MIPUG/COALITION I-1

Part and Chapter:	**MH 2017/18 & 2018/19 GRA MH-88, Public Hearing Transcript; MH 2012/13 & 2013/14 GRA Appendix 13.1**	**Page No.:**	
Topic:	**Cost of Service**		
Sub Topic:			

PREAMBLE TO IR:

On Slide 16 of MH-88 in the 2017/18 & 2018/19 GRA Manitoba Hydro ("MH") estimated that the RCC for GSL > 100 kV would decrease from 108.6% (PCOSS18) to 101.5% with Bipole III coming into service. This was also stated in the Public Hearing when Mr. Greg Barnlund testified that:

> (Page 2280) "… the general service large customers see their revenue cost coverage ratios fairly dramatically decrease as a result of [Bipole III] coming into service."

On Page 6 of Appendix 13.1 of the 2012/13 & 2013/14 GRA, MH's Prospective Cost of Service Study (PCOSS13) resulted in a sharp decrease in RCC for GSL >100 kV compared to PCOSS11, the largest decrease of any customer class. The reasons provided for this reduction in RCC were related to the new depreciation study, Wuskwatim Generating Station coming into service, and a reduction in Extraprovincial Revenues. The Wuskwatim Generating Station alone was said to have a major affect on the RCC of GSL > 100 kV as:

> (Pages 5-6) "The increase in average generation costs will tend to decrease the RCC of classes served upstream of the Distribution system, such as the GSL >100 kV class for whom generation costs represent 82% of the cost to serve."

QUESTION:

a) For each of the above Prospective Cost of Service Studies, please note Ms. Derksen's role at Manitoba Hydro (if any) at the time the submission was prepared, and any role Ms. Derksen had in preparing the noted submissions.

RESPONSE:

Ms. Derksen, under the guidance and direction of Mr. Robin Wiens, then Division Manager of Rates and Regulatory Affairs, prepared and/or oversaw the preparation of both PCOSS11 and PCOSS13.

Ms. Derksen had responsibility for and/or oversaw the preparation of PCOSS18, until leaving the corporation in approximately July 2017.

MIPUG/COALITION I-2

Part and Chapter:	Midgard Consulting Incorporated – Evidence For The Consumers Coalition	Page No.:	6-7
PUB Approved Issue No.:			
Topic:	Reliability		
Sub Topic:			

PREAMBLE TO IR:

Midgard indicates on page 6 of their evidence that MH's reliability performance is at a level that customers:

> "… do not clearly desire or wish to pay extra for."

On page 7 Midgard writes that:

> "Ratepayers have not clearly indicated they want to pay for a superior reliability system."

QUESTION:

a) Please confirm that Midgard did not undertake research regarding customer preference.

b) Please confirm that Midgard's assessment of customer preferences is largely summarized by quoting the evidence of Coalition witness, Mr. Rainkie, at page 39-40 of the Midgard evidence.

c) Please indicate if Midgard relied on any other survey results or interviews with customers in preparing this conclusion. If so, please provide a summary of the interviews or surveys undertaken.

d) Regarding Manitoba Hydro's survey result, please provide a description of Midgard's understanding of the extent to which the results reflect and/or incorporate the priorities of transmission-served high voltage customers. Please indicate if Midgard does or does not have further information about the relative mix and weighting of the customers surveyed.

e) Midgard indicates at page 41 that the BC Hydro IRP provides a good example of collecting and incorporating customer priorities and feedback. Please provide a comparison of the approaches and steps used by BC Hydro versus Manitoba Hydro and indicate the key differences of concern to Midgard.

RATIONALE FOR QUESTION:

Understanding of the supporting rationale for comments on customer desires and willingness to pay for reliability.

RESPONSE:

a) Confirmed, Midgard did not undertake research regarding customer preference of Manitoba Hydro ratepayers.

b) Midgard's overall assessment of customer preference, based on its independent review of the customer preference evidence filed by Manitoba Hydro, aligns with the excerpted quote from Mr. Rainkie's evidence included at page 39 – 40 of Midgard's evidence.

   Midgard observes that the customer preference evidence provided by Manitoba Hydro is neither comprehensive, nor was it gathered using Midgard's understanding of industry best practices for determining customer preference.

c) Please see the response to a) above.

d) Midgard understands that the Manitoba Hydro survey does not reflect and/or incorporate the priorities of transmission-served high voltage customers.

   Midgard does not have information about the relative mix and weighting of the customers surveyed beyond what is provided in the Manitoba Hydro evidence. Manitoba Hydro's evidence indicates that only residential ratepayers were surveyed (i.e., "1,000 respondents living within the province") and the survey does not distinguish between customer classes. Furthermore, respondent information is focused on residential ratepayer-oriented information such as age, gender, income etc. as discussed in MFR-12.

e) To clarify, the Midgard evidence at page 41 refers to a survey performed by Innovative Research Group (Innovative) for the BC Residential Customer Intervener Association (RCIA). The survey results were incorporated in evidence filed by RCIA in BC Hydro's ongoing 2021 Integrated Resource Plan proceeding. RCIA is an intervener in the BC Hydro IRP proceeding, the Innovative survey was not undertaken for BC Hydro.

In the referenced material, Innovative outlines industry best practices and steps to effectively elicit customer preference opinions. Innovative sets out the appropriate steps that can be used in surveys to determine customer preferences:[1]

"Scenarios should clearly state…

1. *The baseline (or status quo) conditions*
2. *Uncertainty in the baseline, if any*
3. *The mechanism of change*
4. *Uncertainty in the change being valued, if any*
5. *The change to be valued*
6. *The monetary amounts (i.e., choose cost or bid amount for range and spacing)*
7. *Binding payment to prevent free riding and ensure a consequential design (especially necessary for public goods)*
8. *Frequency of payment (e.g., annual or monthly)*
9. *Duration of payment (e.g., one time or annually for 5 years)*
10. *Method of payment (e.g., utility bill or income tax)*
11. *Who pays (e.g., household or individual)*

When it comes to value elicitation,…

12. *Value should be elicited through a single binary-choice question for each respondent, generally (but not always) consisting of a baseline or status quo alternative versus the change being evaluated*
    - *Avoid classic open-ended questions (to ensure incentive compatible). Use has declined in recent years. The problem is that it often leads to high zeros and unrealistic high WTP responses.*

[1] **Source:** BC Hydro 2021 Integrated Resource Plan, Exhibit C7-8, PDF 95-96 of 246, https://docs.bcuc.com/Documents/Proceedings/2023/DOC_69670_C7-8-RCIA-Written-Evidence-Midgard.pdf

13. *"No-answer" option recommended in NOAA is optional since including or excluding it yields comparable results. Those who would choose the "no-answer" option answer "no" when the option is excluded*
14. *It should communicate decision rule (e.g. referendum vote when the use of a majority vote is a plausible decision mechanism, like for public good valuation)*
15. *The survey should include supporting questions to identify protest responses or other motivations for value elicitation responses (i.e., debriefing questions)*
16. *The survey should include supporting questions to identify demographic, household or other characteristics"*

The Customer Values Assessment Study performed by Manitoba Hydro, approaches developing scenarios and eliciting value its question sets using the following methodology and steps:[2]

- *"PRA conducted an online survey using its Manitoba panel, gathering responses from 1,000 respondents living within the province.*
- *The survey ran from April 30 to May 7, 2019.*
- *All results in this report are presented out of the total n-size of 1,000 unless otherwise stated.*
- *For this study, the sample is weighted to the general population data for Manitoba to correct for differences in age, gender, and income. Proportions in this report are weighted unless otherwise stated.*
- *Differences between groups identified in this report as statistically significant have a p-value of less than .001 unless otherwise stated.*
- *Data in charts may not always sum to 100% due to rounding."*

The Manitoba Hydro methodology does not appear to be primarily a set of steps, but rather a combination of steps and the parameters of the survey itself, (e.g., the dates the survey was conducted and the n-size). It is not clear to Midgard what survey methodology was used by Manitoba Hydro, nor the degree to which the selected methodology may have influenced the survey results. Consequently,

[2] Application, MFR 12, Attachment 1, p. 3 of 41.

there is insufficient evidence regarding Manitoba Hydro's survey to draw comparisons to Innovative's survey and value elicitation methodologies.

As a result, the primary concern related to methodology was raised by Mr. Rainkie regarding the formulation of leading questions that result from Manitoba Hydro's methodology, as summarized in evidence:

> *"…there is a weak underpinning with respect to MH's interpretation with respect to customer preferences involving tradeoffs between reliability and lower rates.*
>
> *…*
>
> *The concerns with respect to MH's interpretation of this customers survey is that they fail to consider the overall findings of the survey and they are based on leading questions. The perceptions and tracking surveys clearly demonstrate customers assess MH's overall service levels and reliability as high, with scores well in excess of 8 out of 10. In contrast, scores with respect to the price of electricity lags in the range of 6 out of 10.*
>
> *The rates-reliability tradeoff questions appear to ignore these overall findings and specify that there is a problem in terms of number and duration of outages and then prompt respondents on what should be done about them. In this regard, the tradeoff questions appear to be leading, they don't provide the customer with an option that improved reliability is not needed and instead presuppose the need to address reliability. Even with the leading questions, the responses are balanced around the score of 5 and are not overwhelming supportive of additional spending to improve reliability. Caution should be exercised in the interpretation of such questions that there isn't a solution searching for a problem."* [3]

[3] Exhibit CC-8, Section 7.2.1, p. 39-40.

MIPUG/COALITION I-3

Part and Chapter:	**Midgard Consulting Incorporated – Evidence For The Consumers Coalition**	**Page No.:**	**7**
PUB Approved Issue No.:			
Topic:	**Reliability**		
Sub Topic:			

PREAMBLE TO IR:

Midgard indicates in the summary on page 7 of its evidence that:

> "At least a 10% reduction in BOC capital budgets is warranted until such time as MH provides evidence that its asset decision-making is supported by quality asset management data, tools and decision-making frameworks."

On that same page Midgard notes that capital and O&M can be trade-offs (which is understood to mean that reductions in capital can be, or may need to be, met with increases to O&M spending, presumably to respond to equipment failures or careful monitoring of aging assets, etc.).

QUESTION:

a) Please confirm if Midgard assessed Manitoba Hydro's O&M spending related to system operations and reliability. If yes, please indicate how this assessment was undertaken, what factors were reviewed, and any conclusions about the appropriateness of Hydro's spending on reliability and response to system issues.

b) If Midgard's recommendation regarding a 10% reduction is accepted, is this implicitly or explicitly reflecting a justification for Manitoba Hydro's current (or increased) O&M budgets? Please explain the answer.

RATIONALE FOR QUESTION:

Understanding of assessments made in respect to the relationship between total operations and maintenance spending and spending specific to system operations, reliability, and response.

RESPONSE:

a) Midgard did not undertake a detailed review of Manitoba Hydro's O&M spending. Midgard's mandate was focused on Manitoba Hydro's asset and risk management processes and capital spending plans. Midgard observes that the most economical life-cycle approach to managing certain asset classes can involve deferring replacement of low-risk assets that can be run to failure without compromising public or employee safety. Doing so requires maintaining an adequate field operations staff complement to enable rapid replacement of such assets when they do fail.

b) The proposed 10% BOC spending reduction neither explicitly nor implicitly reflects a justification for Manitoba Hydro's current (or increased) O&M budgets. Manitoba Hydro has not provided evidence demonstrating that it considered material tradeoffs between O&M budgets and capital expenditures.

   MH's proposed O&M spending increases over the test period may or may not be justified by their potential to offset sustaining spending, either now or over the longer term. Midgard explained in its evidence, citing MH's response to COALITION/MH II-98e, that it supports Manitoba Hydro asset management strategies targeted to extract maximum value for ratepayers (e.g., running distribution pole top transformers to failure) and concedes that adjustments to O&M spending may be required to support some asset management strategies without unduly impacting customer reliability.

   > *"MH is not incorrect when it states that aging of its distribution assets is leading to overall increases in failure rates of those assets, but Midgard asserts it is also the correct strategy to continue letting some assets run-to-fail (or near failure) because it maximizes the value that is extracted for ratepayers from those assets, minimizes rates, and as demonstrated in Figure 4 has not compromised MH's superior system performance relative to its Canadian utility peers."*

   Manitoba Hydro has not filed evidence addressing changes in its O&M budgets to any increases in its field operations staff complement that would be necessary to implement such optimized asset management strategies, therefore, Midgard cannot provide an opinion whether the proposed test period O&M budget in this area is adequate or not. Midgard notes that Manitoba Hydro has historically followed a run-to-fail strategy for at least some assets, so only minimal associated

O&M staffing adjustments should be necessary to maintain reliability performance over the short term.

In fact, the incremental O&M spending increases for the test period proposed in the GRA appear to be more heavily weighted to head office and administrative functions, so it is likely that Manitoba Hydro identified no significant requirement for incremental O&M staffing to maintain reliability when developing the test period O&M budget.

MIPUG/COALITION I-4

Part and Chapter:	**Midgard Consulting Incorporated – Evidence For The Consumers Coalition**	**Page No.:**	**20**
PUB Approved Issue No.:			
Topic:	**Reliability**		
Sub Topic:			

PREAMBLE TO IR:

On page 20 of its evidence, Midgard gives the example of a forest fire impacting reliability and how this event should be excluded from data due to being outside of MH's control.

QUESTION:

a) Please comment on the extent to which MH can design and construct its overall system to reduce exposure to forest fires and improve resilience to loss of individual elements?

   For example, if MH utilized alternative transmission paths, sized transmission lines to supply load under an N-1 or N-2 event, or constructed towers of resilient materials or configurations, would that be considered capital spending that helps to avoid exposure to forest fire related outages?

b) Please comment on operational asset management techniques that may help reduce exposure to forest fire risk, such as the frequency and quality of line brush clearing, widening of cleared rights of way, etc. Is Midgard's comment about MH' control focused only on capital-related activities, or also operational activities?

RATIONALE FOR QUESTION:

Exploration of options available for mitigation of impacts from events outside the control of Manitoba Hydro.

RESPONSE:

a) Over the long-term Manitoba Hydro could choose to preferentially prioritize different tower design options (e.g., metallic vs. wood poles), vegetation management strategies (e.g., wider RoWs or fire breaks) or RoW selection strategies (e.g., re-routing to use other features such as roads to provide fire breaks) to mitigate exposure of its facilities to forest fires. However, all such choices would have to satisfy a broader set of evaluation parameters beyond simply their benefits from a forest fire survival perspective. Furthermore, the reliability impact of making these different choices would be experienced prospectively and would not directly affect performance of the existing asset base. Midgard would not suggest that existing assets that are presently in satisfactory condition should be replaced solely to address forest fire risks, except perhaps in specific cases where exceptional circumstances warrant undertaking such a costly premature replacement approach.

In the near term, Manitoba Hydro is tasked with managing its existing asset base in an economically prudent risk-aware basis, which means managing its current asset base with the understanding that there are unavoidable vulnerabilities to forest fire risk.

In the future however, Manitoba Hydro should be making asset choices (e.g., choice of material, ROW siting, vegetation management practices) on the basis of reducing full lifecycle costs. Midgard cannot speculate on the expected outcomes of these types of analysis for Manitoba Hydro, but it may lead to increased use of forest fire resistant options in the future should they be economic on a full lifecycle basis.

b) Midgard is not a vegetation management expert with operational asset management techniques that may reduce exposure to forest fire risk, such as the frequency and quality of line brush clearing, widening of cleared rights of way, etc. Midgard has high level utility management expertise in areas that include vegetation management. As a result, Midgard's cannot comment on the appropriateness of Manitoba Hydro's vegetation management techniques.

However, Midgard does provide commentary on the necessity within a robust asset management program to tradeoff O&M versus capital investment costs as part of developing optimized O&M and capital investment plans. As a result, Midgard's comments include both O&M and capital investment activities.

MIPUG/COALITION I-5

Part and Chapter:	**Midgard Consulting Incorporated – Evidence For The Consumers Coalition**	**Page No.:**	**6**
PUB Approved Issue No.:			
Topic:	**Reliability**		
Sub Topic:			

PREAMBLE TO IR:

On page 6 of its evidence Midgard indicates that MH's reliability is superior compared to its peers.

QUESTION:

a) Please define reliability as this term is used by Midgard. Please specifically address the relevance of transient outages (less than 1 second; less than 1 minute), voltage stability, frequency control, and other factors within this definition.

b) Please provide the industry-accepted definition of SAIDI and SAIFI, indicating the relevant industry standards for measuring these metrics and any differences related to the way Manitoba Hydro measures and references these metrics.

c) Please provide an overview of the differences between non-momentary and momentary events, and explain how each type of event is referenced within the SAIDI and SAIFI calculation.

d) Please confirm Midgard's reliance on SAIDI and SAIFI, which reflects primarily an assessment of distribution system reliability. If not, please explain how and to what degree transmission-served customer reliability performance is included in the metrics Midgard relied upon.

e) Please comment on differences in the measurement of reliability at the low voltage distribution level versus for high voltage transmission served customers. Has Midgard assessed or received information relevant to assessing reliability for high voltage transmission-served customers?

    i. If yes, please provide a description of any conclusions that differ from those for low voltage distribution-served customers.

ii. If not, please indicate what data or information Midgard would require when making this assessment.

f) Has Midgard assessed or received information relevant to assessing reliability for transmission and sub-transmission-served customers, in respect to power quality, voltage/frequency fluctuations, and/or momentary outages of less than 5 seconds, less than 30 seconds, or less than 1 minute?

i. Can Midgard comment on the relative impact that momentary events, including outages, brownouts, voltage/frequency fluctuations, and other power quality events may have on industrial operations?

RATIONALE FOR QUESTION:

Examine the relevance of SAIFI and SAIDI metrics to the reliability of service provided to transmission and sub-transmission-served customers.

RESPONSE:

a) In this proceeding Midgard is using the same definition of reliability as Manitoba Hydro bases its SAIDI and SAIFI metrics upon. As stated by Manitoba Hydro:

> *"Note that it is common industry knowledge that up to 70% of outages in the Canadian electric utility industry are transient, where no cause can be practically identified. This may include situations where a breaker trips and an automatic reclose is successful at restoring service. However, most of these types of transient events are under 1 minute in duration (momentary) and therefore not subject to reporting, while the events longer than 1 minute are reported and identified as 'unknown/other.'"* [4]

Transient outages (e.g., less than 1 second, less than 1 minute), voltage stability, and frequency control events are typically considered either power quality issues (for transient outages, transient voltage sags or surges, or transient frequency anomalies) or system control issues (for voltage collapses and system wide off-nominal frequency events). If such events do not cause extended or cascading outages, they are not typically captured within the industry-standard reliability metrics applied by Manitoba Hydro and other Canadian and North American utilities.

[4] Manitoba Hydro Response to IR No. 2, COALITION/MH II-78c, p. 4-5.

This does not mean that such events do not represent legitimate concerns for particular customer classes, but not all customers are equally impacted by such events, and eliminating or mitigating such events can be challenging and costly, both because determining the cause of each transient event is not always possible, and also because preventing a transient event even if the cause is known (e.g., lightning strike) can be either impossible or extremely costly.

It should be noted that many transient events (such as momentary outages) which might impose significant cost impacts on large industrial customers with sensitive production processes might either go unnoticed or cause only minor inconvenience to residential customers. Consequently, it would be unreasonable to impose the potentially very high costs of developing a power system which is largely unaffected by transient events upon customer classes which would not materially benefit from the potentially substantial associated incremental investments.

This is why industrial loads with sensitive processes often make substantial behind-the-meter investments in power quality and power backup facilities, since they cannot reasonably expect their utility to make the substantial grid investments needed to achieve the level of power quality and reliability required by their sensitive processes.

b) Midgard notes the following definition of SAIDI and SAIFI, as provided by Electricity Canada (formerly the Canadian Electricity Association):[5]

> *"System Average Interruption Duration Index (SAIDI)*
>
> *This index is defined as the system average interruption duration for customers served per year.*
>
> *SAIDI = Total Customer-Hours of Interruptions/Total Customers Served**
>
> **Total customers served represents the number of end customers the utility is delivering electricity to.*
>
> *System Average Interruption Frequency Index (SAIFI)*

[5] **Source:** Electricity Canada, *Transmission & Distribution Indicators.* https://www.electricity.ca/knowledge-centre/the-grid/transmission/transmission-and-distribution-indicators/

> *This index is defined as the average number of interruptions per customer served per year.*
>
> *SAIFI = Total Customer-Interruptions/Total Customers Served**
>
> **Total customers served represents the number of end customers the utility is delivering electricity to."*

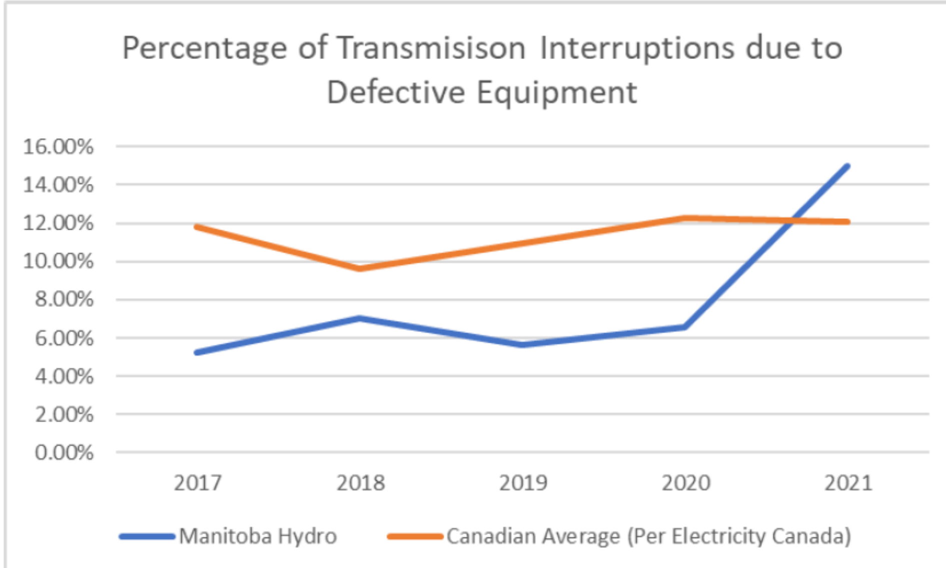
c) Outage events lasting less than the minimum duration threshold set by the utility (in Manitoba Hydro's case, outages lasting less than one minute) would not be included in SAIDI or SAIFI calculations.

d) SAIDI and SAIFI values are calculated using customer outages, and since the preponderance of customers by volume are connected to the distribution system, the overall weighting of total SAIDI and SAIFI results reflects distribution system reliability events, which due to a number of factors (e.g., narrower RoW, less aggressive vegetation management, smaller phase separations, smaller clearances to ground, less robust structures, more linear kms, shared RoW with roads, etc.) are both more frequent and typically of longer duration than transmission system events, especially in the redundant networked sections of the transmission system.

   However, Midgard did consider the T-SAIDI and T-SAIFI metrics provided by Manitoba Hydro in Section 7.2.5 of Midgard's evidence, specifically:

> *"The same pattern of investment justification on the basis of an asset focus rather than a system focus also appears to be present in AC transmission as well:*
>
> > *"Manitoba Hydro is observing a decline in the performance of its AC transmission system. There has been a recent increase in the number of outages caused by defective equipment on the transmission system, of which there are a variety of root causes, including age-related failures.*
> >
> > *…*

Figure 7.3 Transmission Interruptions due to Equipment Failure



” 6

However, although Transmission System Average Interruption Duration Index (“T-SAIDI”) with major events which are outside MH’s direct control is showing a negative trend, when MH describes their T-SAIDI and Transmission System Average Interruption Frequency Index (“T-SAIFI”) without major events, MH states that T-SAIDI is “aligned with historic values” and T-SAIFI has shown a slight improvement in the last 10-years:

> *“Over the last decade, T-SAIDI [with major events] is showing a negative trend which indicates line outages are taking longer to restore than in previous years. This trend is influenced heavily by the significance of several major weather events that have occurred in recent years. Excluding these major events, such as significant wildfires and the October 2019 storm, results in T-SAIDI values for fiscal years 2019, 2020 and 2022 of 78.68, 42.75, and 100.48, respectively, which is more aligned with historic values. Due to such significant influence from uncontrollable weather events, arriving at conclusions regarding the impacts of asset degradation on this metric is difficult.*

[6] Manitoba Hydro 2023/24 & 2024/25 General Rate Application, Tab 07, Page 9-10 of 51

> > *Manitoba Hydro's T-SAIFI has shown slight improvement in the last 10 years."* [7]
>
> *But MH insists that despite a trend of improvements in T-SAIDI, increasing equipment failure rates is the issue to address:*
>
> > *"Despite the improvement in T-SAIFI overall, equipment failure is contributing negatively to the trend."* [8]
>
> *Consequently, MH again appears to be ignoring its asset management policy of focusing on the system rather than assets, and justifies investments solely on the basis of equipment failure rates despite improving AC Transmission performance. As a result, Midgard would recommend that any increases in AC transmission budgets be denied and budget get static because the current budget levels are leading to improving AC transmission performance."* [9]

As it pertains to transmission-served industrial customers sensitive to events that are not reflected in T-SAIDI and T-SAIFI parameters, Midgard is unable to provide an opinion in this proceeding since there is no evidence on the record.

As discussed in response a) above, Midgard notes that there are other power quality parameters and events that may be important to transmission-served industrial customers that are not reflected in T-SAIDI and T-SAIFI. In cases where these other factors are relevant, Midgard provides the following:

1) <u>Power Quality:</u> Manitoba Hydro presumably has power quality standards that it meets (e.g., "IEEE 1159-2019: IEEE Recommended Practice for Monitoring Electric Power Quality"). To the extent that an industrial customer has an issue with its power quality, it can measure its received power quality. Should Manitoba Hydro's provided service levels fall short the customer can ask Manitoba Hydro to adhere to its standard.

2) <u>Transient Outages:</u> As discussed above in response to Question (a), T-SAIDI and T-SAIFI do not include outages less than one minute. As a result, if industrial customers desire Manitoba Hydro to provide

[7] Manitoba Hydro 2023/24 & 2024/25 General Rate Application, Tab 07, Page 11 of 51

[8] Manitoba Hydro 2023/24 & 2024/25 General Rate Application, Tab 07, Page 11 of 51

[9] Exhibit CC-8, Section 7.2.5, AC Transmission, p. 54.

transmission service performance that exceeds the system performance targets desired by other ratepayers, Midgard assumes that this should be done to the account of industrial ratepayers rather than all ratepayers. Manitoba Hydro did not provide evidence that specifically highlighted the different considerations of different ratepayer classes regarding reliability expectations, and as a result Midgard cannot comment upon those differences.

In cases where transmission-served customers require performance that exceeds the expectations of other ratepayer classes and/or Manitoba Hydro's prevailing reliability standards, such customers may consider making behind-the-meter investments to address their customized power supply requirements. If behind-the-meter investments are not economical, such customers could request Manitoba Hydro to undertake incremental interconnection investments (such as double-circuiting or installing solid-state automatic transfer switches between independent circuits), on the understanding that such incremental investments are driven by requirements that exceed normal system performance expectations, and so should be financed by the customer requiring the specialized performance.

e) Midgard has not received information in this proceeding relevant to differentially assessing reliability for customers served at distribution or transmission voltages other than the SAIDI, SAIFI, T-SAIDI and T-SAIFI parameters discussed in the above responses.

Midgard understands that residential and industrial customers typically have different expectations with respect to acceptable levels of reliability and power quality. Industrials with sensitive processes generally require better power quality and more reliable service than do residential ratepayers.

Industrials are typically served via the high voltage transmission system, which in most cases provides a much higher-level of service reliability than does the distribution system. Furthermore, utilities typically provide dedicated customer representatives for industrial customers, so individual industrial customers are more easily able to communicate any dissatisfaction with their service performance to their utility.

Industrials fed via long radial transmission lines (and particularly sub-transmission lines with narrow rights of way) may be exposed to more frequent and longer duration outages than are experienced by industrial customers fed via higher voltage and/or redundant networked facilities. But even in such cases, transmission voltage service quality usually significantly exceeds the quality experienced by distribution voltage customers. For example, the frequency of animal-caused phase to phase or phase to ground faults is typically significantly lower on 69 kV sub-transmission circuits than it is on 25 kV distribution circuits, due to the larger insulators and greater phase spacing utilized at the transmission voltage, in addition to the wider clearance to vegetation maintained at the higher voltage. These performance differences only increase for customers served at higher transmission voltages.

Furthermore, industrial customers who are not receiving adequate service quality typically have better access to capital than do residential customers and have the wherewithal to either install permanent power quality metering or hire contractors able to temporarily monitor power quality at their service entrances to demonstrate the basis of their concerns to their utility provider.

The differences in the measurement of power quality are ones of implementation rather than principle, as the measurement equipment is different, but the types of parameters measured are substantively similar (e.g., voltage, frequency and deviations from target). The differences in the measurement of reliability are different in terms of definition, as residential ratepayers are generally adequately served by the SAIDI and SAIFI definition of reliability, but industrials may not be. Industrials are sensitive to both the definition of SAIDI/SAIFI as discussed above, and power quality (e.g., transients that would have comparatively minor impact on residential ratepayers). The evidence filed by MH does not appear to distinguish between the requirements of residential vs. Industrial customers regarding factors that go beyond the SAIDI/SAIFI/T-SAIDI/T-SAIFI reliability metrics utilized by Manitoba Hydro.

f) As discussed in the previous response, Midgard has not received information in this proceeding relevant to differentially assessing reliability for customers served at distribution or transmission voltages other than the SAIDI, SAIFI, T-SAIDI and T-SAIFI parameters utilized by Manitoba Hydro.

Midgard is aware that different industrial customers can be susceptible to a wide range of power system performance anomalies that would not pose a material problem for other customer classes, or other industrials, depending upon the sensitivity of their processes and control systems.

Utilities cannot economically guarantee a perfect or ideal voltage signal, so utility regulators often set system performance targets (e.g., for reliability and power quality) at levels that can be economically achieved by the utility to avoid imposing undue costs upon the majority of ratepayers for service levels that they neither require nor expect.

The utility grid exists in the harsh world of reality – it must be robust enough to endure the conditions that the world will typically impose upon it, but it is unrealistic to expect that it can economically be made immune to all events. For example, the electrical system is designed to momentarily take itself offline to clear events such as lightning strikes, animal contacts, or tree contacts. But for more catastrophic events such as tornados or extreme icing, the economically prudent approach is to fix whatever the catastrophic event breaks, rather than build a system that is everywhere able to withstand extreme events that will only affect a very small proportion of assets in any given year.

Customers who demand a higher level of service than is required by most customers should be prepared to pay differentially for any incremental investments needed to achieve the higher demanded level of service.

MIPUG/COALITION I-6

Part and Chapter:	**Midgard Consulting Incorporated – Evidence For The Consumers Coalition**	**Page No.:**	**23**
PUB Approved Issue No.:			
Topic:	**Reliability**		
Sub Topic:			

PREAMBLE TO IR:

Midgard recommends that on vegetation management, and other operational spending, the dollars spent should be related to the SAIFI or SAIDI improvements.

QUESTION:

a) Does Midgard suggest a given \$/SAIDI minute or \$/SAIFI event standard for this type of comparison. If no, or it depends on the utility, please provide a description of the current status of Manitoba's information to make sure a determination, and what data would be required for Midgard to recommend such a metric.

RATIONALE FOR QUESTION:

Examine whether adequate measures are being undertaken to support vegetation management and other operational spending to maintain and/or improve reliability.

RESPONSE:

Midgard suggests that Manitoba Hydro could adopt \$/SAIDI minute or \$/SAIFI event metrics to compare the effectiveness of its vegetation management program spending against other competing areas of expenditure, such as O&M staffing levels or capital investments in new assets. Midgard's mandate did not include an extensive review of Manitoba Hydro's vegetation management program spending, strategy or performance trends, so Midgard cannot specifically comment on the current status of Manitoba Hydro's related information, data or processes.

Generically, a useful starting point would be to begin developing long-term trends of vegetation management \$/SAIDI minute and \$/SAIFI event to establish trend direction and enable course adjustments. Such a "compete against yourself" metric is both appropriate and useful. Comparing Manitoba Hydro's vegetation management performance against that of its peers is less useful, as each of Manitoba Hydro's provincial-scale utility peers is faced with its own unique vegetation and climate zones, topography, population density and system topology, all of which affect vegetation management requirements and outcomes.

Midgard notes that vegetation management is undertaken by electric utilities to address utility risks – utilities are not forestry companies who benefit by establishing targets such as cubic metres of marketable wood harvested or acreage cleared. Some of the key risks utility vegetation management efforts are intended to mitigate include:

a) Risk A: Circuit interruptions caused by momentary contacts (e.g., branches blowing in wind);
b) Risk B: Asset damage and/or longer-duration circuit interruptions caused by branches or trees falling against or growing into structures, conductors or guywires; and
c) Risk C: Wildfires caused by either momentary or permanent contacts with energized elements.

For networked transmission lines, Risk A events typically do not cause customer interruptions[10], although they may cause voltage sags at buses connected with the affected circuit. For radial transmission or distribution circuits, Risk A events typically cause momentary service interruptions for customers fed via the affected radial circuit. Multiple momentary events can be caused by a single branch if it fails to burn off between contacts.

Risk B events on networked transmission lines may or may not directly cause customer outages, but they can involve more costly mitigation (e.g., repairing or replacing structures or conductors damaged by treefalls, or burned down by wildfires). Utilities typically track extended transmission circuit interruption parameters even if they do not cause customer outages, so $/circuit interruption is another metric that might be useful for a utility to manage. Risk B events on radial transmission or distribution circuits will typically cause extended outages to all customers fed via those circuits (in the case of

[10] In extreme cases, such as the Eastern Interconnection blackout of August 2003 or the Western Interconnection system events of July and August 1996, tree contacts were the triggering events that led to cascading system outages that affected multiple states and provinces, which is why this area of concern has received so much attention from reliability agencies. However, it should be noted that the consequences of the tree contacts in the cited cases would have been minimal absent multiple coincident poor practices and exacerbating circumstances, including failure of system operators to maintain adequate voltage control reserves, overloading of key circuits and system paths, protection setting errors, and in the case of the 2003 event, multiple system control centre system and operator failures.

long distribution circuits, all customers downstream of the last circuit recloser upstream of the event).

Risk C events can have impacts other than electric service reliability, depending upon the area affected by the resulting wildfire. Such events can affect electric service reliability, but the risk evaluation must incorporate the much larger risks associated with wildfires.

Overall, Midgard recommends that Manitoba Hydro evaluate the risk-management cost-effectiveness (on a level playing field/full lifecycle NPV basis) of all the different O&M expenditures and capital investments available to it. Midgard does not need additional data to make this recommendation, as it allows Manitoba Hydro the flexibility to use whatever metrics are practically available to Manitoba Hydro given its data and process limitations.

MIPUG/COALITION I-7

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Sub Topic:			

PREAMBLE TO IR:

In respect of generation (and Bipole) availability, Midgard notes a concern that Hydro has focused on individual assets rather than system performance.

QUESTION:

a) Is reliability the only driver for maintaining high generation availability? For example, are potential lost revenues (mainly from export or surplus energy customers) a potential justification for investing in generation asset reliability? If yes, please indicate how Midgard has taken this into account?

b) Similarly, could generator outages lead to inefficiencies in reservoir management (having to change where generation occurs in a manner different than was originally planned when reservoirs were optimized and releases scheduled) which could impact overall output quantities?

c) Are SAIDI and SAIFI typical metrics for measuring generation performance? If not, please indicate appropriate metrics for measuring generation performance and its impact on customers at the distribution and transmission level.

d) Does Midgard agree with Manitoba Hydro that trends seen over 1 - 3 years are meaningful indicators of system performance.? Is it Midgard's view that this degree of focus may be an indicator of noise in data, rather than an indicator of meaningful changes in system performance?

RATIONALE FOR QUESTION:

Examination of measures available for evaluating the reliability performance of generation, and exploration of the relevance for SAIFI and SAIDI metrics in establishing performance improvement or degradation over the short-term.

RESPONSE:

a) Reliability is not the only driver for maintaining high generation availability. Potential lost revenues from surplus generation that is sold to other parties such as export markets could be a driver for maintaining high generation availability. However, if surplus generation is to be prudently justified, it needs to be justified on the basis for which it is going to be used, not unrelated arguments implying that reliability is the basis of the surplus investment.

   For example, if surplus generation beyond what is necessary to supply the domestic market is developed to serve the export market, then the economic justification for maintaining high generation reliability for the surplus generation is purely economic, not reliability-based. In its filing, Manitoba Hydro has not provided economic justifications for its surplus generation and associated reliability to serve the export market. Instead, Manitoba Hydro has relied on reliability arguments to justify all generation investments (including investments in surplus generation, which it admits to carrying). As a result, Manitoba Hydro has not economically justified its investments in surplus generation on the basis of export markets (or other offtakers). Midgard would be happy to review any evidence made available by Manitoba Hydro to justify its surplus generation (and associated transmission) investments on an economic rather than a reliability basis.

b) Unplanned generator outages could lead to changes in Manitoba Hydro's operational plans. However, the risk posed by changes to plans that lead to reductions in efficiency need to be quantified so that they can be evaluated accurately. Manitoba Hydro has not provided evidence demonstrating that such a risk analysis has been performed or quantified, so Midgard is unable to evaluate the prudence of Manitoba Hydro's investments. As such, although unplanned changes to Manitoba Hydro's operational plans may lead to sub-optimization, the extent of the sub-optimization has not been quantified and therefore cannot be used as a basis of evaluation.

   In addition, Manitoba Hydro carries a planning reserve margin of 12% and these resources are already included in the plan to address such contingencies:

> *"Manitoba Hydro's capacity criterion requires that the corporation carry a minimum reserve which is intended to protect against capacity shortfalls resulting from breakdown of generation/transmission equipment, or increases in winter peak load due to extreme weather conditions. The reserve is calculated as 12% of the Manitoba forecast peak winter demand in effect at the time for each year that is forecasted. The maximum demand for capacity in Manitoba occurs in the winter season, and therefore the reserve margin of 12% is applied to the winter peak demand.*
>
> *The reserve margin of 12% has been adequate for Manitoba Hydro's predominantly hydro-electric generation based system because of relatively low hydro generator outage rates combined with the relatively small size of the hydro-generating units."* [11]

Therefore, ratepayers are already paying for the insurance to cover an unplanned generation outage should it occur. As a result, it is inappropriate to carry both planning reserve margin for an unplanned generation outage <u>and</u> justify surplus generation investments on the basis of avoiding suboptimal generation dispatch when unplanned outages are already covered by the planning reserve margin.

c) SAIDI and SAIFI are not typical metrics for measuring generation reliability. A typical approach is to define a planning criterion through Loss-of-Load Probability ("LOLP") modelling, which determines the amount of effective generation capacity needed to meet a long run reliability standard, and then calculating a Planning Reserve Margin ("PRM") by dividing the total effective capacity required by the median or 1-in-2-year peak demand.

Common reliability metrics quantified using LOLP models include:[12]

- <u>Loss of load expectation ("LOLE", units of days/yr):</u> average number of days per year with loss of load (at least once during the day) due to system load exceeding available generating capacity

[11] Application, Appendix 5.5, Section 1.1, p. 1 of 2, l. 14-23.

[12] **Source:** Northwest Power Pool, Exploring a Resource Adequacy Program for the Pacific Northwest, Oct. 2019, p. 14. https://www.westernpowerpool.org/private-media/documents/2019.11.12_NWPP_RA_Assessment_Review_Final_10-23.2019.pdf

- Loss of load events (“LOLEV”, units of events/yr): average number of loss of load events per year, of any duration or magnitude, due to system load exceeding available generating capacity
- Loss of load probability (“LOLP”, units of %): probability of system load exceeding the available generating capacity during a given time period
- Loss of load hours (“LOLH”, units of hours/yr): average number of hours per year with loss of load due to system load exceeding available generating capacity
- Expected unserved energy (“EUE”, units of MWh/yr): average total quantity of unserved energy over a year due to system load exceeding available generating capacity

However, from a ratepayer perspective it is unclear why the root causes of outages are treated so differently between generation and transmission & distribution, considering that the impact on ratepayers is the same (i.e., an outage). Therefore, evaluating the root cause of outages on a consistent basis has merit in an asset management program that is seeking to provide a targeted level of reliability for least cost.

d) Midgard does not agree with Manitoba Hydro that trends seen over 1 - 3 years are meaningful indicators of system performance. This degree of focus may be an indicator of noise in data, rather than an indicator of meaningful changes in system performance. Please refer to Midgard’s response to the Manitoba PUB’s IR PUB/COALITION I-2(b) for further discussion.