the potential for additional revenues for MH's clean, dispatchable products. The export revenue as presented in the GRA assumes no renewal or replacement contracts and assumes that MH's future supply sales are valued only at the MISO market energy price. We believe this is a reasonable, but conservative, assumption, and that it is likely that there will be opportunities for premium pricing or additional revenues for MH's exports as the MISO market continues to evolve.

Request:

1. Can Daymark comment on the apparent contradiction of its conclusions. On one hand, it's saying that there is potential for MH to market its clean, flexible and firm capacity and energy to the MISO market, particularly as the penetration of intermittent resources continues to grow across the MISO footprint. But at the same time, Daymark concludes that it's "reasonable" to value it at low market prices rather than premium product that it is. The conservative assumption being used by MH in its forecasts – and confirmed by Daymark to be reasonable – appears to be in direct contradiction of the value that MH's assets can extract on export markets.

Response:

Daymark does not agree that there is a contradiction in these conclusions. Daymark concluded that it is likely that in the future there will be an increased demand for firm, clean, dispatchable resources and thus potentially a premium value on these resources. However, at this time, the outlook for the market value of existing products (energy, capacity, ancillary services) is low, and it is not clear whether and when MISO market rules will ascribe specific value to non-emitting resources that are not intermittent. Further, it is unclear whether MISO market rules and federal regulations will be modified in a

manner conducive to MH specific products or whether other options to provide firm non-emitting generation might become more competitive than MH power. Until new products are developed that value the characteristics of MH's assets, or the market starts assigning a premium for these characteristics, it would be unreasonable for MH to include such a premium in its export revenue forecast.

See additional discussion in Daymark's response to AMC/DAYMARK I-5 and PUB/DAYMARK I-1.

AMC I-11 **Reference: Daymark Evidence, page 83**

Preamble: MH also builds many other constraints into its decision-making process. For example, the corporation must abide by the licenses for its hydroelectric facilities, which dictate certain flow levels and elevations for points in its system; license compliance is reviewed at the weekly RRPS meetings, and any violations are reported. MH must also operate to limit adverse impacts, such as avoiding slushing as discussed in PUB/MH I-60d. Finally, MH has a long lead time relative to the gap from a decision to release water to when that water produces power. Typically, the water takes three weeks to get from the large storage facilities in southern Manitoba to the generating stations in the Lower Nelson. This physical constraint makes “fine adjustments” difficult to accomplish.

Request:

1. Did Daymark review the number of license violations incurred by MH throughout the drought? If so, please provide a list of the violations and where they occurred.

Response:

We did not review the number of license violations incurred by MH throughout the drought.

AMC I-12 Reference: Daymark Evidence, page 89

Preamble: Throughout the period where MH hedged energy and natural gas purchases there was significant discussion at the oversight committee regarding the need for hedging and the recommendations of the WPT. Volumes approved through that process were roughly of forecasted opportunity purchases (with respect to energy purchase hedges) or based on forecasted Brandon generation (with respect to natural gas purchase hedges).

In such an environment, hedging trading risk is prudent for any entity such as MH. Not only was there significant uncertainty as to the price of forecasted purchases, but tying the volumes approved to a percentage of forecasted purchases ensured there was a high probability that the hedges would be backed by the physical transmission of energy meaning that the transactions were not speculative. Therefore, our investigation focused on the process for determining when to hedge and the policies, safeguards, and oversight of the activity

Request:

1. MH's strategy of hedging appears to have been an exercise of shielding ratepayers from high energy and gas prices at a time when the price signal is most important. In the process, MH "lost" nearly $20 million on its hedges.
    a. Can Daymark comment on whether it's appropriate for MH to be pursuing hedges at all?
    b. Can Daymark provide examples of similar activities by comparable utilities such as BC Hydro, Hydro Quebec, NL Hydro and SaskPower?
    c. Can Daymark comment on whether it's more appropriate to allow price signals to highlight scarcity rather than pursue hedges which may incur losses for the utility that must ultimately be borne by ratepayers?

Response:

a. Hedging trading risk is a standard process that most if not all utilities engage in. The extent and sophistication of the risk management policies and procedures surrounding hedging activity can vary widely and tend to correlate to the amount of hedging activity that occurs. For context, MH engages in less trading volume than many utilities that Daymark has reviewed or assisted in the past.

   We believe that rather than thinking of the result as "lost money" it is more appropriate to think of this as a $20 million charge for insurance against bad winter energy market outcomes. One bad winter storm in the US as MH needed to buy power could have produced negative results far outstripping the final $20 million cost. This is an example of why it is appropriate for MH to have a hedging policy and practice.

b. Examples where Daymark has direct experience reviewing risk management and hedging policies include Nova Scotia Power, Algonquin Power, Wisconsin Power & Light and PacifiCorp. Beyond the utilities where we have played an active part in reviewing or shaping risk management policies we are generally aware that most electric utilities have hedging programs and policies. The sophistication of those policies generally align with the volume of activity and the value at risk through those programs.

c. It is unclear what is meant by “allow price signals to highlight scarcity rather than pursue hedges”. As a general rule however, scarcity pricing is appropriate in markets where consumers have an ability to respond to that pricing.

   In this case, it is unclear whether MH customers could have responded in a meaningful way to address the risk of higher energy prices in the winter months. Had the market conditions that MH were most concerned about occurred (high energy prices due to winter storms or other exogenous events contemporaneous with cold Manitoba weather leading to higher demand) then customers would likely have had to absorb the financial impacts of that event without meaningful recourse in terms of reducing consumption.

AMC I-13 Reference: Daymark Evidence, page 92

Preamble: MISO prices did not increase throughout the winter. The price of natural gas, while increasing slightly over the first quarter of 2022, did not spike as it sometimes does in winter. Additionally, no significant storm event occurred. In combination, the easing of natural gas prices and the absence of price spikes due to winter storm events created a calmer winter from an energy price perspective, which in turn caused the hedges to be "out of the money" as shown above.

Despite that result, however, the rationale and process for contracting those hedges, however, remains sound. Hedges are used to mitigate risk and provide a measure of price certainty. While P197 states that the goal of wholesale power transactions is, in part, "to minimize the net costs to Manitoba customers," the emphasis is on reducing portfolio risk, not comparing the actual results of any given hedge. Given the potential for significant increases to the cost of procuring power over the winter, it was reasonable to hedge a portion of projected purchases in the fall of 2021 to protect against such a high-cost outcome.

Request:

1. Can Daymark comment on the contradiction between hedges being "used to mitigate risk" for ratepayers and the reality that hedges can create risk, as occurred in the drought and cost ratepayers nearly $20 million.

Response:

A hedge provides risk mitigation in that for a certain quantity of energy, the purchase or sale price becomes fixed as of the date of the transaction, avoiding future variability. As can be seen from the final results of marking the 2021 hedges to market, mitigating risk does not mean avoiding all risk. The risk of dramatic increase in the price of energy was mitigated for the quantities of energy that MH hedged by virtue of locking in the purchase price of those quantities. Energy prices could have increased by several multiples, meaning that the "upside" risk of prices increasing was significant. Once the price was locked in, there was then the risk that prices would not rise but would instead fall. This risk was of a lesser magnitude as there was only so far prices could decline. In actual fact of course, prices did not rise and therefore in this specific instance, customers would have paid a lower price for that energy if it had been left open to the spot market. However, doing so could have led to a dramatically worse outcome than $20 million in costs had future prices been different.

AMC I-14 Reference: Daymark Evidence, page 93

Preamble: MH's hedging strategy is focused on the portfolio risk that is derived from the volume of projected purchases or sales. This is consistent with its policies regarding wholesale power trading and hedging. Approvals are focused on volumes, with hedging pricing being the outcome of WPT negotiating efforts. There does not appear to be any distinction between the revenue risks born by purchase transactions versus the revenue risks born by sales transactions, at least in the documented plans and policies related to hedging. This is a potential area to investigate for future improvements.

Sales and purchases do not necessarily produce the same risk to MH or its customers. Higher prices are beneficial when selling but detrimental when purchasing. Lost sales revenue has an effective floor, although negative pricing does expand that risk as more and more renewables come online in MISO. Additional purchasing costs, on the other hand, have no realistic ceiling in most market conditions.

This lack of symmetry in terms of what market conditions are harmful and what level of financial harm those conditions can produce suggests that differentiating hedging strategy between purchase conditions and sales conditions could be beneficial to MH and its customers. While focusing on volumes to hedge is a reasonable shortcut approach, combining projected volumes with potential dollar impact for that volume might lead to more nuanced trading limits.

Request:

1. Is Daymark proposing that MH split its hedging strategy between sales and purchases? If so, what would a reasonable strategy between sales and purchasing hedges look like?

Response:

We are observing that the MH strategy might benefit from expanding the language regarding the ultimate goal of hedging and as a consequence, that expansion would likely produce some variance in the policy and procedure treatment of sales versus purchases. A reasonable strategy would not look significantly different than their current one, but might be more explicitly based on "value at risk", either as a formal calculation or simply as a stated policy goal. Value-at-risk is a well established principal in risk management that MH certainly already considers. We can see this by their explanation of why they decided to hedge. The risk of significantly higher prices, potentially at the same time that MH would need to purchase significant power, created material risk to the projected net export revenues.

Formalizing the approach in a policy, potentially with some language regarding how to measure the value-at-risk, might cause MH to focus on what the nature of the risk is to entering into a hedge or remaining open to the market in a different or more nuanced way that occurs today. This might allow MH personnel to more finally tune recommendations

regarding targets for percentage to hedge, for instance. Doing so would, in our opinion, almost certainly create a different target for percentage of purchases to hedge and percentage of sales to hedge.