

## Board Counsel Book of Documents

## Volume 3

## Asset Management and Capital Panel

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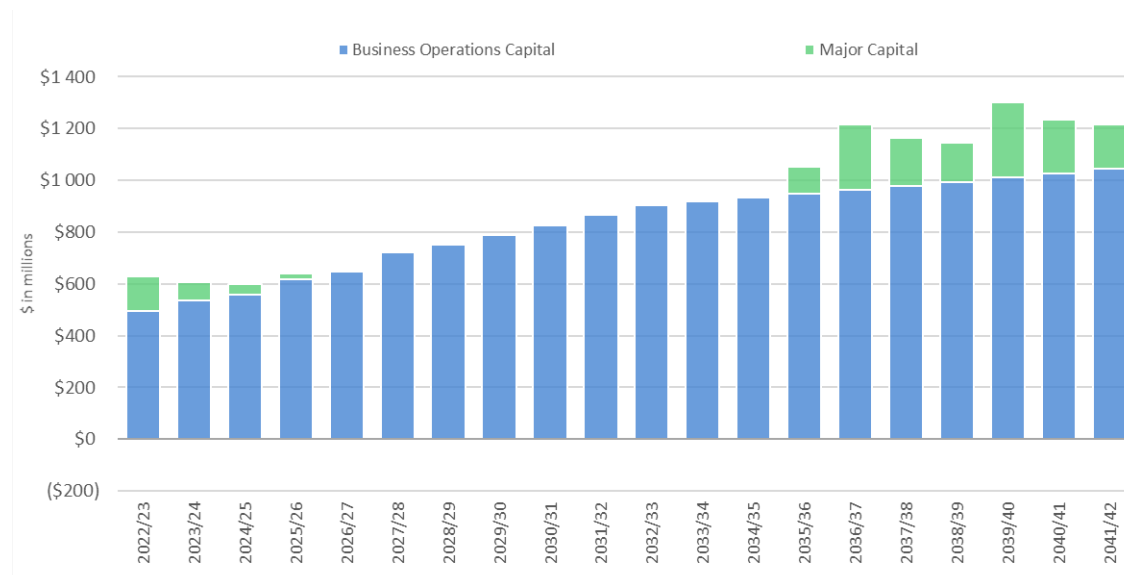
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Figure 3.28 Capital Expenditures

(\$ in millions)	2022/23 Forecast	2023/24 Preliminary Budget	2024/25 Preliminary Budget	2022/23 - 2031/32 10 Year Total	2022/23 - 2041/42 20 Year Total
<b>Major Capital</b>					
Capacity & Growth	\$132	\$69	\$41	\$267	\$1 634
<b>Business Operations Capital</b>					
Sustainment	286	313	354	4 305	10 476
Capacity & Growth	122	140	117	1 551	3 939
Business Operations Support	87	85	88	952	2 115
<b>Electric Total</b>	<b>\$627</b>	<b>\$607</b>	<b>\$601</b>	<b>\$7 076</b>	<b>\$18 164</b>

Figure 3.29 Capital Expenditures



- 1 Capital expenditures are anticipated to increase over the forecast scenario primarily as a result
- 2 of an increasing need for expenditures to sustain existing assets to maintain system reliability.
- 3 Manitoba Hydro is legislatively mandated by *The Manitoba Hydro Act* to provide reliable service,
- 4 and these investments are required to allow Manitoba Hydro to satisfy this mandate.
- 5 As outlined in Figure 3.28, the majority of the forecasted capital expenditures are related to
- 6 Business Operations Capital. Unlike the major capital projects that were almost entirely debt
- 7 funded, Manitoba Hydro seeks to fund Business Operations Capital primarily from cash from
- 8 operations. The proposed rate increases in the Test Years help ensure there is sufficient cash
- 9 from operations to fund capital expenditures associated with Business Operations Capital in the
- 10 majority of the years in the financial forecast.

**Figure 13: Operating & Administrative Expenses - MH22 vs MH16 - Millions**

1	2	3	4	5
			(2 - 3)	
			MH22 vs.	Cumulative
Year	MH22	MH16	MH16	Inc (Dec)
2023	589	536	53	53
2024	657	548	109	162
2025	687	559	128	290
2026	683	571	112	402
2027	697	583	114	516
2028	711	595	116	632
2029	724	607	117	749
2030	736	620	116	865
2031	739	633	106	971
2032	754	646	108	1079
2033	769	660	109	1188
2034	785	674	111	1299
2035	800	688	112	1411
2036	816	702	114	1525

**Figure 14: Business Operations Capital - MH22 vs MH16 - \$Millions**

1	2	3	4	5
			(2 - 3)	
			MH22 vs.	Cumulative
Year	MH22	MH16	MH16	Inc (Dec)
2023	495	549	-54	-54
2024	538	561	-23	-77
2025	559	618	-59	-136
2026	617	643	-26	-162
2027	647	663	-16	-178
2028	722	671	51	-127
2029	750	697	53	-74
2030	788	688	100	26
2031	827	727	100	126
2032	866	734	132	258
2033	905	748	157	415
2034	919	760	159	574
2035	933	835	98	672
2036	948	852	96	768

Additionally, a comparison of the PUB determination of O&A for rate-setting purposes for 2019/20 of \$489 million, with 1% escalation to the actual and forecast MH O&A, is provided in the following figure, and demonstrates that the MH forecast of O&A in the 2024/25 Test Year is \$173 million higher than the rate-setting signaling provided by the PUB in Order 69/19:

of its cash flow earlier in the year by postponing or reducing its spending on Business Operations Capital.

If the drought continues and Manitoba Hydro's cash flow concerns continue next year, the Board finds that Manitoba Hydro shall seek savings in its Business Operations Capital, just as it committed to do at the NFAT proceeding when it explained how it would confront financial liquidity concerns related to drought. The Board will consider Manitoba Hydro's steps to reduce its Business Operations Capital at the next General Rate Application. While the Board does not have the legal jurisdiction to approve specific capital projects or order Manitoba Hydro to reduce its capital spending, it will consider Manitoba Hydro's efforts to control costs (including operating statement costs from new Business Operations Capital) when adjudicating rate increases. **The Board directs Manitoba Hydro to demonstrate the savings in Business Operations Capital that are found by showing the updated Business Operations Capital spending compared to the spending proposed at this interim proceeding. Manitoba Hydro should be planning for the drought to continue and it must therefore control its Business Operations Capital spending to address the financial impacts of a continuing drought. However, Manitoba Hydro is to seek these savings regardless of whether the water conditions recover and the drought ends.**

### ***Operating & Administrative Expenses***

Operating & Administrative ("O&A") expenses are comprised primarily of labour and benefits, material, contracted services, and overhead costs associated with operating and maintaining all of Manitoba Hydro's facilities and providing service to its customers. Employee labour and benefits are the most significant components of O&A expenses.

Manitoba Hydro points out that in 2021 the Manitoba Labour Board awarded general wage increases to employees represented by the International Brotherhood of Electrical Workers totalling 3.5% which has an ongoing impact on Manitoba Hydro's O&A expenses. Additionally, Manitoba Hydro identifies inflationary pressures on its non-salary related O&A expenses, environmental monitoring of Keeyask Generating Station, zebra

## 12.0 IT IS THEREFORE ORDERED THAT:

1. Directive 3 in Order 137/21 and Directive 2 of Order 140/21 **BE AND ARE HEREBY VARIED** such that the interim rate increases approved in those Orders will remain in effect only until November 30, 2022, unless Manitoba Hydro files a General Rate Application by November 15, 2022, to confirm the 2021/22 interim rate increases, to seek rates for 2022/23, and for 2023/24 should it so decide. If Manitoba Hydro does not file a General Rate Application by November 15, 2022, the rates will revert to those in effect prior to Order 140/21.
2. Manitoba Hydro file, by February 28, 2022, updated electronic schedules of its revenue requirement for the 2021/22 and 2022/23 fiscal years reflecting the decisions and rates approved in Orders 137/21 and 140/21.
3. Manitoba Hydro file, as soon as released to stakeholders and by no later than November 15, 2022, a complete copy of Strategy 2040.
4. Manitoba Hydro include in its 2022/23 General Rate Application its long-term financial forecast of at least 20 years together with its underlying assumptions.
5. Manitoba Hydro include in its 2022/23 General Rate Application its updated Prospective Cost of Service Study which includes revised costs for Manitoba Hydro's major capital projects, including the Keeyask Generating Station.
6. At the 2022/23 General Rate Application, Manitoba Hydro demonstrate the savings in Business Operations Capital that are found by showing the updated Business Operations Capital spending compared to the spending proposed at this interim proceeding.
7. At the 2022/23 General Rate Application, Manitoba Hydro demonstrate the savings in O&A expenses that are found by showing the updated O&A expenses compared to the O&A expenses proposed in this interim proceeding.



**REFERENCE:**

Tab 7 p. 48 of 51, Tab 9 p. 5 of 28, Directive 6 of Order 9/22, and PUB MFR 19 from 2021/22 Interim

**PREAMBLE TO IR (IF ANY):**

PUB MFR 19 from the 2021/22 Interim Rate Application provides Manitoba Hydro's 5-year Capital Expenditure Forecast (CEF) for fiscal years 2021/22 to 2025/26 (including Business Operations Capital expenditures).

Order 9/22 Directive 6 states: *"At the 2022/23 General Rate Application, Manitoba Hydro shall demonstrate the savings in Business Operations Capital that are found by showing the updated Business Operations Capital spending compared to the spending proposed at this interim proceeding."*

Figure 7.16 (Tab 7 p. 48) of the 2023/24 & 2024/25 GRA provides a summary of Business Operations Capital from Manitoba Hydro's latest capital expenditure plan for fiscal years 2022/23 to 2041/42.

Table A, found below, compares the business operations capital expenditures included in the CEFs filed at the 2021/22 Interim Rate Application and the 2023/24 & 2024/25 GRA:

Table A: Business Operations Capital - Comparisons Between 2021/22 Interim and 2023/24 & 2024/25 GRA

[\$ millions]

	Row #	Fiscal Year	Budget Type	Sustain-ment	Capacity & Growth	Business Operations Support	Sub-Total
1	2021/22 Interim	2021/22	Forecast	\$279	\$141	\$104	\$524
2	23/24 & 24/25 GRA	2021/22	Actuals	TBD	TBD	TBD	\$504
3			<b>Variance (row 2-1)</b>	<b>TBD</b>	<b>TBD</b>	<b>TBD</b>	<b>-\$20</b>
4	2021/22 Interim	2022/23	Prelim Plan	\$314	\$130	\$101	\$545
5	23/24 & 24/25 GRA	2022/23	Forecast	\$286	\$122	\$87	\$495
6			<b>Variance (row 5-4)</b>	<b>-\$28</b>	<b>-\$8</b>	<b>-\$14</b>	<b>-\$50</b>
7	2021/22 MH Interim	2023/24	Plan	\$335	\$163	\$98	\$596
8	23/24 & 24/25 GRA	2023/24	Prelim Budget	\$313	\$140	\$85	\$538
9			<b>Variance (row 8-7)</b>	<b>-\$22</b>	<b>-\$23</b>	<b>-\$13</b>	<b>-\$58</b>
10	2021/22 MH Interim	2024/25	Plan	\$360	\$159	\$86	\$605
11	23/24 & 24/25 GRA	2024/25	Prelim Budget	\$354	\$117	\$88	\$559
12			<b>Variance (row 11-10)</b>	<b>-\$6</b>	<b>-\$42</b>	<b>\$2</b>	<b>-\$46</b>
13	2021/22 MH Interim	2025/26	Plan	\$374	\$159	\$86	\$619
14	23/24 & 24/25 GRA	2025/26	TBD	TBD	TBD	TBD	\$617
15			<b>Variance (row 14-13)</b>	<b>TBD</b>	<b>TBD</b>	<b>TBD</b>	<b>-\$2</b>

Sources:

- a) Rows 1, 4, 7, 10 and 13 - PUB MFR 19 from 2021/22 MH Interim.
- b) Rows 5, 8, and 11 - Tab 7 (Figure 7.16) [or Appendix 7.7 pp. 13-18 of 18] from 23/24 & 24/25 GRA
- c) Row 2 (sub-total only) - Appendix 3.1 p. 44 of 118 (line 3) from 2023/24 & 2024/25 GRA
- d) Row 14 (sub-total only) - MFR 21 p. 5 of 17 (Column D) from 2023/24 & 2024/25 GRA

**QUESTION:**

- a) Please file an updated version of preamble Table A, including the missing data from rows 2, 3, 14, and 15 of the table. If applicable, please also correct any other information shown in preamble Table A.

**RESPONSE:**

Please see Table A updated below.

[\$ millions]

	Row #	Fiscal Year	Budget Type	Sustain-ment	Capacity & Growth	Business Operations Support	Sub-Total
1	2021/22 Interim	2021/22	Forecast	\$279	\$141	\$104	\$523
2	23/24 & 24/25 GRA	2021/22	Actuals	\$269	\$125	\$111	\$504
3			<b>Variance (row 2-1)</b>	<b>-\$10</b>	<b>-\$16</b>	<b>\$7</b>	<b>-\$20</b>
4	2021/22 Interim	2022/23	Prelim Plan	\$314	\$130	\$101	\$545
5	23/24 & 24/25 GRA	2022/23	Forecast	\$286	\$122	\$87	\$495
6			<b>Variance (row 5-4)</b>	<b>-\$28</b>	<b>-\$8</b>	<b>-\$14</b>	<b>-\$50</b>
7	2021/22 MH Interim	2023/24	Plan	\$335	\$163	\$98	\$596
8	23/24 & 24/25 GRA	2023/24	Prelim Budget	\$313	\$140	\$85	\$538
9			<b>Variance (row 8-7)</b>	<b>-\$22</b>	<b>-\$23</b>	<b>-\$13</b>	<b>-\$58</b>
10	2021/22 MH Interim	2024/25	Plan	\$360	\$159	\$86	\$605
11	23/24 & 24/25 GRA	2024/25	Prelim Budget	\$354	\$117	\$88	\$559
12			<b>Variance (row 11-10)</b>	<b>-\$6</b>	<b>-\$42</b>	<b>\$2</b>	<b>-\$46</b>
13	2021/22 MH Interim	2025/26	Plan	\$374	\$159	\$86	\$619
14	23/24 & 24/25 GRA	2025/26	Plan	\$404	\$109	\$103	\$617
15			<b>Variance (row 14-13)</b>	<b>\$30</b>	<b>-\$50</b>	<b>\$17</b>	<b>-\$2</b>



**REFERENCE:**

Tab 7 p. 48 of 51, Tab 9 p. 5 of 28, Directive 6 of Order 9/22, and PUB MFR 19 from 2021/22 Interim

**PREAMBLE TO IR (IF ANY):**

PUB MFR 19 from the 2021/22 Interim Rate Application provides Manitoba Hydro's 5-year Capital Expenditure Forecast (CEF) for fiscal years 2021/22 to 2025/26 (including Business Operations Capital expenditures).

Order 9/22 Directive 6 states: "At the 2022/23 General Rate Application, Manitoba Hydro shall demonstrate the savings in Business Operations Capital that are found by showing the updated Business Operations Capital spending compared to the spending proposed at this interim proceeding."

Figure 7.16 (Tab 7 p. 48) of the 2023/24 & 2024/25 GRA provides a summary of Business Operations Capital from Manitoba Hydro's latest capital expenditure plan for fiscal years 2022/23 to 2041/42.

Table A, found below, compares the business operations capital expenditures included in the CEFs filed at the 2021/22 Interim Rate Application and the 2023/24 & 2024/25 GRA:

Table A: Business Operations Capital - Comparisons Between 2021/22 Interim and 2023/24 & 2024/25 GRA

[\$ millions]

Row #	CEF Filing	Fiscal Year	Budget Type	Sustain-ment	Capacity & Growth	Business Operations Support	Sub-Total
1	2021/22 Interim	2021/22	Forecast	\$279	\$141	\$104	\$524
2	23/24 & 24/25 GRA	2021/22	Actuals	TBD	TBD	TBD	\$504
3			<b>Variance (row 2-1)</b>	<b>TBD</b>	<b>TBD</b>	<b>TBD</b>	<b>-\$20</b>
4	2021/22 Interim	2022/23	Prelim Plan	\$314	\$130	\$101	\$545
5	23/24 & 24/25 GRA	2022/23	Forecast	\$286	\$122	\$87	\$495

6			<b>Variance (row 5-4)</b>	<b>-\$28</b>	<b>-\$8</b>	<b>-\$14</b>	<b>-\$50</b>
7	2021/22 MH Interim	2023/24	Plan	\$335	\$163	\$98	\$596
8	23/24 & 24/25 GRA	2023/24	Prelim Budget	\$313	\$140	\$85	\$538
9			<b>Variance (row 8-7)</b>	<b>-\$22</b>	<b>-\$23</b>	<b>-\$13</b>	<b>-\$58</b>
10	2021/22 MH Interim	2024/25	Plan	\$360	\$159	\$86	\$605
11	23/24 & 24/25 GRA	2024/25	Prelim Budget	\$354	\$117	\$88	\$559
12			<b>Variance (row 11-10)</b>	<b>-\$6</b>	<b>-\$42</b>	<b>\$2</b>	<b>-\$46</b>
13	2021/22 MH Interim	2025/26	Plan	\$374	\$159	\$86	\$619
14	23/24 & 24/25 GRA	2025/26	TBD	TBD	TBD	TBD	\$617
15			<b>Variance (row 14-13)</b>	<b>TBD</b>	<b>TBD</b>	<b>TBD</b>	<b>-\$2</b>

Sources:

- a) Rows 1, 4, 7, 10 and 13 - PUB MFR 19 from 2021/22 MH Interim.
- b) Rows 5, 8, and 11 - Tab 7 (Figure 7.16) [or Appendix 7.7 pp. 13-18 of 18] from 23/24 & 24/25 GRA
- c) Row 2 (sub-total only) - Appendix 3.1 p. 44 of 118 (line 3) from 2023/24 & 2024/25 GRA
- d) Row 14 (sub-total only) - MFR 21 p. 5 of 17 (Column D) from 2023/24 & 2024/25 GRA

**QUESTION:**

- b) Please explain the factors supporting the variances shown at rows 3, 6, 9, 12, and 15 of the updated version of preamble Table A (i.e., revised per item a) above). For example, are the apparent reductions in Business Operations Capital (BOC) expenditures between the CEF filed at the 2021/22 Interim and this GRA (for FY2021/22 to 2025/26) the result of cancellations of certain BOC projects and program activities, the deferral of previously planned BOC projects and programs to future years, the result of revised BOC project and program cost outlooks (i.e. same work scope but lower costs), improved BOC optimization resulting from Copperleaf 55 analysis and application of Manitoba Hydro's Corporate Value Framework, or other factor(s)?

**RESPONSE:****Row 3 21/22 - (\$20) Million Variance**

The variance was driven by construction work that was suspended during the IBEW strike in 2021, supply chain issues due to Covid, and external resource availability that resulted in construction delays.

**Row 6 22/23 – (\$50) Million Variance**

The variance between the Interim Rate Application and the General Rate Application are due to work that had to be delayed due to the wet spring and high water flows, continued supply chain issues, and contractors not able to meet schedules due to lack of available workers.

**Row 9 23/24 – (\$58) Million Variance; Row 12 24/25 – (\$46) Million Variance; Row 15 25/26 (\$2) Million Variance**

As described in Tab 7, Section 7.4.3, optimization of the capital portfolio begins with the establishment of financial planning targets. To achieve this, a detailed review of all committed and potential need investments in the portfolio was carried out to optimize spend levels for fiscal years 2023 to 2025.

Factors that resulted in the variances were reprioritizing investments using Manitoba Hydro's Corporate Value Framework. This resulted in some investments being deferred. Other factors are existing challenges with global supply chains slowing work down and existing levels of internal and external resources not being able to deliver all the required work. These two factors were used to re-optimize the portfolio using Copperleaf C55 analysis.

1 On September 20, 2022, Manitoba Hydro delivered a presentation on Strategy 2040 to the  
2 PUB and other interested stakeholders.

3 Please also refer to Tab 2 of the Application, as well as Appendix 2.1 for additional  
4 information on Strategy 2040 and the strategic pillars and initiatives to support the  
5 execution of Strategy 2040. Manitoba Hydro requests PUB confirmation that this directive  
6 has now been satisfied.

7 **4. Manitoba Hydro shall include in its 2022/23 General Rate Application its long-**  
8 **term financial forecast of at least 20 years together with its underlying**  
9 **assumptions.**

10 Status: Open

11 Manitoba Hydro has provided a long-term financial forecast scenario as Appendix 4.1 of  
12 Tab 4 of this Application. Manitoba Hydro requests PUB confirmation that this directive has  
13 now been satisfied.

14 **5. Manitoba Hydro shall include in its 2022/23 General Rate Application its updated**  
15 **Prospective Cost of Service Study which includes revised costs for Manitoba**  
16 **Hydro's major capital projects, including the Keeyask Generating Station.**

17 Status: Open

18 Manitoba Hydro filed its updated Prospective Cost of Service Study, including revised costs  
19 for the major capital projects, with Phase 2 of its Application on December 21, 2022.  
20 Manitoba Hydro requests PUB confirmation that this directive has now been satisfied.

21 **6. At the 2022/23 General Rate Application, Manitoba Hydro shall demonstrate the**  
22 **savings in Business Operations Capital that are found by showing the updated**  
23 **Business Operations Capital spending compared to the spending proposed at this**  
24 **interim proceeding.**

25 Status: Open

26 Please see Tab 7 of the Application for details on Manitoba Hydro's capital expenditure  
27 plan related to Business Operations Capital. Tab 7 also discusses how Manitoba Hydro's  
28 assets are aging, and system performance is declining, which is driving the need for  
29 increased investment to maintain required levels of performance and mitigate risks related  
30 to safety, reliability, compliance, and the environment. **Manitoba Hydro is committed to**  
31 **mature its asset management system and continue to improve its prioritization and**

1 optimization of capital spending using Corporate Value Framework, to manage the  
2 challenge of aging assets and growing demand.

3 Accordingly, Manitoba Hydro requests that this directive either be set aside or requests  
4 confirmation that this directive has been satisfied.

5 **7. At the 2022/23 General Rate Application, Manitoba Hydro shall demonstrate the**  
6 **savings in O&A expenses that are found by showing the updated O&A expenses**  
7 **compared to the O&A expenses proposed in this interim proceeding.**

8 Status: Open

9 Please see Tab 6 of the Application which provides details of Manitoba Hydro's forecast of  
10 Operating & Administrative ("O&A") expenses. Tab 6 also discusses the operating cost  
11 pressures being experienced, many of which are not unique to Manitoba Hydro, and  
12 discusses the need to build staffing levels to meet the current and evolving energy needs  
13 of customers. As a result of the current cost pressures Manitoba Hydro is experiencing,  
14 both internal and external, focus has shifted to cost containment and fostering a culture of  
15 continuous evaluation and improvement.

16 Accordingly, Manitoba Hydro requests that this directive either be set aside or requests  
17 confirmation that this directive has been satisfied.

## 9.5 Directives 2 and 3 from PUB Order 140/21 and 137/21

18 **The interim rate increases approved in this Order will remain in effect only until**  
19 **November 15, 2022 unless Manitoba Hydro has filed a General Rate Application**  
20 **seeking rates for 2022/23 and to confirm the 2021/22 interim rate increases by**  
21 **that date.**

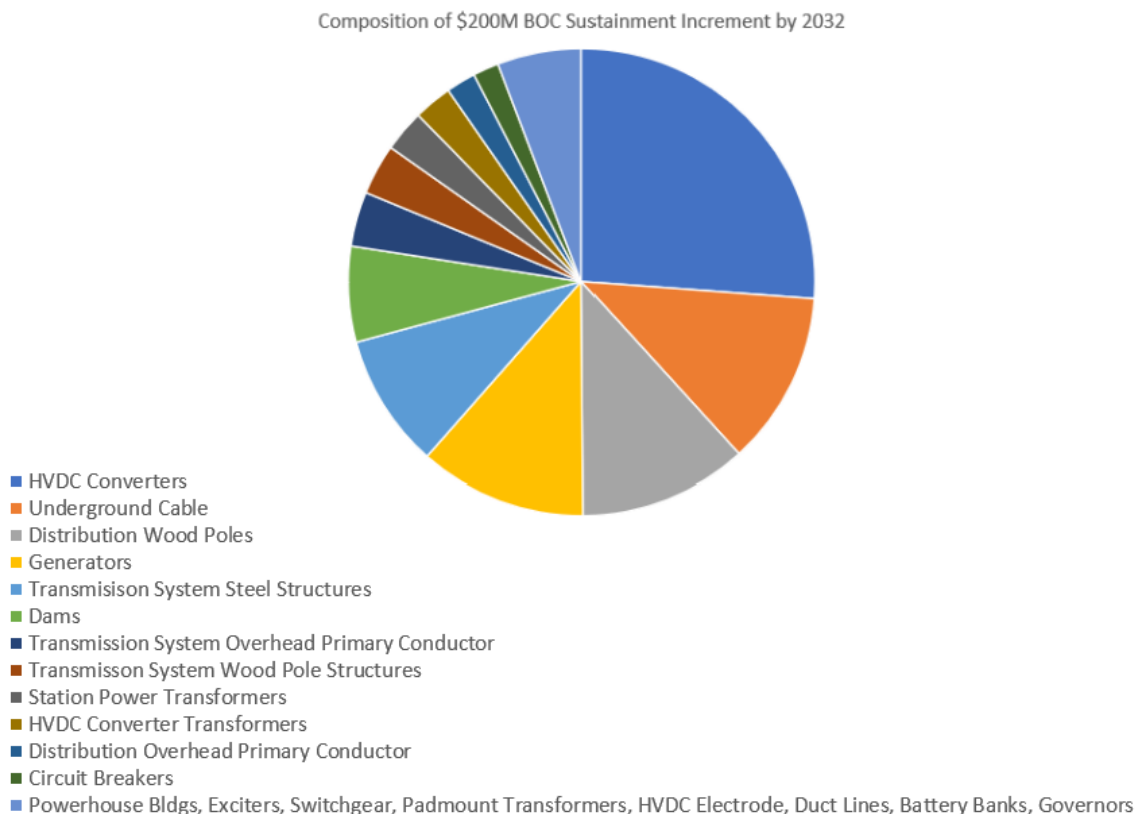
22 Status: Open

23 Manitoba Hydro is seeking confirmation of the 2021/22 interim rate increases approved in  
24 PUB Order 140/21 and 137/21 as part of this Application. Please refer to Tab 1 for further  
25 detail on the relief sought in this Application. Manitoba Hydro requests confirmation that  
26 this directive has now been satisfied.

## 9.6 Directives From PUB Order 150/20

27 **2. Manitoba Hydro is to notify its affected customers, who have 1000 watt High**  
28 **Pressure Sodium street lights that are being converted to LED street lights, of the**



**Figure 7.13** Composition of \$200M Business Operations Capital Sustainment Increment Projected by 2032

1 This projection provides a targeted trajectory for resourcing and workloads. Due largely to  
 2 the timelines associated with building a workforce with the required competencies and  
 3 planning high-complexity infrastructure projects, changing the cadence of asset  
 4 intervention from historical levels is a significant undertaking that must be started well in  
 5 advance of the actual intervention (workload) requirements.

6 As Manitoba Hydro Asset Management matures, the accuracy of this projection will  
 7 improve, and the trajectory will be adjusted accordingly. By preparing for the resource  
 8 requirements and workloads of Manitoba Hydro's current projection now, the potential to  
 9 change abruptly in reaction to significant system performance decline is significantly  
 10 mitigated or avoided, thereby reducing potential inefficiencies and significant risks to the  
 11 electrical infrastructure system.

# Capital Spending Business Operations Capital - Breakdown

Source: 2023/24 & 24/25 MH GRA, Appendix 7.7 pp. 5 to 18 of 18

BOC Projects >\$50M	Total Project Cost	In-Service Date	Comment	CEF Planning Items	Estimated Cost	Estimated Schedule
Pointe du Bois Renewable Energy Project	\$308M	Mar-27	<i>Assumes receipt of \$114M in federal grant</i>	Bipole I and II HVDC Refurbishment	\$1,000M - \$1,800M	2022-2034
Portage Area Capacity Enhancement	\$85M	Feb-27	<i>Assumes receipt of \$71M in federal grant</i>	Long Spruce G.S. Unit Overhauls	\$235M	2022-2036
De Salaberry-Letellier 230kV Transmission Line	\$74M	Jan-25		Kettle G.S. Unit Overhauls	\$315M	2020-2034
Laverendrye-St. Vital 230kV Line & Breakers	\$59M	Mar-24		Advanced Metering Infrastructure	\$300M	2022-2032
Note: Appendix 7.7 shows 45 more individual BOC projects >\$1M				Grid Modernization	\$180M	2022-2032
				Dispatchable Capacity Resources (three combustion turbine units)	\$1,400M	2035-2042

Capital Projects, Programs and Portfolio Adjustments \$ in millions	Total Project Cost	2022/23 Forecast	2023/24 Preliminary Budget	2024/25 Preliminary Budget	2022/23- 2031/32 10 Year Total	2022/23- 2041/42 20 Year Total
<b>BUSINESS OPERATIONS CAPITAL</b>						
Sustainment						
System Renewal						
Projects						
Pointe du Bois Renewable Energy Project	308.3	37.9	52.1	64.7	305.4	305.4
Dorsey Synchronous Condenser Refurbishment	65.4	2.9	0.1	0.1	3.1	3.1
System Control Centre Replacement - 820 Taylor	48.2	28.6	0.2	-	28.8	28.8
Limestone Units 1-3 & 5-10 Stator Re-Wedge	37.8	6.2	8.5	6.9	29.0	29.0
Churchill Weir Rehabilitation	29.4	10.0	6.4	11.5	27.9	27.9
Kettle Unit 5 Stator Overhaul	27.5	13.1	11.0	-	24.1	24.1
Kettle Unit 9 Stator Overhaul	27.3	-	-	-	27.3	27.3
Kettle Unit 7 Stator Overhaul	25.5	-	-	-	25.3	25.5
Kettle Unit 11 Stator Overhaul	24.9	-	-	-	24.9	24.9
Enterprise PCB Remediation	24.8	3.7	7.2	7.8	24.8	24.8
Kettle Unit 12 Stator Overhaul	24.4	-	-	-	24.4	24.4
McArthur Falls Electrical Components Replacement/Refurbish	24.4	-	3.0	3.9	24.1	24.1
Kettle Unit 6 Stator Overhaul	23.3	0.4	8.8	14.1	23.3	23.3
Kettle Unit 8 Stator Overhaul	23.1	-	-	2.7	23.1	23.1
Kettle Unit 10 Stator Overhaul	22.9	-	2.6	6.3	22.9	22.9
Long Spruce Generator Protection Replacement	22.5	4.2	4.0	3.5	13.7	13.7
Grand Rapids Unit 1 Overhaul	21.2	-	0.0	0.0	21.1	21.1
HVDC BP2 Valve Hall Wall Bushing Replacement	19.7	0.8	0.1	8.0	18.4	18.4
13.2kV Shunt Reactor Replacements	19.3	0.3	0.5	-	0.8	0.8
Grand Rapids Unit 4 Major Overhaul	18.2	1.1	2.9	4.8	17.6	17.6
Kelsey GS SS 138kV Breaker Replacement	18.1	0.4	1.2	5.0	17.5	17.5
HVDC - Gapped Arrester Replacement	16.1	1.3	0.4	2.3	4.0	4.0
Generation Security Infrastructure Update	14.9	2.1	3.6	2.9	10.8	10.8
BP6 & BP7 Permanent Re-Route	12.0	4.2	7.7	0.2	12.0	12.0
University Station Switchgear Replacement	10.6	5.8	0.2	-	6.0	6.0
Dawson Road Station Feeder Conversions	9.6	6.3	1.1	0.4	7.9	7.9
HVDC BiPole 1 Direct Current Transductor Replacement	8.8	1.1	1.1	-	2.2	2.2
HVDC Transformer Marshalling Kiosk Replacement	7.5	0.5	0.7	-	1.1	1.1
Kelsey House Units 1 & 2 Refurbishment	6.6	3.5	1.6	-	5.1	5.1
Lower Nelson River Station Spillway Diesel Backup	6.4	3.9	1.0	-	4.9	4.9
Seven Sisters Intake Frost Protection	6.1	0.4	0.7	-	1.1	1.1
HVDC BiPole 1 Disconnect Replacement	5.6	1.8	1.7	(0.1)	3.2	3.2
De Bourmont Station Replacement	5.0	4.3	0.6	-	4.9	4.9
Limestone Unit 5 Overhaul	4.8	2.7	0.1	0.0	2.8	2.8
Kettle Unit 1-3,5-8&10-12 Dewater Piping Replacement	4.8	0.3	0.7	0.7	2.5	2.5
Mobile Substation Replacement	4.6	0.0	0.0	0.0	4.4	4.4
Russell Control Structure Stabilization	3.5	0.4	1.9	-	2.3	2.3
Limestone Unit 9 Overhaul	3.5	-	0.2	0.0	3.5	3.5
Diesel Upgrades - Brochet	3.4	0.7	0.5	1.6	2.7	2.7
66kV W18 Oil Filled Cable Replacement	3.4	1.2	2.2	-	3.4	3.4
KT1 & KT2 Line Protection Replacement	3.4	1.5	0.0	-	1.5	1.5
Limestone Unit 1 Overhaul	3.3	0.0	1.7	1.6	3.3	3.3
Limestone Unit 6 Overhaul	3.3	0.0	0.0	1.1	3.3	3.3
Limestone Unit 7 Overhaul	3.3	1.7	0.9	-	2.6	2.6
Limestone Unit 4 Overhaul	3.2	-	-	-	3.2	3.2
Long Spruce GS 230kV Disconnect Replacements	3.1	2.1	0.0	-	2.1	2.1
Limestone Unit 10 Overhaul	3.1	-	-	0.3	3.1	3.1
Limestone Unit 8 Overhaul	3.1	-	-	0.3	3.1	3.1
Laurie River Accommodations Replacement	3.1	0.9	2.2	-	3.1	3.1
Limestone Unit 3 Overhaul	3.1	-	-	0.3	3.1	3.1
Limestone Unit 2 Overhaul	3.0	0.5	2.4	0.0	3.0	3.0
Jenpeg Fire Water System Replacement	2.8	-	-	-	2.7	2.7
Grand Rapids RipRap Replacement	2.8	1.4	1.4	-	2.8	2.8
Kettle U1-4 Generator Terminal Cubicles	2.6	0.3	2.2	-	2.6	2.6
KN36 Tap to Keeyask Rebuild	2.6	0.3	0.1	-	0.4	0.4
Dorsey VG42 High Speed Switch Failure	2.4	1.6	0.3	-	1.9	1.9
Grand Rapids Intake Gantry Crane Upgrade	2.1	-	-	-	2.1	2.1
Missi Falls Diesel Generator Replacement	2.0	0.2	0.2	1.4	1.8	1.8
Long Spruce Unit 1-10 Surface Air Cooler Replacement	1.9	0.0	0.9	0.9	1.9	1.9
Grand Rapids Draft Tube Gantry Crane Upgrade	1.8	0.4	1.1	0.0	1.4	1.4
Diesel Upgrades - Shamattawa	1.8	(0.3)	(0.2)	1.5	1.1	1.1
Slave Falls Tailrace Crane Refurbishment	1.5	0.1	1.2	0.1	1.4	1.4
BPI and BPII Modernization	1.5	1.0	0.4	-	1.4	1.4
PDB Unit 16 Turbine Pit Water Leak Refurb	1.4	0.3	1.1	-	1.3	1.3
Jenpeg 129V Battery Bank Replacement	1.1	0.6	0.2	-	0.8	0.8
Jenpeg Spillway Stoplog Hoist Modernization	1.1	0.1	0.3	0.7	1.0	1.0
Grand Rapids U1-3 Fire Detection Upgrades	1.0	-	1.0	-	1.0	1.0
Jenpeg Spare Stator Bar Purchase	1.0	0.1	0.9	-	1.0	1.0
		<b>162.8</b>	<b>153.0</b>	<b>155.4</b>	<b>870.3</b>	<b>870.5</b>

Capital Projects, Programs and Portfolio Adjustments \$ in millions	Total Project Cost	2022/23 Forecast	2023/24 Preliminary Budget	2024/25 Preliminary Budget	2022/23- 2031/32 10 Year Total	2022/23- 2041/42 20 Year Total
<b>BUSINESS OPERATIONS CAPITAL</b>						
<b>Sustainment</b>						
<b>System Renewal Programs</b>						
Overhead - Pole & Feeder Replacements		26.1	26.6	27.1	285.6	633.7
Distribution Modifications - Small Scope		12.8	13.1	13.3	140.2	311.0
Lighting - Standard, Base & Cable Replacement		9.0	9.5	10.0	104.3	232.6
Overhead - IPM Pole Treatment		8.3	8.5	8.7	91.4	202.9
Underground - Cable Replacement		7.4	7.6	7.8	81.9	182.0
Damaged Plant & Emergency Pole Replacements - Small Scope		4.8	4.8	4.9	52.0	115.4
Underground - Cable Injection		4.0	4.5	5.0	51.4	115.6
Transmission Line Wood Pole Replacement Program		4.0	4.1	4.2	43.8	97.2
Stations In-Service Equip Failures Prog		3.7	3.7	3.8	40.1	89.0
Control Centre Technology Infrastructure		3.5	3.6	3.6	38.3	85.0
Converter Stations Program		3.5	3.5	3.6	37.8	83.8
Telecommunication Program		3.4	3.5	3.5	37.3	82.8
Underground - Civil Structures		2.3	2.6	2.8	29.1	65.3
Distribution Stations Program		2.2	2.3	2.3	24.3	53.9
Generation Auxiliary Systems		2.1	2.1	2.2	22.8	50.5
Transmission Stations Program		2.1	2.1	2.1	22.4	49.8
Transmission Protection Relay Replacement Program		1.7	2.0	2.0	21.2	47.4
Overhead - Right of Way Widening		2.3	1.8	1.5	17.1	36.4
Support Infrastructure		1.6	1.7	1.7	17.7	39.4
Transmission Line Footing & Anchor Replacement Program		1.6	1.6	1.6	17.1	37.9
Generation Core Equipment		1.3	1.4	1.4	14.6	32.5
Overhead - Clearances		1.3	1.4	1.4	14.6	32.5
Overhead - Distribution Grounding Replacement		1.3	1.4	1.4	14.5	32.2
Underground - Padmount Equipment Replacement		1.3	1.3	1.3	13.7	30.3
Station Ground Grid Sustainment Program		0.5	1.0	1.0	10.4	23.8
Operational Enhancement & Reliability - Winnipeg		1.0	1.0	1.0	10.7	23.7
		112.9	116.5	119.4	1,254.5	2,786.7
Other Projects, Programs & Portfolio Adjustments		(36.0)	(14.8)	31.5	1,542.5	5,299.7
<b>System Renewal Total</b>		239.7	254.7	306.3	3,667.3	8,956.8
<b>System Efficiency Projects</b>						
Jenpeg Unit 2 Overhauls	53.4	0.3	0.5	1.7	53.4	53.4
Station Battery Bank Capacity & System Reliability Increase	45.5	0.6	1.0	1.0	2.6	2.6
Long Spruce Unit 10 Overhaul	12.7	-	-	0.8	12.7	12.7
Long Spruce Unit 2 Overhaul	12.4	0.8	3.3	7.3	12.4	12.4
Long Spruce Unit 9 Overhaul	12.3	-	0.7	3.5	12.3	12.3
Pointe du Bois Fire Safety & Employee Egress Install	7.0	-	-	-	7.0	7.0
Secondary Network Visibility	5.4	1.0	1.1	0.2	2.3	2.3
Kettle Headgate Platform Fall Protection Replacement	4.7	0.1	0.3	0.4	4.1	4.7
Henday Zebra Mussels Mitigation	2.3	0.7	1.6	-	2.3	2.3
Seven Sisters Stoplog Hoist Replacement	1.9	0.5	1.4	-	1.9	1.9
LR Rip-Rap Slope Protection Addition	1.9	1.8	0.1	-	1.9	1.9
Shamattawa Generator Cooling Systems	1.0	(0.6)	1.5	-	0.9	0.9
		5.2	11.5	15.0	113.6	114.2
<b>Programs</b>						
Operational Enhancement & Reliability - Rural		3.5	3.6	3.7	38.6	85.5
24kV Switch Automation		2.5	3.5	1.9	8.0	8.0
66kV Remote Switch Replacements		2.0	2.5	-	4.5	4.5
Network Visibility - Feeders & Lines		1.0	2.2	2.2	12.8	12.8
Operational Enhancement & Reliability - Winnipeg		1.3	1.3	1.3	13.8	30.5
Overhead - Right of Way Widening		1.3	1.0	0.8	9.4	19.9
Transmission Stations Program		0.9	1.0	1.0	10.4	23.1
		12.5	15.1	10.9	97.4	184.4
Other Projects, Programs & Portfolio Adjustments		2.5	3.4	6.7	209.1	654.0
<b>System Efficiency Total</b>		20.1	30.0	32.6	420.1	952.6
<b>Mandated Compliance Projects</b>						
Public Water Safety/Security	35.8	5.5	2.7	0.1	8.3	8.3
Generation North Sewer & Domestic Water System Upgrade	25.8	0.6	4.5	-	5.1	5.1
Aquatic Data Collection	24.2	4.9	5.9	6.0	16.8	16.8
Station PCB Bushing Replacement	15.5	5.1	0.3	(0.0)	5.3	5.3
Transmission Line Upgrades for Improvement Clearance	13.0	0.7	2.8	-	3.6	3.6
Water Power Act Water Licenses	6.3	2.2	1.1	1.1	4.5	4.5
Gen South PCB Regulation Compliance	5.5	0.9	0.6	0.0	1.5	1.5
Lake Sturgeon Stewardship Programs & Reg	5.2	1.5	1.5	1.3	4.3	4.3
Bulk Power System Protection Upgrade - Group 1	4.5	1.3	2.6	0.0	3.9	3.9
Arctic Baysis & RCEA	2.1	0.9	0.5	0.5	1.8	1.8
Line V38R-230kV T/L Right-Of-Way in Riding Mtn National Park	1.6	0.1	0.7	-	0.8	0.8
Manitoba Infrastructure St. Mary's Interchange	1.5	1.7	1.5	(1.8)	1.4	1.4
Missi Falls Sewer & Water Upgrade	1.4	-	0.1	1.0	1.2	1.2
Sturgeon Bay Resort Water Storage Purchase	1.1	1.0	0.1	-	1.0	1.0
		26.3	24.9	8.2	59.4	59.4
<b>Programs</b>						
Plant Relocations - Winnipeg		1.6	1.6	1.7	17.5	38.7
Plant Relocations - Rural		1.5	1.5	1.5	15.9	35.3
		3.0	3.1	3.2	33.4	74.0
Other Projects, Programs & Portfolio Adjustments		(6.3)	(2.0)	1.8	89.4	340.0
<b>Mandated Compliance Total</b>		23.1	26.0	13.1	182.1	473.4
<b>Decommissioning</b>						
Other Projects, Programs & Portfolio Adjustments		2.9	1.9	2.3	35.7	93.0
<b>Decommissioning Total</b>		2.9	1.9	2.3	35.7	93.0
<b>Sustainment Total</b>		285.9	312.6	354.4	4,305.2	10,475.9

**REFERENCE:**

Appendix 7.7, MFR 88

**PREAMBLE TO IR (IF ANY):**

Appendix 7.7 presents Manitoba Hydro's capital expenditure plan for fiscal years 2022/23 to 2041/42. Inclusive of Major Capital investments, the electric capital spending is estimated at \$18,164 million over the 20-year planning period.

MFR 88 presents the following table (continued on the next page) showing the actual project costs and final pre-construction budgets for all completed capital projects in excess of \$10 million since 2018:

	<b>Project [\$ millions]</b>	<b>Final Project Costs</b>	<b>Final Pre-Construction Budgets</b>	<b>\$ Diff.</b>	<b>% Diff.</b>	<b>Comment</b>
1	Rural District Office A Renovation	17	10	7	70%	Over
2	Gillam Recreation Center Refurbishment	38	38	0	0%	On Budget
3	Enterprise Asset Management - Phase 2	34	17	17	100%	Over
4	Grand Rapids Unit Transformers Replacement	23	19	4	21%	Over
5	Pine Falls GS Units 1-4 Major Overhauls	86	33	53	161%	Over
6	Great Falls Unit 4 Overhaul	53	20	33	165%	Over
7	McArthur Falls/Pine Falls Breaker Replacement Program	15	11	4	36%	Over
8	Pointe du Bois Units 1-15 Major Overhaul	22	133	-111	-83%	Under
9	Kettle Transformers Replacements	45	36	9	25%	Over
10	Slave Falls Seven Bay Sluiceway	18	19	-1	-5%	Under
11	Slave Falls Creek Spillway Rehabilitation	16	26	-10	-38%	Under
12	Selkirk Generating Station Environmental Enhancements	15	14	1	7%	Over
13	Water Licenses & Renewals	86	41	45	110%	Over
14	Generation & Wholesale Remote Control &	12	4	8	200%	Over



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	Project [\$ millions]	Final Project Costs	Final Pre-Construction Budgets	\$ Diff.	% Diff.	Comment
	Monitoring					
15	Generation North Physical Security Upgrades	11	10	1	10%	Over
16	Gillam Housing Retrofit Program	10	11	-1	-9%	Under
	Gillam Redevelopment & Expansion Program					
17	Phase 1A	24	26	-2	-8%	Under
18	Generation South Physical Security Upgrade	12	15	-3	-20%	Under
19	Gillam Apartment Rehabilitation	12	6	6	100%	Over
20	Gillam 2017 Municipal Road Upgrade	10	0	10	N/A	N/A
	Gillam Trailer Court Sewer Linear					
21	Infrastructure	11	0	11	N/A	N/A
22	Transmission Line Re-Rating Upgrades	30	24	6	25%	Over
23	BiPole I&II Spacer Damper Replacement	30	31	-1	-3%	Under
	Southern Air Conditioning System Breaker					
24	Replacements	13	15	-2	-13%	Under
25	Virden West & Reston 66kV Capacitors	10	11	-1	-9%	Under
	Stanley Station 2nd Bank & S60L					
26	Sectionalization	14	16	-2	-13%	Under
	Winnipeg - Brandon Transmission System					
27	Improvements	14	43	-29	-67%	Under
28	Lake Winnipeg East System Improvements	83	65	18	28%	Over
	HVDC System Transformer & Reactor Fire					
29	Prevention	10	10	0	0%	On Budget
	HVDC Circuit Breaker Operating Mechanisms					
30	Replacement	13	9	4	44%	Over
31	Mobile Radio System Modernization	25	31	-6	-19%	Under
	Heaslip Distribution Supply Centre and 8-25kV					
32	Conversion	13	13	0	0%	On Budget
33	Madison Station - 115/24kV	82	66	16	24%	Over
34	Harrow Station Bank Addition	10	25	-15	-60%	Under
35	Mohawk Station Bank Addition	15	20	-5	-25%	Under

	Project [\$ millions]	Final Project Costs	Final Pre-Construction Budgets	\$ Diff.	% Diff.	Comment
36	McPhillips Station - 115kV/24kV	33	47	-14	-30%	Under
37	St. Vital Station - 115/24kV	39	51	-12	-24%	Under
38	York Station-Bank 1,3,5 & Switchgear Addition	11	11	0	0%	On Budget
39	Adelaide Station - 66/12kV	67	62	5	8%	Over
40	Rover 4kV Interchange Station and Conversion	12	13	-1	-8%	Under
41	Martin Station-New 66-4/12kV Station	34	28	6	21%	Over
42	Advanced Information Management	11	11	0	0%	On Budget
43	Winnipeg North West Phase 2	26	31	-5	-16%	Under
44	Kettle Units 1-4 Stator Replacement	106	14	92	657%	Over
45	Bipole III - Transmission Line	1733	1082	651	60%	Over
46	Bipole III - Converter Stations	2586	1104	1482	134%	Over
47	Bipole III - Collector Lines	221	191	30	16%	Over
48	Bipole III - Community Development Initiative	56	61	-5	-8%	Under
49	Pointe du Bois Spillway Replacement	567	818	-251	-31%	Under
50	Kelsey Re-running	321	184	137	74%	Over

**QUESTION:**

- a) Please confirm whether the pre-construction budgets listed in the above table are in fact the final pre-construction budgets, considering the September 2014 Bipole III budget was \$4.65 billion as shown in CEF14 and PUB/MH I-20 from the 2014/15 & 2015/16 GRA.
- b) Other than for the Bipole III and Winnipeg North West Phase 2 projects, please provide the reasons for a large number of Manitoba Hydro's capital projects exceeding the final pre-construction budgets by an amount in excess of \$10 million. For example, were the pre-construction budgets for these projects preliminary estimates that ultimately proved unrealistic given specific site requirements, were unforeseen cost increases incurred due to contractor issues or pandemic-related supply-chain issues, etc.?

- c) Please explain whether the lessons learned (e.g., technical work scopes, contractor issues, budgeting processes, project resource allocation, etc.) from the above list of completed capital projects completed since 2018 are being applied to similar types of capital projects or programs (both current and planned) such that capital budget cost overruns are minimized going forward.

**RESPONSE:**

- a) Manitoba Hydro does not track “Final Pre-Construction Budgets” as requested in MFR 88 at this time. Manitoba Hydro interpreted “Final Pre-Construction Budgets” as being the CIJ/CIJA approved before any construction-related expenditures were incurred, and to be responsive to MFR 88, undertook a detailed review of all approval documents to determine the amount as interpreted by Manitoba Hydro.

For Bipole III, there were some miscellaneous costs, which were inadvertently identified as construction costs and, therefore, the amounts in the table included in the Preamble are incorrect. The Bipole III final pre-construction budget was \$4.65 billion.

Project [\$millions]	Final Project Costs	Final Pre-Construction Budgets	\$ Diff.	% Diff.	Comment
Bipole III-Transmission Line	1733	1655	78	5%	Over
Bipole III – Converter Stations	2586	2675	-89	-3%	Under
Bipole III – Collector Lines	221	260	-39	-15%	Under
Bipole III – Community Development Initiative	56	62	-6	-10%	Under
<b>Total</b>	<b>4596</b>	<b>4652</b>	<b>-56</b>	<b>-1%</b>	<b>Under</b>



Upon further review, there are some other corrections required to the table included in MFR 88 as follows:

- the pre-construction budget identified for Kettle Units 1-4 Stator Replacement of \$14 million budget only reflected one unit and did not reflect the full scope of the project. The correct pre-construction budget for that project is \$104 million.
- the pre-construction budgets for the Gillam 2017 Municipal Road Upgrade and the Gillam Trailer Court Sewer Linear Infrastructure Projects indicated \$0 as the pre-construction budget which was an error. The CIJs were inadvertently missed in the analysis, as explained in the variance explanations for those line items in b) below.

b) Please see the table below for variance explanations for capital projects exceeding the final pre-construction budgets by an amount in excess of \$10 million.

Project \$ in millions	Final Project Costs	Final Pre- Construction Budgets	\$ Diff.	% Diff.	Variance Explanation
Enterprise Asset Management - Phase 2	34	17	17	100%	The original build and test estimates did not match the complexity of the project and replanning was required. In addition, the training, deployment, conversion and reporting schedules were underestimated. Furthermore, the interest and escalation charges for the project were over the budgeted amount due to delays in the schedule.
Pine Falls GS Units 1-4 Major Overhauls	86	33	53	161%	Scope was increased to add two units (3 and 4) as well as crane modernization work. In addition, there were commissioning delays and miscellaneous cost overruns.

Project \$ in millions	Final Project Costs	Final Pre- Construction Budgets	\$ Diff.	% Diff.	Variance Explanation
Great Falls Unit 4 Overhaul	53	20	33	165%	Addendum #4 was approved in 2011 at \$43.5M after significant condition assessment and scoping activities were completed. Construction activities on preparation items such as loading bay floor strengthening and powerhouse crane upgrades were required to be completed in advance of the actual unit overhaul work, which started in fall 2014.
Water Licenses & Renewals	86	41	45	110%	The original approved CPJ for this project was \$41M in 2005 and does not reflect the current project scope. The scope has increased over the years due to additional license renewals and increased work requirements from the Province.
Lake Winnipeg East System Improvements	83	65	18	28%	Construction costs increased due to a prolonged licensing process as well as an updated methodology and pricing for the contract. In addition, the line length increased by 10km. Furthermore, an additional construction season was required compared to the plan as the season was cut short due to poor ground conditions and weather.
Madison Station - 115/24kV	82	66	16	24%	Project scope increased after initial project approval during detailed engineering. There were higher than planned contract costs for the revised overall scope of work.

Project \$ in millions	Final Project Costs	Final Pre- Construction Budgets	\$ Diff.	% Diff.	Variance Explanation
Kelsey Re- running	321	184	137	74%	Project scope increased after initial project approval, including additional draft tube modifications, increased rehabilitation costs for intake gates because condition was poorer than expected, increased scope for inner head cover, and increased project management and construction management costs. In addition, contract costs exceeded estimates.

- c) Historically, lessons learned have been retained and applied across Generation, Transmission and Distribution assets in different ways using different tools. Manitoba Hydro created a new Project Management Division in 2021, further to the business model realignment identified in Section 2.4, Tab 2 of this Application, which centralized many project management functions in one division. In addition, support groups were centralized. It is recognized that there is a need to drive consistency in project systems and processes to facilitate application of lessons from previous work. Some ongoing and future initiatives to improve project management practices include a maturity assessment, a governance framework, development of common standards and procedures, a review of project management competencies, and enhancements to training programs. Risk management processes are being adapted, recognizing that each project has unique risks that cannot always be foreseen.”

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1 Asset management maturity is an ongoing journey. Maturing the asset management  
2 system requires developing, integrating, and continuously improving the people, processes  
3 and technology that are the asset management system.

4 Manitoba Hydro has been on this journey for many years, even before it was formally  
5 recognized as the discipline of asset management. Some highlights of this journey include:

- 6 • **2000-2010:** Instituted Best Value Procurement on a case-by-case basis and began  
7 shifting focus from upfront costs to lifecycle costing. Implemented Reliability  
8 Centred Maintenance for some assets, formalizing asset maintenance strategies.
- 9 • **2010-15:** Early adopter of the Copperleaf software as an asset investment planning  
10 tool.
- 11 • **2016:** Began work on an enterprise-wide Corporate Value Framework (“CVF”),  
12 moving toward evaluating the benefits and costs of various projects across the  
13 Corporation on a consistent scale. Engaged the consulting group UMS to conduct  
14 an Asset Management Maturity Assessment. Established a Corporate Governance  
15 structure to provide oversight on asset management.
- 16 • **2018:** Developed Corporate Asset Management Policy (P55000), outlining Hydro’s  
17 principles of asset management.
- 18 • **2018-Present:** Developed and delivered asset management training program to  
19 further build competence.
- 20 • **2019:** Developed Strategic Asset Management Plan (“SAMP”), including asset  
21 management objectives.
- 22 • **2020:** Restructured with clear asset management accountabilities, including the  
23 formation of the Asset Management Division.
- 24 • **2020-22:** Developed plans to achieve the SAMP objectives and demonstrated  
25 progress against the plans.
- 26 • **2022:** Engaged the consultant Asset Management Company Ltd. (“AMCL”) to  
27 conduct an asset management maturity assessment.

28 Manitoba Hydro continues to build its asset management competencies. Since 2018, over  
29 450 employees have had formal asset management training. This includes 175 staff who  
30 have earned the IAM Certificate, which certifies understanding of fundamental asset  
31 management principles. Many managers and senior leaders at Manitoba Hydro have

### 6.3 Board Findings

The Board finds that, while in a period of major capital spending on Keeyask and Bipole III, Manitoba Hydro should find savings in Business Operations Capital.

The Board does not accept the Business Operations Capital spending forecast in Capital Expenditure Forecast CEF16. The Board does not accept that all Test Year investments are condition-driven and reasonably required for the safe and reliable operation of the system. The Board finds that Business Operations Capital spending can be safely decreased by \$160 million, based on Manitoba Hydro's evidence that it can defer \$160 million of spending in the Test Year. This is consistent with the Board's findings in Order 73/15 that Manitoba Hydro has not adequately evaluated the long-term pacing and prioritization requirements for Business Operations Capital spending. In that Order, the Board did not endorse Manitoba Hydro's long-term Business Operations Capital plan. The Board accepts the evidence that Manitoba Hydro can reduce the level of spending from its forecast and has shown that it has done so in the past, as with the Gillam Town Site Redevelopment project and with the lower spending in the past three years than was originally forecast.

Based on the suggestion of the Boston Consulting Group in its initial report that the spending reductions can be maintained over a longer period, this issue will be revisited at future GRAs. Reducing Business Operations Capital helps offset the expenditures on Keeyask, which are anticipated to mostly be complete by 2023. Reductions in Business Operations Capital result in a reduced need to borrow funds and will enhance Manitoba Hydro's cash flow. Furthermore, the additional reliability obtained from Bipole III and additional generating capacity from Keeyask mean Manitoba Hydro will have added system-level redundancy, reducing the need for non-critical generation investments.



In addition to the positive impact on Manitoba Hydro's cash flow, reducing Business Operations Capital also results in improvement to the debt-to-equity ratio. Manitoba Hydro's analysis also shows that a reduction of capital spending of \$100 million annually increases its retained earnings by \$414 million after 10 years.

The Board accepts METSCO's evidence that Manitoba Hydro cannot demonstrate the proposed spending is necessary or has been optimized to any extent. Manitoba Hydro acknowledges that it has not evaluated alternative Business Operations Capital spending scenarios or the performance and reliability impacts of different Business Operations Capital spending levels.

The Board recognizes that Order in Council 92/2017 does not give the Board authority to direct Manitoba Hydro to amend its planned Business Operations Capital spending. Rather, the Board has factored into its rate decision the reduction in Business Operations Capital of \$160 million. Manitoba Hydro can decide whether to accept the Board's finding and reduce its Test Year Business Operations Capital spending, or to incur additional debt in order to maintain spending at the proposed levels in CEF16.

The reduction in spending on Business Operations Capital in no way diminishes Manitoba Hydro's responsibility and obligation to provide for an ongoing safe and reliable supply of energy to its customers in the most efficient and environmentally sensitive manner. The Board expects that Manitoba Hydro will appropriately assess, plan, and prioritize Business Operations Capital spending in order to meet its obligations in this regard.

The Board finds that Manitoba Hydro has taken initial steps towards developing asset management processes, and is to be commended for doing so in order to better ensure that the financial resources allocated to Business Operations Capital bring maximum

value to the Utility's ratepayers. Further to the direction from Orders 116/08 and 73/15, Manitoba Hydro has developed asset condition assessments for some asset classes, but the health of certain asset classes is characterized solely by the age of the assets. Manitoba Hydro must continue to develop asset condition assessments for all of its major asset classes so that it has the necessary data to make prudent spending decisions within its asset management framework.

At present, Manitoba Hydro prioritizes its capital spending based on the views and experience of its subject-matter experts in Generation, Transmission, and Distribution. Manitoba Hydro has not yet developed processes and practices that would enable it to objectively compare the value of different projects across its business units, nor can Manitoba Hydro quantify in terms of increased reliability the impact of spending on a generation project compared to a transmission project compared to a distribution project. More mature asset management processes, including a more complete set of asset condition assessments, are required so that Manitoba Hydro is in a position to objectively prioritize and optimize its spending across business units based on a common definition of risk.

The Board understands that developing a modern asset management system takes time and wishes to monitor Manitoba Hydro's progress. Manitoba Hydro is directed to hire an independent consultant to assess the Utility's progress with the development of its asset management program and in addressing the recommendations made by its consultant, UMS. The consultant is to also assess progress with the development of the Corporate Value Framework. Manitoba Hydro is to file with the Board by June 29, 2018 the Terms of Reference for the consultant for the Board's review and comment. Manitoba Hydro is directed to report back to the Board on its progress and the result of the consultant's assessment at the next GRA.

The Board acknowledges the contributions from past and present Manitoba Hydro personnel in designing, constructing, and maintaining the electrical system. Clearly, with top quartile reliability, Manitoba Hydro has constructed, operated, and maintained an outstanding electrical system to the benefit of Manitobans. With this Order, the Board does not intend to diminish these contributions, but it does recognize the cost pressures that result from the capital program that includes Bipole III, Keeyask, and a new interconnection with the U.S. Those cost pressures mean that Manitoba Hydro can no longer continue to fund Business Operations Capital at its historic levels unless and until it can demonstrate through mature asset management processes that those investments are necessary.

has been reduced by 15%, and any advice or recommendations received from external consultants retained to assist with the restructuring and transition.

13. Manitoba Hydro file with the next GRA details of its actual Operating & Administrative expenditures dating back 10 years through to the date of the filing, along with forecast Operative & Administrative expenditures by cost element and business unit, including the details of the Utility's pension liability related to the reduced staffing levels. The actual Operating & Administrative expenditures are to include the compound annual growth both before and after accounting changes.
14. Manitoba Hydro retain an independent consultant to assess Manitoba Hydro's development of its asset management program and its progress in addressing the recommendations made by UMS, as well as the progress of the development of the Corporate Value Framework. Manitoba Hydro is to file with the Board by June 29, 2018 the Terms of Reference for the consultant for the Board's review and comment. Manitoba Hydro is directed to report back to the Board on its progress and the result of the consultant's assessment at the next GRA.
15. Manitoba Hydro consider implementing the recommendations made by the Independent Expert Consultants with respect to Keeyask, Manitoba-Minnesota Transmission Project, and Great Northern Transmission Line, including implementing the recommendations to improve productivity to meet the control budget and schedule for Keeyask. Manitoba Hydro is to report to the Board at the next GRA whether and the extent to which it has implemented these recommendations and the projected cost savings and schedule impacts.

## EXECUTIVE SUMMARY

Manitoba Hydro is a provincial Crown Corporation and one of Canada's largest integrated electricity and natural gas distribution utilities, serving over 600,000 electric and nearly 300,000 natural gas customers. As a steward of over \$27 billion in assets, asset management is critical to Manitoba Hydro and its business objectives. Therefore, continually improving their asset management system is a key focus for Manitoba Hydro.

In 2016, the UMS Group Inc assessed Manitoba Hydro's asset management practices to compare them to industry best practices, as well as to international standards for asset management (PAS 55 and ISO 55000). That assessment was undertaken against a maturity scale defined by the Institute of Asset Management (IAM).

Manitoba Hydro has since undergone significant organizational restructuring to centralize its asset management functions. The Asset Management Division is within the Asset Planning & Delivery (AP&D) business unit. This newly formed division comprises approximately 100 staff who were brought together from separate operating groups, i.e. generation, transmission, and distribution, to a central asset management group, creating a centre of expertise.

This restructuring positions Manitoba Hydro to further improve its asset management maturity as they drive for continuous improvement, including identifying and adopting consistent best practices.

The Asset Management Division's mandate is to optimize Manitoba Hydro's energy system across the entire asset management lifecycle to achieve the targeted performance and risk levels at the lowest lifecycle cost; it is responsible for planning, delivering, and managing Manitoba Hydro's energy system assets through their lifecycle to meet the evolving energy needs of Manitobans and maximize value to customers and the province's clean energy advantage.

In 2022, Manitoba Hydro has engaged AMCL to assess the current maturity of Manitoba Hydro's asset management system. The key purpose of this assessment was to re-baseline Manitoba Hydro's asset management maturity following the organizational changes, but also to provide an additional level of insight into where good practice exists between the energy streams to support the development of a more targeted improvement plan. Manitoba Hydro also sought recommendations to reach an appropriate maturity level on the IAM maturity scale for subjects aligned to its strategic priorities, and those that will maximize benefits towards achieving their corporate goals.

The full scope of this engagement included four main components:

1. Assess maturity against the 39 subjects defined by the Global Forum on Maintenance & Asset Management (GFMAM) for asset management
2. Assess progress against 2016 assessment recommendations
3. Assess the expected maturity score on completion of the existing asset management objectives
4. Recommendations for areas of improvement

The following is a summary of each of these components.

## Maturity Against the GFMAM 39 Subjects

Manitoba Hydro recognizes differences in practices exist between energy streams, and there may be areas that would benefit from aligning to best practices across electric generation, electric transmission, electric and gas distribution portfolios, as well as information technology, telecommunications, fleet, facilities, and land. Therefore, the assessment was split into two main phases; the Enterprise Level and Energy Stream Level assessments:

**Enterprise Level Assessment:** The scope of this assessment was Manitoba Hydro’s enterprise-wide asset management program and corporate functions; this covered the overall approach to asset management for Manitoba Hydro as a whole. The aim was to understand Manitoba Hydro’s organizational plan and objectives, common frameworks (such as for risk, procurement, information, etc.) and how these are cascaded and applied within the individual energy streams. This assessment also incorporated centrally managed business support functions such as information technology, telecommunications, fleet, facilities and land.

**Energy Stream Level Assessments:** The scope of these assessments was the four main energy streams; electric generation, electric transmission, electric distribution, and gas distribution. The objective was to understand how each stream applies Manitoba Hydro’s asset management approach and any local or isolated practices. These areas focus on Group 3 – Lifecycle Delivery Activities, specific subjects within Group 2 – Asset Management Decision Making, and Group 6 – Risk and Review. These areas were identified because the systems, processes and techniques used are expected to differ due to the nature of the assets, risks and performance requirements.

The GFMAM 39 subjects are organized into six groups. A summary of the scores against the six groups is shown in Table 1, a more detailed breakdown of scores against the 39 subjects is in Table 7 of Section 3. Strategy and Planning, Asset Information and Organization & People were not scored at Energy Stream level as these activities have now been centralized, this should be taken into account when considering the overall score for the energy stream.

GFMAM Groups		SCORE					
Group	Subject	Enterprise & Support Functions	EGen	ETx	EDx	GDx	Company Average (Weighted)
1	Asset Management Strategy & Planning	2.05					2.05
2	Asset Management Decision Making	1.79	1.83	2.25	1.75	2.22	1.83
3	Lifecycle Delivery Activities	2.03	2.02	1.89	2.34	2.14	2.09
4	Asset Information	1.32					1.32
5	Organisation & People Enablers	2.13					2.13
6	Risk & Review	1.42	2.00	3.00	2.00	3.00	1.45
Average (Weighted)		1.75	1.98	2.00	2.20	2.17	1.81

Table 1 Assessment Scores at GFMAM Group Level

The maturity scale used is aligned to the asset management maturity scale defined by the IAM, where a score of 3 would indicate broad conformance with the ISO 55001 standard.<sup>1</sup> A detailed explanation of the maturity scale is included in Section 2.3.

**Note:** The total scores shown in the above table are weighted by the number of criteria tested against each subject rather than a numerical average.

Key	
0	Innocent
1	Aware
2	Developing
3	Competent

<sup>1</sup> ISO 5500X is a set of international standards governing asset management; ISO 55001 - 2014 specifies requirements for an asset management system within the context of the organization.

## Progress Made Since 2016 Assessment

In September 2016, the UMS Group Inc assessed Manitoba Hydro's asset management practices to compare them to industry best practices, as well as to international standards for asset management (PAS 55 and ISO 55000). The organizations appearing at the top end of the scale are generally European and Australian organizations, these have been working in a performance based regulatory environment for over 20 years.

Since 2016, Manitoba Hydro has developed its long-term strategic vision, which has been published as 'Strategy 2040'. Addressing the eight improvement items listed below has been a key enabler to delivering Strategy 2040, culminating in the significant organizational restructuring undertaken in 2021, which included centralizing Hydro's asset management functions.

**Manitoba Hydro's overall Asset Management Maturity Score has increased from 1.5 to 1.81.**

In interpreting the overall score, it is important to understand global standards on Asset Management assessment, and in particular the scoring scale. In moving from Maturity Level 1 to Maturity Level 3, organizations are developing new capabilities or refining existing capabilities, but crucially they are integrating these capabilities, converging them into a coordinated, managed system for Asset Management that can be independently certifiable to the requirements of ISO 55001. Most organizations start their Asset Management journey at Maturity level 1 and take many years to achieve Maturity level 3. In fact, there are only a handful of organizations around the world that score significantly above 3.

**This assessment has shown that Manitoba Hydro has made good progress on its Asset Management journey and an Asset Management Maturity Score of 1.81 is consistent with peer organizations in North America who are on a similar journey.**

**Manitoba Hydro has made good progress against the recommended areas for improvement identified by UMS in 2016** (full report included in Appendix G), specifically with completion of the following eight items:

1. Decide on and declare the Operating Model for Asset Management
2. Formally acknowledge the Corporate Asset Management Executive Committee's (CAM EC) role as the Asset Owner
6. Develop and deliver a road show to communicate changes
9. Formalize the Asset Manager and Service Provider roles within each business unit and clarify accountabilities
10. Develop an organizational structure which consolidates asset management functions
11. Group the functions focused on asset management under a single group
14. Create an Asset Strategist role with overall responsibility for the integrated Asset Life-Cycle Strategy
23. Define a corporate-wide process for identifying and sharing best practices

A summary of progress against all the UMS recommendations has been included in Appendix C.

The 2016 improvement items were consolidated by Manitoba Hydro into seven Strategic Asset Management Plan<sup>2</sup> (SAMP) objectives described in the following section, and approved Terms of Reference (ToR) for six of them.

<sup>2</sup> Manitoba Hydro; Strategic Asset Management Plan, 2019

## Expected Score on Completion of Existing AM Objectives

Current leadership commitment to implementing asset management is evident, reflected in an increased score. Manitoba Hydro has developed departmental mandates for the new asset management departments and some processes. Work was in progress at the time of the assessment, and the interfaces between departments are not yet well understood at an individual employee level. However, this should be resolved as the new organizational structure is embedded.

An Asset Management Policy and SAMP was developed and formally released in 2019, including seven foundational strategic asset management objectives encompassing the UMS recommendations.

- AM Objective # 1:** Deliver an Asset Management Plan (AMP)
- AM Objective # 2:** Document Asset Strategies
- AM Objective # 3:** Develop an Asset Information Strategy (AIS)
- AM Objective # 4:** Implement a Consistent Asset Risk Management Practice
- AM Objective # 5:** Institute an Asset Management System Continuous Improvement Cycle
- AM Objective # 6:** Lead, Engage and Support Employees Through the Change of Implementation of the Asset Management System
- AM Objective # 7:** Maintain Historic Levels of Asset Performance

These objectives remain appropriate, and although some of them require significant effort to implement, Manitoba Hydro has credible plans in place to achieve them. Combined with the recent reorganization, Manitoba Hydro is well placed to further improve its asset management maturity as they embed a culture of continuous improvement, including identifying and adopting best practices. **The overall weighted average score is expected to improve from 1.81 to 2.45 if Manitoba Hydro completes its current seven asset management objectives.** An explanation of the Asset Management maturity scale is contained in Section 2.3.

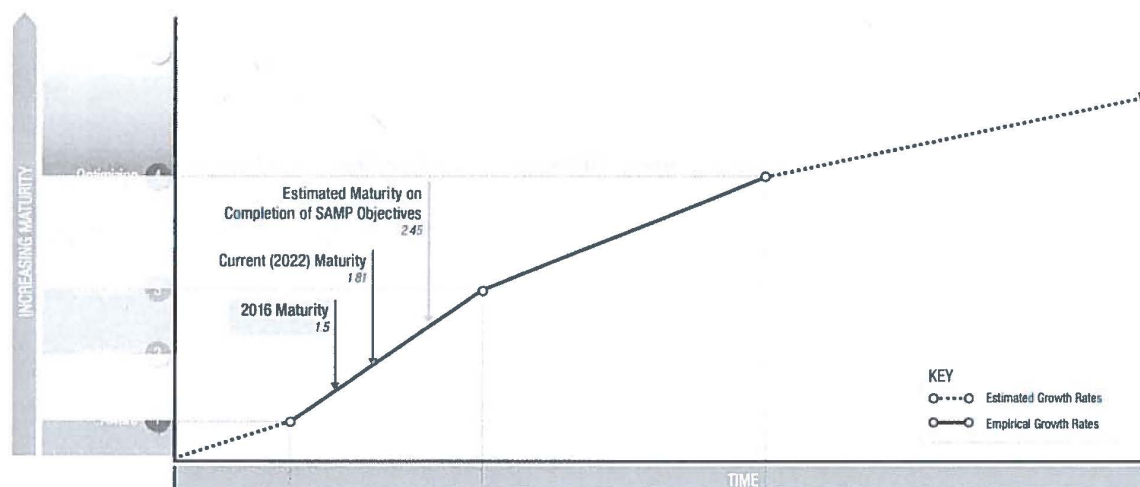


Figure 2 Historic, Current and Forecast Maturity Scores



## Opportunities For Improvement

Manitoba Hydro has strengths in several areas of asset management, for example, outage management, general organizational structure and culture. However, there are some opportunities for improvement in areas such as defining information requirements to support long-term decision-making and resilience management.

Increased asset management capability will enable Manitoba Hydro to gain more value from its capital and operational expenditures and more effectively manage its risks while maintaining current service levels. Ultimately, it leads to greater value for Manitoba Hydro and increased confidence (from stakeholders and regulators) that the business is being appropriately managed.

Implementing these improvements will enable Manitoba Hydro to proactively strengthen its practices and respond to future demands and changes effectively. The recent reorganization of the business and leadership commitment has provided a stable environment for what is, in effect, a transformational business change. The additional detail in this GFMAM 39 subjects assessment enables a meaningful roadmap to be developed that considers the interdependencies and prerequisites between each area and ensures the organization evolves at a sustainable pace.

Transformation enablers do not have a direct impact on asset management maturity, however they are required to facilitate the business processes, systems, decision support tools and capabilities required to implement improvements in asset management practices. Enablers need to be in place for these improvements to be made, specifically continuing with AM Objective # 6 to Lead, Engage and Support Employees Through the Change of Implementation of the Asset Management System. A recent example of this is the organizational restructuring undertaken in 2021, which has enabled Manitoba Hydro to improve its asset management maturity in a practical, coordinated, controlled and integrated manner. A key enabler for Manitoba Hydro will be establishing a detailed asset management roadmap and implementation plan, with timescales that account for interdependencies between subject areas and their relative maturity.

The following three continual improvement areas are therefore critical:

- Manitoba Hydro should develop a detailed asset management roadmap to develop a coordinated set of activities that account for the interdependence of the SAMP Objectives. The asset management roadmap can be appropriately resourced and supported by organizational change management.
- Manitoba Hydro should develop ToR for AM Objective # 7: Maintain Historic Levels of Asset Performance; this is the only objective without an approved ToR. The ToR should include having systems and monitoring in place to monitor cost, risk and performance trends and derive the capital and operational spend required to maintain current levels of performance; this will form the baseline for measuring the success of future improvements.
- Manitoba Hydro should continue to resource and deliver the change management program as defined in Phase 1, 2 and 3 of the ToR for AM Objective # 6 to Lead, Engage and Support Employees Through the Change of Implementation of the Asset Management System

Three specific areas that AMCL has highlighted as being interdependent in terms of maturity are asset information, risk and review, and asset management decision making. Effective asset management decision-making is founded on a clear understanding of current asset performance and future operating risk, coupled with a consensus understanding of operating costs, failure costs, and the cost of asset repairs and renewals. A complete understanding of asset-related costs, risk and performance relies on adequate asset data.

Therefore, Manitoba Hydro's ability to improve the score in Group 2: Asset Management Decision-Making is constrained by the current maturity of Group 4: Asset Information. However, it is impractical to attempt to mature these areas sequentially. AMCL has recommended three areas, outlined below, that must evolve in parallel. This includes defining the information needed to support incremental improvements in risk-based decision-making, and developing the asset information strategy and improvement plan.

#### Asset Information

- Develop an asset information strategy that sets out the approach for defining future information needs and gaps and agree priority areas with the business.
- Review, improve and implement data standards for assets and operational data that will support asset decision making.
- Review and improve asset data assurance processes, data quality requirements to support decision making.
- Review information systems' current capability and future requirements and develop an improvement plan.

#### Risk & Review

- Review current performance indicator monitoring and develop leading indicators that will drive asset decision making.
- Determine whether the current operating risk is stable, improving or deteriorating.
- Develop a resilience index that can be derived consistently across the asset base.
- Ensure the existing financial fixed asset register is maintained consistently with the physical asset register.
- Capture actual capital and operating costs with consistent yardsticks at sufficient granularity to develop capital and operational cost models.

#### Asset Management Decision Making

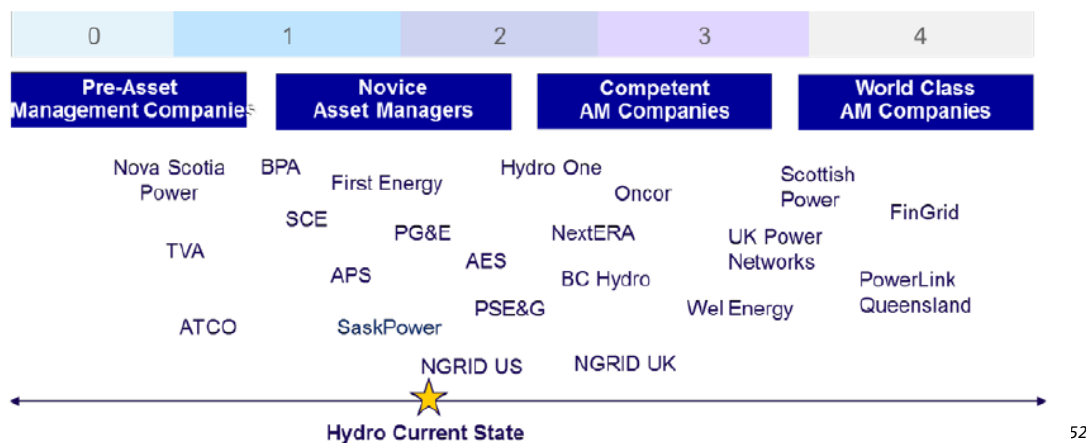
- Ensure there is sufficient detail to define how asset classes contribute to organizational objectives.
- Develop a standard format and structure for asset cost models.
- Review planned preventive maintenance schedules and align with resourcing strategy.
- Integrate operations and maintenance decision-making with capital decision-making.

The UMS Report found that MH had an overall score of 1.5 which corresponds to MH being in the “Awareness” category and moving towards the “Developing” category of asset management maturity<sup>50</sup>.

*“Overall, Hydro scored a 1.5 with the individual Business Unit Scores as follows: Generation Operations (GO) = 1.7, Transmission = 1.6, and Customer Service & Distribution (CS&D) = 1.3.”<sup>51</sup>*

For context, this means that MH was an asset management laggard compared to its larger provincial Canadian utility peers such as BC Hydro, Hydro One, but similar to other provincial utilities such as SaskPower:

**Figure 10: Manitoba Hydro Asset Management Maturity vs. Peers**



MH’s position is not unusual in a broader North American context with its array of small and medium sized utilities because North American utilities are laggards compared to many of their global peers in terms of asset management maturity:

*“Against the industry, Manitoba Hydro compares favorably versus North American utilities in terms of its Asset Management maturity level. However, North America lags global Asset Management best practice as embodied by utilities overseas who have been developing their capabilities for more than two decades.”<sup>53</sup>*

In the present General Rate Application MH engaged AMCL+ to provide an updated asset management maturity assessment. The results of the asset management maturity assessment indicate that MH has been advancing its asset management maturity in select areas:

<sup>50</sup> Manitoba Hydro 2023/24 & 2024/25 General Rate Application, Appendix 7.4, Page 14 of 184

<sup>51</sup> Manitoba Hydro 2017/18 & 2018/19 General Rate Application, Appendix 5.1, Page 6 of 48

<sup>52</sup> Manitoba Hydro 2017/18 & 2018/19 General Rate Application, Appendix 5.1, Page 11 of 48

<sup>53</sup> Manitoba Hydro 2017/18 & 2018/19 General Rate Application, Appendix 5.1, Page 6 of 48

**REFERENCE:**

Appendix 7.4 pp.5,6

**PREAMBLE TO IR (IF ANY):**

On page 5 of its report, AMCL states: “Manitoba Hydro's overall Asset Management Maturity Score has increased from 1.5 to 1.81. In interpreting the overall score, it is important to understand global standards on Asset Management assessment, and in particular the scoring scale. In moving from Maturity Level 1 to Maturity Level 3, organizations are developing new capabilities or refining existing capabilities, but crucially they are integrating these capabilities, converging them into a coordinated, managed system for Asset Management that can be independently certifiable to the requirements of ISO 55001. Most organizations start their Asset Management journey at Maturity level 1 and take many years to achieve Maturity level 3. In fact, there are only a handful of organizations around the world that score significantly above 3.”

On page 6 of its report, AMCL states: “The overall weighted average score is expected to improve from 1.81 to 2.45 if Manitoba Hydro completes its current seven asset management objectives.”

**QUESTION:**

- a) Approximately how many organizations around the world score approximately 3 (for example, 2.75 to 3.25) in terms of their asset management maturity, as opposed to “significantly above 3”?
- b) In AMCL’s experience, how many years does it take for a utility to move from a maturity level of 1.5 to 2? From 1.5 to 3?
- c) How long does AMCL estimate it will take Manitoba Hydro to complete the seven asset management objectives and thus mature its asset management methodologies to a score of 2.45? If AMCL is unable to provide an estimate, Manitoba Hydro may provide an estimate.

**RESPONSE:**

a) The following response was provided by AMCL:

The distribution of maturity scores from assessments undertaken by AMCL within the electricity sector is as follows:

- 70% of electricity sector organizations score below 2.75
- 15% of electricity sector organizations score between 2.75 and 3.25
- 15% of electricity sector organizations score above 3.25

It is worth noting that many of these benchmarked organizations are in heavily regulated jurisdictions and have been required to demonstrate good practice asset management for many years. Those that choose to appoint a consultant for a maturity assessment are generally actively pursuing asset management certification; therefore, the data is not a statistically representative sample across all organizations around the world but is likely representative of electricity sector organizations in mature jurisdictions.

b) The following response was provided by AMCL.

The time taken for a utility to move from a maturity level of 1.5 to a 2 or 3 is dependent on the resources committed to delivering the business changes. A typical 'trajectory' for asset management capability improvement is between 2 and 3 years to move from a level 1.5 to level 2, and between 4 and 5 years to move from level 1.5 to level 3

c) AMCL is unable to provide a time estimate without a resourced plan.

Manitoba Hydro can advise that the SAMP Objective Roadmap in Appendix 7.3 in Tab 7 of the application indicates completion of the current SAMP Objectives by July 2027 (4.5 years from now). However, these timelines are preliminary as many of the deliverables associated with the completion of the objectives, such as strategic documents, frameworks, and prototypes are yet to be finalized. As these deliverables are finalized, the timelines will become more defined and confidence will be gained in the schedule.

Further, completion of the SAMP objectives per the road map does not in itself, produce a maturity of 2.45. Achieving this score requires the embedment of the resultant practices and process into the day-to-day asset interactions and planning. Some associated initiatives, such as creating a robust asset information system, require a further time delay for data accumulation in order to realize and embed the benefits of the objectives. For these reasons, a 5-7 year timeframe is a reasonable estimate for both completion of the SAMP objectives and achievement of a 2.45 maturity score.

SAMP Objective # 7 (performance)	2019 SAMP Target	2019/ 20 Results	2020/21 Results	2021/22 Results	Commentary
Maintain historic levels of asset performance					
Hydroelectric Generator Availability	91.9% to 93.9%	95.3%	94.3%	90.9%	Increased planned maintenance outages as well as increased forced outages contributed to the decline in 2021/2022.
SAIDI (System Average Interruption Duration Index) (Customer minutes)	<148	299	159	263	Ice Storm Oct 10-14, 2019, contributed 134 minutes to overall SAIDI  Forest Fires from July-Oct 2021 contributed 108 minutes to overall SAIDI  Additional decline has significant contribution from equipment failure
SAIFI (System Average Interruption Frequency Index) (interruptions/customer)	<1.59	1.92	1.58	1.58	Target achieved.

1 The restructured Asset Management business model has allowed for significant progress  
2 against the SAMP objectives in 2022. All information on the SAMP objectives is posted on  
3 the Asset Management Centre of Expertise (“COE”) internal SharePoint site, which  
4 promotes efficient reporting, information sharing, and accountability.

5 A common initiative that is closely related to SAMP Objectives 2, 3 and 4 (identified in  
6 Figure 7.7) is the Maintenance Program Review (“MPR”) project. This project is a significant  
7 effort to rationalize and standardize maintenance programs for a given asset population by  
8 applying corporate and industry best practice consistently. The collection of asset condition  
9 information is being built into routine maintenance work so that condition information and,  
10 ultimately, asset health indices, are consistent and continuously available to allow for  
11 quantification of asset risk.

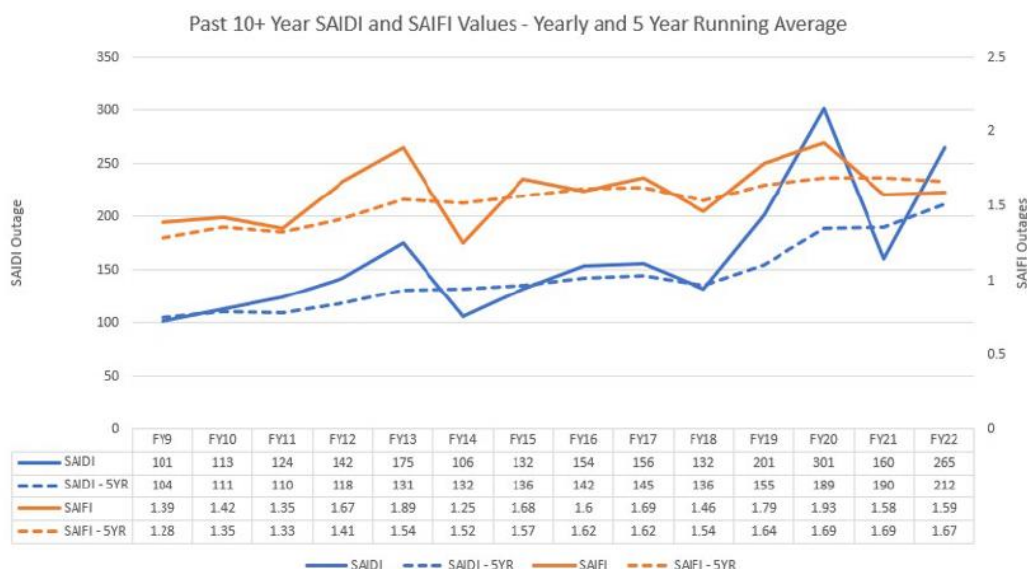


**REFERENCE:**

Tab 07, page 15-16, Figure 7.8 and Figure 7.9.

**PREAMBLE TO IR (IF ANY):**

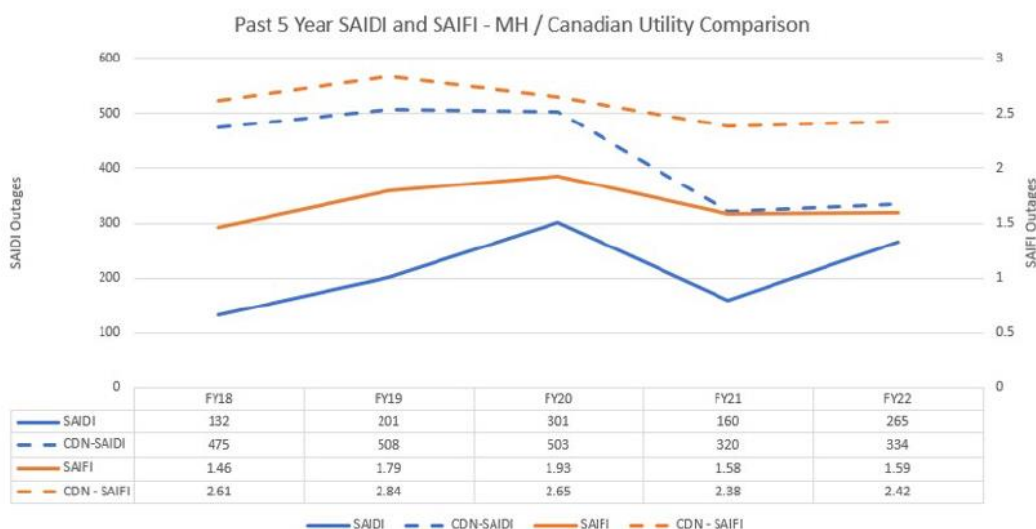
**Figure 7.8 5-Year Historic Average of SAIDI and SAIFI Values**



Benchmarking of SAIFI and SAIDI values to Canadian utilities is available through Electricity Canada. As can be seen in Figure 7.9 below, Manitoba Hydro’s distribution performance (shown with a solid line) has historically been better than the Canadian average.

The figure also demonstrates that the average Canadian utility showed improved SAIFI and SAIDI values in recent years, while Manitoba Hydro’s metrics have been deteriorating. The primary reason for the decline in Manitoba Hydro’s performance trends is failure of aging assets. Per the 2021 Service Continuity Report (Electricity Canada) Manitoba Hydro distribution outages were caused by equipment failure 35% of the time, while the Canadian average is almost half, at 19%.

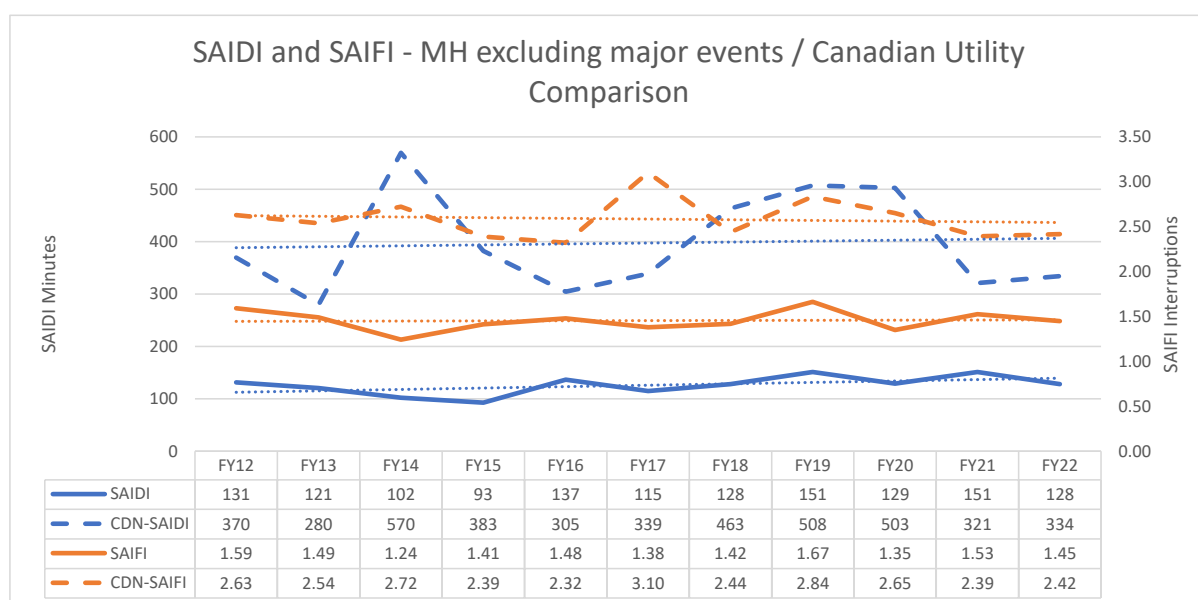


**Figure 7.9 5-Year History SAIDI and SAIFI Canadian Utility Comparison**

**QUESTION:**

- a) Please revise Figure 7.8 as follows:
  - i. To exclude major events or event days (e.g. weather and forest fires)
  - ii. Add CDN-SAIDI and CDN-SAIFI
  - iii. Add linear trend lines for SAIDI, SAIFI, CDN-SAIDI and CDN-SAIFI
  - iv. Update the table associated with all the revised Figure 7.8 data
- b) Please explain the reasons for the significant increases in MH SAIDI in each of the years FY20 and FY22.
- c) If known, please explain the reasons for the significant decrease in CDN-SAIDI in FY21 and FY 22.
- d) Referring to the 2021 Service Continuity Report (Electricity Canada), please break out SAIDI and SAIFI values into those caused by equipment failure and those caused by other causes (non-equipment failures) per the following:
  - i. Please provide SAIDI(Equipment) and SAIDI (Other Causes - Not Equipment) for both Canada and MH.
  - ii. Please provide SAIFI(Equipment) and SAIFI (Other Causes - Not Equipment) for both Canada and MH.

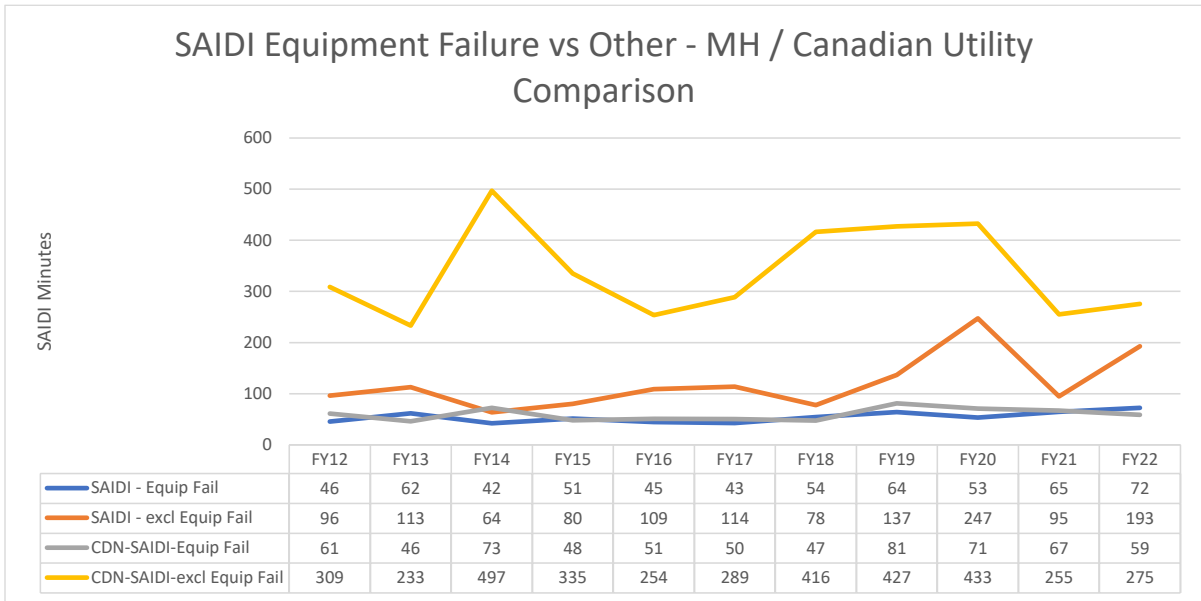
**RESPONSE:**

- a) Major event day - Major event days were categorized as days with > 2,000,000 customer minutes of interruption with a common outage cause (excluding scheduled).

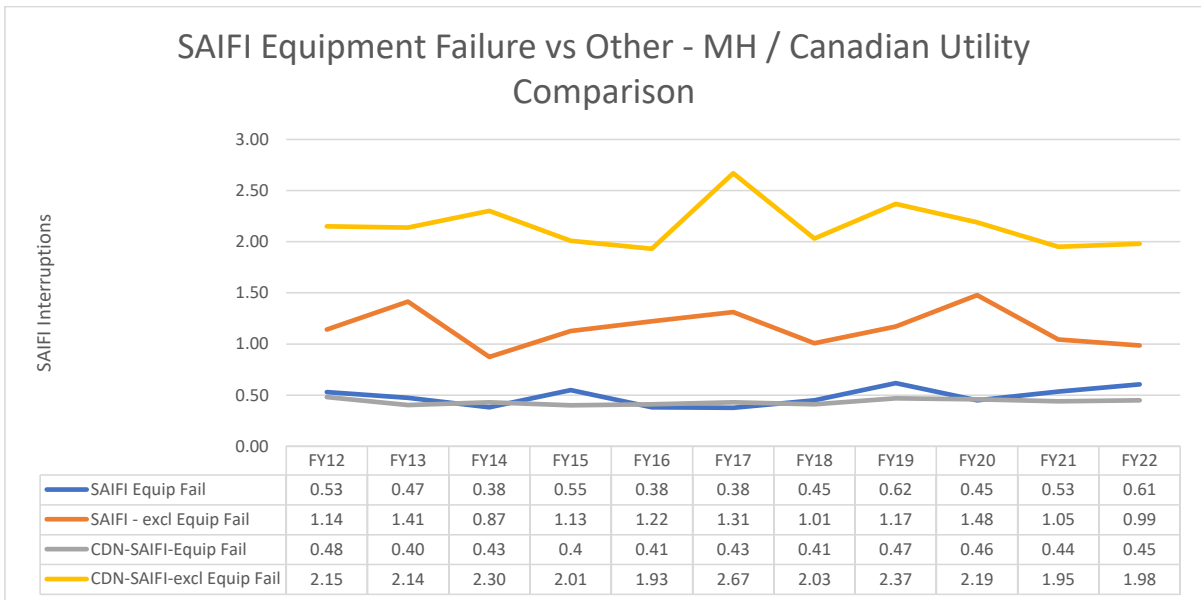


\*The entire day was excluded for identified major event days

- b) Please refer to Figure 7.10 (page 22) of Tab 7 of Application.
- c) The reasons for the significant decrease in CDN-SAIDI in FY21 and FY 22 are unknown to Manitoba Hydro.
- d) i. The graphs below provide the with SAIDI and SAIFI metrics due to equipment failure, and other causes shown separately. Additionally, please refer to MIPUG/MH I-75 d) for trends in SAIDI and SAIFI for equipment failure for FY12 to FY22.



ii.



- c) The 2023 SAMP will not include scenario analysis as this is out of scope. Scenario analysis is in scope for the Asset Management Plan (AMP), to which Tab 7 is a precursor. Manitoba Hydro's initial AMP is in early production, with completion scheduled for late 2023. While "cost of service to relative levels of service delivery" is a long-term goal of the AMP, it is not anticipated that this can be delivered in the initial AMP. Making sound, quantitative assessments of system performance based on varying resource inputs is demonstrative of a higher level of asset management maturity than Manitoba Hydro currently holds. A reasonable short-term goal is the production of insights based on trends in leading and lagging indicators (such as maintenance completion rate and interruption frequency) and continuous evaluation and refinement of those insights. Strategic action in the Strategic Asset Management Plan (SAMP) would be driven by the trends.
- d) While it would be intuitive to assume that lowering performance targets will result in lower required business operations capital investment, Manitoba Hydro is unable to confirm this. Manitoba Hydro's asset management maturity is not sufficient to be able to adjust business operations capital investment to achieve target levels of performance. i.e., it is unknown how a change in business operations capital investment will impact performance levels.

Manitoba Hydro is targeting to maintain the reliability that our customers are accustomed to and that they have indicated are important to them. Please refer to COALITION/MH-I-129.

Although MH began its asset management journey some time ago, MH's consultant AMCL finds that MH has only advanced its overall asset management maturity from 1.5 to 1.81 (i.e., still in the "Awareness" Category) since the 2016 General Rate Application. Of note is MH's weaknesses in the areas of Asset Management Decision Making, Asset Information and Risk & Review. **Consequently, without good input data, tools and decision-making frameworks, MH's decision-making is impaired and does not adequately support its proposed investments or demonstrate they are appropriately prioritized.**

**As a result, Hydro continues to employ a top-down budget envelope approach to setting budgets that are not quantitatively connected to the assets MH is managing. MH demonstrates that it is unable to optimally or adequately prioritize its capital investment decisions, and therefore it cannot justify its implicitly subjectively determined Business Operations Capital ("BOC") investment plans. A BOC budget reduction of at least 10% is warranted until such time as MH can demonstrate its decision-making is based upon quality data, tools and decision-making frameworks.**

In summary:

- 1) MH has overbuilt its electrical system and is using this overbuilt system to provide superior reliability to its ratepayers.
- 2) Ratepayers have not clearly indicated they want to pay for a superior reliability system.
- 3) MH's asset based is aging as expected and MH needs to increasingly transition to sustainment, rather than growth, activities.
- 4) MH is still beginning its asset management journey and lacks the data and associated tools to make fully informed budget prioritizations, especially regarding generation and transmission.
  - a. On the distribution side there may be a need to increase sustainment expenditures, but MH has not provided evidence that demonstrates the appropriate trade-offs between capital and operations & maintenance have been made.
- 5) MH lacks the quality of data and decision-making frameworks necessary to support its proposed investments.
- 6) 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.

### **2.3 Qualifications of Authors**

Christopher Oakley and Peter Helland are Professional Engineers and founding principals of Midgard Consulting Incorporated. They have the relevant background, experience and expertise necessary to prepare the scope of evidence PILC has engaged them to deliver.

2023/24 & 2024/25 General Rate Application  
December 9, 2022

Appendix 4.4 (Amended)  
Sensitivity Analysis – Key Financial Measures

Incremental Increase/(Decrease) from Financial Forecast Scenario	Net Income (in millions of \$)																			
Fiscal Year Ending March 31	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
<b>Amended Financial Forecast Scenario</b>	\$ 751	\$ 469	\$ 295	\$ 149	\$ 166	\$ 97	\$ 92	\$ 111	\$ 105	\$ 169	\$ 190	\$ 219	\$ 277	\$ 250	\$ 282	\$ 309	\$ 358	\$ 439	\$ 507	\$ 569
5 Year Drought beginning in 2025/26	0	0	0	(370)	(474)	(273)	(300)	(294)	(75)	(78)	(81)	(84)	(88)	(92)	(97)	(100)	(106)	(110)	(114)	(120)
7 Year Drought beginning in 2025/26	0	0	0	(239)	(120)	(183)	(419)	(728)	(455)	(275)	(105)	(110)	(115)	(120)	(126)	(132)	(138)	(142)	(149)	(156)
Above Average Water Flows (2025/26 to 2034/35)	0	0	0	99	100	105	111	115	121	127	133	139	143	50	51	56	60	62	64	67
Below Average Water Flows (2025/26 to 2034/35)	0	0	0	(83)	(88)	(92)	(95)	(99)	(104)	(108)	(112)	(118)	(124)	(44)	(47)	(49)	(52)	(53)	(56)	(58)
High Electricity Price Forecast Sensitivity	0	126	93	127	154	153	174	184	199	210	221	228	256	307	343	360	358	350	387	378
Low Electricity Price Forecast Sensitivity	0	(97)	(57)	(76)	(89)	(107)	(107)	(118)	(124)	(128)	(126)	(136)	(151)	(178)	(190)	(205)	(209)	(200)	(224)	(230)
High Interest Rate Sensitivity	0	2	(9)	(14)	(31)	(48)	(65)	(85)	(96)	(116)	(122)	(125)	(130)	(138)	(147)	(155)	(167)	(178)	(190)	(200)
Low Interest Rate Sensitivity	0	1	9	16	28	41	57	70	77	94	99	100	100	102	105	110	119	128	131	135
Business Operations Capex increase by 10% per year	0	(1)	(5)	(10)	(15)	(21)	(27)	(35)	(41)	(48)	(56)	(65)	(73)	(83)	(95)	(105)	(116)	(126)	(138)	(150)
Business Operations Capex decrease by 10% per year	0	1	5	10	14	19	26	32	40	48	58	66	73	80	88	98	110	123	132	142
2% Rate Path with Government Fees Unchanged	(183)	(189)	(191)	(197)	(209)	(219)	(229)	(242)	(255)	(266)	(277)	(294)	(317)	(328)	(346)	(363)	(380)	(396)	(413)	(432)
0% Rate Increase in 2023/24	0	(24)	(40)	(41)	(45)	(48)	(51)	(56)	(59)	(63)	(66)	(72)	(77)	(83)	(90)	(97)	(104)	(111)	(120)	(128)
0% Rate Increases in 2023/24 & 2024/25	0	(24)	(77)	(82)	(87)	(94)	(100)	(107)	(114)	(121)	(130)	(140)	(149)	(161)	(176)	(189)	(203)	(217)	(233)	(250)
3.6% Interim rolled back on Sept 1/23, 2.0% in 2024/25	0	(65)	(108)	(114)	(122)	(131)	(139)	(149)	(160)	(170)	(183)	(195)	(208)	(226)	(245)	(263)	(284)	(303)	(325)	(348)

Net Income (in millions of \$)	Fiscal Year Ending March 31																			
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
<b>Amended Financial Forecast Scenario</b>	\$ 751	\$ 469	\$ 295	\$ 149	\$ 166	\$ 97	\$ 92	\$ 111	\$ 105	\$ 169	\$ 190	\$ 219	\$ 277	\$ 250	\$ 282	\$ 309	\$ 358	\$ 439	\$ 507	\$ 569
5 Year Drought beginning in 2025/26	751	469	295	(221)	(308)	(176)	(209)	(184)	30	91	108	134	189	158	185	209	253	329	393	449
7 Year Drought beginning in 2025/26	751	469	295	(90)	46	(86)	(327)	(617)	(350)	(106)	84	108	162	130	156	177	220	297	358	413
Above Average Water Flows (2025/26 to 2034/35)	751	469	295	248	266	202	203	226	226	296	323	357	419	299	333	365	418	501	571	636
Below Average Water Flows (2025/26 to 2034/35)	751	469	295	66	78	5	(3)	11	1	61	77	101	153	205	235	261	307	386	451	512
High Electricity Price Forecast Sensitivity	751	595	387	277	320	250	266	295	304	379	410	447	533	557	625	669	716	789	894	947
Low Electricity Price Forecast Sensitivity	751	372	238	73	76	(10)	(15)	(7)	(19)	41	63	82	126	72	92	104	149	239	284	340
High Interest Rate Sensitivity	751	471	286	135	135	49	27	26	9	53	67	93	147	112	135	154	191	261	318	369
Low Interest Rate Sensitivity	751	470	304	165	193	137	148	181	182	263	289	319	377	352	387	420	478	567	638	704
Business Operations Capex increase by 10% per year	751	469	289	139	151	76	65	76	64	121	133	154	204	167	188	204	242	313	369	419
Business Operations Capex decrease by 10% per year	751	470	300	159	180	116	118	143	145	217	247	285	350	330	370	407	469	562	639	711
2% Rate Path with Government Fees Unchanged	568	281	104	(48)	(44)	(122)	(137)	(131)	(150)	(97)	(87)	(76)	(40)	(78)	(63)	(54)	(22)	43	94	137
0% Rate Increase in 2023/24	751	446	255	108	120	49	41	55	46	106	123	147	199	167	192	212	254	329	388	441
0% Rate Increases in 2023/24 & 2024/25	751	446	218	67	78	3	(8)	3	(9)	48	59	79	127	89	106	120	155	222	275	319
3.6% Interim rolled back on Sept 1/23, 2.0% in 2024/25	751	405	187	35	44	(34)	(47)	(39)	(55)	(1)	7	23	68	24	37	46	75	137	183	221

*“Note: At the historical rate of equipment failures, Manitoba Hydro operations staff can restore service within a short period of time and therefore, avoid significant impacts to SAIDI and SAIFI. However, the increasing trend suggests that additional demands to restore service will be placed on Manitoba Hydro’s operations staff in the future, if assets are not renewed.”<sup>43</sup>*

Midgard suggests that increasing operational staff resources to allow them to continue to address equipment failures in a timely manner remains the best near-term strategy for MH rather than replacing low cost (i.e., fully or mostly depreciated) assets with new un-depreciated assets.

In summary, MH should expect increased failures due to its aging asset demographics, but increased equipment failures alone do not justify replacing assets with low failure consequences, because better value may be provided to ratepayers by keeping aging assets in such classes in service longer by improving operational resource supports.

Moreover, given the cost consequences of overbuilding new (or replacement assets), and considering the aging asset demographics of a mature utility with lower growth rates, modern asset management tools are required to facilitate the sea-change from growth mode to sustainment mode, and consequently, modern asset management has been widely adopted globally as best practice for meeting these needs, as will be further discussed in the next section.

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<sup>43</sup> Manitoba response to COALITION/MH II-77a-b

C55-CIJ-PROJ  
e

**CAPITAL INVESTMENT JUSTIFICATION  
FOR**

Pointe du Bois Renewable Energy Project

**Investment Type (Project)**

<b>BUDGET:</b>	\$422,447
<b>CONTRIBUTIONS:</b>	(\$114,150)
<b>NET BUDGET:</b>	\$308,297
(values listed above are in thousands of dollars)	
<b>CORPORATE VALUE</b>	<b>Value:</b> 76,098
<b>FRAMEWORK SCORE:</b>	<b>Value/\$K:</b> 0.28

**DATE PREPARED:** 2022-10-07

**EC/MHEB APPROVAL MINUTE & DATE:** Approved MHEB Minute  
952.10 on October 28, 2022



APPROVER	APPROVER TITLE	COMMENT	ORGANIZATIONAL UNIT	APPROVAL DATE
Turner, Hal	VP ASSET PLANNING & DELIVERY		VP Asset Planning & Delivery	2022-10-20
Pawluk, James	DIRECTOR ASSET MANAGEMENT		Director - Asset Management	2022-10-14
Ward, Ryan	DIRECTOR PROJECT MANAGEMENT		Director Project Management	2022-10-13
Halayko, Krista	ASSET MGMT STRATEGY & PLANNING DEPT MGR		Asset Management Strategy & Planning	2022-10-13
Orellana, Cristian	GENERATION PROJECTS DEPARTMENT MANAGER		Generation Projects	2022-10-11
Johnson, Erin	CHARTERED PROFESSIONAL ACCOUNTANT		Financial Advisory Services	2022-10-11
Swait, Caitlin	FINANCIAL SERVICES LEAD - GEN PROJECTS		Project Services	2022-10-07
Dlot, Aaron	ASSET INVESTMENT PLANNING SECTION HEAD		Asset Management Strategy & Planning	2022-10-07

CAPITAL INVESTMENT MASTER DATA			
<b>RESPONSIBLE OPERATING/CORPORATE GROUP:</b>	Asset Planning & Delivery	<b>REQUESTING OPERATING/CORPORATE GROUP:</b>	Asset Planning & Delivery
<b>RESPONSIBLE DIVISION:</b>	Project Management	<b>REQUESTING DIVISION:</b>	Asset Management
<b>RESPONSIBLE DEPARTMENT:</b>	Generation Projects	<b>ISD: (YYYY/MM/DD)</b>	2027/03/31
<b>I.M. NODE NUMBER:</b>	2.1.20.15.02.57	<b>W.B.S. NUMBERS:</b>	P:28206, P:35600, P:37848, P:37847
<b>C55 INVESTMENT CODE:</b>	11676		
<b>SAP PROJECT TYPE:</b>	21 - BOC-MHEB Audit & Finance Committee	<b>C55 INVESTMENT SUB-CATEGORY:</b>	Shell
<b>CORPORATE INVESTMENT CATEGORIES:</b>	(Level 1) C3 / Sustainment (Level 2) CM / System Renewal		

CONTACTS			
<b>PREPARED BY:</b>	Swait, Caitlin FINANCIAL SERVICES LEAD - GENERATION PROJECTS 51185	<b>REQUESTOR:</b>	Dave Hildebrand, Asset Lifecycle Management
<b>PROJECT MANAGER:</b>	Freeman, Keith TEAM LEADER 51460		

**MANITOBA HYDRO**  
**CAPITAL INVESTMENT JUSTIFICATION**  
Pointe du Bois Renewable Energy Project

**RECOMMENDATION**

Approve funding of \$308.3 million for the Pointe du Bois Renewable Energy Project to replace units 2, 3, 4, 5, 7, 8, 9 and 11 and all associated Transmission upgrades.

**SCOPE**

The scope of work includes:

- Supply of intake bulkheads
- Supply of site infrastructure (office trailer, washcar, utilities, bird exclusion)
- Upgrades to the turbine and generator hall cranes
- Removal of four (4) existing units
- Civil demolition, generator base modifications and concrete embedment installation required for new Units
- 115kV Transmission Line from Pointe du Bois Generating Station to Whiteshell Station (PW75)
- Infrastructure at the Whiteshell Station and at the Pointe du Bois Switchyard Station (outlined in Investment 13854)
- Removal of the existing 66 kV Transmission Lines P3 & P4 between Lee River Distribution Supply Centre (DSC) and Pointe du Bois Station
- Supply and installation of 8 new turbine and generator units including:
  - Units 2, 3, 4, 5, 7, 8, 9, 11
  - Excitation system
  - Protection system
  - Generator Switch Gear
  - Unit Control & Monitoring system
  - Governor system
- Station service upgrades
- Generator Step-Up transformer replacement (2)
- 129V DC Upgrades
- Remote Terminal Unit Replacement
- Installation of Intake Wheeled Gates
- Trashrack Upgrades
- Turbine Pit Wall Refurbishments
  - Brick removal
  - Grouting
  - Siding Installation

**BACKGROUND**

Of the original 16 units at Pointe du Bois, 6 remain in operation with the other 10 units at end of life (6 units are permanently out of service and 4 units have been removed from the station). Three of the operational units have a near-term end of life, while the other three operational units are performing at an acceptable reliability and are expected to remain up to the 2050s. The installation of 8 new units will restore some of the generation capacity at this station. The benefits of this project and the federal funding deadline provide justification to expedite the

Capital Investment Justification

**BACKGROUND**

planning and implementation of new units.

An interconnection evaluation study was completed October 2021 and identified that a new 115kV transmission line (PW75) from Pointe du Bois Station to Whiteshell Station was required to accommodate the increased generation output from the generating station. In addition to accommodating the increased generation from Pointe du Bois this line will eliminate the need to build alternative transmission infrastructure in the future. The existing P3 and P4 lines will be salvaged from Pointe du Bois to Lee River DSC and this section right-of way will be re-used for PW75. The portion of PW75 from Lee River DSC to the Whiteshell Station will be located on a new right-of-way and will require a route segment analysis to determine a preferred route. The new transmission line will also be used to transmit power from Slave Falls Generating Station and to serve local load in the long term.



1e

**JUSTIFICATION – BUSINESS CASE ANALYSIS (SUMMARY):**

**JUSTIFICATION**

Execution of this investment is expected to return the following measurable value:

**Generation Revenue Benefit** (including benefits for deferral of future capacity and energy investments)

- The Project would increase system capacity by 54 megawatts (MW) and increase the annual amount of clean, renewable energy generated at the Pointe du Bois Generating Station. The 8 new generating units would produce on average 380 gigawatt hours (GWh) per year between 2024 and 2055.
- The cost of energy produced by the Project would be lower than new thermal generation resource options and comparable to or lower than new wind and solar generation. The hydro units will have a high capacity factor resulting in a dispatchable source of power that can serve peak loads. The dispatchable generation source is more beneficial than the intermittent generation from solar and wind.

**Capital Financial Benefit**

- The new 115 kV transmission line will avoid other long term transmission investments that would be required to serve local load growth.

**Other Benefits**

- The project has an incremental net present value, with the ICIP Funding, of \$90M and \$50M, for cost estimates with P50 and P80 levels of confidence respectively, incorporating both cost and schedule risks. The value is incremental to the alternative of advancing other generation resources to meet future load growth assuming Pointe du Bois GS operates to 2055.
- The generation resulting from this renewable energy source will qualify for Renewable Energy Credits which are a tradable commodity that provides an additional source of revenue.

**Environmental Risk**

- The investment is expected to reduce approximately 9 megatonnes of global greenhouse gas emissions by 2055 or 250,000 tonnes each year. The Project aligns with several federal climate and energy policies and objectives that aim at reducing GHG emitting electricity generation, expanding the supply of non-emitting

**JUSTIFICATION – BUSINESS CASE ANALYSIS (SUMMARY):**

electricity, and/or encouraging electrification. This additional non-emitting generation resource will assist in mitigating future load growth risk and supports corporate and provincial goals to reduce greenhouse gas emissions.

**Safety Risk**

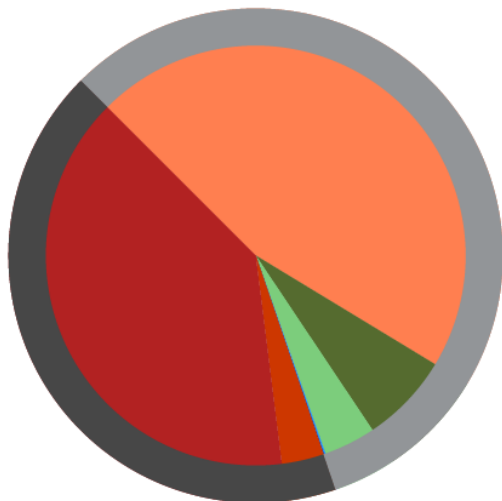
- Modernized systems will improve worker safety, operability and reduce risk of failure during operation.

**O&M Cost**

- The operation and maintenance costs will increase by \$1.3 million per year as there will be more units in operation than the current state.

Capital Investment Justification

**CORPORATE VALUE FRAMEWORK**



Value Measure	Value Points	% of Value
Generation Revenue Benefit	298,038	44.93%
Capital Financial Benefits	44,814	6.75%
Environmental Risk	25,787	3.89%
Safety Risk	834	0.00%
Financial Risk	278	0.00%
O&M Costs	-20,837	3.14%
Total Cost	-272,816	41.12%
<b>Total Value</b>	<b>76,098</b>	
<b>Value/\$K</b>	<b>0.28</b>	

Capital Investment Justification

ANALYSIS OF ALTERNATIVES:

ECONOMIC ANALYSIS		
Discount Rate	For current corporate rates see P911 6%	

Active Option	NPV Benefits/(Costs)	CVF Score	Value/\$K
Recommended		76,098	0.28

Other Alternatives	NPV Benefits/(Costs)	CVF Score	Value/\$K
See Other Alternatives Considered section			

INVESTMENT RISK ANALYSIS
<p>Risk registers were created to determine specific risks associated with the Transmission and Generation components of the project. The specific risks highlight potential problems associated with physical conditions, supply/financial markets, project interfaces, environmental/permit issues, project execution and commissioning. The risk evaluation also considers broad risks such as corporate maturity, project planning, estimate/schedule quality, estimate/schedule competitiveness, PM effectiveness and technical/execution complexity. The risks were quantified as to the cost and schedule impacts and then the residual risk was quantified after mitigation efforts were applied. The top 5 residual risks for the Generation component of the Project include:</p> <ul style="list-style-type: none"> <li>• Community consultation and the requirement for Free, Prior and Informed Consent (FPIC) may cause project delays</li> <li>• Supply Chain disruptions resulting in materials/equipment not arriving on time causing impacts to project budget and timeline</li> <li>• Subsurface or conditions underneath concrete structure are unknown</li> <li>• Market turmoil due to political tension, corona virus, major weather events affecting industrial commodity (steel, copper, resin) prices and project schedule.</li> <li>• Systemic risks with large scale projects may reveal new scope</li> </ul> <p>The top 5 residual risks for the Transmission component of the Project include:</p> <ul style="list-style-type: none"> <li>• Delays in receiving licensing resulting in a delay to the start of construction</li> <li>• Uncertain scope associated with the control building expansion/new construction at the Pointe du Bois Switching Station that is required for this project may cause budget/schedule issues</li> <li>• Unforeseen route changes may increase structure costs as a result of additional structures needed</li> <li>• Geotechnical conditions require a change to the existing foundation design to a more expensive micro-pile foundations</li> <li>• Increased property costs due to the route segment analysis recommending a preferred route on private land</li> </ul> <p>A detailed risk review was completed for the Generation and Transmission components of the Project covering systemic and project specific risks. The results of the risk analysis are as follows:</p>

Capital Investment Justification

**INVESTMENT RISK ANALYSIS**

P50 Cost Contingency \$39.92 M  
P80 Cost Contingency \$83.82 M

The Project will be funded at the P80 level.

A risk analysis was undertaken for the economic evaluation which showed that the project would continue to be more economical than the alternative without the project even if the risks materialized. Risks considered include lower than forecast opportunity export prices, higher than expected cost, higher than forecast discount rate and lower than expected generating unit performance.

**ESTIMATED COST FLOW**

The annual projected cost flows are as follows (in thousands of dollars):

Fiscal Year	Budget	Contributions	Net Budget
Prev. Actuals	\$2,857	\$0	\$2,857
2022/2023	\$43,085	(\$5,150)	\$37,935
2023/2024	\$84,282	(\$32,151)	\$52,131
2024/2025	\$101,843	(\$37,113)	\$64,730
2025/2026	\$81,805	(\$35,951)	\$45,854
2026/2027	\$91,673	(\$3,785)	\$87,888
2027/2028+	\$16,902	0	\$16,902
<b>Total</b>	<b>\$422,447</b>	<b>(\$114,150)</b>	<b>\$308,297</b>

**IMPACT ON O&A COSTS**

The completion of this project is anticipated to result in an increase in operating and administrative expenses equal to \$1.3 million per year as there will be more units to operate/maintain than are currently in-service.

**PROPOSED SCHEDULE**

The Project will begin in late 2022 and is scheduled to be complete by June of 2027. The Proposed in-service dates of each Unit are as follows:

- First Unit – December 2024
- Second Unit – February 2025
- Third Unit – September 2025
- Fourth Unit – October 2025
- Fifth Unit – May 2026
- Sixth Unit – July 2026
- Seventh Unit – January 2027
- Eight Unit – March 2027



Capital Investment Justification

**PROPOSED SCHEDULE**

PW75 Available August 2026

**RELATED INVESTMENTS**

Pointe du Bois 8 Unit Replacement CIC P:28206  
13854 – Pointe du Bois Transmission

**OTHER ALTERNATIVES CONSIDERED**

There are no other alternative means of executing this project to consider at this time that would meet the requirements of the ICIP funding.

The alternative to carrying out this project is to continue to invest in powerhouse life extension upgrades to enable continued operation of existing units until the 2050s. This alternative delays construction of the new 115kV transmission line to the 2050s to provide generation outlet transmission for Slave Falls Generating Station and to serve local load in the long term. Another alternative that was considered was continued operation of the powerhouse to 2030 followed by decommissioning. Both alternatives would require other generation resources to be developed to meet future load growth and the associated investments to be advanced. All alternatives include new energy and capacity resources to meet future load growth. The lowest cost new energy resource is assumed to be wind generation and the lowest cost capacity resource is a new gas turbine. The Pointe du Bois Renewable Energy Project defers future investments in these future energy and capacity resources.

The levelized cost of energy (LCOE) for this project is \$45/MWh (P80) and compares favorably with other alternatives for energy:

Alternative	LOCE (\$/MWh)
Wind	56
Solar	70
Notigi Generating Station (Hydro)	90
Conawapa Generating Station (Hydro)	92
Combined Cycle Gas Turbine	107
Simple Cycle Gas Turbine	177

**REFERENCE DOCUMENTS**

[DAD\\_PDB\\_GS\\_STUDY.docm](#)

[11676\\_CIC\\_AD\\_PDB\\_GS\\_SCOPE\\_DEVELOPMENT\\_1.docx](#)

Capital Investment Justification

**REFERENCE DOCUMENTS**

[11676 CIC AD PDB GS Life Assessment \(Shell\) 2.docx](#)

[11676 CIC AD Pointe du Bois 8 Unit Replacem 3.docx](#)

[Approved - REC-PdB Unit Replacement CIC-20220706.pdf](#)

[11676 CIC AD Pointe du Bois Renewable Energ 4.docx](#)

**REFERENCE:**

Coalition/MH I-85 Attachment 1; Coalition/MH I-109 Attachment 1; 2017/18 & 2018/19 GRA Tab 5 p.11; CEF15 p.20; Coalition/MH I-27 Figure 12

**PREAMBLE TO IR (IF ANY):**

In CEF15 on page 20, Manitoba Hydro describes the Pointe du Bois project: *“Replace generating units and accessory equipment at the Pointe du Bois generating station.”* The forecasted costs are \$138.4 million. A separate project *“Pointe du Bois Transmission”* was forecasted to cost \$118.1 million.

On page 11 of Tab 5 of the 2017/18 & 2018/19 GRA, Manitoba Hydro states: *“Investment plans within CEF16 have been reduced significantly as compared to CEF15 by deferring asset renewal projects at the Point de Bois Generating Station. Pointe du Bois is Manitoba Hydro’s oldest generating station built circa 1911. Assets at the site have significantly deteriorated over time and much of the equipment is obsolete and no longer serviceable. The spillway and water retaining structures were replaced in 2015 to address dam and public safety concerns and assure control of the river. Plans were also in place to repower the power house by replacing some of the generating units and modernizing station equipment to improve safety and reduce maintenance/operating requirements. **Due to declining export power prices, the business case for reinvestment in the Pointe du Bois power house is being re-evaluated to assess the viability of the facility as a generating station investment; decommissioning of the power house is under consideration.”***

Attachment 1 of Coalition/MH I-85 states on page 17 of 51: *“Of the original 16 units at Pointe du Bois, 6 remain in operation with the other 10 units at end of life (6 units are permanently out of service and 4 units have been removed from the station). Three of the operational units have a near-term end of life, while the other three operational units are performing at an acceptable reliability and are expected to remain up to the 2050s.”*

In Attachment 1 to Coalition/MH I-109, Manitoba Hydro states: *“As an example, the Pointe du Bois Generating Station underwent a life extension evaluation in 2018 that determined that making investments to extend the life of the station would be more economical and*

*provide more value than decommissioning the station. The life extension of the station and replacement of several hydraulic turbines and generators that are past their economic life results in low-cost renewable energy.”*

Figure 12 in Coalition/MH I-27 shows the average unit export revenue to be below that of IFF16 from 2027 onward.

Appendix 7.7 p.6 states: *“The project cost of \$308 million is net of the non-refundable federal grant of \$114 million that Manitoba Hydro has applied for.”*

**QUESTION:**

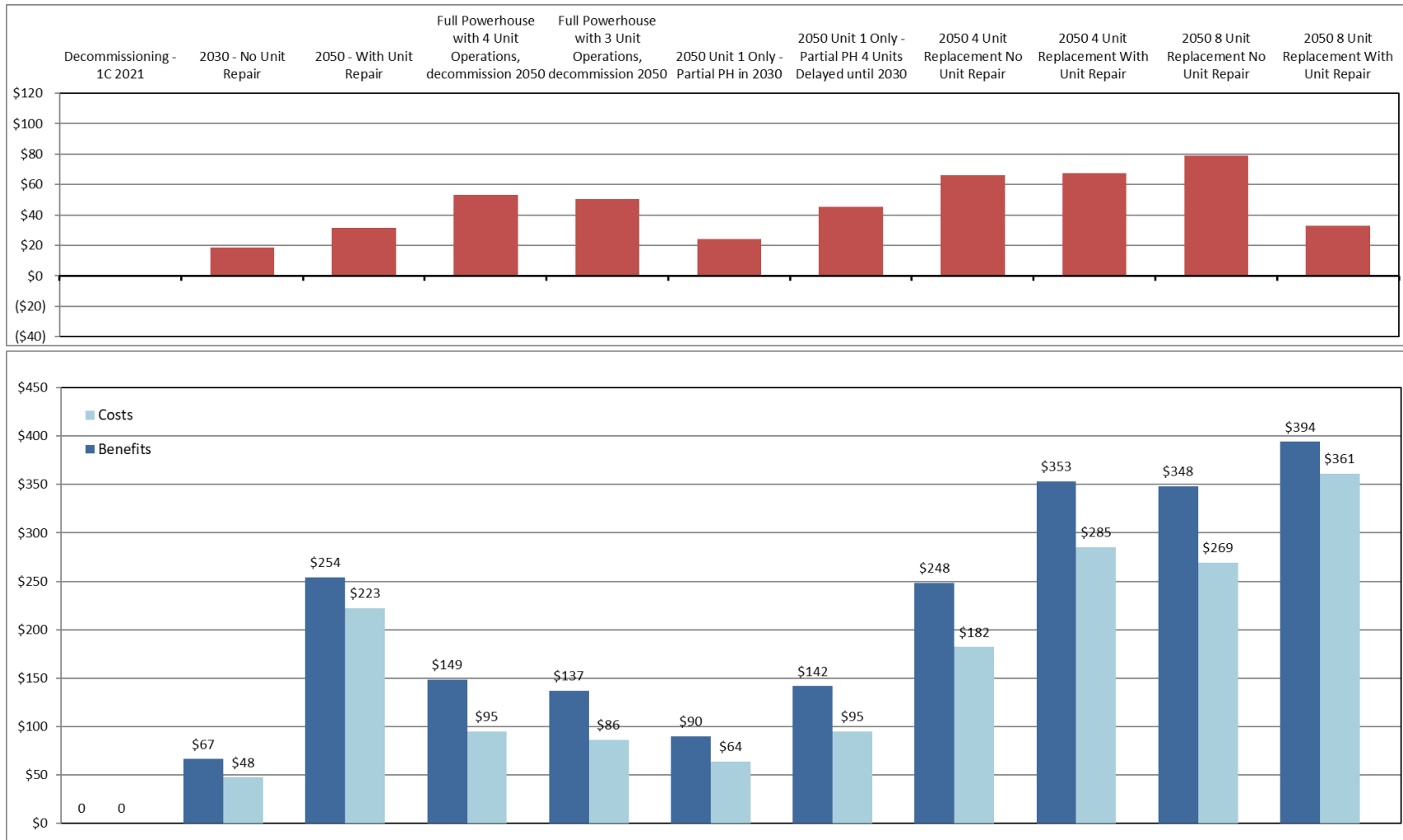
- a) Given that the principal reason given for suspending or ceasing the Pointe du Bois upgrades in 2017 was declining export prices, which are now even lower, please explain what has changed since the decision articulated at the 2017/18 & 2018/19 GRA to remove refurbishment of Pointe du Bois from CEF16.
- b) Please explain why the cost for this project has increased from CEF15’s \$138 million (along with the transmission component of \$118 million) to the current \$422 million (gross).

**RESPONSE:**

- a) Since the 2017/18 & 2018/19 GRA more detailed planning of the generation and transmission components was undertaken resulting in a new project and updated cost estimates (see response to Part b). The new generating units defer the future need for new energy and capacity resources, which have been advanced relative to the supply and demand analysis provided in the 2017/18 & 2018/19 GRA, resulting in financial benefits. A new 115 kV transmission line avoids future transmission and distribution investments that would otherwise be required if the new 115 kV transmission line is not constructed. Based on a project cost of \$308 M, net of ICIP Funding, PREP results in a Net Present Value of \$70 M (Discount Rate = 3.55%). The Net Present Value increases to \$93 M with a 50% reduction in Water Rental Fees and the Debt Guarantee Fee as announced by the Provincial government. Please see response to COALITION/MH II-103a for additional details.

- b) CEF15 included a different project called the Pointe du Bois Unit & Accessories Replacement, which contained different scope compared to the Pointe du Bois Renewable Energy Project (PREP). CEF15 included replacement of only 4 units compared to 8 for PREP. Also, CEF15 did not include civil work, or the removal of units. However, CEF15 did include refurbishment of 3 units. In addition, there were differences in mechanical and electrical scope. There were differences in scope for the transmission component as well. Some transmission elements were not included because they were completed in other projects in order to meet system needs. Besides differences in scope, escalation over seven years would also be a significant factor.

Figure 2: Incremental Economic Analysis Results Relative to Decommissioning in 2021 (Million PV 2018\$)



# 3

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*“SAIDI and SAIFI are industry accepted metrics used to assess distribution system reliability performance. The target SAIDI of <148 and target SAIFI of <1.59 are based on the average performance over the previous 5 years (2014-2018)”<sup>66</sup>*

*“Confirmed, MH has regarded performance over the 5 years (2014-2018) as its “historical performance.” In alignment with Manitoba Hydro’s Strategic Asset Management Plan objective 7, which refers to maintaining historical performance, these performance targets were used to give context to the recent history of SAIDI and SAIFI performance.”<sup>67</sup>*

As a result, the evidence indicates that MH is not basing its Performance (Reliability) targets on a customer-driven tradeoff, and it does not intend to use customer feedback to modify its reliability targets, but rather intends to continue basing its reliability target on a 5-year historic average of its superior performance relative to its Canadian utility peers. An example of good practice guidelines in respect of seeking customer preferences, based on academic literature review and implementation, can be found in evidence submitted in the recent BC Hydro 2021 Integrated Resource Plan as part of a survey performed by Innovative Research Group<sup>68</sup>.

## 7.2.2 Capital Planning and Budgeting

### Budget Control via Forced Ranking

Forced-ranking processes<sup>69</sup> are necessarily applied by all capital-constrained organizations with more potential projects than money to pay for them, which effectively means all organizations except those with unlimited budgets (i.e., fictional) or no spending plans.

In an organization with fully developed and functionally mature asset management and risk management processes, the entire portfolio of potential capital projects across all business groups can be ranked by unit value created (with value scores that integrate factors such as expected net income, reliability improvement, risk mitigation, etc.) per dollar spent, because an organization with mature asset and risk management processes can consistently assess and attribute value-creation across dissimilar projects. Note that an

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<sup>66</sup> Manitoba Hydro response to COALITION/MH I-95a

<sup>67</sup> Manitoba Hydro response to COALITION/MH II-82

<sup>68</sup> BC Hydro 2021 Integrated Resource Plan, Exhibit C7-8, PDF 93 of 246, [https://docs.bcuc.com/Documents/Proceedings/2023/DOC\\_69670\\_C7-8-RCIA-Written-Evidence-Midgard.pdf](https://docs.bcuc.com/Documents/Proceedings/2023/DOC_69670_C7-8-RCIA-Written-Evidence-Midgard.pdf)

<sup>69</sup> Forced-ranking is a screening process applied to abridge a superset of alternatives, items or expenditures within a maximum envelope. The envelope can limit (for example) the number of items (e.g., # of standby seats available on an airplane) or the total value of expenditures allowed to pass the screening step. Forced ranking as applied to capital spending portfolio decisions involves applying an overall spending limit (capital envelope) to a prioritized listing of potential capital expenditures. A running total of cumulative costs is summed for all projects in the list, and all expenditures with lower priority than the lowest priority project that fits within the envelope are rejected (or deferred to a subsequent spending period). See Enwin example in this section.

# Appendix A: Literature Summary

# Grounding Questionnaire Development in Academic Literature

**The questionnaire development was grounded in and informed by academic literature. The article below is an academic literature review of recent developments in measuring stated preference. It identifies key elements that are necessary to include in a willingness to pay study.**

Johnston, R. J. et al., 2017. Contemporary Guidance for Stated Preference Studies. *Journal of the Association of Environmental and Resource Economists*, 4(2).

Available at: <https://aura.abdn.ac.uk/bitstream/handle/2164/10529/691697.pdf?sequence=1>

[Accessed 4 November 2022]

# Scenario Development

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)

# Value Elicitation

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.
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

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