April 2017

Capital Expenditure & Demand Side Management Forecast (CEF16)

2016/17– 2026/27

Finance & Strategy

Manitoba Hydro

Available in accessible formats upon request

Capital Expenditure & Demand Side Management Forecast (CEF16) 2016/17 – 2026/27

FINANCE & STRATEGY
APRIL 2017

Manitoba Hydro

Table of Contents

1.0 Overview

The Capital Expenditure & Demand Side Management Forecast (CEF16) is a projection of Manitoba Hydro's capital expenditures for new and replacement facilities to meet the electricity and natural gas service requirements in the Province of Manitoba as well as expenditures required to meet firm sale commitments outside the province. Expenditures included in the Capital Expenditure Forecast will provide for an ongoing safe and reliable supply of energy in the most efficient and environmentally sensitive manner. CEF16 also includes a projection of Manitoba Hydro's expenditures related to the corporation's Electric and Natural Gas Demand Side Management (DSM) programs which provide education, incentives and expertise to achieve energy savings to offset growing demand.

Capital expenditures are categorized between Major New Generation & Transmission (MNG&T) projects and Business Operations Capital. MNG&T projects provide significant new generation and transmission capacity and include projects of a substantial cost. Business Operations capital addresses requirements to sustain electricity and natural gas service through replacement of aging or obsolete assets, capacity enhancements as well as system expansion due to load growth. Included are expenditures which support business operations such as fleet, administrative buildings and information technology hardware and software. Both MNG&T and Business Operations capital are classified further by investment category per section 2.0.

Capital expenditures are comprised of executing projects, programs, potential investments as well as planning investments which outline proposed future capital requirements.

In CEF16, executing projects are defined as projects underway where significant engineering detail or construction has commenced. This includes projects under scope development with planned expenditures in 2017/18.

Potential investments are identified to explore potential remedial alternatives to address an asset need based upon undesirable operating costs, performance or risk as well as to identify system expansion needs to meet customer demand. A tentative start date may be associated with the potential investment, but is fluid until a decision is made to execute.

Programs are a collection of asset classes requiring renewal that are generally not planned on a specific asset basis, but rather as a fleet. Examples include large populations of inexpensive assets which require annual replacement for sustainability (e.g. wood poles), ongoing fleet life extension works (e.g. cable injection) and run to failure assets. Programs also include long term plans of lower value, short lived asset replacements defined within specific spending categories.

Planning investments (long term planning items) are generally planned at either the investment category or asset levels without a specific investment or projects defined and are identified investment requirements to maintain a sustainable balance of asset risk and performance.

Portfolio adjustments in the near term account for anticipated variances in portfolio cost flow from forecast due to the inherent deviation from schedules associated with project uncertainty. Project schedules consist of a multitude of interrelated activities planned in time to achieve the deliverable at the earliest date possible by following the critical path to completion. Project execution often deviates from plan as many of the project activities are susceptible to unpredictable and/or uncontrollable factors that hinder progress. The aggregate effect is an anticipated variance in actual portfolio cost flow as compared to plan, which is managed with adjustments.

Portfolio adjustments are also used to smooth planning items in the longer term to achieve target levels of spending over multiple years where capital requirements are fluid.

Appendix A provides a summary of capital expenditures for executing projects, potential investments, programs and planning investments. In addition, Appendix B provides a listing of executing projects greater than $1 million and additional details for each project including total project cost, description and projected in-service date.

The focus of CEF16 is on the ten year period from 2017/18 to 2026/27 to align with the corporation's revised financial plan. Detailed capital requirements within this timeframe have been identified, reviewed and prioritized. An extension to 2035/36 (20 years) is included to provide a longer term directional projection of capital requirements.

($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	2017-2036 20 Year Total
Major New Generation & Transmission	2 355	2 476	2 126	1 274	1 066	746	358	75	4	4	5	**8 134**	**10 491**
Electric Business Operations Capital	574	526	517	516	511	499	521	544	616	640	659	**5 549**	**12 835**
Natural Gas Business Operations Capital	51	31	32	29	31	33	35	34	39	39	40	**343**	**812**
Capital Expenditures Total	**2 980**	**3 033**	**2 675**	**1 819**	**1 609**	**1 278**	**914**	**652**	**659**	**683**	**703**	**14 026**	**24 138**
Year End Outlook Adjustment	(45)	-	-	-	-	-	-	-	-	-	-	**-**	**(45)**
Revised Capital Expenditures Total	**2 935**	**3 033**	**2 675**	**1 819**	**1 609**	**1 278**	**914**	**652**	**659**	**683**	**703**	**14 026**	**24 093**
Demand Side Management	60	66	111	105	100	98	77	71	73	77	81	**858**	**1 762**
CEF16 & Demand Side Management Total	**2 995**	**3 099**	**2 786**	**1 924**	**1 708**	**1 376**	**991**	**723**	**732**	**760**	**784**	**14 884**	**25 855**

The CEF16 totals $14 884 million for the ten year period from 2017/18 through 2026/27. Expenditures for MNG&T total $8 134 million, with the balance of $5 892 million comprised of expenditures for infrastructure renewal, system safety and security, new and increasing load requirements and ongoing efficiency improvements. In addition, DSM expenditures total $858 million for the same period.

MNG&T expenditures total $10 491 million over the twenty year forecast 2016/17 through 2035/36. Business Operations capital totals $13 602 million over the same period. The twenty year forecast includes projected expenditures for 2016/17 as well as forecast requirements to 2035/36. Over the latter ten years of the forecast period increases for Business Operations capital have been incorporated in order to address expected aging infrastructure requirements

DSM expenditures total $1 762 million over the twenty year forecast. The increase within the twenty year forecast reflects continued investment in both Electric and Natural Gas DSM programs.

Comparison to CEF15

Capital Expenditures

The following table summarizes the changes in Capital Expenditures between CEF15 and CEF16 over the 10 and 20 year period.

	Total Projected Cost	Total Projected Cost Increase (Decrease)	10 Year Increase (Decrease) 2018 to 2027	20 Year Increase (Decrease) 2017 to 2036
	($ Millions)			
Keeyask - Generation	8 726	2 230	2 505	2 307
Bipole III Reliability	5 042	389	835	695
Manitoba-Minnesota Transmission Project	453	100	113	103
Generating Station Improvements & Upgrades	NA	NA	(256)	(572)
Target Adjustment for MNG&T	NA	NA	(293)	(181)
Other MNG&T Projects	NA	NA	(59)	(520)
Business Operations Capital	NA	NA	(236)	(67)
Electric Power Smart Programs	NA	NA	(90)	(290)
Gas Power Smart Programs	NA	NA	15	50
			$ 2 532	**$ 1 526**

Major New Generation & Transmission

Over the 10 year period from 2017/18 to 2026/27, the MNG&T forecast expenditures are $8.1 billion or $2.8 billion higher as compared to CEF15. The increase over the 10-year period is primarily due to increased estimates for Keeyask GS ($2 230 million), Bipole III Reliability ($389 million) and the Manitoba-Minnesota Transmission project ($100 million) as well as cost flow adjustments for under expenditures in the prior years and schedule changes on the Bipole III Reliability ($446 million) and Keeyask GS ($275 million) projects. These increases are partially offset by the removal of the Generating Station Improvements and Upgrades planning investment ($256 million) as this future requirement has been reflected in various planning items within Electric Business Operations capital, the removal of the rolling cost flow target adjustment included in CEF15 ($293 million) as well as other project reductions under MNG&T ($72 million).

The following provides a summary of the Keeyask Generating Station, Bipole III Reliability and associated Manitoba-Minnesota Transmission (MMTP) projects:

- Construction on the Keeyask Generating Station has continued. Excavation of the spillway and the powerhouse are complete and concrete placement commenced in the spring for the powerhouse, intake, service bay and spillway. Concrete work will continue over the remainder of this construction season and the next, including construction of the north dyke, north and central dam structures. The planned in-service date has been deferred 21 months to August 2021 with a revised projected total cost of approximately $8.7 billion.

- Construction activities on the Bipole III Reliability project have progressed including clearing of the transmission right-of-way, installation of the tower anchor and foundation footprints, as well as foundation work for the converter stations. Tower erection has commenced and will continue over the winter season. The planned in-service date remains July 2018 with a revised projected total cost of approximately $5.0 billion.

- The MMTP is a 235 kilometer 500 kV AC transmission line which requires approval from federal and provincial regulatory authorities prior to construction in 2017. The planned in-service date is May 2020 with a projected total cost of approximately $450 million.

Please see Section 2.0 for additional information on cost and schedule revisions for each of the projects discussed above.

Business Operations Capital

Business Operations capital targets have decreased over the 10 year period ($236 million) as compared to CEF15 reflecting projected labour and sourcing savings identified as part of the plan to improve the corporation's financial position. However an increase in funding in future periods relative to CEF16 may be required as further extensive reviews and analyses progress to address the growth requirements of our customers and to sustain our current infrastructure. High priority areas of capital investment include:

- Refurbishment or replacement investments associated with deteriorating or obsolete assets;
- Distribution substation development both within and outside the city of Winnipeg to address operational load conditions beyond maximum load ratings; and
- Capacity related investments to address higher load growth in certain geographic areas of the province;

Any potential high priority increased capital requirements identified will be incorporated into future forecasts.

Demand Side Management (DSM)

Over the ten year period 2017/18 to 2026/27, DSM expenditures are $0.9 billion reflecting a decrease of $75 million over CEF15. The decrease over this period is primarily due to decreased estimates for Electric DSM programs ($90 million) including the Load Displacement & Alternative Energy, Industrial Energy Efficiency and Other Emerging Technologies programs. This is partially offset by an increase in Natural Gas DSM programs ($15 million).

2.0 Investment Categories & Project Summaries

Manitoba Hydro has incorporated the use of investment categories, which are commonly used within the industry to provide stakeholders with a better understanding of the primary driver for the investment. The primary investment categories are further broken down into sub-categories.

The primary investment categories are Capacity & Growth, Sustainment and Business Operations Support. Capacity & Growth investments provide for future load growth or address existing capacity constraints in key geographic areas on the transmission and distribution system. Sustainment investments are required to ensure the continued and future performance capability of the electricity system and address the issue of aging or obsolete assets. Business Operations Support investments support corporate operations including IT investments, fleet and administrative buildings. Further information on the investment categories can be found in Appendix D of the Capital Expenditure & Demand Side Management Forecast (CEF16).

The following table provides a summary of CEF16 by investment category.

	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year	2018-2027 10 Year Total	2017-2036 20 Year
Major New Generation & Transmission									
Capacity & Growth									
New Energy	940.3	1 090.2	1 299.5	1 116.7	867.9	707.1	5 081.4	5 474.3	6 414.6
System Load Capacity	1 357.7	1 229.3	657.1	17.1	2.5	-	1 906.0	1 906.0	3 263.6
Grid Interconnections - Import/ Export	10.1	90.6	116.7	101.5	164.5	10.8	484.1	484.1	494.2
Capacity & Growth Total	2 308.1	2 410.1	2 073.3	1 235.3	1 034.9	717.9	7 471.4	7 864.3	10 172.5
Sustainment									
System Renewal	29.4	17.6	6.8	-	-	-	24.3	24.3	55.3
Sustainment Total	29.4	17.6	6.8	-	-	-	24.3	24.3	55.3
Business Operations Support									
Town site Infrastructure	15.1	36.9	39.7	37.2	31.5	28.3	173.6	226.5	241.5
Corporate Facilities	2.8	11.7	6.2	1.4	-	-	19.2	19.2	22.1
Business Operations Support Total	17.9	48.6	45.9	38.6	31.5	28.3	192.8	245.7	263.6
Major New Generation & Transmission Total	**2 355.4**	**2 476.2**	**2 125.9**	**1 273.9**	**1 066.4**	**746.1**	**7 688.6**	**8 134.3**	**10 491.3**
Major New Generation & Transmission Total	**2 355.4**	**2 476.2**	**2 125.9**	**1 273.9**	**1 066.4**	**746.1**	**7 688.6**	**8 134.3**	**10 491.3**
Business Operations									
Electric									
Capacity & Growth									
System Load Capacity	158.5	143.4	127.3	136.0	94.4	59.6	560.6	886.5	1 819.9
Customer Connections - Residential, Commercial & Industrial	36.5	40.1	43.2	45.2	44.9	39.3	212.7	454.3	1 060.4
Capacity & Growth Total	195.0	183.4	170.5	181.2	139.3	98.9	773.3	1 340.8	2 880.3
Sustainment									
System Renewal	224.8	217.1	230.1	223.0	249.2	286.9	1 206.4	3 062.2	7 284.7
Mandated Compliance	56.5	38.8	36.7	34.8	44.1	35.2	189.6	302.3	652.0
System Efficiency	21.9	23.4	17.3	16.7	15.9	14.5	87.8	177.8	485.7
Decommissioning	0.2	0.2	0.3	0.3	0.7	0.9	2.4	6.5	21.0
Sustainment Total	303.4	279.6	284.4	274.8	309.8	337.5	1 486.1	3 548.7	8 443.4
Business Operations Support									
Information Technology	24.6	26.5	26.7	19.6	25.6	26.1	124.6	263.3	576.0
Fleet	17.1	15.0	15.1	11.8	15.5	15.8	73.2	157.0	348.2
Tools and Equipment	5.0	5.0	5.3	4.7	4.6	4.3	23.9	52.4	158.8
Town site Infrastructure	3.3	4.2	1.3	1.2	1.2	1.0	8.9	16.5	42.0
Generation Buildings and Grounds	-	-	1.1	2.7	2.7	3.2	9.7	31.8	74.8
Corporate Facilities	25.2	12.1	12.4	19.9	12.5	12.7	69.6	138.3	311.0
Business Operations Support Total	75.1	62.8	61.9	60.0	62.1	63.1	309.8	659.2	1 510.8
Electric Business Operations Total	**573.6**	**525.8**	**516.8**	**516.0**	**511.2**	**499.4**	**2 569.3**	**5 548.7**	**12 834.5**

	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year	2018-2027 10 Year Total	2017-2036 20 Year
Natural Gas									
Capacity & Growth									
System Load Capacity	17.9	2.7	1.4	1.3	1.4	1.5	8.2	16.6	53.5
Customer Connections - Residential, Commercial & Industrial	16.2	15.8	16.1	14.9	15.7	16.5	79.1	171.9	393.7
Capacity & Growth Total	34.1	18.5	17.5	16.2	17.1	18.0	87.3	188.5	447.3
Sustainment									
System Renewal	4.5	4.8	4.8	4.3	4.6	4.8	23.3	51.2	119.3
Mandated Compliance	5.4	5.5	8.2	7.1	7.6	8.0	36.4	82.8	193.9
System Efficiency	6.8	2.2	1.8	1.6	1.7	1.9	9.2	19.9	51.0
Decommissioning	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.9
Sustainment Total	16.8	12.5	14.9	13.0	13.9	14.8	69.1	154.3	365.1
Natural Gas Business Operations Total	**50.8**	**31.0**	**32.4**	**29.2**	**31.1**	**32.7**	**156.4**	**342.8**	**812.4**
Business Operations Total	**624.4**	**556.8**	**549.2**	**545.2**	**542.3**	**532.2**	**2 725.7**	**5 891.5**	**13 646.9**
Capital Expenditure Total	**2 979.8**	**3 033.0**	**2 675.1**	**1 819.1**	**1 608.7**	**1 278.3**	**10 414.3**	**14 025.8**	**24 138.2**
Unallocated Year End Outlook Adjustment - Electric	(45.0)								(45.0)
Revised Capital Expenditure Total	**2 934.8**	**3 033.0**	**2 675.1**	**1 819.1**	**1 608.7**	**1 278.3**	**10 414.3**	**14 025.8**	**24 093.2**
Demand Side Management									
Electric	50.1	55.7	99.4	94.3	88.9	86.9	425.1	751.6	1 557.3
Natural Gas	9.7	10.3	11.7	10.8	10.8	10.9	54.4	106.8	204.3
Demand Side Management Total	**59.9**	**66.0**	**111.1**	**105.1**	**99.6**	**97.8**	**479.6**	**858.4**	**1 761.6**
CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT TOTAL	**2 994.7**	**3 099.0**	**2 786.2**	**1 924.2**	**1 708.3**	**1 376.1**	**10 893.8**	**14 884.2**	**25 854.8**

2.1 MAJOR NEW GENERATION & TRANSMISSION

MAJOR NEW GENERATION & TRANSMISSION ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Capacity & Growth	2 308	2 410	2 073	1 235	1 035	718	**7 471**	**7 864**	**10 172**
Sustainment	29	18	7	-	-	-	**24**	**24**	**55**
Business Operations Support	18	49	46	39	31	28	**193**	**246**	**264**
Major New Generation & Transmission Total	**2 355**	**2 476**	**2 126**	**1 274**	**1 066**	**746**	**7 689**	**8 134**	**10 491**

2.1.1 Capacity and Growth

Investments required for the expansion of Manitoba Hydro's generation, transmission or High Voltage Direct Current (HVDC) systems. Capacity and Growth is further broken down between New Energy, System Load Capacity and Grid Interconnections.

CAPACITY & GROWTH ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
New Energy	940	1 090	1 299	1 117	868	707	5 081	5 474	6 415
System Load Capacity	1 358	1 229	657	17	2	-	1 906	1 906	3 264
Grid Interconnections - Import/ Export	10	91	117	101	164	11	484	484	494
Capacity & Growth Total	2 308	2 410	2 073	1 235	1 035	718	7 471	7 864	10 172

2.1.1.1 New Energy

Addition of new generating assets or upgrades to existing generating assets for the purpose of increasing generation capacity or energy including the associated new or upgraded infrastructure. Also includes new or upgraded transmission assets required to deliver the new or increased energy into the grid.

CAPACITY & GROWTH ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
New Energy										
Keeyask - Generation	8 726	914	1 077	1 290	1 117	868	707	**5 060**	**5 453**	**6 367**
Kelsey Improvements & Upgrades	337	4	7	9	-	-	-	**16**	**16**	**20**
Wuskwatim - Generation	1 422	4	5	-	-	-	-	**5**	**5**	**9**
Conawapa - Generation	380	18	-	-	-	-	-	**-**	**-**	**18**
New Energy Total		**940**	**1 090**	**1 299**	**1 117**	**868**	**707**	**5 081**	**5 474**	**6 415**

Project summaries for New Energy executing projects are provided below:

Keeyask – Generation

Description:
Design and build the Keeyask generating station with seven generators and nominal capacity of 695MW on the Nelson River downstream of the Kelsey generating station. Project costs also include activities necessary to obtain approval and community support to proceed with the construction of the future generating station. These costs are comprised of extensive First Nations and other community consultations, pre-project training, joint venture business developments, environmental studies, impact statement preparations, submissions, regulatory review processes, detailed pre-engineering requirements, acquiring all necessary licensing, the design and construction of associated transmission facilities, and improvements to access roadways.

Justification:
This project increases generation for export power purposes and ultimately domestic load requirements.

In-Service Date:
First power August 2021

Revision:
The revised control budget reflects a more detailed review conducted by Manitoba Hydro. The revised control budget considers the current state of the project's progress including actual results of the first full year of concrete construction (2016) and allows for contingency to account for risks that still remain on the project. First power in-sevice date has been deferred twenty-one months from November 2019.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 6 496.1	$ 1 112.0	$ 1 226.2	$ 835.8	$ 552.6	$ 193.0	$ 140.4
Increase (Decrease)	2 230.0	(197.8)	(148.7)	454.7	564.1	674.9	959.6
Revised Forecast	$ 8 726.0	$ 914.2	$ 1 077.5	$ 1 290.5	$ 1 116.7	$ 867.9	$ 1 100.0

Kelsey Improvements & Upgrades

Description:
Overhaul and uprate all seven Kelsey generating station units including the replacement of turbine runners, bottom rings, discharge rings or weld overlays, transformers, generator windings and exciters. Perform model testing to refine runner design, perform extensive intake gate rehabilitation, perform draft tube modifications, perform an 8 000 hour inspection, and upgrade rail spur and overhead crane. Upgrade transmission facilities necessary to integrate the additional Kelsey generation into the Manitoba Hydro system network.

Justification:
Rerunnering presents the best economic solution for increasing efficiency at the Kelsey generating station and for adding system capacity without flooding or requiring a new water power license. Overhauling the units will improve the unit output by up to 11MW per unit. The transmission upgrade of a portion of the Kelsey 138 and 230kV buses and the revisions to the Northern AC Cross Trip scheme are required to accommodate the 77MW of additional Kelsey output.

In-Service Date:
December 2017

Revision:
Project decreased due to inner headcover deficiency costs lower than expected. In service date deferred thirteen months from November 2016.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 338.8	$ 12.6	$ 6.5	$ 0.2	$ -	$ -	$ -
Increase (Decrease)	(1.9)	(8.8)	0.8	8.8	-	-	-
Revised Forecast	$ 336.9	$ 3.7	$ 7.3	$ 9.0	$ -	$ -	$ -

Wuskwatim - Generation

Description:
Design and build the new Wuskwatim generating station with three generators and installed capacity of approximately 200MW on the Burntwood River upstream of Thompson.

Justification:
This project increases generation for both export power purposes and domestic load requirements.

In-Service Date:
First power June 2012

Revision:
Reflects a revision in scope for the staffhouse from a three level 60 room hotel style building to 11 ready-to-move duplex homes consisting of 22 full suites. In addition, estimates on the generating station plant deficiencies and project close-out costs have been lowered through reduced potential risk on direct contract costs through favourable market conditions. The final in-service date for the staffhouse has been advanced by four months to September 2017 and final project close-out is anticipated to be completed in March 2018.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 1 448.6	$ 17.7	$ 13.1	$ -	$ -	$ -	$ -
Increase (Decrease)	(27.0)	(13.7)	(7.6)	-	-	-	-
Revised Forecast	$ 1 421.6	$ 4.1	$ 5.4	$ -	$ -	$ -	$ -

Conawapa - Generation

Description:
The current estimate includes a wrap up of the preliminary engineering studies and limited environmental and aboriginal studies through to December 2016.

Justification:
Manitoba Hydro has suspended development work on the Conawapa Project. The engineering, environmental and aboriginal studies activities are necessary to preserve the knowledge gained to date through extensive field work and will assist in shaping local community development and resource management plans.

In-Service Date:

Revision:
Estimates reflects a decrease in environmental studies and field work, as well as, lower than anticipated costs for agreements related to Aboriginal Traditional Knowledge. Capitalized interest is suspended effective December 2016.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 404.7	$ 30.5	$ 9.1	$ -	$ -	$ -	$ -
Increase (Decrease)	(22.0)	(9.2)	(9.1)	-	-	-	-
Revised Forecast	$ 382.7	$ 21.3	$ -	$ -	$ -	$ -	$ -

2.1.1.2 System Load Capacity

Addition of new or upgrades to existing transmission or distribution assets for the purpose of increasing the system's capacity to address anticipated load growth not driven by one large customer.

CAPACITY & GROWTH ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Load Capacity										
Bipole III	5 042	1 356	1 229	657	17	2	-	**1 906**	**1 906**	**3 262**
Riel 230/500kV Station	320	1	-	-	-	-	-	**-**	**-**	**1**
System Load Capacity Total		**1 358**	**1 229**	**657**	**17**	**2**	**-**	**1 906**	**1 906**	**3 264**

Project summaries for System Load Capacity executing projects are provided below:

Bipole III - Transmission Line

Description:
Design and build a +/- 500kV HVdc transmission line of approximately 1 341km (west of Lakes Winnipegosis & Manitoba) from Riel converter station to Keewatinohk converter station. Conduct environmental impact assessment, acquire property, and obtain licensing necessary for a +/- 500kV DC transmission line and converter stations at Riel and Keewatinohk.

Justification:
Provides increased reliability to the Manitoba Hydro system due to the critical risk to the Province and the Corporation of not mitigating an Interlake (Bipole 1 and 2) corridor outage or a Dorsey station common mode outage. In normal steady state operation, it will also provide an increase in southern power, due to decreased line losses (approximately 76MW under full existing generation). The rating for Bipole III was increased from 2000MW to 2300MW to ensure adequate spare HVdc transmission on the northern collector system. The increased rating ensures future generation can be transmitted via Bipole I, Bipole II and Bipole III in the event of a single valve group outage.

In-Service Date:
July 2018

Revision:
The revised estimate incorporates increases in actual costs and awarded contracts to date as a result of higher than planned market rates for anchors and foundation construction and tower assembly, erection and stringing contracts. Other increases include: delay claims (weather and material) experienced to date, construction schedule compression and resultant costs, increased equipment and vehicle costs to support construction, additional materials required for southern route changes, property costs for finalized southern route, greater material management costs, relationship management costs, environmental monitoring costs and contingency to address project risks.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 1 655.4	$ 495.0	$ 359.8	$ 86.5	$ -	$ -	$ -
Increase (Decrease)	302.2	(18.1)	151.4	259.0	9.0	1.9	-
Revised Forecast	$ 1 957.6	$ 477.0	$ 511.2	$ 345.5	$ 9.0	$ 1.9	$ -

Bipole III - Converter Stations

Description:
Design and build an HVdc converter station with a rating of 2300MW at the proposed Keewatinohk site, including property acquisition costs and the Keewatinohk 230kV AC switch yard. Design and build an HVdc converter station with 2300MW of converters at Riel, including four LCC HVdc synchronous condensers, property acquisition costs and expansion of the Riel 230kV AC switch yard.

Justification:
Provides increased reliability to the Manitoba Hydro system due to the critical risk to the Province and the Corporation of not mitigating an Interlake (Bipole I and II) corridor outage or a Dorsey station common mode outage. The rating for Bipole III was increased from 2000MW to 2300MW to ensure adequate spare HVdc transmission on the northern collector system. The increased rating ensures future generation can be transmitted via Bipole I, Bipole II and Bipole III in the event of a single valve group outage.

In-Service Date:
July 2018

Revision:
The increase in the estimate is due to the inclusion of additional provincial road upgrades and an increase in contingency levels to a higher (P75) confidence level to better address project risks. The 2014 estimate was based on a P50 confidence level.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 2 675.1	$ 943.4	$ 372.9	$ 180.3	$ 12.2	$ 1.8	$ -
Increase (Decrease)	105.6	(121.9)	306.1	106.0	(4.2)	(1.3)	-
Revised Forecast	$ 2 780.7	$ 821.5	$ 679.0	$ 286.3	$ 8.0	$ 0.6	$ -

Bipole III - Collector Lines

Description:
Design and construct three permanent and two temporary 230kV collector lines for the Keewatinohk Converter station. Construct power substation for the Keewatinohk converter station, 138 kV line, microwave tower, and distribution feeders for the Keewatinohk converter station. Design and construct the Riel and Keewatinohk electrode lines, sectionalize the 230kV transmission line R49R at Riel. Includes the property acquisition and/or easements for the collector lines and the electrode lines. Design and construct a new bay and modify existing Long Spruce 230 KY AC switchyard for the new collector line to Keewatinohk converter station. Design and construction of a new bay and modifications at existing Henday 230 KY AC switchyard for the four new collector lines to Keewatinohk converter station. Design and construction of breaker replacements at existing stations (Ridgeway, Rosser, and McPhillips) for Bipole III.

Justification:
Provides increased reliability to the Manitoba Hydro system due to the critical risk to the Province and the Corporation of not mitigating an Interlake (Bipole 1 and 2) corridor outage or a Dorsey station common mode outage.

In-Service Date:
July 2018

Revision:
The decrease in estimate is due to lower than planned accommodation costs for contractors, lower than planned steel structure contracts and lower interest and escalation on the revised cost flows. These were partially offset by increased scope changes for additional tower requirements for dead end footings, and a switch to external resources from internal resources on Long Spruce and Henday work.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 260.2	$ 56.1	$ 44.1	$ 11.3	$ -	$ -	$ -
Increase (Decrease)	(13.6)	(1.0)	(7.7)	13.1	-	-	-
Revised Forecast	$ 246.6	$ 55.1	$ 36.4	$ 24.4	$ -	$ -	$ -

Bipole III - Community Development Initiative

Description:
Establishment of an obligation for a Community Development Initiative to provide benefits to First Nations, Community Councils, rural Municipalities and incorporated Towns and Villages within the vicinity of the Bipole III Project.

Justification:
Manitoba Hydro is responding to community feedback seeking longer term benefits for communities in proximity to high voltage transmission facilities. These funds will be available for community development projects that benefit a broad segment of eligible communities.

In-Service Date:
July 2018

Revision:
Decreased estimate primarily a result of some eligible CDI participants entering into alternative arrangements with the Corporation.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 62.0	$ 1.8	$ 1.5	$ 0.6	$ -	$ -	$ -
Increase (Decrease)	(5.3)	0.8	1.1	0.3	-	-	-
Revised Forecast	$ 56.6	$ 2.6	$ 2.7	$ 0.9	$ -	$ -	$ -

Riel 230/500kV Station

Description:
Conduct environmental impact assessment and obtain licensing necessary for the Riel 230/500kV station. Design and construct a 230/500kV station at the Riel site including the installation of a 230kV bus with a maximum of five Bays, the installation of a 500kV ring bus, the installation of a 230/500kV 1200MVA transformer bank using two 230kV and one 500kV breaker, and the installation of 500kV line reactors with relocating of a reactor phase from Dorsey. Install a second reactor phase from Dorsey as a spare at Riel after the Riel reactors are in-service and salvage the third reactor phase at Dorsey. Sectionalize two 230kV transmission lines R32V and R33V into Riel station using eight 230kV breakers and associated equipment resulting in two Riel-Ridgeway and two Riel-St. Vital transmission lines. Sectionalize 500kV transmission line D602F into Riel station using two 500kV breakers and associated equipment resulting in Dorsey-Riel and Riel-Forbes 500kV circuits.

Justification:
The sectionalization of the 500kV line allows power to be imported during a catastrophic Dorsey outage, as well as an alternate path for power export during a Dorsey transformer outage.

In-Service Date:
May 2015

Revision:
Cost flow revision only.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 319.9	$ -	$ -	$ -	$ -	$ -	$ -
Increase (Decrease)	-	1.4	-	-	-	-	-
Revised Forecast	$ 319.9	$ 1.4	$ -	$ -	$ -	$ -	$ -

2.1.1.3 Grid Interconnections - Import/ Export

New assets to deliver energy associated with requests for transmission service (import, export and through-flow requirements).

CAPACITY & GROWTH ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Grid Interconnections - Import/ Export										
Manitoba-Minnesota Transmission Project	453	7	87	114	83	147	-	**431**	**431**	**438**
Manitoba-Saskatchewan Transmission Project	56	3	4	2	19	18	11	**53**	**53**	**56**
Grid Interconnections - Import/ Export Total		**10**	**91**	**117**	**101**	**164**	**11**	**484**	**484**	**494**

Project summaries for Grid Interconnections - Import/Export executing projects are provided below:

Manitoba-Minnesota New 500kV Transmission Line

Description:
Design, construct and commission a 235km 500kV AC single-circuit transmission line from Dorsey station to the US border. Design and install one 500kV breaker, one 150MVAr 500kV shunt reactor, one double-wye ungrounded 46kV 73.4MVAr shunt capacitor bank and associated communications and protection at Dorsey. Design and install two 500kV breakers, one 230kV breaker, two double-wye ungrounded 46kV 73.4MVAr shunt capacitor banks, a 1 200MVA 230/500kV autotransformer and associated communications and protection at Riel. Acquire property for right-of-way, conduct environmental impact assessment, conduct community consultations, obtain licensing and perform environmental monitoring for all new facilities. Design, procure and install a new 300MVA phase shifter at Glenboro station and re-align the transmission lines at the Glenboro station to accommodate the new transformer.

Justification:
Manitoba Hydro (MH) and Minnesota Power entered into agreements that require 383MW of new transmission service (southbound and northbound). MH and Wisconsin Public Service (WPS) entered into agreements that require 200MW of new transmission service (southbound and northbound). The 500kV line is an integral part of MH development plan. Transmission Service Requests have been made under the Manitoba Hydro Open Access Transmission Tariff, to increase the Manitoba to United States export and import capability by 883MW. The proposed transmission facilities will provide these capabilities.

In-Service Date:
May 2020

Revision:
Increase due to updated costs for transmission line construction, licensing and environmental assessment work, station improvements and contingency including management reserve and funding for Indigenous opportunities.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 353.6	$ 16.5	$ 114.0	$ 69.1	$ 89.5	$ 45.2	$ -
Increase (Decrease)	99.6	(9.5)	(27.3)	45.3	(6.7)	101.6	-
Revised Forecast	$ 453.2	$ 7.0	$ 86.8	$ 114.3	$ 82.9	$ 146.8	$ -

Manitoba-Saskatchewan Transmission Project

Description:
Design and construct the transmission enhancements required to supply the SaskPower 100 MW System Power Sale. Based upon Transmission Facilities study the following network upgrades are required in Manitoba: add a new 44 km 230 kV transmission line between Birtle South (Manitoba) to the Manitoba-Saskatchewan border; terminate at Birtle South station; re- tension the MH section of the P52E line to 100°C design rating; and 230 kV line 869R current transformer (CT) ratio change at Birtle South station.

Justification:
This transmission project will allow for a twenty year 100 MW system power sale which will provide MH with a fixed revenue stream from 2020 to 2040 and a potential to extend the sale beyond the twenty years. There is also the potential for additional surplus sales in the off peak. In addition to the sale, the new interconnection to Saskatchewan will also expand and diversify MH's market access and customer base.

In-Service Date:
June 2021

Revision:
Decrease reflects lower interest, escalation and internal labour rates.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 57.0	$ 2.4	$ 3.8	$ 2.2	$ 18.9	$ 18.1	$ 10.9
Increase (Decrease)	(0.6)	0.7	0.1	0.1	(0.3)	(0.4)	(0.1)
Revised Forecast	$ 56.5	$ 3.1	$ 3.9	$ 2.3	$ 18.6	$ 17.7	$ 10.8

2.1.2 Sustainment

Investments to sustain the current and future performance capability of Manitoba Hydro's generation, transmission, High Voltage Direct Current (HVDC) or distribution assets.

SUSTAINMENT ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Renewal	29	18	7	-	-	-	24	24	55
Sustainment Total	29	18	7	-	-	-	24	24	55

2.1.2.1 System Renewal

Work performed to either replace, refurbish or remove an existing asset as the asset is approaching or is at the end of its useful life, the existing technology is approaching obsolescence, spare parts are not available, and/or the technology is/will be no longer supported. Includes repairs or replacement of assets due to damage caused by the public.

SUSTAINMENT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Renewal										
Kettle Improvements & Upgrades	112	19	13	1	-	-	-	**14**	**14**	**32**
Pointe du Bois Spillway Replacement	576	7	5	6	-	-	-	**11**	**11**	**17**
Pointe du Bois - Transmission	82	4	0	-	-	-	-	**0**	**0**	**4**
System Renewal Total		**29**	**18**	**7**	**-**	**-**	**-**	**24**	**24**	**55**

Project summaries for System Renewal executing projects are provided below:

Kettle Improvements & Upgrades

Description:
Install a new stator frame, core and winding for units 1-4. Perform rotor refurbishment, thrust runner replacement, new excitation transformers, rebabbitting of bearings, excitation upgrade replacements, control and protection system replacements, mechanical systems replacements, and intake gate and wicket gate work for units 1-4.

Justification:
The stator windings at Kettle are polyester bonded mica which is prone to internal degradation as a result of thermal and electrical stresses. There has been a much higher failure rate for stator coils at Kettle than in any of our other generators installed since 1960. Analysis of the internal conditions of the insulation system is ongoing. Unit 4 required repairs due to an incident that occurred in August 2006, where a top clamping finger on the unit broke off and fell into the air gap causing extensive damage to the windings and core. Units 1-4 have a common design deficiency in the clamping finger.

In-Service Date:
November 2017

Revision:
Estimate reflects a decrease for the cancellation of the Units 5-12 stator rewinds. A planning item was identified in the 1990's for the stator rewind of Units 5 to 12 at Kettle GS. This planning item was never formalized into a capital project and has been removed pending further study and analysis. In addition, estimates for work on units 1-3 have been reduced to reflect the awarding of mechanical contracts at a significantly lower cost and lower than expected internal resource requirements. In-service date on units 1-4 are advanced one month from December 2017.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 190.9	$ 25.8	$ 20.7	$ 30.8	$ 30.4	$ -	$ -
Increase (Decrease)	(78.7)	(7.3)	(8.1)	(29.8)	(30.4)	-	-
Revised Forecast	$ 112.2	$ 18.5	$ 12.6	$ 1.0	$ -	$ -	$ -

Pointe du Bois Spillway Replacement

Description:
Design and build a new spillway and new concrete and earth fill dams to replace the existing spillway structures. Estimate includes engineering and environmental studies, community consultation, obtaining regulatory approval, and de-commissioning the existing spillway.

Justification:
Pointe du Bois does not currently meet dam safety guidelines with respect to spillway capacity. A new spillway is required to meet these guidelines.

In-Service Date:
October 2015

Revision:
The estimate reduction reflects planned contract risks not materializing, better than expected contractor performance and reduced costs. The forecast includes costs for remaining site restoration, general civil contract commercial settlement and project contingency.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 594.8	$ 10.4	$ -	$ -	$ -	$ -	$ -
Increase (Decrease)	(19.1)	(3.7)	4.9	5.7	-	-	-
Revised Forecast	$ 575.7	$ 6.8	$ 4.9	$ 5.7	$ -	$ -	$ -

Pointe du Bois - Transmission

Description:
Redevelop Stafford terminal station (formerly Scotland station), replace Bank 7 at Pointe du Bois switchyard station, salvage 66kV P lines between Pointe du Bois and Rover stations, install a 115kV transmission line between Pointe du Bois and Whiteshell stations, add Bank 8 to Pointe du Bois switchyard, install a 66kV line between Ridgeway and Rover stations, and upgrade protection at Slave Falls switchyard station.

Justification:
The 66kV lines P1, P2, P3, and P4 between Pointe du Bois and Rover stations have exceeded their expected serviceable life and pose threats to public and employee safety. The reliability of the transmission system in the Winnipeg Central area has been degraded due to the poor physical condition of these lines. In order to successfully operate the power system and continuously deliver high quality power to our customers and protect the public, the P Lines should be removed. The rebuild of Stafford station is required to address due diligence concerns, including Manitoba Hydro grounding and switching standards and public safety, and to increase Winnipeg Central capacity. This work involves converting the 138kV system to 115kV, so work at Pointe du Bois is also required.

In-Service Date:
December 2016

Revision:
Decrease in estimate due to the transfer of forecasted costs to a planning item of potential future work involving a new 115kV transmission line from Pointe du Bois to Whiteshell and associated terminations, the Bank 8 addition and the salvage of the Pointe du Bois to Rover 66kV lines. Partially offset by an increase associated with the Stafford Station Rebuild and the Slave Falls Switchyard Protection Upgrades. Final in-service advanced 40 months from March 2020.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 118.1	$ 4.5	$ 12.5	$ 12.3	$ 8.2	$ -	$ -
Increase (Decrease)	(35.7)	(0.4)	(12.4)	(12.3)	(8.2)	-	-
Revised Forecast	$ 82.4	$ 4.1	$ 0.1	$ -	$ -	$ -	$ -

2.1.3 Business Operations & Support

Investments to support business operations and are shared or common throughout the corporation.

BUSINESS OPERATIONS SUPPORT ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Town site Infrastructure	15	37	40	37	31	28	174	226	242
Corporate Facilities	3	12	6	1	-	-	19	19	22
Business Operations Support Total	18	49	46	39	31	28	193	246	264

2.1.3.1 Townsite Infrastructure

Expenditures associated with community infrastructure including staff houses, housing and permanent camps. Costs for infrastructure associated with the first-time construction of a new or incremental generation, transmission, HVdc or distribution asset would typically be included with the corresponding project and not classified as Business Operations Support.

BUSINESS OPERATIONS SUPPORT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Town Site Infrastructure										
Gillam Redevelopment & Expansion Program	266	15	37	40	37	31	28	**174**	**226**	**242**

A project summary for the Town Site Infrastructure executing project is provided below.

Gillam Redevelopment and Expansion Program (GREP)

Description:
Redevelop and expand the Town of Gillam infrastructure in Phases 1B, 2 and 3. Phases 2 & 3 will require further definition based on conceptual design and the requirement of Manitoba Hydro's construction of new facilities in the North.

Justification:
Redevelopment of the Town of Gillam is required to address existing operational needs and to prepare for the growth associated with new generation facilities. The GREP will improve the overall quality of infrastructure in Gillam, which will positively affect attraction and retention for existing and new generation facilities. The GREP supports Corporate initiatives to develop the hydroelectric potential of the Lower Nelson River.

In-Service Date:
March 2027

Revision:
Cost flow revision only.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 266.5	$ 37.7	$ 40.1	$ 27.6	$ 26.2	$ 28.7	$ 66.7
Increase (Decrease)	-	(22.7)	(3.2)	12.1	11.0	2.8	14.4
Revised Forecast	$ 266.5	$ 15.1	$ 36.9	$ 39.7	$ 37.2	$ 31.5	$ 81.1

2.1.3.2 Corporate Facilities

Expenditures associated with corporate buildings and properties and the required telecommunications. Corporate buildings are facilities where the primary function is to house staff or storage of equipment/inventory, and include customer service centers, office buildings, warehouses, storage facilities and vehicle service garages. They do not include buildings which have a direct association with the generation, transmission or distribution of energy.

BUSINESS OPERATIONS SUPPORT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Corporate Facilities										
Grand Rapids Fish Hatchery Upgrade & Expansion	23	3	12	6	1	-	-	**19**	**19**	**22**

A project summary for the Corporate Facilities executing project is provided below.

Grand Rapids Hatchery Upgrade and Expansion

Description:
Expand the capacity of the existing facility through tank replacement/reconfiguration and upgrade of supporting water treatment infrastructure. Modifications to the Research Centre (a separate facility on the Grand Rapids hatchery site), including well and potable water supply, to serve as a temporary production facility during hatchery upgrade and expansion, and the purchase of portable satellite facilities to allow for fish rearing during hatchery construction. Install electrical service from Grand Rapids generating station service to the hatchery.

Justification:
Upgrades to the Grand Rapids hatchery are a requirement of the Keeyask Environment Act licence as well as recently introduced national and provincial regulatory requirements for water quality and biosecurity.

In-Service Date:
April 2019

Revision:
Cost flow revision only.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 23.5	$ 4.0	$ 7.4	$ 7.9	$ 1.9	$ -	$ -
Increase (Decrease)	-	(1.2)	4.3	(1.7)	(0.5)	-	-
Revised Forecast	$ 23.5	$ 2.8	$ 11.7	$ 6.2	$ 1.4	$ -	$ -

2.2 ELECTRIC BUSINESS OPERATIONS CAPITAL

Summaries by investment category of significant projects or potential investments within Electric Business Operations capital are provided below. Project summaries are provided for those projects with a total forecast of greater than $50 million. Appendix B provides a listing of executing projects or potential investments with a forecast greater than $1 million and additional details including total project cost, description, and projected in-service date.

ELECTRIC OPERATIONS CAPITAL ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Capacity & Growth	195	183	170	181	139	99	**773**	**1 341**	**2 880**
Sustainment	303	280	284	275	310	337	**1 486**	**3 549**	**8 443**
Business Operations Support	75	63	62	60	62	63	**310**	**659**	**1 511**
Electric Operations Capital Total	**574**	**526**	**517**	**516**	**511**	**499**	**2 569**	**5 549**	**12 835**

2.2.1 Capacity & Growth

Investments required for the expansion of Manitoba Hydro's generation, transmission or High Voltage Direct Current (HVDC) systems. Capacity and Growth is further broken down into System Load Capacity and Customer Connections.

CAPACITY & GROWTH ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Load Capacity	159	144	128	136	95	60	562	890	1 833
Customer Connections - Res., Comm. & Indus.	36	40	43	45	45	39	211	451	1 047
Capacity & Growth Total	195	183	170	181	139	99	773	1 341	2 880

2.2.1.1 System Load Capacity

Addition of new or upgrades to existing transmission or distribution assets for the purpose of increasing the system's capacity to address anticipated load growth not driven by one large customer.

CAPACITY & GROWTH ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Load Capacity									
Steinbach Area 230-66kV Capacity Enhance	2	9	26	17	26	2	**80**	**82**	**84**
Letellier - St. Vital 230kV Transmission	1	1	2	37	14	-	**54**	**54**	**55**
Dawson Road Station - 66/24kV	0	18	19	14	-	-	**51**	**51**	**52**
Southwest Winnipeg 115kV Transmission Improvements	3	0	8	26	1	2	**37**	**37**	**40**
New McPhillips Station - 115kV to 24kV	18	14	14	-	-	-	**28**	**28**	**46**
Stanley Area 115kV to 230kV Migration	2	7	3	0	-	1	**11**	**24**	**26**
St. Vital Station - 115/24kV	27	22	1	-	-	-	**23**	**23**	**50**
Harrow Station - Bank & Feeder Addition	1	4	9	10	-	-	**23**	**23**	**24**
Laverendrye-St. Vital 230kV Line & Breaker Replacement	3	3	1	9	9	0	**21**	**21**	**25**
Lake Winnipeg East System Improvements	31	19	-	-	-	-	**19**	**19**	**49**
Stanley Station 230-66kV Transformer Addition	1	8	4	0	-	-	**13**	**13**	**14**
Souris East Transformer Capacity Enhancement	0	1	7	3	-	-	**11**	**11**	**11**
Heaslip DSC and 8-25kV Conversion	2	5	5	-	-	-	**11**	**11**	**13**
Mohawk Station - Bank & Feeder Addition	8	6	3	2	-	-	**11**	**11**	**18**
Planning Investments:							-		
Marketing & Customer Service Planning Investments	-	-	-	6	19	19	**45**	**175**	**544**
Transmission Planning Investments	-	-	-	-	8	14	**23**	**74**	**224**
Other*	59	25	26	12	17	22	**103**	**233**	**557**
System Load Capacity Total	**159**	**144**	**128**	**136**	**95**	**60**	**562**	**890**	**1 833**
Customer Connections - Residential, Commercial & Industrial	**36**	**40**	**43**	**45**	**45**	**39**	**211**	**451**	**1 047**
Capacity & Growth Total	**195**	**183**	**170**	**181**	**139**	**99**	**773**	**1 341**	**2 880**

* Other includes numerous lower cost projects required for system capacity enhancements for Distribution and Transmission Lines and Stations

Steinbach Area 230-66kV Capacity Enhancement

Description:
Construct a new 230-66kv station in the Grunthal area and sectionalize the St. Vital - Letellier 230kV line into the new station, creating two new 230kV line segments from Grunthal to Letellier and St. Vital to Grunthal. Construct 150 km of 66kV line to tie the existing 66kv system into the new Grunthal station and remove 11km of the 115kV transmission line between the Hanover and Randolph stations. Decommission the 115-66kv Hanover station.

Justification:
The capacity enhancement will address reliability, voltage, and loading issues resulting from above-average load growth in south Winnipeg and southeastern Manitoba including the Steinbach, Richer, and south St. Vital areas. Currently, during severe winter conditions, an equipment outage could result in lengthy customer restoration times. Future restoration efforts are expected to become even more difficult as area loading continues to grow at an accelerated rate, with the potential for an estimated 5,000 customers to experience rolling blackouts during cold winter peak conditions and lasting for an extended period of time. Deferral of this project will place customers at risk of no supply.

In-Service Date:
October 2020

Revision:
Decrease primarily related to cost flow revisions for the New Grunthal 230-66kV Station.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 84.5	$ 2.1	$ 7.5	$ 27.9	$ 22.4	$ 19.5	$ 4.2
Increase (Decrease)	(0.6)	(0.4)	1.9	(2.0)	(5.2)	6.1	(0.2)
Revised Forecast	$ 83.9	$ 1.7	$ 9.4	$ 25.9	$ 17.2	$ 25.6	$ 3.9

Letellier - St. Vital 230kV Transmission

Description:
Design and construct a new 230kV line from the Letellier station to the St. Vital station including associated terminations and communications. Estimate includes environmental licensing and monitoring, and property rights acquisition.

Justification:
The supply to Letellier station must be improved in order to overcome the contingency loading and low voltage problems in the south central area of Manitoba caused by load growth, as well as to maintain export levels on the 230kV Tie Line L20D (Letellier to Drayton) at these increased loads.

In-Service Date:
July 2020

Revision:
Cost flow revision and a one year deferral from July 2019.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 59.0	$ 1.3	$ 1.8	$ 34.5	$ 16.1	$ -	$ -
Increase (Decrease)	(0.2)	(0.1)	(0.4)	(32.7)	20.5	14.0	-
Revised Forecast	$ 58.8	$ 1.2	$ 1.5	$ 1.7	$ 36.7	$ 14.0	$ -

Dawson Road Station - 66/24kV

Description:
Install a 2-bank 66kV/24kV station complete with six feeder positions and two capacitor banks to replace existing 24kV distribution equipment at the Dawson Road station.

Justification:
Justification is based on fulfilling customer-driven demand for electricity in the area as well as providing a reliable supply to customers in contingency situations.

In-Service Date:
March 2020

Revision:
Cost flow revision only.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 51.8	$ 4.2	$ 17.8	$ 20.0	$ 9.6	$ -	$ -
Increase (Decrease)	-	(4.0)	0.6	(0.8)	4.3	-	-
Revised Forecast	$ 51.8	$ 0.3	$ 18.3	$ 19.2	$ 13.9	$ -	$ -

St. Vital Station - 115/24kV

Description:
Install a 3-bank 115/24kV station complete with nine feeder positions and protection to replace the existing 24kV distribution at the St. Vital station.

Justification:
The project addresses the equipment rating concerns currently mitigated by station operating restrictions and customer-driven demand for electricity in the area, as well as restoring reliable station contingency plans.

In-Service Date:
March 2018

Revision:
Cost flow revision only. Trailing costs and salvage work deferred to 2018/19.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 51.3	$ 25.1	$ 22.2	$ -	$ -	$ -	$ -
Increase (Decrease)	-	1.8	(0.6)	1.2	-	-	-
Revised Forecast	$ 51.3	$ 27.0	$ 21.6	$ 1.2	$ -	$ -	$ -

Lake Winnipeg East System Improvements

Description:
Build a new 115/66kV Manigotagan Corner station complete with two 6OMVA transformers, a new 65km, 115kV transmission line from the Pine Falls station to the Manigotagan Corner station and the associated terminations and communications.

Justification:
The Pine Falls station currently operates over firm transformation during winter peak, which could cause customer outages in the Lake Winnipeg East area during a Pine Falls transformer outage. The outage would last greater than a week and affect more than 1,300 permanent customers and more than 13,000 seasonal (summer) customers. The new 115/66kV Manigotagan Corner station and Pine Falls – Manigotagan Corner 115kV transmission line will provide firm capacity for area load for the next 20 years, as well as enable the Bloodvein SVC to control effectively the voltage at Bloodvein, Little Grand Rapids, Beren's River and Poplar River for the next 20 years. It also reduces the loading on the Pine Falls 115/66kV station, thereby accommodating load growth in the Victoria Beach, Grand Beach and Bissett areas.

In-Service Date:
September 2017

Revision:
Increase project scope for the Pine Falls to Manigotagan Corner 115kV transmission line to increase line length by 10km, along with increased cost estimates for civil and electrical construction on the Manigotagan Corner Station, and a deferral of the in-service date by 3 months from June 2017.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 64.6	$ 26.6	$ 10.3	$ -	$ -	$ -	$ -
Increase (Decrease)	11.0	4.0	8.4	-	-	-	-
Revised Forecast	$ 75.5	$ 30.5	$ 18.6	$ -	$ -	$ -	$ -

Rockwood East 230/115kV Station

Description:
Design and construct a new 230/115kV Rockwood East station adjacent to 230kV circuits A3R (Ashern-Rosser) and S65R (Silver-Rosser) including associated equipment, protection, control and communication systems. Sectionalize and extend 230kV and 115kV transmission lines as required and provide communication and protection upgrades.

Justification:
Construction of the Rockwood East station with three 115kV line terminations would alleviate the overload scenarios for Rosser 230/115kV Banks 2 and 4 and for 115kV circuits CR4 or CR2 between Rosser and Parkdale stations. It would also increase the 115kV capacity in the Rosser/Parkdale/Selkirk area. The existing Parkdale 115/66kV station switchyard has very limited opportunity for adding new capacity due to the station's poor condition and limited space.

In-Service Date:
February 2016

Revision:
Decrease primarily due to a reduction in project contingency requirements. Additional in-service date of February 2016 added to the 230kV T/L A3R Sectionalization into Rockwood East project.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 53.2	$ 0.2	$ -	$ -	$ -	$ -	$ -
Increase (Decrease)	(3.2)	-	-	-	-	-	-
Revised Forecast	$ 50.0	$ 0.2	$ -	$ -	$ -	$ -	$ -

2.2.1.2 Customer Connections - Residential, Commercial & Industrial

New customer-driven connections for domestic service resulting from residential, commercial and/or industrial customer load. This category is populated with numerous low cost projects.

CAPACITY & GROWTH ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Customer Connections - Res., Comm. & Indus.	36	40	43	45	45	39	211	451	1 047

2.2.2 Sustainment

Investments to sustain the current and future performance capability of Manitoba Hydro's generation, transmission, High Voltage Direct Current (HVDC) or distribution assets. Sustainment is further broken down into System Renewal, Mandated Compliance, System Efficiency and Decommissioning.

SUSTAINMENT ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Renewal	225	217	230	223	249	287	1 206	3 062	7 285
Mandated Compliance	56	39	37	35	44	35	190	302	652
System Efficiency	22	23	17	17	16	14	88	178	486
Decommissioning	0	0	0	0	1	1	2	6	21
Sustainment Total	303	280	284	275	310	337	1 486	3 549	8 443

2.2.2.1 System Renewal

Work performed to either replace, refurbish or remove an existing asset as the asset is approaching or is at the end of its useful life, the existing technology is approaching obsolescence, spare parts are not available, and/or the technology is/will be no longer supported. Includes repairs or replacement of assets due to damage caused by the public.

SUSTAINMENT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Renewal										
Bipole 2 Thyristor Valve Replacement	236	-	-	0	1	1	14	**16**	**236**	**236**
Brandon Units 6 & 7 "C" Overhaul Program	51	-	-	-	-	1	13	**14**	**51**	**51**
HVDC Transformer Replacement Program	178	8	14	10	0	0	1	**26**	**41**	**68**
Transmission Transformer Sustainment Capital Program	64	-	-	-	0	0	2	**3**	**32**	**64**
Pine Falls GS Units 1-4 Major Overhauls	89	19	20	10	-	-	-	**30**	**30**	**49**
Slave Falls Spillway Rehabilitation	29	0	0	1	8	12	5	**26**	**29**	**29**
HVDC BP2 Valve Hall Wall Bushing Replacement	19	0	1	2	0	0	4	**7**	**19**	**19**
HVDC Dorsey Synch Condenser Refurbishmt	74	8	7	1	0	0	0	**8**	**16**	**24**
Adelaide Station - 66/12kV	62	32	10	3	1	-	-	**14**	**14**	**47**
HVDC BP2 Refrigerant Condenser Replacement	13	-	-	-	-	-	-	**-**	**13**	**13**
Long Spruce Fire Protection System Replacement	16	2	1	11	-	-	-	**13**	**13**	**15**
HVDC - Gapped Arrester Replacement	16	2	3	3	1	3	3	**12**	**12**	**14**
Slave Falls G.S. Creek Spillway Rehabilitation	20	7	11	0	-	-	-	**11**	**11**	**18**
Winnipeg Area Capacitor Bank Additions	11	-	-	5	6	0	-	**11**	**11**	**11**
Transmission Line Wood Pole Structure Replacement Program	14	1	1	1	1	1	1	**5**	**10**	**11**
Kettle Fire Protection System Replacement	10	-	1	9	-	-	-	**10**	**10**	**10**
BP1 & 2 DC Converter Transformer Bushing Replacement	9	0	0	0	2	3	2	**7**	**9**	**9**
Planning Investments:										
Generation & Wholesale Planning Investments		-	-	25	63	63	75	**226**	**744**	**1 753**
Transmission Planning Investments		-	-	-	-	24	41	**66**	**215**	**651**
Marketing & Customer Service Planning Investments		-	-	-	8	23	24	**55**	**215**	**669**
Other*		146	147	151	132	116	102	**647**	**1 331**	**3 525**
System Renewal Total		**225**	**217**	**230**	**223**	**249**	**287**	**1 206**	**3 062**	**7 285**

*Other includes numerous lower cost projects required for HVDC upgrades and asset replacement as well as generating station upgrades, equipment replacements, distribution & transmission pole replacements and distribution transformer & bank replacements. The suspended projects for Pointe du Bois Unit & Accessories Replacement and Safety Upgrades are included in Other.

Bipole 2 Thyristor Valve Replacement

Description:
Removal of the existing eight (8) thyristor valve groups and their controls, and replace them with eight new de-ionized water cooled HVDC thyristor valve groups and controls.

Justification:
The Bipole 2 thyristor valves and controls are nearing the end of their useful life and require replacement. Replacing the existing thyristor valve groups and controls with new ones will result in reducing the probability of forced outages. This will result in a significant decrease in failures, reduce maintenance requirements, and generally improved reliability for Bipole 2.

In-Service Date:
March 2027

Revision:
Cost flow revision to reflect postponing construction until after Bipole III Reliability project in-service. Final in-service date has been deferred forty one months from October 2023.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 235.8	$ -	$ 2.2	$ 13.4	$ 23.2	$ 57.8	$ 139.2
Increase (Decrease)	0.1	-	(2.2)	(12.9)	(22.7)	(56.5)	94.4
Revised Forecast	$ 236.0	$ -	$ -	$ 0.5	$ 0.5	$ 1.3	$ 233.6

Brandon Units 6 & 7 "C" Overhaul Program

Description:
Perform C inspections/overhauls of the Brandon gas turbines Unit 6 & 7 when each of them acquires 24,000 Equivalent Operating Hours (EOH).

Justification:
The reliability of the hot gas path components cannot be predicted after 24,000 EOH. Failure of hot gas path parts could lead to significant collateral damage and an extended forced outage of the units.

In-Service Date:
November 2024

Revision:
Decrease due to revised interest, escalation and internal labour rates.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 50.6	$ -	$ -	$ -	$ -	$ 1.1	$ 49.4
Increase (Decrease)	(0.1)	-	-	-	-	(0.0)	(0.1)
Revised Forecast	$ 50.5	$ -	$ -	$ -	$ -	$ 1.1	$ 49.4

HVDC Transformer Replacements

Description:
Maintain an inventory of eight spare converter transformers for use at Radisson, Henday and Dorsey converter stations. Plan for the proactive replacement of critical red-lined transformers as necessary.

Justification:
Maintenance of an inventory of spare converter transformers will limit outage durations ad outage costs in the event of converter transformer failures.

In-Service Date:
November 2024

Revision:
Cost flow revisions only.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 178.4	$ 12.8	$ 7.2	$ 7.5	$ 9.2	$ 7.8	$ 9.5
Increase (Decrease)	-	(4.4)	7.2	2.4	(8.8)	(7.7)	6.6
Revised Forecast	$ 178.4	$ 8.4	$ 14.4	$ 9.9	$ 0.4	$ 0.1	$ 16.1

Transmission Transformer Sustainment Program

Description:
Replace or refurbish approximately twenty-one transmission system transformers over the next twenty years. The estimate is based on replacing four large transformers (>8OMVA), ten small transformers, and seven tap changers. Estimate assumes minimal modifications to associated foundations/structures and to protection and controls.

Justification:
The proactive replacement or refurbishment of transformers will reduce system failure risks, help maintain system reliability levels, and when based on economic end-of-life analysis, will reduce repair and refurbishments costs associated with the transmission transformer asset base.

In-Service Date:
September 2032

Revision:
Decrease due to revised interest and escalation.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 67.6	$ -	$ -	$ -	$ 0.2	$ 0.3	$ 32.7
Increase (Decrease)	(3.2)	-	-	-	(0.0)	(0.0)	(1.5)
Revised Forecast	$ 64.4	$ -	$ -	$ -	$ 0.2	$ 0.3	$ 31.2

Pine Falls Units 1-4 Major Overhauls

Description:
Rewind Units 1-4 generators, install two (2) transformers, two (2) propeller type turbines and machine the associated water passage components. Also includes modernizing various components on Units 1 – 4 to present standards.

Justification:
Assessment of the mechanical systems has identified concerns in terms of obsolete equipment, safety, fire risk and adaptability to present day operating conditions and standards. Upgrading is necessary to ensure reliable safe and economical operation. Pine Falls consistently spills more water than the other Winnipeg River plants. Additional generation can be obtained (approximately 17%) with increased discharge capability. Tests have confirmed that the two stator windings are in danger of failure at any time.

In-Service Date:
December 2018

Revision:
Decrease due to revised interest, escalation and internal labour rates.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 90.0	$ 18.2	$ 22.0	$ 10.6	$ -	$ -	$ -
Increase (Decrease)	(1.2)	0.9	(1.7)	(0.7)	-	-	-
Revised Forecast	$ 88.8	$ 19.1	$ 20.3	$ 9.9	$ -	$ -	$ -

HVDC Dorsey Synchronous Condenser Refurbishment

Description:
Mechanical refurbishment of all nine (9) Dorsey Synchronous Condensers including stator re-wedging, refurbishment of bearings, rotor, and poles, and replacement of protection & control cubicles, Motor Control Center (MCC), excitation system and cables. Also includes replacement of the H2/CO2 ventilation and detection systems on all condensers except SC9Y, vibration monitoring, pony motor brushgear, and liquid mixing valves.

Justification:
Synchronous condensers are required for proper operation of the HVDC system, voltage regulation of the southern AC system and to provide reactive power for power export to the United States. A major inspection and overhaul of each machine is necessary to prevent catastrophic failure, involving the rotors and rotor bolts as indicated by the failures of SC12Y in 1987 and SC11Y in 1988. The cost of repairing a failure when combined with the inability to export power will well exceed the cost of major inspection and overhaul.

In-Service Date:
March 2026

Revision:
Increase due to the deferral of Pole 1 Synchronous Condenser (SC) overhauls to reflect the results of a review conducted by System Planning on the requirement of Pole 1 SCs post Riel SC in-service. Final in-service date deferred 53 months from October 2021.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 73.1	$ 7.2	$ 7.2	$ 2.3	$ 2.4	$ 2.4	$ 1.5
Increase (Decrease)	0.5	0.4	(0.2)	(1.8)	(2.4)	(2.3)	7.1
Revised Forecast	$ 73.6	$ 7.5	$ 6.9	$ 0.5	$ 0.0	$ 0.0	$ 8.6

Adelaide Station 66/12kV

Description:
Construct a new Adelaide station with three 66-12kV, 30 MVA transformers and three line-ups of switchgear for twenty-three feeder positions. Install a control building for 12kV switchgear, communication, control and protection equipment and a 66kV GIS building/equipment for station supply terminations. Extend the 66kV line to terminate at the new station and install new distribution ductline egresses from the new station to connect to the existing system in downtown area.

Justification:
Constructing the new Adelaide station will allow for the decommissioning of the King station, addressing all concerns with safety and aging infrastructure at the King station. The Adelaide station also provides sufficient area capacity to allow the proposed William station project to be deferred. Five feeders from the new Adelaide station will be expressed through new ductline towards the Health Science Centre (HSC) to aid the Sherbrook station in supplying that area. The Sherbrook station does not have capacity to continue to handle load growth around the HSC complex by itself.

In-Service Date:
March 2020

Revision:
Cost flow revision only.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 62.1	$ 27.3	$ 6.9	$ 3.4	$ 0.7	$ -	$ -
Increase (Decrease)	-	4.8	3.5	(0.2)	0.1	-	-
Revised Forecast	$ 62.1	$ 32.1	$ 10.4	$ 3.2	$ 0.9	$ -	$ -

Madison Station - 115/24kV

Description:
Build a new 115-24kV Madison station, new and upgraded feeders, and conversion of St. James, Ness, Berry and King Edward station feeders from 4kV to 24kV. Install 1.5km of 115kV cable from St. James to Madison stations and protection upgrades at Rosser, Inkster Sherbrook, Mohawk and La Verendrye stations.

Justification:
This project is required to ensure firm supply and a reliable system in the St. James area.

In-Service Date:
March 2018

Revision:
Cost flow revisions due to delays impacting scheduled commissioning and associated activities. Work that cannot start until equipment has been removed from the St. James Station has been deferred to 2018. Final in-service has been deferred twelve months from March 2017.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 87.1	$ 9.7	$ -	$ -	$ -	$ -	$ -
Increase (Decrease)	-	2.0	4.5	-	-	-	-
Revised Forecast	$ 87.1	$ 11.7	$ 4.5	$ -	$ -	$ -	$ -

Great Falls Unit 4 Overhaul

Description:
Major overhaul to generating Unit 4 including generator rewind, turbine re-runnering, new water passage embedded components, one 3-phase unit transformer, and modernization of components.

Justification:
The re-runnering and major overhaul will provide an opportunity to upgrade/modernize the unit while taking advantage of an already planned outage for the intake gates. The re-runnering will add both capacity and efficiency. The existing transformer is in poor condition and water passage components are starting to fail. The overhaul will increase reliability and extend the asset life by 40 to 50 years.

In-Service Date:
Feburary 2016

Revision:
Increase in estimate was a result of a delay in the in-service due to unforeseen severe cracking in the upper bracket resulting in higher mechanical contract & equipment costs, internal resource requirements and higher interest costs. The in-service date was deferred five months from September 2015.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 48.8	$ 1.6	$ -	$ -	$ -	$ -	$ -
Increase (Decrease)	3.8	(0.9)	0.1	-	-	-	-
Revised Forecast	$ 52.5	$ 0.6	$ 0.1	$ -	$ -	$ -	$ -

Pointe du Bois Unit & Accessories Replacement

Description:
Manitoba Hydro is suspending the Pointe du Bois Unit & Accessories and Pointe du Bois Safety Upgrade projects pending further evaluation of the options for the facility in order to make an informed decision on the overall life cycle plan. The economic viability of ongoing investment in the generating facilities at Pointe du Bois has become less conclusive as costs to upgrade the powerhouse and replace the units have increased, the impacts on transmission and distribution systems and associated costs have been better defined, and the value of generation has decreased. The evaluation will consider options spanning from decommissioning to upgrades of units and accessories.

Justification:
The long term economic viability of the Pointe du Bois Generating Station has become less conclusive.

In-Service Date:
Project suspended

Revision:
The project has been suspended pending further evaluation which is expected to be completed by the end of fiscal year 2017/18. A decision outcome is expected in 2018.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 138.4	$ 10.9	$ 32.1	$ 30.0	$ 31.4	$ 8.8	$ 3.5
Increase (Decrease)	(116.2)	(9.3)	(32.1)	(30.0)	(31.4)	(8.8)	(3.5)
Revised Forecast	$ 22.3	$ 1.6	$ -	$ -	$ -	$ -	$ -

Pointe du Bois GS Safety Upgrades

Description:
Manitoba Hydro is suspending the Pointe du Bois Unit & Accessories and Pointe du Bois Safety Upgrade projects pending further evaluation of the options for the facility in order to make an informed decision on the overall life cycle plan. The economic viability of ongoing investment in the generating facilities at Pointe du Bois has become less conclusive as costs to upgrade the powerhouse and replace the units have increased, the impacts on transmission and distribution systems and associated costs have been better defined, and the value of generation has decreased. The evaluation will consider options spanning from decommissioning to upgrades of units and accessories.

Justification:
The long term economic viability of the Pointe du Bois Generating Station has become less conclusive.

In-Service Date:
Project Suspended

Revision:
The project has been suspended pending further evaluation which is expected to be completed by the end of fiscal year 2017/18. A decision outcome is expected in 2018.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 50.0	$ 13.4	$ 11.3	$ 4.8	$ 0.5	$ 12.7	$ -
Increase (Decrease)	(43.5)	(12.6)	(11.3)	(4.8)	(0.5)	(12.7)	-
Revised Forecast	$ 6.5	$ 0.8	$ -	$ -	$ -	$ -	$ -

2.2.2.2 Mandated Compliance

Investments required to address application of legislative, legal, regulatory or corporate policy, or to address requests from government or other agencies to relocate Manitoba Hydro assets to accommodate other infrastructure.

SUSTAINMENT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Mandated Compliance										
Transmission Line Upgrades for Improved Clearance	75	5	5	5	5	17	17	**49**	**66**	**71**
Water Licenses & Renewals	99	14	9	9	9	8	0	**34**	**34**	**48**
Generation North Sewer & Water Installation or Upgrades	31	4	7	0	1	2	3	**13**	**18**	**22**
AMD PCB Bushing Elimination Program	19	1	2	2	3	3	3	**12**	**18**	**19**
Public Water Safety and Security	18	2	2	2	1	3	-	**8**	**8**	**10**
Other**	-	31	15	19	15	12	12	**74**	**158**	**482**
Mandated Compliance Total		**56**	**39**	**37**	**35**	**44**	**35**	**190**	**302**	**652**

** Other includes numerous lower cost projects mandated by provincial laws or NERC with regards to minimum clearances, capacity, street lighting and diesel sites.

Transmission Line Upgrades for Improved Clearance

Description:
This project consists of a nine year program to upgrade over 1000 transmission line spans to meet CSA Standards for line clearance. A priority listing of the transmission lines and spans requiring mitigation will be developed based on assessment work considering operational and safety risks specific to each line/span.

Justification:
This program addresses discrepancies between the design ratings and actual field ratings of transmission lines thereby ensuring continued reliability and operation of the electrical system as well as mitigating risks to public safety due to insufficient line clearance.

In-Service Date:
March 2023

Revision:
Decrease due to a reduction in the estimated number of spans requiring remediation as a result of completing an initial assessment of the entire MH transmission line system (115kV and above).

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 152.9	$ 9.0	$ 9.1	$ 25.0	$ 25.5	$ 26.0	$ 52.7
Increase (Decrease)	(78.2)	(4.3)	(4.1)	(19.9)	(20.3)	(9.3)	(18.3)
Revised Forecast	$ 74.7	$ 4.6	$ 5.0	$ 5.1	$ 5.2	$ 16.7	$ 34.4

Water Licenses and Renewals

Description:
Conduct hydraulic studies, geotechnical assessments, property status and severance line determinations, mapping, license documentation, environmental reviews, and community informational sessions necessary to secure license finalization and/or renewals for Manitoba Hydro's hydraulic plants.

Justification:
All hydraulic facilities must be authorized under water power licenses and these licenses need to be clearly in force to significantly reduce risk exposure, maintain operating flexibility, maximize export revenues, and contribute to financial strength.

In-Service Date:
December 2021

Revision:
Additional funding is required for the Aquatic Data Collection programming to accommodate one additional year to support scheduled licensing activities and reflect monitoring commitments. These programs include the Coordinated Aquatic Monitoring Program (CAMP), the South Indian Lake Environmental Monitoring Program (SIL), and the Reservoir Greenhouse Gas Monitoring (RGHGM) program. Under Regional Cumulative Effects Assessment (RCEA), Water Power Act licensing is now covering 86% of the RCEA costs instead of 67%, increasing the 2016/17 budget as well as an adjustment from Keeyask costs Assessment from 2015/16. The Integrated Summary Report has taken significantly more time and resources to complete than originally anticipated. Increased WPA costs for an additional year in 2020/21.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	$ 89.3	$ 10.6	$ 9.2	$ 8.4	$ 7.7	$ 0.1	$ -
Increase (Decrease)	9.7	3.0	(0.6)	0.5	1.3	7.7	0.0
Revised Forecast	$ 99.0	$ 13.6	$ 8.6	$ 8.8	$ 9.0	$ 7.8	$ 0.0

2.2.2.3 System Efficiency

Addition of new assets or work performed on existing assets in order to improve the operation of the system. Such enhancements are aimed at reducing costs, minimizing the frequency and duration of outages and/or preventing equipment damage.

SUSTAINMENT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
System Efficiency										
Advanced Information Management	15	5	10	-	-	-	-	**10**	**10**	**15**
Other***	-	17	14	17	17	16	14	**78**	**168**	**471**
System Efficiency Total		**22**	**23**	**17**	**17**	**16**	**14**	**88**	**178**	**486**

***Other includes numerous lower cost projects for transmission & distribution stations and lines which provide operational enhancements and improved reliability

2.2.2.4 Decommissioning

Expenditures associated with the permanent decommissioning of Manitoba Hydro generation, transmission, or distribution assets. The removal of an asset in preparation for the construction of an asset in its place is categorized within System Renewal.

SUSTAINMENT ($ Millions)	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Decommissioning Total		-	-	-	-	**1**	**1**	**2**	**6**	**21**

2.2.3 Business Operations Support

Investments to support business operations and are shared or common throughout the corporation including:

- INFORMATION TECHNOLOGY - Expenditures associated with Information Technology assets for the data centre(s), network connectivity, infrastructure, security and business systems including hardware and printers, software licenses, installation and implementations. This category does not include technology assets which operate the electric or natural gas systems.

- FLEET - Expenditures associated with corporate vehicles, mobile equipment and trailers. Primarily includes cars, vans, SUVs, trucks, aerial devices, radial boom diggers, cranes, construction equipment, and all recreation equipment and trailers. These assets typically transport people or goods over land (both on and off road) or water, or is a mobile piece of equipment.

- CORPORATE FACILITIES - Expenditures associated with corporate buildings and properties and the required telecommunications. Corporate buildings are facilities where the primary function is to house staff or storage of equipment/inventory, and include customer service centers, office buildings, warehouses, storage facilities and vehicle service garages. They do not include buildings which have a direct association with the generation, transmission or distribution of energy.

- TOOLS AND EQUIPMENT - Expenditures on tools and equipment used by maintenance crews and/or field staff while working on maintenance or capital projects. Also includes specialized tools and equipment used by design staff to test apparatus and systems.

- GENERATION BUILDINGS AND GROUNDS – Expenditures associated with site buildings related to generating station assets which are primarily designed for operations, as well as property, fencing, roads, railway spurs, water & sewer, public safety, security, PCB, fire suppression and drainage.

- TOWNSITE INFRASTRUCTURE - Expenditures associated with community infrastructure including staff houses, housing and permanent camps. Costs for infrastructure associated with the first-time construction of new or incremental generation, transmission, HVdc or distribution asset, would typically be included with the corresponding project and not classified as Business Operations Support.

BUSINESS OPERATIONS SUPPORT ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Information Technology	25	27	27	20	26	26	**125**	**263**	**576**
Fleet	17	15	15	12	15	16	**73**	**157**	**348**
Corporate Facilities	25	12	12	20	13	13	**70**	**138**	**311**
Tools and Equipment	5	5	5	5	5	4	**24**	**52**	**159**
Generation Buildings and Grounds	-	-	1	3	3	3	**10**	**32**	**75**
Town Site Infrastructure	3	4	1	1	1	1	**9**	**16**	**42**
Business Operations Support Total	**75**	**63**	**62**	**60**	**62**	**63**	**310**	**659**	**1 511**

2.3 NATURAL GAS BUSINESS OPERATIONS CAPITAL

Summaries of Natural Gas Operations Capital by Investment Category are provided below.

($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Natural Gas Business Operations Capital									
Capacity & Growth	34	19	18	16	17	18	**87**	**188**	**447**
Sustainment	17	13	15	13	14	15	**69**	**154**	**365**
	51	**31**	**32**	**29**	**31**	**33**	**156**	**343**	**812**

2.3.1 Capacity & Growth

Investments required for the expansion of Manitoba Hydro's gas transmission main and station assets, distribution main and station assets as well as cathodic protection assets. Capacity & Growth includes:

- CUSTOMER CONNECTIONS - Addition of new customer-driven connections for domestic service resulting from commercial and/or industrial customer load.
- SYSTEM LOAD CAPACITY - Addition of new or upgrades to existing transmission or distribution assets for the purpose of increasing the system's capacity to address load growth not driven by one large customer.

CAPACITY & GROWTH ($ Millions)	2017 Update	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Customer Connections - Residential, Commercial & Industrial	16	16	16	15	16	16	**79**	**172**	**394**
System Load Capacity	18	3	1	1	1	1	**8**	**17**	**54**
Capacity & Growth Total	**34**	**19**	**18**	**16**	**17**	**18**	**87**	**188**	**447**

2.3.2 Sustainment

Investments to sustain the current and future performance capability of Manitoba Hydro's gas transmission main and station assets, distribution main and station assets as well as cathodic protection assets. Sustainment includes:

- MANDATED COMPLIANCE - Investments required to address application of legislative, legal, regulatory or corporate policy, or to address requests from government or other agencies to relocate Manitoba Hydro assets to accommodate other infrastructure.

- SYSTEM RENEWAL – Work performed to either replace, refurbish or remove an existing asset as the asset is approaching or is at the end of its useful life, the existing technology is approaching obsolescence, spare parts are not available, and/or the technology is/will be no longer supported. Includes repairs or replacement of assets due to damage caused by the public.

- SYSTEM EFFICIENCY - Addition of new assets or work performed on existing assets in order to improve the operation of the system. Such enhancements are aimed at reducing costs, minimizing the frequency and duration of outages and/or preventing equipment damage.

SUSTAINMENT ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Mandated Compliance	5	6	8	7	8	8	36	83	194
System Renewal	4	5	5	4	5	5	23	51	119
System Efficiency	7	2	2	2	2	2	9	20	51
Sustainment Total	17	13	15	13	14	15	69	154	365

2.4 DEMAND SIDE MANAGEMENT

CEF16 includes expenditures which identify demand side management investments for both Electric and Gas operations not recognized as period costs.

DEMAND SIDE MANAGEMENT ($ Millions)	2017 Outlook	2018	2019	2020	2021	2022	2018-2022 5 Year Total	2018-2027 10 Year Total	2017-2036 20 Year Total
Electric	50	56	99	94	89	87	425	752	1 557
Natural Gas	10	10	12	11	11	11	54	107	204
Demand Side Management Total	**60**	**66**	**111**	**105**	**100**	**98**	**480**	**858**	**1 762**

2.4.1 Electric Demand Side Management

Expenditures related to pursuit of electric energy conservation and efficiency activities designed to manage the demand for energy.

Electric DSM Programs

Description:
Design, implement and deliver incentive based DSM conservation programs to reduce electricity consumption in Manitoba.

Justification:
The Electric DSM plan is cost effective as a resource option and is included in Manitoba Hydro's Power Resource Plan (PRP). The DSM plan provides customers with exceptional value through the implementation of cost-effective energy conservation programs that are designed to minimize the total cost of energy services to customers, position the Corporation as a national leader in implementing cost-effective energy conservation and alternative energy programs, protect the environment and promote sustainable energy supply and service.

In-Service Date:
Ongoing

Revision:
Revisions to energy saving and expenditures for a number of programs to reflect current market information and changes in design to pursue cost-effective market-achievable savings. Forecast in the latter years has been decreased to align with load reduction forecasts. With the adoption of IFRS in 2015/16, the demand side management programs continue to be deferred, under the interim standard that continues to permit rate-regulated accounting.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	NA	$ 58.0	$ 98.8	$ 94.6	$ 90.2	$ 92.4	$ 465.8
Increase (Decrease)		(7.9)	(43.1)	4.8	4.1	(3.6)	(52.4)
Revised Forecast	NA	$ 50.1	$ 55.7	$ 99.4	$ 94.3	$ 88.9	$ 413.4

2.4.2 Natural Gas Demand Side Management

Expenditures related to pursuit of gas energy conservation and efficiency activities designed to manage the demand for energy.

Natural Gas DSM Programs

Description:
Design, implement and deliver incentive based DSM conservation programs to reduce natural gas consumption in Manitoba

Justification:
The Natural Gas DSM plan encourages the efficient use of natural gas. The DSM plan provides customers with exceptional value through the implementation of cost-effective energy conservation programs that are designed to minimize the total cost of energy services to customers, position the Corporation as a national leader in implementing cost-effective energy conservation and alternative energy programs, protect the environment and promote sustainable energy supply and service.

In-Service Date:
Ongoing.

Revision:
Revisions to energy saving and expenditures for a number of programs to reflect current market information and changes in design to pursue cost-effective market-achievable savings. Energy savings and expenditures associated with existing programs have been refined to reflect current information and planned future outcomes. With the adoption of IFRS in 2015/16, the demand side management programs continue to be deferred, under the interim standard that continues to permit rate-regulated accounting.

	Total	2017	2018	2019	2020	2021	2022-27
Previously Approved	NA	$ 12.6	$ 10.5	$ 9.3	$ 9.3	$ 9.1	$ 53.7
Increase (Decrease)		(2.9)	(0.2)	2.4	1.5	1.7	9.5
Revised Forecast	NA	$ 9.7	$ 10.3	$ 11.7	$ 10.8	$ 10.8	$ 63.2

Appendix A

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF16)

(in millions of dollars)

	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	20 Year Total
Major New Generation & Transmission														
Executing Projects														
Keeyask - Generation	8 726.0	914.2	1 077.5	1 290.5	1 116.7	867.9	707.1	329.9	58.2	2.4	1.5	0.9	5 452.6	6 366.8
Bipole III Reliability:														
Bipole III - Transmission Line	1 957.6	477.0	511.2	345.5	9.0	1.9	-	-	-	-	-	-	867.7	1 344.6
Bipole III - Converter Stations	2 780.7	821.5	679.0	286.3	8.0	0.6	-	-	-	-	-	-	973.9	1 795.4
Bipole III - Collector Lines	246.6	55.1	36.4	24.4	-	-	-	-	-	-	-	-	60.8	116.0
Bipole III - Community Development Initiative	56.6	2.6	2.7	0.9	-	-	-	-	-	-	-	-	3.6	6.2
Bipole III Total	5 041.5	1 356.2	1 229.3	657.1	17.1	2.5	-	-	-	-	-	-	1 906.0	3 262.2
Wuskwatim - Generation	1 421.6	4.1	5.4	-	-	-	-	-	-	-	-	-	5.4	9.5
Pointe du Bois Spillway Replacement	575.7	6.8	4.9	5.7	-	-	-	-	-	-	-	-	10.6	17.4
Manitoba-Minnesota Transmission Project	453.2	7.0	86.8	114.3	82.9	146.8	-	-	-	-	-	-	430.8	437.8
Conawapa - Generation	379.8	18.3	-	-	-	-	-	-	-	-	-	-	-	18.3
Kelsey Improvements & Upgrades	336.9	3.7	7.3	9.0	-	-	-	-	-	-	-	-	16.3	20.0
Riel 230/500kV Station	319.9	1.4	-	-	-	-	-	-	-	-	-	-	-	1.4
Gillam Redevelopment and Expansion Program (GREP)	266.5	15.1	36.9	39.7	37.2	31.5	28.3	28.0	16.9	2.1	2.1	3.8	226.5	241.5
Kettle Improvements & Upgrades	112.2	18.5	12.6	1.0	-	-	-	-	-	-	-	-	13.6	32.1
Pointe du Bois - Transmission	82.4	4.1	0.1	-	-	-	-	-	-	-	-	-	0.1	4.1
Manitoba-Saskatchewan Transmission Project	56.5	3.1	3.9	2.3	18.6	17.7	10.8	-	-	-	-	-	53.3	56.4
Grand Rapids Fish Hatchery Upgrade & Expansion	23.5	2.8	11.7	6.2	1.4	-	-	-	-	-	-	-	19.2	22.1
Subtotal Executing Projects		2 355.4	2 476.2	2 125.9	1 273.9	1 066.4	746.1	357.9	75.1	4.5	3.6	4.7	8 134.3	10 489.7
Long Term Planning Investments														
Single Cycle Gas Turbines & Thermal Transmission	NA	-	-	-	-	-	-	-	-	-	-	-	-	1.6
Subtotal Planning Items		-	-	-	-	-	-	-	-	-	-	-	-	1.6
MAJOR NEW GENERATION & TRANSMISSION TOTAL		**2 355.4**	**2 476.2**	**2 125.9**	**1 273.9**	**1 066.4**	**746.1**	**357.9**	**75.1**	**4.5**	**3.6**	**4.7**	**8 134.3**	**10 491.3**

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF16)

(in millions of dollars)

	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	20 Year Total
Business Operations Capital														
Electric Segment														
Generation & Wholesale														
Executing Projects														
Pine Falls Units 1-4 Major Overhauls	88.8	19.1	20.3	9.9	-	-	-	-	-	-	-	-	30.1	49.2
Great Falls Unit 4 Overhaul	52.5	0.6	0.1	-	-	-	-	-	-	-	-	-	0.1	0.7
Water Licenses & Renewals	99.0	13.6	8.6	8.8	9.0	7.8	0.0	-	-	-	-	-	34.3	47.9
Projects between $2 Million & $50 Million	703.4	51.5	60.2	32.1	8.5	5.1	3.6	1.9	3.5	0.2	-	-	115.1	166.6
Subtotal Executing Projects		84.8	89.2	50.9	17.5	12.9	3.6	1.9	3.5	0.2	-	-	179.6	264.4
Potential Investments														
Brandon Units 6 & 7 "C" Overhaul Program	50.5	-	-	-	-	1.1	13.0	11.9	13.5	11.0	-	-	50.5	50.5
Investments between $2 Million & $50 Million	28.7	-	-	0.5	7.8	12.1	5.1	3.1	-	-	-	-	28.7	28.7
Subtotal Potential Investments		-	-	0.5	7.8	13.3	18.1	15.0	13.5	11.0	-	-	79.2	79.2
Programs	NA	20.4	20.8	21.2	21.7	22.1	22.5	26.4	23.5	23.9	24.4	24.9	231.4	507.4
Planning Investments														
Generator and Turbine Replacements and Refurbishment	NA	-	-	2.0	10.0	10.0	20.0	30.0	40.0	60.0	60.0	60.0	292.0	772.0
Governor & Excitation Replacements	NA	-	-	4.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0	80.0	230.0
Transformer and Breaker Replacements	NA	-	-	4.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	76.0	157.0
Water Licenses & Renewals	NA	-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	54.0	108.0
AC/DC Electrical Upgrades	NA	-	-	-	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	72.0	153.0
Infrastructure Upgrades/Replacements	NA	-	-	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	52.0	96.0
Powerhouse Upgrades/Refurbishment	NA	-	-	4.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	100.0	208.0
Water Control Refurbishment/Upgrades	NA	-	-	2.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	50.0	104.0
Subtotal Planning Investments		-	-	26.0	66.0	66.0	78.0	88.0	98.0	118.0	118.0	118.0	776.0	1 828.0
Portfolio Adjustments	NA	(2.2)	(15.0)	1.4	(3.0)	(4.2)	(7.6)	3.7	(3.5)	(10.3)	3.3	5.8	(29.3)	139.9
Generation & Wholesale Total		**103.0**	**95.0**	**100.0**	**110.0**	**110.0**	**114.6**	**135.0**	**135.0**	**142.9**	**145.7**	**148.7**	**1 236.9**	**2 819.0**

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF16)

(in millions of dollars)

	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	20 Year Total
Business Operations Capital														
Electric Segment														
Transmission														
Executing Projects														
Rockwood East 230/115kV Station	50.0	0.2	-	-	-	-	-	-	-	-	-	-	-	0.2
Lake Winnipeg East System Improvements	75.5	30.5	18.6	-	-	-	-	-	-	-	-	-	18.6	49.2
Letellier - St. Vital 230kV Transmission	58.8	1.2	1.5	1.7	36.7	14.0	-	-	-	-	-	-	53.8	55.0
Transmission Line Upgrades for Improved Clearance	74.7	4.6	5.0	5.1	5.2	16.7	17.0	17.3	-	-	-	-	66.3	71.0
Steinbach Area 230-66kV Capacity Enhance	83.9	1.7	9.4	25.9	17.2	25.6	1.9	2.0	-	-	-	-	81.9	83.6
HVDC Dorsey Synchronous Condenser Refurbishment	73.6	7.5	6.9	0.5	0.0	0.0	0.0	0.0	5.3	2.8	0.5	-	16.1	23.6
HVDC Transformer Replacement Program	178.4	8.4	14.4	9.9	0.4	0.1	1.0	-	1.2	7.2	5.6	1.1	40.9	67.7
Projects between $2 Million & $50 Million	699.8	49.3	57.1	51.8	57.4	25.4	30.0	27.3	30.7	27.2	7.3	3.8	318.1	383.1
Subtotal Executing Projects		103.5	112.9	94.9	116.9	81.7	50.0	46.7	37.2	37.2	13.3	5.0	595.9	733.4
Potential Investments														
Bipole 2 Thyristor Valve Replacement	236.0	-	-	0.5	0.5	1.3	13.6	22.9	57.4	58.9	60.0	20.9	236.0	236.0
Transmission Transformers Sustainment Program	64.4	-	-	-	0.2	0.3	2.2	1.3	1.9	11.3	3.8	10.7	31.8	64.4
Investments between $2 Million & $50 Million	31.4	-	-	4.7	6.1	0.1	-	0.7	4.8	7.6	7.3	-	31.4	31.4
Subtotal Potential Investments		-	-	5.2	6.9	1.8	15.8	24.8	64.1	77.8	71.1	31.6	299.1	331.8
Programs	NA	39.2	39.2	39.2	40.0	40.8	41.6	42.5	43.3	44.2	45.1	46.0	422.0	918.7
Planning Investments														
Communication Upgrades & Replacements	NA	-	-	-	-	6.3	12.6	9.6	3.3	1.2	1.2	1.2	35.4	46.2
HVDC Upgrades & Replacements	NA	-	-	-	-	3.6	7.0	9.7	8.8	7.7	19.2	32.3	88.3	495.9
Pointe du Bois Transmission Phase 2	NA	-	-	-	-	2.3	9.0	13.5	18.0	2.3	6.0	-	51.1	51.1
Capacity Enhancements & Upgrades T/L	NA	-	-	-	-	-	-	-	-	-	2.0	-	2.0	102.0
Capacity Enhancements & Upgrades Stations	NA	-	-	-	-	19.3	26.7	25.6	-	-	7.7	16.7	96.0	161.9
Transmission Line Footing Sustainment Program	NA	-	-	-	-	2.5	2.5	2.5	2.5	2.5	7.5	7.5	27.5	50.0
Protection Relays Sustainment Program	NA	-	-	-	-	0.3	0.3	0.3	0.3	0.3	0.3	0.6	2.4	7.8
Subtotal Planning Investments		-	-	-	-	34.3	58.1	61.2	32.9	14.0	43.9	58.3	302.7	914.9
Portfolio Adjustments		(12.9)	(20.2)	(5.4)	(23.8)	(18.6)	(25.6)	(35.2)	(37.6)	(23.2)	(23.4)	18.3	(194.6)	240.1
Transmission Total		**129.9**	**132.0**	**134.0**	**140.0**	**140.0**	**140.0**	**140.0**	**140.0**	**150.0**	**150.0**	**159.2**	**1 425.2**	**3 138.9**

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF16)

(in millions of dollars)

	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	20 Year Total
Business Operations Capital														
Electric Segment														
Marketing & Customer Service														
Executing Projects														
New Madison Station - 115/24kV Station	87.1	11.7	4.5	-	-	-	-	-	-	-	-	-	4.5	16.2
St. Vital Station 115/24kV Station	51.3	27.0	21.6	1.2	-	-	-	-	-	-	-	-	22.8	49.8
Dawson Road Station - 66/24kV	51.8	0.3	18.3	19.2	13.9	-	-	-	-	-	-	-	51.4	51.7
New Adelaide Station - 66/12kV	62.1	32.1	10.4	3.2	0.9	-	-	-	-	-	-	-	14.5	46.5
Projects between $2 Million & $50 Million	430.9	107.8	62.9	40.3	12.1	-	-	-	-	-	-	-	115.3	223.1
Subtotal Executing Projects		178.8	117.7	63.9	26.9	-	-	-	-	-	-	-	208.5	387.3
Programs	NA	139.2	156.0	176.3	179.8	183.4	186.2	189.9	193.7	197.6	201.5	205.6	1 870.1	4 054.7
Planning Investments														
Customer Connections – Distribution Lines	NA	-	-	-	-	-	1.8	2.7	3.4	3.6	4.4	4.0	19.9	70.0
Capacity Upgrades – Distribution Lines	NA	-	-	-	-	-	5.5	8.6	10.6	11.3	13.9	12.7	62.7	220.4
Capacity Upgrades – Distribution Stations	NA	-	-	-	-	-	7.4	11.6	14.2	15.2	18.6	17.1	84.0	295.4
System Renewal of Infrastructure – Distribution Lines	NA	-	-	-	-	-	3.7	5.8	7.1	7.5	9.2	8.5	41.7	146.6
System Renewal of Infrastructure – Distribution Stations	NA	-	-	-	-	-	12.2	19.1	23.5	25.0	30.7	28.2	138.7	487.8
Subtotal Planning Investments		-	-	-	-	-	30.5	47.9	58.8	62.6	76.7	70.5	347.0	1 220.3
Portfolio Adjustments		(45.6)	(30.6)	(5.0)	13.6	32.0	(26.0)	(19.8)	(30.1)	5.2	(16.6)	(8.8)	(86.0)	(235.6)
Marketing & Customer Service Total		**272.4**	**243.1**	**235.2**	**220.3**	**215.4**	**190.7**	**218.0**	**222.4**	**265.4**	**261.7**	**267.3**	**2 339.5**	**5 426.7**

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF16)

(in millions of dollars)

	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	20 Year Total
Business Operations Capital														
Electric Segment														
Human Resources & Corporate Services														
Executing Projects														
Projects between $2 Million & $50 Million	94.0	26.7	5.1	1.7	-	-	-	-	-	-	-	-	6.8	33.6
Potential Investments														
Investments between $2 Million & $50 Million	13.9	-	-	-	13.0	-	-	-	-	-	-	-	13.0	13.0
Programs	NA	43.4	48.3	52.8	53.9	55.0	56.1	57.2	58.3	59.5	60.7	61.9	563.6	1 222.8
Portfolio Adjustments	NA	(2.0)	1.5	0.5	(11.9)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(9.6)	(11.2)
Human Resources & Corporate Services Total		**68.1**	**55.0**	**55.0**	**55.0**	**55.0**	**56.1**	**57.2**	**58.4**	**59.5**	**60.7**	**61.9**	**573.9**	**1 258.3**
		68.1	**55.0**	**55.0**	**55.0**	**55.0**	**56.1**	**57.2**	**58.4**	**59.5**	**60.7**	**61.9**	**573.9**	**1 258.3**
Finance & Strategy														
Programs	NA	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.2	4.7
Finance & Strategy Total		**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**2.2**	**4.7**
Unallocated Target Adjustment	NA	-	0.4	(7.6)	(9.5)	(9.4)	(2.3)	(29.7)	(12.2)	(2.6)	22.1	21.7	(28.9)	187.0
ELECTRIC BUSINESS OPERATIONS CAPITAL TOTAL		**573.6**	**525.8**	**516.8**	**516.0**	**511.2**	**499.4**	**520.7**	**543.7**	**615.5**	**640.5**	**659.0**	**5 548.7**	**12 834.5**

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF16)

(in millions of dollars)

	Total Project Cost	2017 Outlook	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2018-2027 10 Year Total	20 Year Total
Business Operations Capital														
Natural Gas Segment														
Marketing & Customer Service														
Executing Projects														
Projects between $2 Million & $50 Million	41.7	25.3	2.7	0.3	-	-	-	-	-	-	-	-	3.0	28.3
Programs	NA	31.1	33.9	40.9	41.8	42.6	43.4	44.3	45.2	46.1	47.0	48.0	433.2	941.5
Portfolio Adjustments	NA	(5.6)	(5.6)	(8.8)	(12.5)	(11.5)	(10.7)	(9.1)	(11.7)	(7.0)	(8.1)	(8.4)	(93.4)	(157.4)
Marketing & Customer Service Total		**50.8**	**31.0**	**32.4**	**29.2**	**31.1**	**32.7**	**35.2**	**33.5**	**39.1**	**38.9**	**39.6**	**342.8**	**812.4**
NATURAL GAS BUSINESS OPERATIONS CAPITAL TOTAL		**50.8**	**31.0**	**32.4**	**29.2**	**31.1**	**32.7**	**35.2**	**33.5**	**39.1**	**38.9**	**39.6**	**342.8**	**812.4**
BUSINESS OPERATIONS CAPITAL TOTAL		**624.4**	**556.8**	**549.2**	**545.2**	**542.3**	**532.2**	**555.9**	**577.3**	**654.6**	**679.4**	**698.6**	**5 891.5**	**13 646.9**
CAPITAL EXPENDITURE FORECAST TOTAL		**2 979.8**	**3 033.0**	**2 675.1**	**1 819.1**	**1 608.7**	**1 278.3**	**913.8**	**652.3**	**659.1**	**683.0**	**703.3**	**14 025.8**	**24 138.2**
Year End Outlook Adjustment - Electric	NA	(45.0)	-	-	-	-	-	-	-	-	-	-	-	(45.0)
REVISED CAPITAL EXPENDITURE FORECAST TOTAL		**2 934.8**	**3 033.0**	**2 675.1**	**1 819.1**	**1 608.7**	**1 278.3**	**913.8**	**652.3**	**659.1**	**683.0**	**703.3**	**14 025.8**	**24 093.2**
ELECTRIC CAPITAL TOTAL		**2 883.9**	**3 002.0**	**2 642.7**	**1 789.9**	**1 577.6**	**1 245.6**	**878.6**	**618.8**	**620.0**	**644.0**	**663.7**	**13 683.0**	**23 280.8**
NATURAL GAS CAPITAL TOTAL		**50.8**	**31.0**	**32.4**	**29.2**	**31.1**	**32.7**	**35.2**	**33.5**	**39.1**	**38.9**	**39.6**	**342.8**	**812.4**
Demand Side Management Forecast														
Programs - Electric	NA	50.1	55.7	99.4	94.3	88.9	86.9	66.5	60.3	62.3	66.6	70.7	751.6	1 557.7
Programs - Natural Gas	NA	9.7	10.3	11.7	10.8	10.8	10.9	10.4	10.6	10.4	10.6	10.3	106.8	205.0
Demand Side Management Total		**59.9**	**66.0**	**111.1**	**105.1**	**99.6**	**97.8**	**77.0**	**70.8**	**72.8**	**77.2**	**81.1**	**858.4**	**1 762.6**
ELECTRIC CAPITAL & DEMAND SIDE MANAGEMENT TOTAL		**2 934.1**	**3 057.7**	**2 742.1**	**1 884.2**	**1 666.5**	**1 332.5**	**945.2**	**679.1**	**682.4**	**710.6**	**734.4**	**14 434.6**	**24 838.5**
NATURAL GAS CAPITAL & DEMAND SIDE MANAGEMENT TOTAL		**60.6**	**41.4**	**44.0**	**40.0**	**41.8**	**43.6**	**45.6**	**44.1**	**49.5**	**49.5**	**50.0**	**449.6**	**1 017.3**

Appendix B – Response to Directive #15/Board Order 73/15

15. Manitoba Hydro shall identify and provide details of individual capital projects with a value greater than $1 million in future Capital Expenditure Forecasts. (Board Order 73/15 pg 98)

Summary of Projects Table provides a listing of executing capital projects and potential investments by operating group with a total cost of greater than $1 million. Projected cash flows for each item are provided for fiscal years 2016/17 through to 2018/19.

Project Details Table provides additional details for each item listed in the Summary of Projects, including total project cost, description and projected in-service date.

Response to Directive #15/Board Order 73/15
Summary of Projects

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
Generation & Wholesale							
Kettle Transformer Replacement Program	45,427	809	-	-	-	-	Mar 2017
Generation North Sewer & Domestic Water System Install/Upgrades	30,640	3,981	6,613	466	10,681	-	Dec 2023
Slave Falls Spillway Rehabilitation	28,746	1	1	537	28,185	-	Oct 2022
Generation South Sewer & Domestic Water System Install/Upgrades	26,191	443	-	-	-	-	Apr 2016
Halon Replacement Project	25,287	118	-	-	-	-	Apr 2015
Gillam Redevelopment & Expansion Phase 1A	24,116	75	-	-	-	-	Nov 2018
Grand Rapids Unit Transformer Replacement	22,021	3,575	1,511	-	-	-	May 2017
Slave Falls G.S. Creek Spillway Rehabilitation	19,866	7,076	11,066	92	-	-	Nov 2017
Public Water Safety/Security	17,874	2,001	1,584	2,222	4,272	-	Oct 2020
Long Spruce Fire Protection System Replacement	16,240	2,411	1,144	11,468	-	-	Oct 2018
Generation South - Slave Falls Seven Bay Sluiceway	15,878	728	380	1,770	-	-	Apr 2018
Selkirk Environmental Enhancements	14,815	120	-	-	-	-	Aug 2016
McArthur Falls/Pine Falls Breaker Replacement Program	14,765	331	-	-	-	-	May 2016
Generation South Security Installations/Upgrades	14,755	7,008	14	-	-	-	Mar 2017
Jenpeg Unit 1 Fire Rehabilitation	11,878	1,886	-	-	-	-	May 2016
Generation Operations Remote Control & Monitoring	11,595	2,019	-	-	-	-	Mar 2017
Gillam Housing Retrofit Program	10,769	958	-	-	-	-	Mar 2017
Generation North Security Installations/Upgrades	10,607	3,823	21	-	-	-	Mar 2017
Brandon Unit 5 License Review	10,315	100	4,671	-	-	-	Mar 2018
Kettle Fire Protection System Replacement	10,043	-	1,476	8,567	-	-	Oct 2018
Grand Rapids Excitation Program	8,877	609	955	125	1,276	-	Dec 2019
Laurie River & CRD Communications	7,325	15	2,006	1,218	-	-	Mar 2019
Notigi Marine Vessel Replacement & Infrastructure Improvement	7,031	227	721	-	-	-	Sep 2017
Grand Rapids Housing	6,892	5	-	-	-	-	Jun 2016
Limestone Generating Station Control and Data Acquisition (GSCADA) Replacement	6,269	1,075	1,749	1,848	1,128	-	Mar 2020
Generation South Roof Replacement Program	6,154	2,471	2,164	-	-	-	Aug 2017
Generation Operations NERC Cyber Security Upgrades	5,681	222	266	286	1,983	-	Mar 2018

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
Great Falls Stator Frame Spare	5 630	1 961	2 274	740	573	-	May 2017
Great Falls Exciter Replacements	5 563	943	1 267	1 294	-	-	Oct 2018
Jenpeg Accommodation Facility	5 149	267	-	-	-	-	May 2016
Grand Rapids Fish Hatchery Project	4 846	65	-	-	-	-	Oct 2015
Kelsey Airport Upgrades	4 539	775	3 764	-	-	-	Sep 2017
Generation South PCB Regulation Compliance	4 478	45	160	203	2 190	-	Mar 2020
Churchill Weir Culvert Bridge Addition	4 463	233	4 230	-	-	-	Oct 2017
Seven Sisters Townsite	4 460	51	-	-	-	-	Jul 2016
Grand Rapids 230kV Reactors Replacement	4 455	198	3 251	1 006	-	-	Jun 2018
Generation South Fall Protection Program	4 294	430	882	529	467	-	Feb 2020
Kettle G.S. Petroleum Storage Facility Tank	3 647	(34)	-	-	-	-	Jul 2015
Limestone Governor Replacements	3 644	521	423	-	-	-	Nov 2017
Limestone U4 Stator Rewedge and Rotor Rehabilitation	3 556	770	2 787	-	-	-	May 2017
Winnipeg River Governor Pumps Replace Valve & ACC Tank	3 274	728	-	-	-	-	Feb 2017
Great Falls Transformer Spares	3 096	788	1 058	-	-	-	Oct 2017
Jenpeg Transformer Refurbishment/Spare	2 978	21	2 630	-	-	-	Oct 2017
Brandon Unit 5 High Pressure Loop Piping Replacement	2 249	581	-	-	-	-	Jul 2015
Generation South - Hydraulic Controls	2 173	81	588	824	635	-	Mar 2020
McArthur Falls Sluiceway Anchoring	2 155	883	-	-	-	-	Oct 2016
MacArthur Falls Stabilization Berm	1 939	777	-	-	-	-	Mar 2016
Slave Falls 129VDC System Upgrade	1 809	768	997	-	-	-	Oct 2017
Slave Falls Cranes Refurbishment	1 695	254	1 422	19	-	-	Mar 2018
Slave Falls Washroom, Lunchroom and Office Renovation	1 691	104	-	-	-	-	May 2014
Laurie River Access Road Upgrade	1 657	1 524	-	-	-	-	Aug 2015
Seven Sisters Unit 2&3 Intake Frost Protection	1 577	132	1 445	-	-	-	Nov 2017
Seven Sisters Spillway Deck Refurbishment	1 572	1 157	-	-	-	-	Nov 2016
Selkirk 250V DC Battery & Inverter Upgrade	1 353	1 353	-	-	-	-	Mar 2017
Generation North Fall Protection Program	1 209	200	281	358	369	-	Dec 2019

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
Transmission							
Station Battery Bank Capacity & System Reliability Increase	46,345	2,928	1,061	1,058	2,934	-	Mar 2022
Winnipeg-Brandon Transmission System Improvements	42,844	460	169	174	31,893	-	Apr 2025
Southwest Winnipeg 115kV Transmission Improvements	40,238	3,242	351	7,531	29,312	-	Oct 2021
Laverendrye-St. Vital 230kV Line & Breaker Replacement	33,250	3,164	3,045	817	17,578	-	Oct 2020
Transmission Line Protection & Teleprotection Replacement	26,387	2,287	2,366	535	54	-	May 2018
Stanley Area 115kV to 230kV Migration	25,867	1,691	7,095	2,848	14,159	-	Mar 2024
Bi-Pole I & II Spacer Damper Replacements (Phase 2)	24,120	6,995	7,065	-	-	-	Dec 2017
Mobile Radio System Modernization	23,558	5,307	2,768	-	-	-	Jun 2017
HVDC BP2 Smoothing Reactor Replacement	21,265	58	0	0	1,750	-	Oct 2023
HVDC BP2 Valve Hall Wall Bushing Replacement	19,146	64	905	1,911	15,685	-	Oct 2024
PCB Bushing Elimination Program	18,862	1,100	1,500	1,500	14,762	-	Mar 2024
Stanley Station 230-66kV Transformer Addition	16,494	1,212	8,207	4,371	104	-	Oct 2018
HVDC - Gapped Arrester Replacement	15,906	1,809	3,187	2,564	6,000	-	Nov 2021
Transmission Breaker Sustainment Capital Program	14,405	0	0	51	1,984	11,150	Mar 2033
Southern AC System Breaker Replacements	14,344	3,608	326	-	-	-	Jun 2017
HVDC Circuit Breaker Operating Mechanism Replacement	14,093	188	759	388	-	-	Mar 2019
13.2kV Shunt Reactor Replacements	13,912	1,638	1,443	3,048	3	-	Nov 2018
Transmission Line Wood Pole Structure Replacement Program	13,774	671	654	643	9,121	-	Mar 2026
HVDC BP2 Refrigerant Condenser Replacement	13,477	-	-	-	13,477	-	Nov 2025
La Verendrye Station 230-66kV Bank Addition	13,282	5	5	5	13,171	-	Oct 2023
Brandon Area Transmission Improvements	12,282	624	1	-	-	-	Jul 2016
HVDC BP1 Direct Current - Current Transformer (DCCT) Transductor Replacement	11,834	205	2,021	2,199	-	7,156	Oct 2028
Ashern Station Bank Addition	11,721	195	198	203	7,727	-	Sep 2023
Souris East Transformer Capacity Enhancement	11,239	217	524	7,425	2,997	-	Oct 2019
Winnipeg Area Capacitor Bank Additions	10,966	-	-	4,734	6,232	-	Nov 2019
HVDC BP1 By-Pass Switch Replacement	10,854	546	51	0	0	-	Nov 2015
HVDC System Transformer & Reactor Fire Protection Upgrades	10,829	171	262	-	-	-	Jun 2017
Transmission Line Wood Pole Spar Arm Replacement Program	9,979	1,033	1,044	1,069	2,339	-	Mar 2026
BP1 & 2 DC Converter Transformer Bushing Replacement	8,734	0	0	108	8,620	-	Mar 2023
Diesel Upgrades - Lac Brochet Diesel G.S.	7,975	43	619	2,496	4,638	-	Mar 2021
HVDC BP2 Thyristor Module Cooling Refurbishment	7,070	152	111	115	-	-	Nov 2018
HVDC Fire Protection Projects	7,060	88	1,785	2,037	220	-	Oct 2018
HVDC Transformer Tapchanger Refurbishment	6,577	240	-	-	-	-	Mar 2016

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
HVDC Transformer Marshalling Kiosk Replacement	6,528	850	1,989	1,152	-	0	Oct 2018
230kV Protection Additions	5,900	-	-	-	4,667	1,233	Nov 2026
HVDC Auxiliary Power Supply Upgrades	5,830	61	403	211	-	-	Mar 2019
HVDC BP1 CQ Disconnect Replacement	5,173	846	678	1,240	2,350	-	Oct 2019
NERC Critical Infrastructure Protection (CIP) V5 Implementation - Transmission Sites	5,090	4,585	-	-	-	-	Mar 2017
Brandon Victoria Ave Breaker Replacement	4,461	1,193	1,080	1,073	1,018	-	Oct 2019
Mobile Substation Replacement	4,312	26	7	7	4,176	-	Nov 2021
HVDC Stations Ground Grid Refurbishment	4,212	-	440	910	447	-	Nov 2019
Diesel Upgrades - Brochet Diesel G.S.	3,822	149	170	1,229	2,339	-	Mar 2020
New 230kV Supply to Enbridge	3,705	458	2,023	820	-	-	Jul 2018
BP1 Pole Differential Protection	3,604	-	-	-	3,604	-	Nov 2024
HVDC BP1 P1 & P2 Battery Bank Separation	3,575	180	14	14	3,285	-	Nov 2023
HVDC Site Upgrades for Transformer Moves	3,313	-	-	-	3,313	-	Nov 2025
HVDC Transformer Bushing Draw Rod & Cap Replacement	3,310	349	170	-	-	-	Sep 2017
Whiteshell Bank 1 Replacement	3,035	289	2,650	19	-	-	Nov 2017
NERC Critical Infrastructure Protection (CIP) V5 Implementation - HVDC Sites	3,005	677	-	-	-	-	Aug 2016
Reston Station New 230kV Ring Breaker	2,614	2	131	1,170	1,274	-	Jun 2020
HVDC Domestic Water System Installations/Upgrade	2,423	147	106	548	176	-	Sep 2019
HVDC BP2 Voltage Divider Replacement	2,389	473	-	-	-	-	Mar 2016
Communication Sites Standby Power Upgrades	2,092	1,233	-	-	-	-	Mar 2014
V38R 230kV Transmission Line ROW in Riding Mountain National Park	2,085	1,118	389	-	-	-	Jun 2017
Dorsey JVC Replacement	1,993	460	1,298	234	-	-	Mar 2018
Dorsey-Riel South Loop ROW Property Acquisition	1,882	1,204	-	-	-	-	Mar 2011
HVDC Controls & System Replica Development	1,668	248	183	622	615	-	Mar 2020
Tadoule Lake Diesel G.S. Tank Farm Upgrade	1,498	20	-	-	-	-	Dec 2015
MTS Fibre Exchange-Neepawa to Roblin	1,385	568	-	-	-	-	Mar 2017
Interlake Microwave (ILMW) Diesel Controllers & Switches Replacement	1,250	419	-	-	-	-	Mar 2015
HVDC BP1 Transformer Neutral Bushing Replacement	1,165	634	-	-	-	-	Mar 2017
Diesel Upgrades - Shamattawa DGS	1,125	193	196	193	274	-	Mar 2020
Shamattawa Capacity Increase	1,054	23	-	-	-	-	Nov 2014
HVDC BP1 Pole Interlocking Relay Replacement	1,036	-	-	-	1,036	-	Nov 2023
Dorsey Synchronous Building Roof Rehabilitation	1,032	2	(15)	(35)	1,050	-	Mar 2019

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
Marketing & Customer Service							
New McPhillips Station - 115kV to 24kV	47,228	17,939	14,463	13,719	-	-	Oct 2018
Martin Station-New 66-4/12kV Station	31,853	1,401	-	-	-	-	Sep 2016
Harrow Station - Bank & Feeder Addition	25,100	1,180	4,118	8,874	10,282	-	Dec 2019
Winnipeg Distribution Infrastructure Requirement	24,785	1,348	2,191	-	-	-	Mar 2018
Mohawk Station - Bank & Feeder Addition	19,701	7,779	5,919	2,854	1,782	-	Jun 2019
Distribution Modernization Project	14,647	4,852	9,795	-	-	-	Mar 2018
Heaslip DSC and 8-25kV Conversion	13,089	2,424	5,131	5,475	-	-	Dec 2018
York Station-Bank 1,3,5 & SwitchGear Addition	12,824	4,692	-	-	-	-	Sep 2016
Rover 4kV Station Salvage& Feeder Conversion	12,752	7,305	-	-	15	-	Mar 2017
Health Science Centre Service Consolidation & Distribution Upgrade	10,216	1,271	-	-	-	-	Sep 2016
Mystery Lake Station Switchgear Replacment & Bank Addition	8,928	3	-	-	-	-	Jan 2016
Tyndall Distribution Supply Centre	8,356	3,175	-	-	-	-	Sep 2016
William Avenue - New Ductline	8,001	2,767	-	-	-	-	Nov 2016
66 kV System Improvements in the Stanley Area	7,917	-	550	7,367	-	-	Oct 2018
Neepawa Area 66kV System Improvement	7,514	1,452	-	-	-	-	Oct 2016
Steinbach Keating/Steinbach Biscayne Distribution Supply Centres	7,387	1,701	-	-	-	-	Oct 2016
Waverley West Supply-Stage 2 (Distribution Supply Centres)	6,619	1,888	-	-	-	-	Sep 2016
Interlake 66kV System Improvement Work	6,531	5,403	500	-	-	-	Oct 2017
Distribution Hot Line Tag Relay Program	6,488	2,460	1,864	1,938	-	-	Mar 2019
Alexander 66-25kV Distribution Supply Centre & Conversion	6,291	5,695	499	-	-	-	Mar 2018
Brandon West 4kV - 12kV Conversion	5,501	2,440	-	-	-	-	Mar 2017
Anola Distribution Supply Centre	5,441	390	-	-	-	-	Sep 2016
Lockport Distribution Supply Centre	5,200	320	-	-	-	-	Jul 2016
Winkler West Distribution Supply Centre	5,193	15	-	-	-	-	Mar 2016
Carmen South Distribution Supply Centre	5,096	5,050	-	-	-	-	Mar 2017
Norris Road Distribution Supply Centre	4,974	569	4,306	-	-	-	Mar 2018
Portage South 66kV L54 & L84 Upgrade	4,400	3,048	1,352	-	-	-	Oct 2017
Gimli West Station GW08-11 & -09 25kV Conversion	4,133	50	-	-	-	-	Dec 2015

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
Property Acquisition-N Downtown Station Site	4,000	50	-	-	-	-	Mar 2016
Norway House Station Bank Addition	3,990	1,174	2,800	-	-	-	Aug 2017
Victoria Beach Distribution Supply Centre	3,929	2,557	500	-	-	-	Aug 2017
Iles des Chenes Distribution Supply Centre	3,634	3,350	-	-	-	-	Nov 2016
Notre Dame de Lourdes Distribution Supply Centre	3,580	664	-	-	-	-	Jun 2016
Outlets of Seasons Development Expansion	3,268	622	-	-	-	-	Jun 2016
Norcraft Distribution Supply Centre Site Bank Addition	3,150	1,974	954	-	-	-	Oct 2017
Whiteshell 33 kV System Improvements	2,590	675	1,575	-	-	-	Oct 2017
Enbridge Gretna Capacitor Bank Addition	2,500	245	2,254	-	-	-	Nov 2017
St. Laurent Station New Feeder	2,424	2,000	422	-	-	-	Mar 2017
Elie Station Bank Replacement	2,420	200	2,200	-	-	-	Sep 2017
Court Station Feeder Additions	2,376	2,135	-	-	-	-	Aug 2016
Skelding Distribution Supply Centre	2,200	2,115	-	-	-	-	Mar 2017
Ste Agathe Station Bank Addition	2,100	316	1,378	-	-	-	Oct 2017
Gimli West GW08-5 & GW08-8 Conversion	2,054	1,800	-	-	-	-	Oct 2016
Winnipeg Area 66kV Line Upgrades	2,031	1,282	114	45	70	-	Dec 2019
Waterford Green Sub division Feeders	1,997	848	-	-	-	-	Jun 2015
Convert Feeder BWS12-07 & 12-09 4kV to 12kV	1,950	249	(2)	1	1	-	Mar 2020
Convert Feeder BWS 12-03 from 4kV to 12kV	1,950	1,766	-	-	-	-	Dec 2015
Convert Feeder BWS 12-05 from 4kV to 12kV	1,950	1,428	-	-	-	-	Dec 2015
Eleanor Lake Distribution Supply Centre & Land Purchase	1,907	623	-	-	-	-	Nov 2014
66kV L14 Upgrade Saltel Tap to Blumenort	1,857	610	-	-	-	-	Jun 2013
Waverley Service Centre 10MVA 66-24KV Distribution Supply Centre	1,834	118	-	-	-	-	Oct 2012
Wilkes Station New Feeders W61,W66,W67,W72	1,820	605	-	-	-	-	Mar 2016
Stonewall Area Feeder Improvements	1,800	(15)	1,600	-	-	-	Nov 2017
Teulon 12kV Area System Improvement	1,620	1,522	-	-	-	-	Nov 2015
Dallas Station Bank Addition	1,616	27	-	-	-	-	Sep 2014
Randolph Station Area System Improvements	1,600	-	-	1,600	-	-	Nov 2018
Beausejour East System Improvement	1,500	-	-	1,500	-	-	Nov 2018
Reconductor H56 Replacement	1,412	1,331	-	-	-	-	Mar 2015
Re-Purpose / Salvage 33 kV Line 17	1,300	-	1,300	-	-	-	Sep 2017
Star Lake STL12-2 Extension (Falcon Estates)	1,250	1,250	-	-	-	-	Nov 2014
Woodlands Distribution System Improvements	1,200	10	1,190	-	-	-	Nov 2017
Morris Feeder MS08-8 Conversion	1,100	888	-	-	-	-	Aug 2015
Re-purpose/Salvage 33kV Line 13	1,100	-	1,100	-	-	-	Sep 2017
Brokenhead Stn Bank Upgrade	1,000	10	590	400	-	-	Jun 2018

	Total Project Cost	2017	2018	2019	2020 to 2026	2027 to 2036	ISD
Human Resources & Corporate Services							
Enterprise Asset Management (EAM) Phase 2	35,186	4,186	3,165	1,701	-	-	Mar 2019
Rural Consolidation	20,350	11,033	-	-	-	-	Mar 2017
Capital Portfolio Management Program	7,368	3,800	1,980	-	-	-	Nov 2017
Gillam Fleet Building	3,199	3,199	-	-	-	-	Feb 2017
Environmental Health & Safety Management	3,168	1,496	-	-	-	-	Sep 2016
Station Transformer Trailer Replacement	3,000	2,998	-	-	-	-	Aug 2016
Travel and Expense Management	2,807	152	-	-	-	-	Jan 2014
Skype for Business	1,011	795	-	-	-	-	Mar 2017

Response to Directive #15/Board Order 73/15
Project Details

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Generation & Wholesale			
Kettle Transformer Replacement Program	45 427	Purchase and replace the step-up transformers at the Kettle Generating Station due to increased winding failures as the existing transformers are reaching life expectancy. This program includes the purchase of 2 spare tranformers, one of which is a universal spare for northern generating stations.	Mar 2017
Generation North Sewer & Domestic Water System Install/Upgrades	30 640	Upgrade or replace the domestic water and waste water systems at northern generating facilities to ensure a continuing safe supply of drinking water and compliance with Waste Water regulations.	Dec 2023
Slave Falls Spillway Rehabilitation	28 746	Extend the life of the Slave Falls Spillway by increasing the stability of the concrete structures, reinforcing the sluiceway gates and spillway stoplogs, decommissioning the water conveyance of the ice sluiceway and installation of a new gate.	Oct 2022
Generation South Sewer & Domestic Water System Install/Upgrades	26 191	Upgrade or replace the domestic water and waste water systems at southern generating facilities to ensure a continuing safe supply of drinking water and compliance with Waste Water regulations.	Apr 2016
Halon Replacement Project	25 287	To install smoke management systems (SMS) at various Manitoba Hydro locations where halon fire protection systems were removed as a result of provincial legislation.	Apr 2015
Gillam Redevelopment & Expansion Phase 1A	24 116	Redevelop and expand the infrastructure in the Town of Gillam to prepare for growth associated with new generation facilities including upgrades to the town centre (stage 1), residential subdivisions, recreation centre refurbishments, and other small projects.	Nov 2018
Grand Rapids Unit Transformer Replacement	22 021	Purchase and install 5 GSU's for Units 1 and 3 at Grand Rapids Generating Station to provide substantial reduction of in-service failure, lost generation risk and improve overall reliability.	May 2017
Slave Falls G.S. Creek Spillway Rehabilitation	19 866	Replace or repair the Slave Falls Creek Spillway to safely retain the forebay and meet the applicable Canadian Dam Association (CDA) guidelines	Nov 2017
Public Water Safety/Security	17 874	Implement a comprehensive "Public Water Safety Around Dams" program which is aligned with the Canadian Dam Association (CDA) Guidelines for Public Safety Around Dams for 15 generating stations, 7 control structures, and 2 weirs.	Oct 2020
Long Spruce Fire Protection System Replacement	16 240	Replace the fire detection and monitoring system at Long Spruce Generating Station due to system failures and obsolescence.	Oct 2018
Generation South - Slave Falls Seven Bay Sluiceway	15 878	Rehabilitation of the Slave Falls Seven Bay Sluiceway including gate hoists, gate & gain heating, and installation of monitoring equpment for concrete assessments. This work will improve the operating reliability of the sluiceway which provides controlled spill and dam safety in high water flow conditions or emergency spiill requirements.	Apr 2018
Selkirk Environmental Enhancements	14 815	Perform environmental enhancements in accordance with the revised licence terms and conditions approved by the Province of Manitoba. The approval was based on continuing operation of the once-through cooling system with the following modifications to the facility: cooling water intake fish screen rehabilitation/modification, lube oil cooling system modification and condenser re-tubing.	Aug 2016
McArthur Falls/Pine Falls Breaker Replacement Program	14 765	Replace McArthur Falls 115kV current transformers (CTs) and breakers and Pine Falls 115kV breakers to address the frequency and severity of failures.	May 2016

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Generation South Security Installations/Upgrades	14 755	Upgrade physical security systems at southern generating stations into a comprehensive, layered plan to increase security. Also, included in this scope are provisions for a centralized monitoring station for dedicated monitoring, initiating responses and notification as well as act as a central repository for all security records to ensure NERC compliance.	Mar 2017
Jenpeg Unit 1 Fire Rehabilitation	11 878	Repair the fire damage to Jenpeg Unit 1 and perform a mechanical condition assessment of high risk components.	May 2016
Generation Operations Remote Control & Monitoring	11 595	Install required automation, remote control and protective devices to reduce any risks associated with the destaffing of the hydraulic station control rooms.	Mar 2017
Gillam Housing Retrofit Program	10 769	Retrofit the interior and exterior of all 1970 vintage houses including houses provided to the Town of Gillam, Frontier School Division and Gillam Hospital.	Mar 2017
Generation North Security Installations/Upgrades	10 607	Upgrade physical security systems at northern generating stations into a comprehensive, layered plan to increase security. Also, included in this scope are provisions for a centralized monitoring station for dedicated monitoring, initiating responses and notification as well as act as a central repository for all security records to ensure NERC compliance.	Mar 2017
Brandon Unit 5 License Review	10 315	Under the Manitoba Environment Act, renewal of the license for Brandon G.S. Unit #5 is required for continuing operation. The implementation of capital upgrades proposed in the Environmental Impact Statement (EIS) is dependent on the outcome of the licence review process and the updated licence terms and conditions. Major capital works are being deferred pending a response from Manitoba Conservation with the knowledge Unit 5 end-of-life date is currently 2019.	Mar 2018
Kettle Fire Protection System Replacement	10 043	Upgrade the fire system at Kettle Generating Station to ensure adequate water flow and pressure to all parts of the station including the replacement of obsolete and undersized fire pumps as well as replacement of defective pipe sections, valves, fittings and main headers.	Oct 2018
Grand Rapids Excitation Program	8 877	Implement a generator excitation system (exciter) replacement progam to phase out unsupported and obsolete equipment at Grand Rapids.	Dec 2019
Laurie River & CRD Communications	7 325	Upgrade the communications infrastructure and replace the annunciation systems with programmable logic controller (PLC) based unit control monitoring system (UCMS) at Laurie River, Missi Falls and Notigi. Updated communications infrastructure and annunciation systems will provide more accurate water level information from the Churchill River Diversion allowing Manitoba Hydro to optimize water flows through the Lower Nelson River generating stations as well as reducing maintenance costs.	Mar 2019
Notigi Marine Vessel Replacement & Infrastructure Improvement	7 031	Purchase a new tug boat and barge, refurbishment of the existing self-propelled Dallas Faye barge and improvements to the marina at Notigi.	Sep 2017
Grand Rapids Housing	6 892	Major renovations to 26 homes within the Grand Rapids townsite. Most of these houses were built in the 1960's. A renovation program is needed to provide a stock of modern, mould free housing.	Jun 2016
Limestone Generating Station Control and Data Acquisition (GSCADA) Replacement	6 269	Replacement of the generating station control and data acquisition (GSCADA) system with unit control and monitoring system (UCMS) due to multiple failures and equipment has reached its life expectancy.	Mar 2020
Generation South Roof Replacement Program	6 154	Replace roof systems in disrepair with new modern roof system that will provide 30+yrs of reliable service. This work will also include the removal of any and all redundant roofing structures or protrusions to prevent future leaks.	Aug 2017

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Generation Operations NERC Cyber Security Upgrades	5 681	To upgrade existing facilities to meet the requirements of NERC Cyber Security Standards. The indentification of critical cyber assets will include all equipment that is used for protection, control or monitoring and utilizes routable protocols (i.e. TCP/IP) or serial dial up communication. The following generating stations require upgrade - Seven Sisters, Pine Falls, Great Falls, Grand Rapids, Kelsey, Kettle, Long Spruce and Limestone.	Mar 2018
Great Falls Stator Frame Spare	5 630	Procure and construct a 30 MVA spare generator stator to protect against an in service failure of Units 1, 3, 5 and 6.	May 2017
Great Falls Exciter Replacements	5 563	Replacement of the generator excitation system (exciter) to phase out unsupported and obsolete equipment at Great Falls GS.	Oct 2018
Jenpeg Accommodation Facility	5 149	Install a new pre-constructed modular accommodation facility attached to the staffhouse at Jenpeg. The accommodations will provide fitness and common areas lacking in the existing facilities and provide accommodation to staff that are currently occupying houses which have exceeded their life expectancy.	May 2016
Grand Rapids Fish Hatchery Project	4 846	In order to modernize obsolete and high maintenance assets, rehabilitation work at the Grand Rapids Fish Hatchery is required, including the main hatchery building, the aeration building, the east and west pump houses, etc. In addition, rehabilitation work is related to fulfilling the services agreement with the Province.	Oct 2015
Kelsey Airport Upgrades	4 539	Refurbish the airport runway and replace the airport lighting system at the Kelsey Generating Station.	Sep 2017
Generation South PCB Regulation Compliance	4 478	Replace equipment identified as containing a polychlorinated biphenyl (PCB) content >50 ppm at southern generating stations to comply with regulation.	Mar 2020
Churchill Weir Culvert Bridge Addition	4 463	Construct a bridge over the existing culvert access structure at Churchill Weir.	Oct 2017
Seven Sisters Townsite	4 460	Transfer of responsibility for the provision of sewer and water services for the Seven Sisters Townsite from Manitoba Hydro to the Rural Municipality of Whitemouth. Manitoba Hydro will contribute funding towards R.M. of Whitemouth sewer and water projects, which would include the connection of the Seven Sisters Townsite sewer and water system to the R.M. of Whitemouth municipal sewer and water system.	Jul 2016
Grand Rapids 230kV Reactors Replacement	4 455	Purchase and install two new 230 kV shunt reactors for lines G8P and G9F in the 230kV switchyard at Grand Rapids GS.	Jun 2018
Generation South Fall Protection Program	4 294	Assessment of fall protection requirements at stations and diesel sites, excluding switchyards. Includes design, procurement and installation of fall protection devices to comply with legislation.	Feb 2020
Kettle G.S. Petroleum Storage Facility Tank	3 647	Design, purchase and installation of American Petroleum Institute (API) compliant storage tanks and new oil pumping system, decommissioning and removal of non-compliant tanks, and replacement of piping system to satisfy provincial regulatory requirements.	Jul 2015
Limestone Governor Replacements	3 644	Replace the existing governor controls and the field device connected to the control system as the system is no longer supported by the manufacturer and is proprietary in design.	Nov 2017
Limestone U4 Stator Rewedge and Rotor Rehabilitation	3 556	Rewedge Unit 4 stator and rehabilitation of the rotor at Limestone GS.	May 2017
Winnipeg River Governor Pumps Replace Valve & ACC Tank	3 274	Replace existing governor pumps, unloader and pressure relief valves with certified components at Great Falls, Seven Sisters, Pine Falls and McArthur Falls Generating Stations as they no longer comply with the Manitoba Department of Labor and Immigration standards. Failure to proceed with the work could revoke operating licenses.	Feb 2017

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Great Falls Transformer Spares	3 096	Purchase 2 spare GSU's and install one in the existing bank 6 location.	Oct 2017
Jenpeg Transformer Refurbishment/Spare	2 978	Purchase a spare generator step-up transformer (GSU) and refurbish the existing generator step-up transformers at Jenpeg Generating Station.	Oct 2017
Brandon Unit 5 High Pressure Loop Piping Replacement	2 249	Replace the high pressure loop piping necessary for the safe and reliable operation of Brandon Unit 5.	Jul 2015
Generation South - Hydraulic Controls	2 173	Replace obsolete control equipment with unit control and monitoring systems (UCMS) at Seven Sisters, Jenpeg, and McArthur Falls Generating Stations.	Mar 2020
McArthur Falls Sluiceway Anchoring	2 155	Install spillway rollway mechanical rock anchors and pier top membrane to conform with Dam Safety guidelines.	Oct 2016
MacArthur Falls Stabilization Berm	1 939	Construction of a stabilization berm for the last 3Km along the downstream toe of Dyke 17W. Includes relocating current ditches along the dyke as needed to ensure existing drains are not clocked and current drainage patterns are not altered; relocating crossings for access roads to ensure continued access to the dyke for inspections.	Mar 2016
Slave Falls 129VDC System Upgrade	1 809	Install dual battery banks with eight-hour capacity, two new battery chargers, and replace the existing DC Distribution Panel No. 1 to meet current and future loading demands.	Oct 2017
Slave Falls Cranes Refurbishment	1 695	Refurbishment and modernization of the powerhouse crane at Slave Falls GS.	Mar 2018
Slave Falls Washroom, Lunchroom and Office Renovation	1 691	Renovation of existing washrooms, lunchroom and office spaces to provide designated male and female washroom and locker room facilities, a designated lunchroom facility to accommodate all workers on site, and office and conference space.	May 2014
Laurie River Access Road Upgrade	1 657	Gravel, grading and drainage improvements along access road from the airport to Laurie River 1.	Aug 2015
Seven Sisters Unit 2&3 Intake Frost Protection	1 577	Preparation and demolition of the existing damaged concrete, installation of heat trace tubing, pouring of new concrete, and miscellaneous repairs to the intake deck.	Nov 2017
Seven Sisters Spillway Deck Refurbishment	1 572	Removal of damaged concrete from 7 beams on the underside of the deck, placement of new concrete on the beams, and minor repairs to the surface of the deck.	Nov 2016
Selkirk 250V DC Battery & Inverter Upgrade	1 353	Replace the existing battery bank, install a second battery bank and new charger(s). The project also lincludes salvage of UPS #1 & 2, replacing with inverter(s) and removing the DC motor/generator set.	Mar 2017
Generation North Fall Protection Program	1 209	Assessment of fall protection requirements at stations and diesel sites, excluding switchyards. Includes design, procurement and installation of fall protection devices to comply with legislation.	Dec 2019

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Transmission			
Station Battery Bank Capacity & System Reliability Increase	46 345	Conduct individual studies, and replace and/or upgrade battery bank capacity and chargers in 156 transmission and distribution stations and 7 stand-alone communications sites, in order to meet the NERC requirements to have a workable system restoration plan. Includes AC service upgrades and building upgrades or extensions.	Mar 2022
Winnipeg-Brandon Transmission System Improvements	42 844	Perform environmental assessments and route selection, design and construct transmission and terminal facilities to provide firm supply to Portage South.	Apr 2025
Southwest Winnipeg 115kV Transmission Improvements	40 238	Improve the capacity into the Southwest Winnipeg 115kV transmission system supplied by the Laverendrye, Rosser and St. Vital 230-115kV Stations. Improvements include rebuilding 115kV lines (Laverendrye to Harrow and St. Vital to Stafford), as well as performing station upgrades at Laverendrye, Harrow, St. Vital, Mohawk and Wilkes.	Oct 2021
Laverendrye-St. Vital 230kV Line & Breaker Replacement	33 250	Install a new 230kV transmission line from Laverendrye Station to St. Vital Station and replace 115kV and 230kV breakers at Laverendrye Station to address circuit breakers that are under-rated for the increase in available fault current that will occur upon completion of Bipole III and the Riel Converter Station.	Oct 2020
Transmission Line Protection & Teleprotection Replacement	26 387	Replace the existing protection and teleprotection equipment indentified on 30 transmission lines due to experiencing an increasing trend of misoperations of the protection schemes.	May 2018
Stanley Area 115kV to 230kV Migration	25 867	Install a third 230-66kV transformer bank at Stanley Station in order to address load growth in the area and provide for the transfer of all 115kV demand from Morden Corner and Rosenfeld Stations, including decommissioning of the two stations plus removal of corresponding transmission lines.	Mar 2024
Bi-Pole I & II Spacer Damper Replacements (Phase 2)	24 120	Replace all spacer dampers on Bipole I and II. The existing units have reached the end of their lives and are no longer protecting the conductors from aeolian vibration.	Dec 2017
Mobile Radio System Modernization	23 558	Replacement of radios and control electronics of the VHF Mobile Radio System with a modern digital system of increased capability due to aging condition and changing requirements for the radio license.	Jun 2017
HVDC BP2 Smoothing Reactor Replacement	21 265	Replace four existing oil-filled BP2 smoothing reactors with air core smoothing reactors at Dorsey and Henday Converter Stations as the reactors have exceeded their life expectancy. Replacement will alleviate enviromental and fire concerns and ensure transmission reliability and protection.	Oct 2023
HVDC BP2 Valve Hall Wall Bushing Replacement	19 146	Replace all oil-filled wall bushings in the BP2 valve halls as they are reaching the end of their useful life and are experiencing gassing, fire and overheating issues.	Oct 2024
PCB Bushing Elimination Program	18 862	Replace select station equipment bushings in order to meet the requirements of environmental legislation that states all in-use/in-service assets with Polychlorinated Biphenyl (PCB) values greater than or equal to 50 parts per million (ppm) must be eliminated by December 31, 2025.	Mar 2024
Stanley Station 230-66kV Transformer Addition	16 494	Install a 230-66kV transformer and associated equipment at Stanley Station. The transformer was previously anticipated to have been installed as a hot standby.	Oct 2018
HVDC - Gapped Arrester Replacement	15 906	Replace existing gapped arresters, porcelain supports, and their associated counters with metal oxide varistor (MOV) arresters, silicon shed supports, and new counters as they have exceeded life expectancy and malfunctions can result in damage to equipment and increase safety risks for employees.	Nov 2021

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Transmission Breaker Sustainment Capital Program	14 405	Implement a Breaker Sustainment Capital Program to replace 21 transmission system breakers over the next twenty years as a result of an analysis of asset condition.	Mar 2033
Southern AC System Breaker Replacements	14 344	Replace fifteen 230kV circuit breakers at Dorsey Station, two 115kV circuit breakers at McPhillips Stationc and one 66kV circuit breaker at Boyd Station due to increasing fault levels.	Jun 2017
HVDC Circuit Breaker Operating Mechanism Replacement	14 093	Replace existing circuit breaker operating mechanisms to improve system reliability and reduce repair and maintenance frequency.	Mar 2019
13.2kV Shunt Reactor Replacements	13 912	Replace fifteen 13.2kV shunt reactors which have reached their life expectancy as identified through internal inspections and dissolved gas analysis.	Nov 2018
Transmission Line Wood Pole Structure Replacement Program	13 774	Replace approximately 817 transmission line wood poles structures over a multi-year period based on health index scores and failure rate assessments.	Mar 2026
HVDC BP2 Refrigerant Condenser Replacement	13 477	Replace existing air conditioning systems in the BP2 valve halls, maintenance block and administration areas at Dorsey and Henday Converter Stations as the systems have reached their life expectancy and are experiencing frequent failures. In addition, repair and maintenance costs are increasing and there is the potential for increased costly valve outages.	Nov 2025
La Verendrye Station 230-66kV Bank Addition	13 282	Addition of a third 230-66kV transformer at Laverendrye Station. Based on current load growth on the west side of Winnipeg, the firm rating at Laverendrye Station will be exceeded by the winter of 2017/18.	Oct 2023
Brandon Area Transmission Improvements	12 282	Install a 4th bank at Cornwallis Station to address load requirements beyond firm capacity and close line MR11 at Raven Lake Station to reduce the power flow through Cornwallis transformers.	Jul 2016
HVDC BP1 Direct Current - Current Transformer (DCCT) Transductor Replacement	11 834	Replace existing oil-filled DC transductors with optical transductors at Dorsey and Radisson Converter Stations as the transductors are reaching the end of their useful life, failures are becoming more frequent and could result in a lengthy pole outage.	Oct 2028
Ashern Station Bank Addition	11 721	Addition of a third 230-66kv transformer bank and the creation of a new 66 kv four-breaker ring bus at Ashern Station as two existing banks have reached their winter firm limit.	Sep 2023
Souris East Transformer Capacity Enhancement	11 239	Installation of a 230-66kv transformer at Souris East Station and associated equipment to provide firm transmission. The absence of firm transmission at Souris East Station could result in loss of power to customers during a transformer outage.	Oct 2019
Winnipeg Area Capacitor Bank Additions	10 966	Install capacitor banks at Harrow 66kV Station, LaVerendrye 115kV Station and Stafford 66kV Station to meet the reactive power requirements in the Winnipeg area under certain system conditions.	Nov 2019
HVDC BP1 By-Pass Switch Replacement	10 854	Replace the existing by-pass vacuum switch (BPVS) and by-pass switch (BPS) with a single BPS in each of the Bipole valve halls at Dorsey and Radisson Converter Stations. The existing switches are at the end of their useful life, require substantial maintenance and have caused many forced outages.	Nov 2015
HVDC System Transformer & Reactor Fire Protection Upgrades	10 829	Install fire protection upgrades on 28 converter transformers and 2 synchronous condenser transformers. Also, install water deluge sprinklers at Dorsey and Henday and construct fire response buildings at Dorsey and Radisson. This will minimize the high risk of fire spread and catastrophic damage throughout the AC and DC switchyards and eliminate a potential transformer loss.	Jun 2017

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Transmission Line Wood Pole Spar Arm Replacement Program	9 979	Replace approximately 1,642 spar arms on other transmission line wood pole structures over a multi-year period based on health index scores and failure rate assessments.	Mar 2026
BP1 & 2 DC Converter Transformer Bushing Replacement	8 734	Replace bushings on converter transformers at all converter stations due to reaching life expectancy. Bushing failures can result in transformer failures.	Mar 2023
Diesel Upgrades - Lac Brochet Diesel G.S.	7 975	Design and construction of a new diesel generating station in Lac Brochet, including the replacement of the existing diesel fuel storage tank farm as the diesel generators are approaching the end of their expected service life and will not be capable of reliably meeting the forecasted load growth in the community.	Mar 2021
HVDC BP2 Thyristor Module Cooling Refurbishment	7 070	Refurbish 1,566 thyristor module cooling components in BP2 by replacing the manifolds, connectors, and cooling tubes as they are reaching the end of life expectancy and are causing forced system outages.	Nov 2018
HVDC Fire Protection Projects	7 060	Replace exisiting incipient fire detection (IFD) panels at all HVDC stations, fire piping & pumps at Radisson C.S. and install a fire water backup system at Henday C.S. The IFD system, required for early detection of fires within the valve halls, has high failure rates and the backup fire protection does not meet fire code.	Oct 2018
HVDC Transformer Tapchanger Refurbishment	6 577	Refurbish the remaining 27 transformer tap changers an include the addition of MESSKO breathers and larger diverter tanks on BP2 as well as MESSKO breathers on BP1. These tapchangers and associated equipment are over 40 years old and have reached the end of their useful life.	Mar 2016
HVDC Transformer Marshalling Kiosk Replacement	6 528	Replace nine BP1 transformer marshalling kiosks and upgrade nineteen control boxes at the transformer. The kiosks have reached the end of their useful life and the control boxes are not operating efficiently causing several forced outages due to failures of tap changer timing relays or temperature extremes.	Oct 2018
230kV Protection Additions	5 900	Implementation of protection upgrades to a number of 230kV lines and Birtle South, Cornwallis, Glenboro, Laverendrye, Letellier, Raven Lake, Reston, Vermilion and Virden West stations in order to meet North American Electric Reliability Corporation (NERC) TPL standards.	Nov 2026
HVDC Auxiliary Power Supply Upgrades	5 830	Upgrade Bi-Pole 1 (BP1) and Bi-Pole 2 (BP2) auxiliary power supply at all converter stations and at Radisson and Henday Relay Buildings to reduce pole outages and maintain reliability of the HVDC system.	Mar 2019
HVDC BP1 CQ Disconnect Replacement	5 173	Replace AC and DC disconnects at Radisson and Dorsey Converter Stations as the disconnects have been in service for approximately 43 years and have experienced recent failures causing pole outages.	Oct 2019
NERC Critical Infrastructure Protection (CIP) V5 Implementation - Transmission Sites	5 090	Implement physical security infrastructure and systems integration with the new corporate Centralized Security Management System (CSMS) at 56 transmission stations in order to achieve compliance and audit readiness with the North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) standard.	Mar 2017
Brandon Victoria Ave Breaker Replacement	4 461	Replace nine 115kV circuit breakers at Brandon Victoria Station following an assessment which recommended the replacement of under-rated breakers at a fault level of approximately 95% of their individual Maximum Symmetrical Interrupting Rating (MSIR).	Oct 2019

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Mobile Substation Replacement	4 312	Purchase a new 15MVA mobile substation as a replacement for a failed mobile substation.	Nov 2021
HVDC Stations Ground Grid Refurbishment	4 212	Upgrade the existing ground grid systems at Dorsey, Radisson and Henday Converter Stations to address frost heaving and extensive corrosion to improve the integrity of the system.	Nov 2019
Diesel Upgrades - Brochet Diesel G.S.	3 822	Upgrade the diesel generating station and diesel fuel storage tank farm at Brochet to maintain station reliability, compliance with provincial petroleum storage regulations and employee safety.	Mar 2020
New 230kV Supply to Enbridge	3 705	Provide a 230kV supply to Enbridge Pipelines Inc.'s new station via a new 230kV transmission line from the St. Leon Station.	Jul 2018
BP1 Pole Differential Protection	3 604	Modify and/or upgrade the BP1 Pole Differential Protection in order to prevent the blocking of a healthy pole to reduce outages and increase availability.	Nov 2024
HVDC BP1 P1 & P2 Battery Bank Separation	3 575	Separate Pole 1 & Pole 2 battery banks at Dorsey and Radisson Converter Stations and upgrade the battery banks and charger ratings to comply with current Manitoba Hydro design criteria.	Nov 2023
HVDC Site Upgrades for Transformer Moves	3 313	Fortify the roadways/access corridors at Dorsey Converter Station and upgrade the rail spur at Radisson Converter Station to facilitate the safe movement of transformers during the replacement of aging BP1 transformers.	Nov 2025
HVDC Transformer Bushing Draw Rod & Cap Replacement	3 310	Replace the trench DC bushing draw rods and caps on various converter transformers at all converter stations to eliminate the risk of transformers reaching operating temperatures above recommended levels and the possibility of an explosion.	Sep 2017
Whiteshell Bank 1 Replacement	3 035	Replace Whiteshell Station Bank 1 with a new 115 - 33 x 66kV 3OMVA power transformer.	Nov 2017
NERC Critical Infrastructure Protection (CIP) V5 Implementation - HVDC Sites	3 005	Implement physical security infrastructure and systems integration with the new corporate Centralized Security Management System (CSMS) at all converter stations in order to achieve compliance and audit readiness with the North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) standard.	Aug 2016
Reston Station New 230kV Ring Breaker	2 614	Install a new 230kv breaker and re-configure the 230kv ring bus at Reston Station to address the post contingency voltage violations at Virden West, Birtle South, Raven Lake and Reston Stations under certain breaker fail contingencies.	Jun 2020
HVDC Domestic Water System Installations/Upgrade	2 423	To complete all domestic water treatment upgrades and replacements for Dorsey and Radisson Converter Stations to ensure full compliance with the Canadian Drinking Water Guidelines, provincial regulation and system licenses.	Sep 2019
HVDC BP2 Voltage Divider Replacement	2 389	Purchase ten 500kV voltage dividers with eight of them being installed (four at Dorsey and four at Henday) and two as spares. These voltage dividers have reached the end of their useful life and have been experiencing electrical discharge and overheating issues which could result in a forced pole outage.	Mar 2016
Communication Sites Standby Power Upgrades	2 092	Conduct geotechnical investigation of the various contaminated corporate faciliites to delineate the extent of any contamination on and/or around the site and prepare a site investigation. Remediate any contamiated areas identified in the site investigation report to environmentally acceptable limits. Issue a final report on the project confirming the facility and surrounding area were remediated and all areas of the work were left in accordance with applicable environmantal regulations.	Mar 2014

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
V38R 230kV Transmission Line ROW in Riding Mountain National Park	2 085	Prepare a comprehensive Environmental Assessment for the 230kV Transmission Line, Vermillion — Raven Lake, in Riding Mountain National Park, negotiate and acquire a long term Land Use Agreement with Parks Canada, and clear vegetation from the corridor in order to be compliant with NERC standards.	Jun 2017
Dorsey JVC Replacement	1 993	Replace Bipole I & II joint var controllers (JVCs) at Dorsey CS, including the design, assembly, testing and shipment of JVC systems.	Mar 2018
Dorsey-Riel South Loop ROW Property Acquisition	1 882	Acquire the necessary right-of-way (ROW) for future transmission lines to be routed around the west and south side of Winnipeg from Dorsey-Laverendrye-St Vital-Riel Stations to protect future development.	Mar 2011
HVDC Controls & System Replica Development	1 668	Procurement of simulator and control hardware, model development and validation necessary to operate, maintain and complete complex simulation of the Nelson River system including BPIII. This is part of the original MH Simulation Centre (MHSC) development plan and is necessary for future Biipole III and HVDC transmission availability and reliability to study the multi-in-feed control interaction between bipoles.	Mar 2020
Tadoule Lake Diesel G.S. Tank Farm Upgrade	1 498	Upgrade of the Tadoule Lake diesel fuel tank farm to provide adequate storage to meet current and future demands and comply with the Canadian Council of Ministers of the Environment (CCME) - Environmental Code of Practice.	Dec 2015
MTS Fibre Exchange-Neepawa to Roblin	1 385	Construct cable entrances at Russell Customer Service Centre, Roblin South Station and Birtle South Station to facilitate the access of MTS fibre optic cable as part of an agreement with MTS to exchange two strands of fibre optic cable on Manitoba Hydro's Interlake Nelson River Optical Cable System (INROCS).	Mar 2017
Interlake Microwave (ILMW) Diesel Controllers & Switches Replacement	1 250	The Diesel generator controllers and automatic transfer swtiches are to be replaced at eighteen radio sites along the Interlake Microwave Radio Route due to increasing failures, discontinued manufacturer's support and spare parts are no longer available.	Mar 2015
HVDC BP1 Transformer Neutral Bushing Replacement	1 165	Replace all old 15kV neutral bushings on Bipole 1 Converter Transformers as thye have surpassed their useful life. Due to their deteriorated condition, the bushings leak oil and the potential for overheating, causing a risk of fire and a catastrophic failure of the transformers is greatly increased.	Mar 2017
Diesel Upgrades - Shamattawa DGS	1 125	Upgrade the diesel generating station at Shamattawa, in order to maintain station reliability and employee safety.	Mar 2020
Shamattawa Capacity Increase	1 054	Install additional capacity at the Shamattawa Diesel Generating Station in order to meet increasing load resulting from new infrastructure development within the community.	Nov 2014
HVDC BP1 Pole Interlocking Relay Replacement	1 036	Replace BP1 pole interlocking relays with new equipment at Dorsey and Radisson which have surpassed the end of their useful life and regularly misoperate during maintenance outages, therefore extending the amount of time required for the pole outage.	Nov 2023
Dorsey Synchronous Building Roof Rehabilitation	1 032	Install two-ply modified bituminous roofing system over existing sheet metal roof on all BP1 and BP2 Sync building at Dorsey Converter Station. Install cladded and roofed tower over buswork conduits on Syncs 11, 12, and 13 to waterproof awkward existing roof details. The electrical equipment inside the Sync building is crucial to the operation of the Dorsey Converter Station and potential roof leaks increases the risk of forced outages.	Mar 2019

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Marketing & Customer Service			
New McPhillips Station - 115kV to 24kV	47 228	Build a new distribution station with three transformers with load tap changers and associated equipment to address load growth and aging infrastructure.	Oct 2018
Martin Station-New 66-4/12kV Station	31 853	Replace Martin Station with a 5 x 15 MVA bank conventional outdoor station to address load growth.	Sep 2016
Harrow Station - Bank & Feeder Addition	25 100	Install one transformer bank and six breaker positions, as well as upgrade four existing station breakers and bank low-side disconnects to address load growth and reliability issues.	Dec 2019
Winnipeg Distribution Infrastructure Requirement	24 785	Completion of all identified replacements to underground distribution (URD) plants in Winnipeg as determined by the URD Assessment Program, including transformers, elbows, and terminations to address aging infrastructure and improve system reliability.	Mar 2018
Mohawk Station - Bank & Feeder Addition	19 701	Install one 115kV-24kV 100MVA transformer bank, four feeder breakers and a capacitor bank to increase Mohawk Station capacity.	Jun 2019
Distribution Modernization Project	14 647	Phase I of a multi-year Distribution System Modernization Program to advance Manitoba Hydro's business capabilities regarding grid management and to further modernize the distribution system. Includes adding new business processes and related technology functions.	Mar 2018
Heaslip DSC and 8-25kV Conversion	13 089	Construct a DSC with 300A voltage regulators and two feeder positions. Convert all feeders from 8kV to 25kV in the Minto and Carroll Station areas.	Dec 2018
York Station-Bank 1,3,5 & SwitchGear Addition	12 824	Install three transformers and three line-ups of switchgear for twelve additional feeder positions at the existing York (2) Station site to address load growth.	Sep 2016
Rover 4kV Station Salvage& Feeder Conversion	12 752	Construct a new control/terminal building on site and salvage the existing control/terminal building to address aging infrastructure, reliability and safety concerns regarding conductor clearances and electrically underrated equipment.	Mar 2017
Health Science Centre Service Consolidation & Distribution Upgrade	10 216	Organize the existing service points at the HSC complex, as well as seven proposed additional services, into five distribution groups based on geographic proximity. The existing distribution feeders will be salvaged and the buildings will be re-supplied via a modular dual radial distribution system to address aging infrastructure and to allow for anticipated load growth.	Sep 2016
Mystery Lake Station Switchgear Replacment & Bank Addition	8 928	Replace switchgear and add a transformer bank to address reliability issues and projected load growth.	Jan 2016
Tyndall Distribution Supply Centre	8 356	Install a DSC located between the communities of Garson & Tyndall to address load growth.	Sep 2016
William Avenue - New Ductline	8 001	Construct a new duct line along William Ave. and extend five feeders from King Station (new Adelaide Station) to the Health Sciences Centre Complex (HSC) to address load growth and aging infrastructure.	Nov 2016
66 kV System Improvements in the Stanley Area	7 917	Split two existing 66 kV lines at Stanley Station into four lines and install an additional 66 kV circuit at Stanley Station for a station total of five lines. Some 66 kV switch installations and some minor line upgrades must also be completed	Oct 2018
Neepawa Area 66kV System Improvement	7 514	Install new 66 kV lines from Neepawa Station to the Neepawa area to address reliability issues and load growth.	Oct 2016
Steinbach Keating/Steinbach Biscayne Distribution Supply Centres	7 387	Install two DSCs located on the northwest and south side of the city of Steinbach to address load growth.	Oct 2016
Waverley West Supply-Stage 2 (Distribution Supply Centres)	6 619	Install three 10 MVA 66-24kv DSC's to supply the Bridgewater Lakes and South Pointe developments in the Waverley West subdivision.	Sep 2016

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Interlake 66kV System Improvement Work	6 531	66 kV improvements to the Interlake 66 kV System to address load growth and reliability issues.	Oct 2017
Distribution Hot Line Tag Relay Program	6 488	Design, procure, test and replace more than 1,500 relays, as well as switch additions on more than 40 relays, located at over 50 stations.	Mar 2019
Alexander 66-25kV Distribution Supply Centre & Conversion	6 291	Install a DSC and convert feeders from 8kV to 25kV to address load growth.	Mar 2018
Brandon West 4kV - 12kV Conversion	5 501	Convert Brandon McTavish and Elviss Stations from 4kV to 12kV, transferring the load to Brandon Fortier Station and installing a 124kV interchange bank as a new tie to Brandon University.	Mar 2017
Anola Distribution Supply Centre	5 441	Construct a new DSC site near the town of Anola to address load growth.	Sep 2016
Lockport Distribution Supply Centre	5 200	Install a DSC centered between the communities of Lockport and Birdshill to address load growth.	Jul 2016
Winkler West Distribution Supply Centre	5 193	Installation of a DSC and transfer of approximately 11MVA of load from Winkler North Station. Includes 66kV line extension and feeder construction to address load growth.	Mar 2016
Carmen South Distribution Supply Centre	5 096	Install a new DSC with three new 25kV feeder egresses. Connect existing feeders to transfer load from Carman Station.	Mar 2017
Norris Road Distribution Supply Centre	4 974	Construct a new DSC site at 2191 Norris Road in Winnipeg, comprised of two 10 MVA high voltage padmount transformers (HVPT) with two feeders to transfer approximately 7 MVA of load from Emerson Station to Norris Road DSC.	Mar 2018
Portage South 66kV L54 & L84 Upgrade	4 400	Rebuild 14km of 66kV Lines 54 & 84 with 336 aluminum stranded conductor (ASC).	Oct 2017
Gimli West Station GW08-11 & -09 25kV Conversion	4 133	Convert the Gimli West Feeders to 25kV to accommodate load growth and address reliablity issues.	Dec 2015
Property Acquisition-N Downtown Station Site	4 000	Purchase three properties bounded by Notre Dame Ave., Hargrave Ave. and Adelaide Ave.as the future site for a downtown distribution substation to replace King Station.	Mar 2016
Norway House Station Bank Addition	3 990	Installation of a new 66-12.47kV 9/12/15MVA transformer at Norway House Station to ensure firm capacity is available in the community of Norway House beyond fifteen years, mitigating the risk of extended customer outages.	Aug 2017
Victoria Beach Distribution Supply Centre	3 929	Installation of a DSC adjacent to Victoria Beach Station site to increase capacity and reliability in the area.	Aug 2017
Iles des Chenes Distribution Supply Centre	3 634	Construct a new DSC site adjacent to Manitoba Hydro's 115kV line near the town of Iles des Chenes comprised of a 1O MVA High Voltage Padmount Transformer (HVPMT), two 2kV feeders, and associated equipment.	Nov 2016
Notre Dame de Lourdes Distribution Supply Centre	3 580	Install a DSC site adjacent to Notre dame Des Lourdes station to address load growth.	Jun 2016
Outlets of Seasons Development Expansion	3 268	Install underground electrical distribution system with associated distribution centres (DCs), automated vista gear and transformation in order to service the proposed Outlets of Seasons development including a fashion mall, hotels, auto dealerships and a variety of retail and multi-unit residential buildings.	Jun 2016
Norcraft Distribution Supply Centre Site Bank Addition	3 150	Install a new 10MVA DSC bank at Norcraft DSC site in order to provide a reliable supply to CPR station customers and add needed capacity to Norcraft DSC site while re-validating feeder ties.	Oct 2017
Whiteshell 33 kV System Improvements	2 590	Improvements to the Whiteshell 33 kV System, including upgrading of distribution lines and installation of 33kV regulators to address load growth.	Oct 2017
Enbridge Gretna Capacitor Bank Addition	2 500	Purchase of land, installation of one padmount transformer and associated equipment to address load requirements for Enbridge pipelines.	Nov 2017

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
St. Laurent Station New Feeder	2 424	Install a new feeder at St. Laurent Station to transfer load from existing Feeders LA12-1 and LA12-3 to improve voltage and protective reach on the new and existing circuits.	Mar 2017
Elie Station Bank Replacement	2 420	Install a new transformer (Bank 1) and associated electrical hardware/civil plant to address load growth.	Sep 2017
Court Station Feeder Additions	2 376	Install seven new 12kV feeder reclosers and two new bus tie breakers at Court Station, and implement a bus tie breaker interlocking scheme.	Aug 2016
Skelding Distribution Supply Centre	2 200	Install a new DSC with two new 25kV feeder egresses. Connect existing feeders to transfer load from Portage la Reine Station.	Mar 2017
Ste Agathe Station Bank Addition	2 100	Install a new transformer at Ste. Agathe station and replace existing hydraulic automatic circuit reclosers (ACR's) with electronic ACR's.	Oct 2017
Gimli West GW08-5 & GW08-8 Conversion	2 054	Conversion of Gimli West feeders from 8kV to 24.9kV to address load growth.	Oct 2016
Winnipeg Area 66kV Line Upgrades	2 031	Upgrade 108 spans on Winnipeg area 66 kV lines to meet minimum clearance requirements.	Dec 2019
Waterford Green Sub division Feeders	1 997	Extend two new 12kV feeders from Court Station to the Waterford Green subdivision and establish an alternate supply for Amber Trails subdivision to address load growth.	Jun 2015
Convert Feeder BWS12-07 & 12-09 4kV to 12kV	1 950	Convert the feeder area located in the north end of Winnipeg from 4kV to 12kV distribution to support decommissioning of aging 66kV, 12kV and 4kV equipment at Charles and Rover Stations and better provide for future load growth in the area.	Mar 2020
Convert Feeder BWS 12-03 from 4kV to 12kV	1 950	Convert the feeder area located in the north end of Winnipeg from 4kV to 12kV distribution to support decommissioning of aging 66kV, 12kV and 4kV equipment at Charles and Rover Stations and better provide for future load growth in the area.	Dec 2015
Convert Feeder BWS 12-05 from 4kV to 12kV	1 950	Convert the feeder area located in the north end of Winnipeg from 4kV to 12kV distribution to support decommissioning of aging 66kV, 12kV and 4kV equipment at Charles and Rover Stations and better provide for future load growth in the area.	Dec 2015
Eleanor Lake Distribution Supply Centre & Land Purchase	1 907	Install a DSC to supply a new customer and address load growth.	Nov 2014
66kV L14 Upgrade Saltel Tap to Blumenort	1 857	Reconductor 8 km of the 66 kV Line and install a 66kV switch at Steinbach First Avenue Station to address load growth.	Jun 2013
Waverley Service Centre 10MVA 66-24KV Distribution Supply Centre	1 834	Install one DSC and associated equipment to address load growth.	Oct 2012
Wilkes Station New Feeders W61,W66,W67,W72	1 820	Install five new 24kV breakers and associated equipment at Wilkes Station to address load growth.	Mar 2016
Stonewall Area Feeder Improvements	1 800	Install a new feeder at Stonewall Station and invest in a new/rebuilt line, reconfiguring feeders in the area to increase system capacity and ensure voltage levels will meet planning target values during peak conditions. Improvements will also balance loading between Banks 1 and 2.	Nov 2017
Teulon 12kV Area System Improvement	1 620	Install/rebuild 12kV lines and equipment as required to address area Teulon area load growth.	Nov 2015
Dallas Station Bank Addition	1 616	Install a new transformer and associated equipment to address load growth.	Sep 2014
Randolph Station Area System Improvements	1 600	Complete 14.5 km of new and rebuilt line as well as reconfigure feeders in the area to leverage existing station capacity and voltage regulation capability. System capacity will be increased and voltage levels will meet planning target values during peak conditions. Improvements will also help balance loading between banks at the station.	Nov 2018

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Beausejour East System Improvement	1 500	Install a new feeder with egress at Beausejour East Station and invest in a new/rebuilt line, reconfiguring feeders in the area and salvage portions of 33kV Line 17 no longer required (with decommissioning of Garson Station).	Nov 2018
Reconductor H56 Replacement	1 412	Reinsulate and replace the hemp conductor on Harrow Station 24kV feeder to address reliability issues and aging infrastructure, and upgrade other conductors, cables and equipment as required to relocate the conductor to a new alignment out of the transmission line R.O.W. to make way for the future rapid transit corridor.	Mar 2015
Re-Purpose / Salvage 33 kV Line 17	1 300	Salvage and re-purpose existing 33kV Line 17 including circuits and balancing/upgrading 12kV feeders and protection as required.	Sep 2017
Star Lake STL12-2 Extension (Falcon Estates)	1 250	Extend distribution line to supply the new Falcon Estates sub-division.	Nov 2014
Woodlands Distribution System Improvements	1 200	Complete system improvement work in the Woodlands area enhancing voltage control and increasing capacity including the installation or relocation of overhead regulators, approximately 8 km of line rebuilds, load balancing and protection enhancements.	Nov 2017
Morris Feeder MS08-8 Conversion	1 100	Convert three phase and single phase from 8kV to 24.9kV and transfer load to McTavish DSC to address load growth and reliability issues.	Aug 2015
Re-purpose/Salvage 33kV Line 13	1 100	Salvage and re-purpose existing 33kV Line 13 including circuits and balancing/upgrading 12kV feeders and protection as required.	Sep 2017
Brokenhead Stn Bank Upgrade	1 000	Replace the existing transformer with a new unit at Brokenhead Station, install a new bank and related equipment and salvage the existing bank.	Jun 2018

	Total Project Cost (in 000's)	Description	In-Service Date (ISD)
Human Resources & Corporate Services			
Enterprise Asset Management (EAM) Phase 2	35 186	Enterprise Asset Maintenance (EAM) is the replacement of the Applied Maintenance Planning System (AMPS) which is obsolete and no longer supported. EAM is the maintenance planning system for assets primarily in the generating and converter stations.	Mar 2019
Rural Consolidation	20 350	Renovation and retrofit of existing offices to accommodate the relocation of staff displaced from the closing of other district offices.	Mar 2017
Capital Portfolio Management Program	7 368	Extend the implementation of the Copperleaf C55 Asset Investment Planning technology application into Transmission, Marketing & Customer Service and Information Technology lines of business to support the standardization of the Corporation's capital investment planning process.	Nov 2017
Gillam Fleet Building	3 199	Construct a vehicle service garage in Gillam to replace the existing garage, which is located on the Kettle Generating Station site.	Feb 2017
Environmental Health & Safety Management	3 168	Implementation of the SAP Environmental Health & Safety module in order to address data management of hazardous materials, as well as streamline and enhance the process for incident management, analysis and reporting.	Sep 2016
Station Transformer Trailer Replacement	3 000	Replace the existing 150 ton capacity trailer for Haulage Services as the existing trailer no longer has the capacity to transport the new larger station transformers.	Aug 2016
Travel and Expense Management	2 807	Implementation of the SAP Travel and Expense Management module in order to consolidate all travel and expense-related expenditures, simplify reporting, bring greater transparency and provide integration with existing SAP modules.	Jan 2014
Skype for Business	1 011	Configuration of Skype for Business server infrastructure, deployment of the Skype for Business software client application to all corporate workstations, and the implementation of meeting room hardware. Skype for Business (SFB) replaces Adobe Connect as the corporate-standard for software video conferencing, and introduces new communication and collaboration technologies to the corporation.	Mar 2017

Appendix C - Investment Category Definitions

Capital Expenditures

Capacity and Growth

Investments required for the expansion of Manitoba Hydro's generation, transmission or High Voltage Direct Current (HVDC) systems, gas transmission main and station assets, gas distribution main and station assets as well as cathodic protection assets. Forecasted investments under Capacity and Growth are categorized as follows:

- NEW ENERGY: Addition of new generating assets, or upgrades to existing generating assets for the purpose of increasing generation capacity or energy including the associated new or upgraded infrastructure. Also includes new or upgraded transmission assets required to deliver the new or increased energy into the grid. (Generally listed under MNG&T);
- SYSTEM LOAD CAPACITY: Addition of new or upgrades to existing transmission or distribution assets for the purpose of increasing the system's capacity to address anticipated load growth not driven by one large customer;
- GRID INTERCONNECTIONS - IMPORT/ EXPORT: New assets to deliver energy associated with requests for transmission service (import, export and through-flow requirements). (Generally listed under MNG&T);
- CUSTOMER CONNECTIONS - RESIDENTIAL, COMMERCIAL & INDUSTRIAL: New customer-driven connections for domestic service resulting from residential, commercial and/or industrial customer load.
- GRID INTERCONNECTIONS - INDEPENDENT POWER PRODUCERS: New assets to deliver energy associated with requests for transmission service for connections to independent power producers.

Sustainment

Investments to sustain the current and future performance capability of Manitoba Hydro's generation, transmission, High Voltage Direct Current (HVDC), electric distribution assets, gas transmission main and station assets, gas distribution main and station assets as well as cathodic protection assets. Forecasted investments under Sustainment are categorized as follows:

- SYSTEM RENEWAL: Work performed to either replace, refurbish or remove an existing asset as the asset is approaching or is at the end of its useful life, the existing technology is approaching obsolescence, spare parts are not available, and/or the technology is/will be no longer supported. Includes repairs or replacement of assets due to damage caused by the public.
- SYSTEM EFFICIENCY: Addition of new assets or work performed on existing assets in order to improve the operation of the system. Such enhancements are aimed at reducing costs, minimizing the frequency and duration of outages and/or preventing equipment damage.
- MANDATED COMPLIANCE: Investments required to address application of legislative, legal, regulatory or corporate policy, or to address requests from government or other agencies to relocate Manitoba Hydro assets to accommodate other infrastructure.
- DECOMMISSIONING: Expenditures associated with the permanent decommissioning of a Manitoba Hydro generation, transmission, or distribution assets as well as gas transmission or distribution assets. The removal of an asset which is preparation for the construction of an asset in its place is categorized with System Renewal.

Business Operations Support

Investments to support business operations and are shared or common throughout the corporation including:

- INFORMATION TECHNOLOGY - Expenditures associated with Information Technology assets for the data centre(s), network connectivity, infrastructure, security and business systems including hardware and printers, software licenses, installation and implementations. This category does not include technology assets which operate the electric or natural gas systems.

- FLEET - Expenditures associated with corporate vehicles, mobile equipment and trailers. Primarily includes cars, vans, SUVs, trucks, aerial devices, radial boom diggers, cranes, construction equipment, and all recreation equipment and trailers. These assets typically transport people or goods over land (both on and off road) or water, or is a mobile piece of equipment.

- CORPORATE FACILITIES - Expenditures associated with corporate buildings and properties and the required telecommunications. Corporate buildings are facilities where the primary function is to house staff or storage of equipment/inventory, and include customer service centers, office buildings, warehouses, storage facilities and vehicle service garages. They do not include buildings which have a direct association with the generation, transmission or distribution of energy.

- TOOLS AND EQUIPMENT - Expenditures on tools and equipment used by maintenance crews and/or field staff while working on maintenance or capital projects. Also includes specialized tools and equipment used by design staff to test apparatus and systems.

- GENERATION BUILDINGS AND GROUNDS – Expenditures associated with site buildings related to generating station assets which are primarily designed for operations, as well as property, fencing, roads, railway spurs, water & sewer, public safety, security, PCB, fire suppression and drainage.

- TOWNSITE INFRASTRUCTURE - Expenditures associated with community infrastructure including staff houses, housing and permanent camps. Costs for infrastructure associated with the first-time construction of new or incremental generation, transmission, HVdc or distribution asset, would typically be included with the corresponding project and not classified as Business Operations Support.

Demand Side Management (DSM)

Expenditures related to pursuit of electric energy conservation and efficiency activities designed to manage the demand for energy.