

April 2018

Capital Expenditure Forecast (CEF18) 2018/19 – 2027/28

Capital Expenditure & Demand Side Management Forecast (CEF18) 2018/19 – 2027/28

FINANCE & STRATEGY
APRIL 2018



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Section A

CEF18 Summary

A – CEF18 Summary

The Capital Expenditure & Demand Side Management Forecast (CEF18) is a projection of Manitoba Hydro's capital expenditures for new and replacement facilities required to deliver safe reliable energy services to customers at a fair price. CEF18 also includes a projection of Manitoba Hydro's expenditures related to the corporation's Electric and Natural Gas Demand Side Management (DSM) programs.

CEF18 forecasts capital expenditures during the ten year period from 2018/19 to 2027/28. The forecast of capital expenditures in the short term is comprised of executing projects and programs. The longer term forecast is comprised of anticipated expenditure trends. Projects are investments planned on an individual basis with a scope, schedule and budget whereas programs are a collection of small investments that are administered in common.

Capital expenditures are categorized between Major New Generation & Transmission (MNG&T) projects and Business Operations Capital. MNG&T projects provide significant new generation or transmission capacity which are typically substantial in 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. Also included are expenditures which support business operations such as fleet, administrative buildings and information technology hardware and software. Business Operations Capital is further categorized by operating system: Generation, Transmission and Distribution, as well as Corporate Infrastructure. A breakdown of the Capital Expenditure & Demand Side Management Forecast (CEF18) is shown below.

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18) SUMMARY

(in millions of dollars)

	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
1.0 MAJOR NEW GENERATION & TRANSMISSION	2 092.5	1 214.4	958.9	777.0	311.2	5 353.9	5 391.2
2.0 BUSINESS OPERATIONS CAPITAL	547.1	546.3	557.9	569.9	601.0	2 822.2	6 074.7
2.1 Electric Business Operations Capital	515.0	510.5	521.4	532.7	563.0	2 642.7	5 693.9
2.1.1 Generation System	95.0	105.0	107.1	109.2	130.0	546.3	1 228.2
2.1.2 Transmission System	130.0	130.0	130.0	130.0	130.0	650.0	1 331.9
2.1.3 Distribution System	210.0	220.5	229.3	238.5	248.0	1 146.4	2 545.3
2.1.4 Corporate Infrastructure	80.0	55.0	55.0	55.0	55.0	300.0	588.5
2.2 Natural Gas Business Operations Capital	32.1	35.8	36.5	37.2	38.0	179.5	380.8
2.2.1 Distribution System & Corporate Infrastructure	32.1	35.8	36.5	37.2	38.0	179.5	380.8
3.0 DEMAND SIDE MANAGEMENT	71.9	105.1	99.6	97.8	77.0	451.4	837.4
CONSOLIDATED CAPITAL EXPENDITURE & DSM FORECAST TOTAL	2 711.5	1 865.7	1 616.4	1 444.7	989.2	8 627.5	12 303.3
ELECTRIC CAPITAL & DSM FORECAST TOTAL	2 670.0	1 819.1	1 569.2	1 396.7	940.8	8 395.7	11 818.8
NATURAL GAS CAPITAL & DSM FORECAST TOTAL	41.5	46.6	47.2	48.0	48.4	231.7	484.5

Both MNG&T and Business Operations Capital are classified further by investment category. For a full description of level 1 and 2 investment categories, please refer to Appendix I – Investment Category Definitions.

Appendix II – Projects Greater than \$1 Million and Less than \$15 Million provides a listing of executing and new projects greater than \$1 million and less than \$15 million. Projects greater than \$15 million are listed separately within Section B – Capital Expenditure & Demand Side Management Forecast by Investment Category.



Section B

Capital Expenditure & Demand Side Management Forecast by Investment Category

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B – Capital Expenditure & Demand Side Management Forecast by Investment Category

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 investments. The primary investment categories (level 1) are Capacity & Growth, Sustainment and Business Operations Support. Capacity & Growth investments provide for future load growth or address existing capacity constraints in various geographic areas on the transmission and distribution system. Sustainment investments are required to ensure the continued and future performance capability of the system and address the issue of aging or obsolete assets. Business Operations Support investments support corporate operations including corporate facilities, information technology, and fleet investments. Detailed investment category definitions are included in Appendix I -Investment Category Definitions.

The following schedule provides a summary of capital expenditure requirements for Major New Generation & Transmission and Business Operations Capital, as well as Demand Side Management.

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
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1.0 MAJOR NEW GENERATION & TRANSMISSIONCapacity & Growth Projects

Keeyask - Generation	8 726.0	1 265.4	1 016.6	846.9	763.9	311.2	4 204.0	4 241.3
Bipole III Reliability	5 041.5	662.6	33.4	2.6	-	-	698.5	698.5
Manitoba-Minnesota Transmission Project	451.7	162.0	144.4	91.2	-	-	397.6	397.6
Birtle Transmission	56.5	2.5	20.0	18.2	13.0	-	53.8	53.8

MAJOR NEW GENERATION & TRANSMISSION TOTAL

	2 092.5	1 214.4	958.9	777.0	311.2	5 353.9	5 391.2
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CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
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2.0 BUSINESS OPERATIONS CAPITAL**2.1 Electric Business Operations Capital****2.1.1 Generation System**Sustainment Projects

Water Licenses & Renewals	99.0	10.7	9.9	4.4	0.3	-	25.2	25.2
Pine Falls Units 1-4 Major Overhauls	77.1	7.4	5.7	0.2	-	-	13.2	13.2
Generation North Sewer & Domestic Water System	31.2	6.0	4.4	0.8	2.1	0.5	13.8	16.6
Grand Rapids Unit Transformer Replacement	23.2	1.8	-	-	-	-	1.8	1.8
Public Water Safety/Security	22.4	3.5	5.2	2.8	-	-	11.5	11.5
Slave Falls Seven Bay Sluiceway	17.7	2.2	0.7	-	-	-	2.9	2.9
Other Projects	252.0	34.5	32.9	19.2	5.5	1.4	93.4	95.2
Subtotal		66.1	58.8	27.3	7.8	1.9	161.9	166.4

Business Operations Support Projects

Town of Gillam Paving and Land Drainage	32.2	5.3	5.5	6.3	5.7	6.6	29.5	30.7
Grand Rapids Fish Hatchery Upgrade & Expansion	23.2	1.4	8.1	5.6	3.7	-	18.9	18.9
Town of Gillam Water Treatment Plant	23.1	0.2	16.9	5.8	-	-	22.9	22.9
Sewer & Water Linear Infrastructure	15.3	-	4.6	5.0	5.8	-	15.3	15.3
Other Projects	101.0	28.6	13.7	1.0	1.0	0.1	44.4	44.4
Subtotal		35.6	48.8	23.6	16.3	6.7	131.0	132.2

Programs

NA	8.6	9.2	9.3	9.5	9.7	46.3	97.9
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Generation System Subtotal

	110.3	116.7	60.3	33.6	18.3	339.2	396.6
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Target Variance

NA	(15.3)	(11.7)	46.8	75.6	111.7	207.2	831.6
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Generation System Total

	95.0	105.0	107.1	109.2	130.0	546.3	1 228.2
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CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
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2.0 BUSINESS OPERATIONS CAPITAL**2.1 Electric Business Operations Capital****2.1.2 Transmission System**Sustainment Projects

Bipole 2 Thyristor Valve Replacement	236.0	0.1	0.1	2.5	5.6	9.9	18.3	235.7
HVDC Transformer Sustainment	177.5	19.7	8.9	4.5	2.5	6.5	42.1	43.9
Dorsey Synchronous Condenser Refurbishment	78.0	2.7	3.1	3.9	4.4	5.8	19.9	19.9
Transmission Line Upgrades for Improved Clearance	74.0	5.0	5.1	18.1	18.4	18.8	65.4	65.4
Transmission Transformer Sustainment	64.1	-	0.2	0.3	2.2	1.3	4.0	33.5
Station Battery Bank Capacity & System Reliability Increase	45.6	0.1	1.7	1.1	0.5	-	3.4	3.4
Transmission Line Protection & Teleprotection Replacement	26.0	2.1	0.3	-	-	-	2.3	2.3
Bipole I&II Spacer Damper Replacement (Phase 2)	24.0	2.2	-	-	-	-	2.2	2.2
HVDC BP2 Valve Hall Wall Bushing Replacement	18.8	0.6	-	-	-	0.1	0.6	18.2
13.2kV Shunt Reactor Replacements	16.2	4.0	3.1	-	-	-	7.1	7.1
HVDC - Gapped Arrester Replacement	15.8	2.4	2.9	0.4	0.6	0.3	6.7	10.8
PCB Bushing Elimination	15.3	1.6	1.7	1.7	1.9	1.9	8.9	11.6
Other Projects	182.3	23.2	12.3	10.4	8.6	2.8	57.4	72.4
Subtotal		63.7	39.4	43.0	44.7	47.5	238.2	526.3

Capacity & Growth Projects

St. Vital-DeSalaberry T/L & DeSalaberry Station	118.9	14.2	42.8	52.7	2.6	2.0	114.2	114.2
Lake Winnipeg East System Improvements	79.3	1.6	-	-	-	-	1.6	1.6
DeSalaberry-Letellier 230kV Transmission Line	67.9	4.6	13.7	16.8	28.4	-	63.5	63.5
Winnipeg-Brandon Transmission System Improvements	43.9	0.2	0.2	0.2	0.2	0.2	0.9	29.8
Southwest Winnipeg 115kV Transmission Improvement	39.2	0.3	24.1	10.3	1.6	0.1	36.4	36.4
Laverendrye-St. Vital 230kV Line & Breakers	33.7	1.2	0.5	3.6	10.8	5.3	21.5	21.5
Stanley Area 115kV to 230kV Migration	24.9	5.2	-	-	0.6	5.9	11.7	19.0
Stanley Station 2nd Bank & S60L Sectionalization	15.3	2.8	-	-	-	-	2.8	2.8
Other Projects	58.8	14.7	1.3	0.3	9.5	6.9	32.7	37.8
Subtotal		44.8	82.6	83.9	53.7	20.4	285.4	326.6

Programs

NA	26.3	26.3	26.8	27.4	27.9	134.8	283.0
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Transmission System Subtotal

	134.8	148.3	153.7	125.7	95.8	658.3	1 135.9
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Target Variance

NA	(4.8)	(18.3)	(23.7)	4.3	34.2	(8.3)	195.9
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Transmission System Total

	130.0	130.0	130.0	130.0	130.0	650.0	1 331.9
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CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
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2.0 BUSINESS OPERATIONS CAPITAL**2.1 Electric Business Operations Capital****2.1.3 Distribution System**Programs

Asset Renewal	NA	73.3	76.4	77.9	79.5	81.1	388.1	818.5
Customer Connections	NA	31.1	31.8	32.4	33.1	33.7	162.1	341.1
Capacity Additions	NA	19.0	19.8	20.2	20.6	21.0	100.6	212.2
Mandated Requirements	NA	9.1	10.4	10.6	10.8	11.0	51.8	110.2
Other Programs	NA	2.1	2.2	2.2	2.3	2.3	11.1	23.6
Subtotal		134.5	140.5	143.4	146.2	149.1	713.8	1 505.5

Capacity & Growth Projects

Panet Station - 66/24kV	51.8	18.1	31.9	-	-	-	50.0	50.0
Reenders Station - 66/12kV	46.8	3.1	22.3	20.9	-	-	46.3	46.3
St. Vital Station - 115/24kV	39.5	0.6	-	-	-	-	0.6	0.6
McPhillips Station - 115kV/24kV	35.2	5.0	0.6	-	-	-	5.6	5.7
Martin Station 66-4/12kV Station	32.8	0.1	-	-	-	-	0.1	0.1
Mohawk Station Bank Addition	17.0	4.5	0.9	-	-	-	5.4	5.4
Harrow Station Bank Addition	15.4	8.6	5.4	-	-	-	14.0	14.0
Other Projects	200.0	30.5	25.6	1.5	-	-	57.6	57.6
Subtotal		70.5	86.7	22.4	-	-	179.6	179.7

Sustainment Projects

Adelaide Station - 66/12kV	69.6	12.8	2.7	-	-	-	15.5	15.5
Other Projects	52.3	15.4	1.1	1.1	-	-	17.6	17.6
Subtotal		28.2	3.7	1.1	-	-	33.0	33.0

Distribution System Subtotal

Target Variance

Distribution System Total

		233.2	231.0	166.9	146.2	149.2	926.5	1 718.2
Target Variance	NA	(23.2)	(10.5)	62.5	92.3	98.9	219.9	827.1
Distribution System Total		210.0	220.5	229.3	238.5	248.0	1 146.4	2 545.3

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
2.0 BUSINESS OPERATIONS CAPITAL								
2.1 Electric Business Operations Capital								
2.1.4 Corporate Infrastructure								
<u>Programs</u>								
Fleet	NA	14.5	14.5	14.8	15.1	15.4	74.3	155.9
Information Technology	NA	10.4	13.8	14.1	14.4	9.3	62.0	111.5
Facilities	NA	3.8	10.2	10.5	10.7	10.9	46.0	103.7
Other Programs	NA	2.2	2.2	2.2	2.3	2.3	11.3	23.7
Subtotal		30.8	40.8	41.6	42.4	37.9	193.5	394.9
<u>Business Operations Support Projects</u>								
Gillam Recreation Center Refurbishment	38.3	25.2	0.6	-	-	-	25.7	25.7
Enterprise Asset Management - Phase 2	35.2	2.9	-	-	-	-	2.9	2.9
Rural Consolidation	18.8	4.3	-	-	-	-	4.3	4.3
Other Projects	41.3	17.3	0.1	-	-	-	17.4	17.4
Subtotal		49.8	0.6	-	-	-	50.4	50.4
Corporate Infrastructure Subtotal		80.6	41.4	41.6	42.4	37.9	243.9	445.3
Target Variance	NA	(0.6)	13.6	13.4	12.6	17.1	56.1	143.2
Corporate Infrastructure Total		80.0	55.0	55.0	55.0	55.0	300.0	588.5
Electric Business Operations Capital Total		515.0	510.5	521.4	532.7	563.0	2 642.7	5 693.9

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
2.0 BUSINESS OPERATIONS CAPITAL								
2.2 Natural Gas Business Operations Capital								
2.2.1 Distribution System & Corporate Infrastructure								
<u>Programs</u>								
Capacity & Additions	NA	24.1	24.8	25.3	25.8	26.3	126.2	265.8
Meters & Mandated Requirements	NA	5.7	9.3	9.5	9.7	9.9	44.3	96.9
Subtotal		29.8	34.1	34.8	35.5	36.2	170.5	362.7
Sustainment Projects	24.8	7.4	4.0	1.8	1.5	-	14.7	14.7
Capacity & Growth Projects	12.3	1.7	3.4	2.5	0.3	-	7.9	7.9
Distribution System & Corporate Infrastructure Subtotal		38.9	41.5	39.1	37.3	36.2	193.0	385.2
Target Variance	NA	(6.8)	(5.7)	(2.6)	(0.1)	1.8	(13.5)	(4.4)
Natural Gas Business Operations Capital Total		32.1	35.8	36.5	37.2	38.0	179.5	380.8
BUSINESS OPERATIONS CAPITAL TOTAL		547.1	546.3	557.9	569.9	601.0	2 822.2	6 074.7

CAPITAL EXPENDITURE & DEMAND SIDE MANAGEMENT FORECAST (CEF18)

(in millions of dollars)

	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
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3.0 DEMAND SIDE MANAGEMENT

Electric Programs	NA	62.5	94.3	88.9	86.9	66.5	399.1	733.7
Natural Gas Programs	NA	9.4	10.8	10.8	10.9	10.4	52.2	103.7
DEMAND SIDE MANAGEMENT TOTAL		71.9	105.1	99.6	97.8	77.0	451.4	837.4

1.0 – Major New Generation & Transmission

Manitoba Hydro's Major New Generation & Transmission investments are entirely driven by the Capacity & Growth investment category as shown below.

MAJOR NEW GENERATION & TRANSMISSION (\$ Millions)	Total Project Cost	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
Capacity & Growth								
New Energy								
Keeyask - Generation	8 726.0	1 265.4	1 016.6	846.9	763.9	311.2	4 204.0	4 241.3
System Load Capacity								
Bipole III - Converter Stations	2 780.7	345.7	23.1	0.2	-	-	369.0	369.0
Bipole III - Transmission Line	1 957.6	290.2	10.2	2.4	-	-	302.8	302.8
Bipole III - Collector Lines	246.6	25.6	-	-	-	-	25.6	25.6
Bipole III - Community Development Initiative	56.6	1.1	-	-	-	-	1.1	1.1
System Load Capacity Total	5 041.5	662.6	33.4	2.6	-	-	698.5	698.5
Grid Interconnections - Import/ Export								
Manitoba-Minnesota Transmission Project	451.7	162.0	144.4	91.2	-	-	397.6	397.6
Birtle Transmission	56.5	2.5	20.0	18.2	13.0	-	53.8	53.8
Grid Interconnections - Import/ Export Total	508.2	164.5	164.5	109.3	13.1	-	451.4	451.4
Capacity & Growth Total	14 275.7	2 092.5	1 214.4	958.9	777.0	311.2	5 353.9	5 391.2

Each of the projects is described below along with changes from the last approved Capital Expenditure and Demand Side Management Forecast (CEF16).

1.1 Keeyask

The Keeyask project is a 695-megawatt (MW) hydroelectric generating station that is being developed in a partnership between Manitoba Hydro and four Manitoba First Nations: Tataskweyak Cree Nation, War Lake First Nation, York Factory First Nation, and Fox Lake Cree Nation. Working together, the Partners are known collectively as the Keeyask Hydropower Limited Partnership.

Located approximately 725 km north of Winnipeg on the lower Nelson River, construction of the Keeyask project includes:

- 7 unit powerhouse/service bay complex on the north side of Gull Rapids;
- 7 bay spillway on the south side of Gull Rapids;
- More than 2 km of dams across Gull Rapids; and
- 23 km of dykes built on the north and south side of the reservoir.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 8 726.0	\$ 1 290.5	\$ 1 116.7	\$ 867.9	\$ 707.1	\$ 329.9	\$ 63.0
Increase (Decrease)	-	(25.1)	(100.2)	(21.0)	56.9	(18.7)	(25.7)
Revised Forecast	\$ 8 726.0	\$ 1 265.4	\$ 1 016.6	\$ 846.9	\$ 763.9	\$ 311.2	\$ 37.3

Status:

No change in total project forecast from CEF16, the project is in the construction phase with first power expected in 2021/22.

1.2 Bipole III Reliability

This high voltage direct current (HVDC) transmission project is required to improve overall system reliability and dependability and involves the construction of:

- A 500kV HVDC transmission line linking the northern power generating complex on the Lower Nelson River with the conversion and delivery system in southern Manitoba;
- 2 new converter stations – Keewatinohk Station in northern Manitoba, located northeast of Gillam and Riel Station, located east of Winnipeg. In addition, there are 2 ground electrodes - 1 at each converter station; and
- Additional 230-kV transmission collector lines in the north to tie the new Keewatinohk Converter Station into the existing northern alternating current (AC) system.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 5 041.5	\$ 657.1	\$ 17.1	\$ 2.5	\$ -	\$ -	\$ -
Increase (Decrease)	-	5.4	16.3	0.1	-	-	-
Revised Forecast	\$ 5 041.5	\$ 662.6	\$ 33.4	\$ 2.6	\$ -	\$ -	\$ -

Status:

No change in total project forecast from CEF16, the project is in the construction phase with in-service expected in 2018/19.

1.3 Manitoba-Minnesota Transmission Project

The Manitoba–Minnesota Transmission Project will strengthen the overall reliability of Manitoba’s electricity supply, will allow Manitoba Hydro to fulfill current export sales agreements and increase access to markets in the United States, supporting export sales. The project includes:

- Construction of a 500kV AC transmission line from the Winnipeg area to the U.S. border in southeastern Manitoba where it will connect to the Great Northern Transmission Line to be constructed by Minnesota Power; and
- Upgrades to associated electrical stations at Dorsey, Riel and Glenboro.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 453.2	\$ 114.3	\$ 82.9	\$ 146.8	\$ -	\$ -	\$ -
Increase (Decrease)	(1.5)	47.7	61.5	(55.7)	-	-	-
Revised Forecast	\$ 451.7	\$ 162.0	\$ 144.4	\$ 91.2	\$ -	\$ -	\$ -

Status:

The total project forecast in CEF18 has been decreased by \$1.5 million from CEF16. The project is in the planning and design phase with an application before the National Energy Board for review and approval with expected in-service in 2020/21.

1.4 Birtle Transmission

The Birtle Transmission project, previously named the Manitoba-Saskatchewan Transmission Project, is a new 230-kV transmission line to be built from Birtle Station to the Manitoba–Saskatchewan border, which is required to supply the SaskPower 100MW System Power Sale.

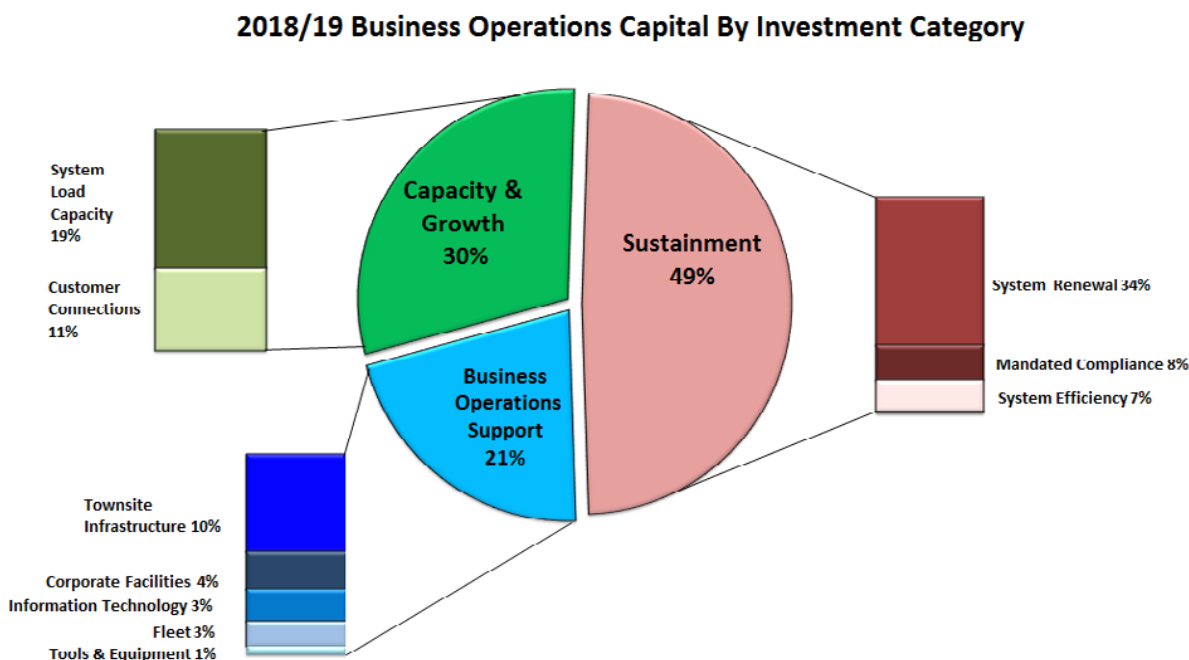
	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 56.5	\$ 2.3	\$ 18.6	\$ 17.7	\$ 10.8	\$ -	\$ -
Increase (Decrease)	-	0.2	1.4	0.5	2.2	-	-
Revised Forecast	\$ 56.5	\$ 2.5	\$ 20.0	\$ 18.2	\$ 13.0	\$ -	\$ -

Status:

The total project forecast in CEF18 is unchanged from CEF16. The project is awaiting approval of an environmental license, upon receipt of which construction will begin. This project is expected to be in-service in 2021/22.

2.0 – Business Operations Capital – Consolidated

The 2018/19 forecast for Electric and Natural Gas Business Operations Capital by investment category is shown below.



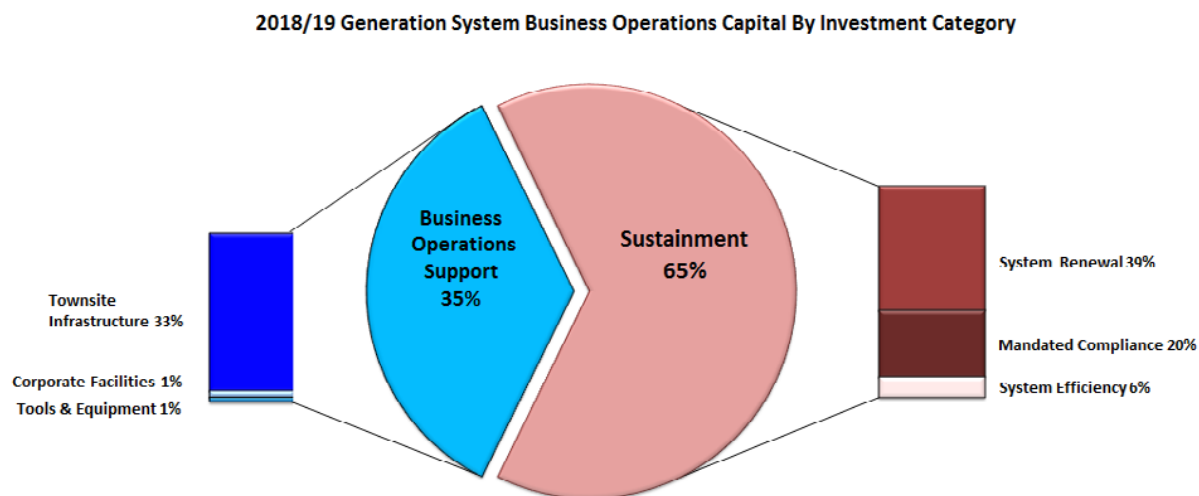
Appendix II – Projects Greater than \$1 Million and Less than \$15 Million contains a list of all executing and new Business Operations Capital projects by investment category with a total project forecast between \$1 million and \$15 million, including projected cashflows. Projects with a total forecast of greater than \$15 million are listed in Section B – Capital Expenditure & Demand Side Management Forecast by Investment Category.

2.1 – Business Operations Capital – Electric

2.1.1 – Generation System

Manitoba Hydro's generation system is made up of 15 hydraulic and 2 thermal generating stations with sufficient capacity to meet domestic and export customer commitments for the foreseeable future once Keeyask Generating Station is placed into service. Generation system assets include water retaining structures, water control equipment, generation drive train assets and associated station infrastructure as well as support infrastructure such as airports and town sites at remote locations.

The generation system capital expenditure forecast for 2018/19 is comprised of projects and programs resulting from sustainment and business operations support investment categories with the majority of the forecast requirements to address system renewal of the generation system and townsite infrastructure requirements primarily for the Town of Gillam, as shown below.



Investment category and cashflow details for generation projects with a total project forecast of greater than \$15 million can be found in Section B – Capital Expenditure & Demand Side Management Forecast by Investment Category and projects with a total project forecast between \$1 million and \$15 million can be found in Appendix II – Projects Greater than \$1 Million and Less than \$15 Million.

Additional details for generation system projects with a total project forecast of greater than \$50 million are summarized below.

2.1.1.1 - Water Licenses & Renewals

The Water Licenses & Renewals project is to secure license finalization and/or renewals for Manitoba Hydro's hydraulic plants to reduce risk exposure, maintain operating flexibility, maximize export revenues and contribute to financial strength.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 99.0	\$ 8.8	\$ 9.0	\$ 7.8	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.9	0.9	(3.4)	0.3	-	-
Revised Forecast	\$ 99.0	\$ 10.7	\$ 9.9	\$ 4.4	\$ 0.3	\$ -	\$ -

Investment Category:

Sustainment – Mandated Compliance

Status:

No change in total project forecast from CEF16, cash flow changes reflect a revised work schedule.

2.1.1.2 - Pine Falls Units 1-4 Major Overhauls

The Pine Falls Units 1-4 Major Overhauls project is to address upgrades and modernization of various components required to ensure reliable, safe and economical operations. Upgrades include generator rewinds, transformer and turbine installations and machine associated water passage components.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 88.8	\$ 9.9	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	(11.7)	(2.5)	5.7	0.2	-	-	-
Revised Forecast	\$ 77.1	\$ 7.4	\$ 5.7	\$ 0.2	\$ -	\$ -	\$ -

Investment Category:

Sustainment – System Renewal

Status:

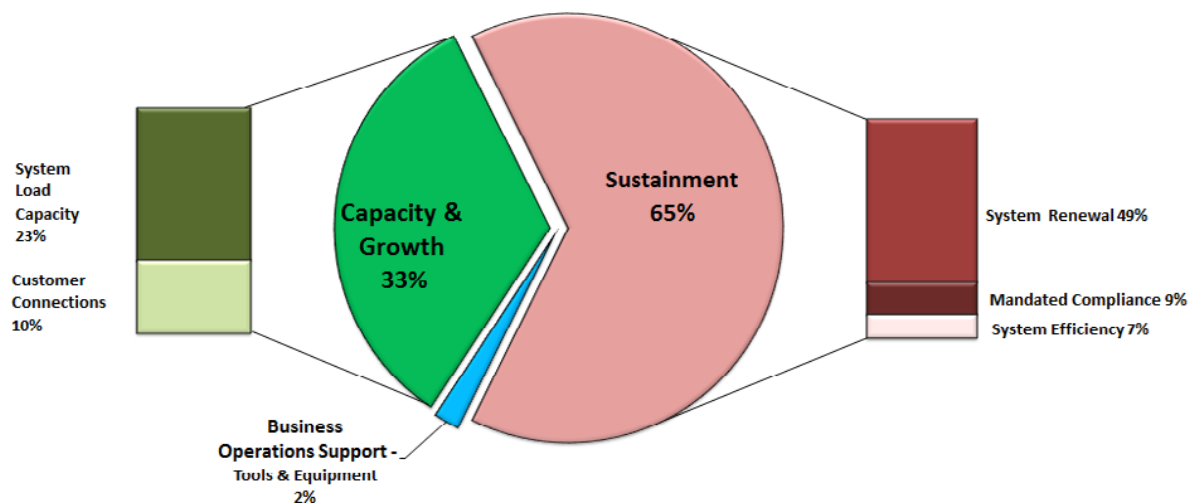
Total project forecast was reduced from CEF16 to reflect a reduction in risks realized. In-service is expected in 2019/20.

2.1.2 – Transmission System

Manitoba Hydro's transmission system consists of over 10 500 km of AC transmission lines and 110 terminal stations, plus almost 1 900 km of HVDC transmission lines and 3 converter stations. Collectively, these systems enable the delivery of power from multiple points of generation to customers across the province and beyond provincial borders. Manitoba Hydro's major transmission system assets include overhead conductor and hardware, wood pole structures and steel structures, and transmission station equipment such as breakers, protection relays and transformers, as well as highly sophisticated apparatus at the HVDC converter stations.

The transmission system capital expenditure forecast for 2018/19 is comprised mainly of sustainment and capacity and growth projects and programs with the majority of the forecast requirements to address system renewal of the transmission system as well as system load capacity as outlined below.

2018/19 Transmission System Business Operations Capital By Investment Category



Investment category and cashflow details for transmission projects with a total project forecast of greater than \$15 million can be found in Section B – Capital Expenditure & Demand Side Management Forecast by Investment Category above and projects with a total project forecast between \$1 million and \$15 million can be found in Appendix II – Projects Greater than \$1 Million and Less than \$15 Million.

Additional details for transmission system projects with a total project forecast of greater than \$50 million are summarized below.

2.1.2.1 - Bipole 2 Thyristor Valve Replacement

The Bipole 2 Thyristor Valve Replacement project will replace thyristor valve groups and controls nearing the end of useful life which will result in a significant decrease in failures, reduce maintenance requirements and improve the overall reliability of Bipole II.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 236.0	\$ 0.5	\$ 0.5	\$ 1.3	\$ 13.6	\$ 22.9	\$ 197.1
Increase (Decrease)	-	(0.4)	(0.4)	1.2	(8.0)	(13.0)	20.3
Revised Forecast	\$ 236.0	\$ 0.1	\$ 0.1	\$ 2.5	\$ 5.6	\$ 9.9	\$ 217.4

Investment Category:

Sustainment – System Renewal

Status:

No change to the total project forecast from CEF16. In-service is expected in 2026/27.

2.1.2.2 - HVDC Transformer Sustainment

The HVDC Transformer Sustainment project is to maintain an inventory of spare converter transformers and plan for the proactive replacement of critical transformers to limit outage durations and outage costs in the event of transformer failures.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 178.4	\$ 9.9	\$ 0.4	\$ 0.1	\$ 1.0	\$ -	\$ 16.6
Increase (Decrease)	(0.9)	9.8	8.5	4.4	1.5	6.5	(14.8)
Revised Forecast	\$ 177.5	\$ 19.7	\$ 8.9	\$ 4.5	\$ 2.5	\$ 6.5	\$ 1.8

Investment Category:

Sustainment – System Renewal

Status:

Total project forecast decreased from CEF16 as cashflows were revised to reflected transformer delivery dates. Last in-service is expected in 2036/37.

2.1.2.3 - Dorsey Synchronous Condenser Refurbishment

The Dorsey Synchronous Condenser Refurbishment project is for the mechanical refurbishment of the synchronous condensers (SC) to prevent catastrophic failure and to ensure 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.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 73.6	\$ 0.5	\$ -	\$ -	\$ -	\$ -	\$ 8.5
Increase (Decrease)	4.4	2.2	3.1	3.9	4.4	5.8	(8.5)
Revised Forecast	\$ 78.0	\$ 2.7	\$ 3.1	\$ 3.9	\$ 4.4	\$ 5.8	\$ -

Investment Category:

Sustainment – System Renewal

Status:

Total project forecast increased from CEF16 to reflect the deferral of work to accommodate other projects as well as advancing overhauls of SC11 and SC12 to mitigate failure risk of SC13Y. Final in-service is expected in 2022/23.

2.1.2.4 - Transmission Line Upgrades for Improved Clearance

The Transmission Line Upgrades for Improved Clearance project is to upgrade over 1 000 transmission spans to meet Canadian Standards Association (CSA) Standards for line clearance to ensure continued reliability and operations of the electrical system as well as to mitigate risks to public safety due to insufficient line clearance.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 74.7	\$ 5.1	\$ 5.2	\$ 16.7	\$ 17.0	\$ 17.3	\$ -
Increase (Decrease)	(0.7)	(0.1)	(0.1)	1.4	1.4	1.5	-
Revised Forecast	\$ 74.0	\$ 5.0	\$ 5.1	\$ 18.1	\$ 18.4	\$ 18.8	\$ -

Investment Category:

Sustainment – Mandated Compliance

Status:

No significant change to the total project forecast from CEF16. Final in-service is expected in 2022/23.

2.1.2.5 - Transmission Transformer Sustainment

The Transmission Transformer Sustainment project is for the proactive replacement or refurbishment of transformers to reduce system failure risks, maintain system reliability and reduce repair and refurbishment costs associated with the transmission transformer asset base.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 64.4	\$ -	\$ 0.2	\$ 0.3	\$ 2.2	\$ 1.3	\$ 29.7
Increase (Decrease)	(0.3)	-	-	-	-	-	(0.2)
Revised Forecast	\$ 64.1	\$ -	\$ 0.2	\$ 0.3	\$ 2.2	\$ 1.3	\$ 29.5

Investment Category:

Sustainment – System Renewal

Status:

Total project forecast decreased from CEF16 to reflect revised cashflows. Final in-service expected in 2032/33.

2.1.2.6 - St Vital-DeSalaberry Transmission Line & DeSalaberry Station

The St. Vital-DeSalaberry Transmission Line & DeSalaberry Station project is to construct a new 230-66kV station in the DeSalaberry area and a new 230kV line from the St. Vital Station to the new 230-66kV station. The project includes terminations and communications to address reliability, voltage and loading issues from above ground load growth in south Winnipeg and southeastern Manitoba.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	118.9	14.2	42.8	52.7	2.6	2.0	-
Revised Forecast	\$ 118.9	\$ 14.2	\$ 42.8	\$ 52.7	\$ 2.6	\$ 2.0	\$ -

Investment Category:

Capacity & Growth – System Load Capacity

Status:

Construction is scheduled to start in the summer of 2018 with an in-service date of 2020/21.

2.1.2.7 - Lake Winnipeg East System Improvements

The Lake Winnipeg East System Improvements project is to build a new 115/66kV Manigotagan station and a new 65 km 115kV transmission line from the Pine Falls station to the Manigotagan Corner station to provide firm capacity for Pine Falls area load and enable the Bloodvein static var compensator (SVC) to effectively control voltage.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 75.5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	3.8	1.6	-	-	-	-	-
Revised Forecast	\$ 79.3	\$ 1.6	\$ -	\$ -	\$ -	\$ -	\$ -

Investment Category:

Capacity & Growth – System Load Capacity

Status:

Total project forecast increased from CEF16 as a result of contractor delays and higher construction costs than expected. The contractor delays have resulted in deferral of the in-service date to 2018/19 from 2017/18.

2.1.2.8 - DeSalaberry-Letellier 230kV Transmission Line

The DeSalaberry-Letellier 230kV Transmission Line project is to design and build a new 230kV transmission line from the proposed new DeSalaberry Station to the Letellier Station, including associated terminations and communications to improve the power network in Southern Manitoba. This project is required to ensure reliability of supply and ensure loads can be served.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	67.9	4.6	13.7	16.8	28.4	-	-
Revised Forecast	\$ 67.9	\$ 4.6	\$ 13.7	\$ 16.8	\$ 28.4	\$ -	\$ -

Investment Category:

Capacity & Growth – System Load Capacity

Status:

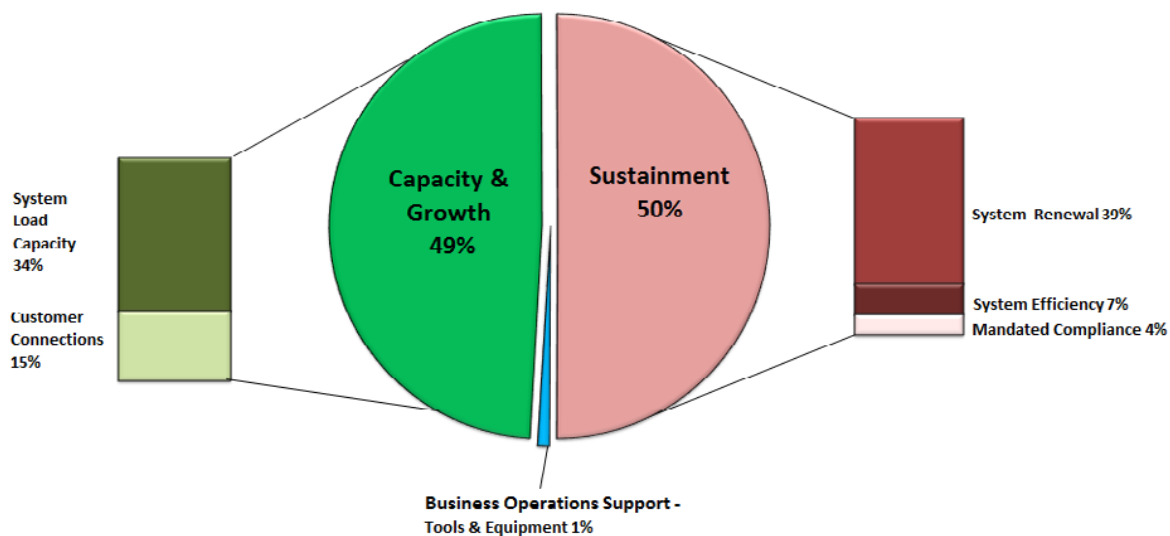
Detailed design will begin in 2018, construction will begin in the summer of 2020 and in-service is anticipated in 2021/22.

2.1.3 – Distribution System

Manitoba Hydro's distribution system is made up of 381 substations that transform electricity from high transmission voltages to voltages suitable for safe distribution throughout the province. The distribution system has 68 100 km of distribution lines, 280 substations across rural Manitoba and 101 substations within the City of Winnipeg. Major distribution system asset classes include underground cables, manholes, duct lines, transformers, substation breakers, conductors, wood poles and street light standards. These assets have relatively low per unit costs but there are millions of separate components spread across the province.

The distribution system capital expenditure forecast for fiscal 2018/19 is comprised mainly of capacity & growth and sustainment projects and programs with the majority of the forecast requirements to address system renewal and system load capacity requirements for the distribution system, as outlined below.

2018/19 Distribution System Business Operations Capital By Investment Category



Programs comprise a significant portion of the distribution capital expenditures specifically in the areas of (1) asset renewal, driven by aging infrastructure; (2) customer connections, driven by customer needs; and (3) capacity additions, primarily driven by customer behavior.

Investment category and cashflow details for distribution projects with a total project forecast of greater than \$15 million can be found in Section B – Capital Expenditure & Demand Side Management Forecast by Investment Category and projects with a total project forecast between \$1 million and \$15 million can be found in Appendix II – Projects Greater than \$1 Million and Less than \$15 Million.

Additional details for distribution system projects with a total project forecast of greater than \$50 million are summarized below.

2.1.3.1 - Panet Station – 66/24kV

The Panet Station – 66/24kV project is to install a 2-bank 115k/V-24kV station to replace the existing 24kV distribution equipment at Dawson Road to fulfill customer-driven demand for electricity in the area as well as providing a reliable supply to customers in contingency situations.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 51.8	\$ 19.2	\$ 13.9	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.1)	18.0	-	-	-	-
Revised Forecast	\$ 51.8	\$ 18.1	\$ 31.9	\$ -	\$ -	\$ -	\$ -

Investment Category:

Capacity & Growth – System Load Capacity

Status:

Construction will begin in 2018/19 with in-service in 2019/2020.

2.1.3.2 - Adelaide Station – 66/12kV

The Adelaide Station – 66/12kV project is for the construction of a new Adelaide Station to allow for the decommissioning of King Station, thus addressing all concerns with safety and aging infrastructure at King Station. The Adelaide Station will also provide sufficient area capacity to allow the deferral of the William Station project.

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved	\$ 62.1	\$ 3.2	\$ 0.9	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	7.5	9.6	1.8	-	-	-	-
Revised Forecast	\$ 69.6	\$ 12.8	\$ 2.7	\$ -	\$ -	\$ -	\$ -

Investment Category:

Sustainment – System Renewal

Status:

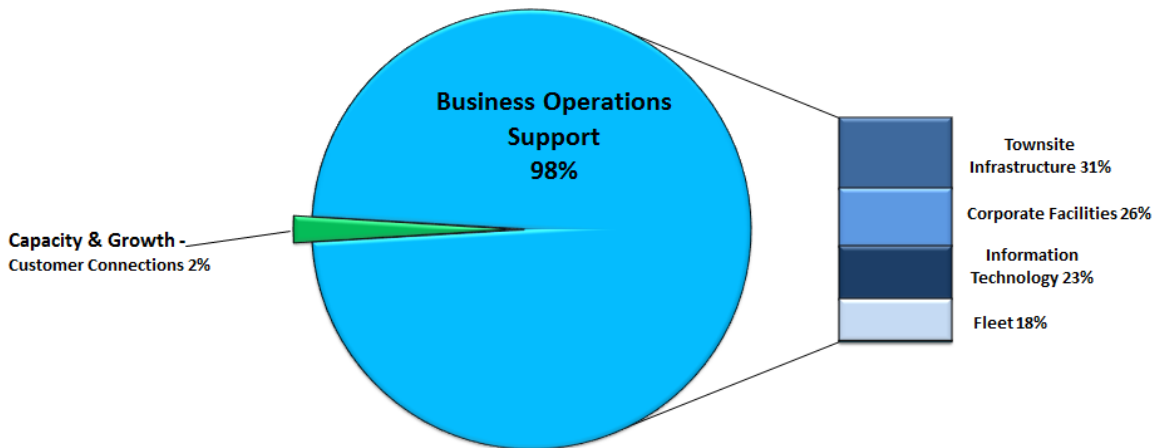
Increase in forecast from CEF16 due to change in project scope during the planning phase. Final in-service date of 2019/20 remains unchanged.

2.1.4 – Corporate Infrastructure

Manitoba Hydro's corporate infrastructure system includes assets that are shared across the corporation organized into four main categories: townsite infrastructure, corporate facilities, information technology and fleet.

The corporate infrastructure system capital expenditure forecast for 2018/19 is comprised mainly of business operations support projects and programs, as outlined below.

2018/19 Corporate Infrastructure Business Operations Capital By Investment Category



Investment category and cashflow details for corporate infrastructure projects with a total project forecast of greater than \$15 million can be found in Section B – Capital Expenditure & Demand Side Management Forecast by Investment Category and projects with a total project forecast between \$1 million and \$15 million can be found in Appendix II – Projects Greater than \$1 Million and Less than \$15 Million.

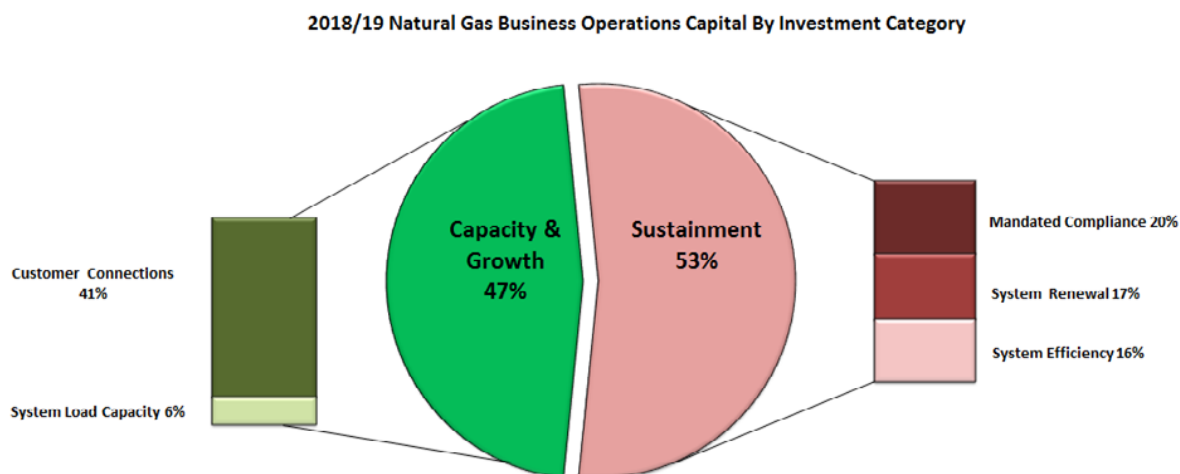
There are no corporate infrastructure projects with a total project forecast greater than \$50 million.

2.2 – Business Operations Capital – Natural Gas

2.2.1 – Distribution System & Corporate Infrastructure

The Manitoba Hydro natural gas distribution system consists of approximately 17 000 km of pipelines, 400 pressure regulating stations and 270 000 services to deliver natural gas service to residential, commercial and industrial customers.

The natural gas distribution system capital expenditure forecast for 2018/19 is comprised entirely of capacity & growth and sustainment projects and programs to address customer connection requirements as well as system upgrades reflecting those as a result of compliance, renewal and efficiency requirements as shown in the graph that follows.



Investment category and cashflow details for natural gas projects with a total project forecast between \$1 million and \$15 million can be found in Appendix II – Projects Greater than \$1 Million and Less than \$15 Million.

There are no distribution system or corporate infrastructure projects with a total project forecast greater than \$50 million.

3.0 – Demand Side Management (DSM)

CEF18 includes demand side management investments for both Electric and Natural Gas operations designed to manage the demand for energy. These expenditures relate to programs that provide education, incentives and expertise to achieve energy savings in an effort to offset growing demand.

Demand Side Management (\$ Millions)	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
Electric Programs	62.5	94.3	88.9	86.9	66.5	399.1	733.7
Natural Gas Programs	9.4	10.8	10.8	10.9	10.4	52.2	103.7
Total	71.9	105.1	99.6	97.8	77.0	451.4	837.4

3.1 – Electric DSM Programs

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved Increase (Decrease)	NA	\$ 99.4 (36.9)	\$ 94.3 -	\$ 88.9 -	\$ 86.9 -	\$ 66.5 -	\$ 334.6 -
Revised Forecast	NA	\$ 62.5	\$ 94.3	\$ 88.9	\$ 86.9	\$ 66.5	\$ 334.6

3.2 – Natural Gas DSM Programs

	Total	2019	2020	2021	2022	2023	2024-28
Previously Approved Increase (Decrease)	NA	\$ 11.7 (2.3)	\$ 10.8 -	\$ 10.8 -	\$ 10.9 -	\$ 10.4 -	\$ 51.4 -
Revised Forecast	NA	\$ 9.4	\$ 10.8	\$ 10.8	\$ 10.9	\$ 10.4	\$ 51.4

The reduction of the 2018/19 forecast as compared to CEF16 is primarily due to a change in the mix of programs and updates to customer activity projections for the Load Displacement program.



Section C

Comparison to CEF16

C – Comparison to CEF16

The following table summarizes the changes in capital expenditures between CEF16 and CEF18 over the 10 year period.

CEF18 vs CEF16 (\$ Millions)	2019	2020	2021	2022	2023	2019-2023 5 Year Total	2019-2028 10 Year Total
1.0 MAJOR NEW GENERATION & TRANSMISSION	(33.5)	(59.6)	(107.5)	30.9	(46.7)	(216.4)	(266.9)
1.1 Keeyask - Generation	(25.1)	(100.2)	(21.0)	56.9	(18.7)	(108.1)	(133.8)
1.2 Bipole III Reliability	5.4	16.3	0.1	-	-	21.9	21.9
1.3 Manitoba-Minnesota Transmission Project	47.7	61.5	(55.7)	0.0	-	53.6	53.6
1.4 Birtle Transmission	0.2	1.4	0.5	2.2	-	4.4	4.4
Other Major New Generation & Transmission	(61.7)	(38.6)	(31.5)	(28.3)	(28.0)	(188.0)	(212.9)
2.0 BUSINESS OPERATIONS CAPITAL	(2.1)	1.1	15.6	37.8	45.1	97.4	28.9
2.1 Electric Business Operations Capital	(1.8)	(5.5)	10.2	33.3	42.3	78.5	0.2
2.1.1 Generation System	(5.0)	(5.0)	(2.9)	(5.4)	(5.0)	(23.3)	(65.3)
2.1.2 Transmission System	(4.0)	(10.0)	(10.0)	(10.0)	(10.0)	(44.0)	(123.7)
2.1.3 Distribution System	(25.4)	-	13.7	47.6	29.8	65.7	175.5
2.1.4 Corporate Infrastructure	25.0	-	-	(1.1)	(2.2)	21.7	6.4
Unallocated Target Adjustment	7.6	9.5	9.4	2.3	29.7	58.4	7.2
2.2 Natural Gas Business Operations Capital	(0.3)	6.6	5.4	4.4	2.8	18.9	28.7
2.2.1 Distribution System & Corporate Infrastructure	(0.3)	6.6	5.4	4.4	2.8	18.9	28.7
3.0 DEMAND SIDE MANAGEMENT	(39.1)	0.0	0.0	(0.0)	0.0	(39.1)	(39.1)
3.1 Electric DSM Program	(36.9)	0.0	0.0	(0.0)	0.0	(36.9)	(36.9)
3.2 Natural Gas DSM Program	(2.3)	0.0	0.0	(0.0)	0.0	(2.3)	(2.3)
CONSOLIDATED CAPITAL EXPENDITURE & DSM FORECAST TOTAL	(74.7)	(58.5)	(91.9)	68.6	(1.6)	(158.1)	(277.2)
ELECTRIC CAPITAL & DSM FORECAST TOTAL	(72.1)	(65.1)	(97.3)	64.2	(4.4)	(174.8)	(303.6)
NATURAL GAS CAPITAL & DSM FORECAST TOTAL	(2.6)	6.6	5.4	4.4	2.8	16.7	26.4

Over the 10 year period from 2018/19 to 2027/28, forecast cash flow expenditures are \$277 million lower as compared to CEF16. The decrease over the 10 year period is primarily associated with Other Major New Generation & Transmission projects included in CEF16. Several of these projects were completed in 2017/18 including: Wuskwatim – Generation, Pointe du Bois Spillway Replacement, Kelsey Improvements & Upgrades, Riel 230/500kV Station, Kettle Improvements & Upgrades and Pointe du Bois Transmission. The Grand Rapids Fish Hatchery Upgrade & Expansion project has been reclassified to Business Operations Capital and all future investment requirements related to the Gillam Redevelopment and Expansion Project (GREP) will also be included as Business Operations Capital items.

Annual cost flow adjustments in the Keeyask Generation project due to scheduling changes and DSM cash flow decreases resulting from a change in the mix of the programs and updates to the projected customer activity for the Load Displacement program further contributed to the 10 year decrease. Annual cost flow adjustments for the Bipole III Reliability Project and Manitoba-Minnesota Transmission Project partially offset the noted reductions.

Appendix I – Investment Category Definitions

The following provides a detailed description of level 1 primary investment categories along with their respective level 2 sub-categories.

Capacity & Growth

Investments required for the expansion of Manitoba Hydro's generation, transmission or 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.
- **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).
- **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, 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 asset 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 centres, network connectivity, infrastructure, security and business systems including hardware and printers, software licenses, installation and implementation. 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 are pieces of mobile 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 centres, 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

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

Appendix II – Projects Greater than \$1 Million and Less than \$15 Million

In accordance with Directive #15/Board Order 73/15, details are provided in CEF18 for individual capital projects with a value greater than \$1 million. Projects greater than \$15 million appear in the body of the CEF18 booklet with projects greater than \$1 million and less than \$15 million included in this appendix.

Individual projects in this appendix are grouped by system and two levels of investment category which details what work is being done, where it is being done and why it is required. Together these details provide significantly more information than historically included in response to the directive. This appendix should be read in conjunction with the overview of the investments by system and category as introduced in Section B – Capital Expenditure & Demand Side Management Forecast as well as the descriptions of the investment categories provided in Appendix I – Investment Category Definitions.

The individual project details are further enhanced through the inclusion of Project Status in this appendix to differentiate Executing Projects from those about to begin in the first year of the CEF, which are described as New Projects.

This appendix also includes total project cost, annual forecast cashflows for fiscal years 2019 through 2021, as well as a summarized cashflow projection from 2022 to 2028 for each project.

Directive #15/Board Order 73/15: 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 page 98)

PROJECTS GREATER THAN \$1 MILLION AND LESS THAN \$15 MILLION

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Generation System						
Sustainment						
System Renewal						
Limestone Unit Control Monitoring Upgrade	Executing Project	9.3	2.5	1.3	1.3	-
Grand Rapids Exciter Replacement	Executing Project	8.9	0.2	1.3	-	-
Notigi Marine Vessel Replacement & Infrastructure Improvement	Executing Project	8.7	1.9	0.2	-	-
Jenpeg Unit Control & Monitoring	Executing Project	6.5	1.5	1.3	1.1	0.4
Laurie River Switchyard Bank 2 Replacement	Executing Project	5.9	1.4	-	-	-
Great Falls Stator Frame Spare	Executing Project	5.6	3.0	-	-	-
Great Falls Exciter Replacement	Executing Project	5.4	0.8	-	-	-
Grand Rapids 230kV Reactors Replacement	Executing Project	4.1	0.7	-	-	-
Missi Fuel Tank Installation	Executing Project	3.2	0.2	-	-	-
Slave Falls 129V DC System Upgrade	Executing Project	1.9	0.7	-	-	-
Selkirk 250VDC Battery & Inverter Upgrade	Executing Project	1.5	-	1.1	0.1	-
Slave Falls Cranes Refurbishment	Executing Project	1.5	0.2	-	-	-
Grand Rapids Zebra Mussels Mitigation	Executing Project	1.4	0.8	-	-	-
Slave Falls Cranes, Gate, & Room Refurbishment	Executing Project	1.1	0.2	0.8	-	-
Slave Falls Transformer Banks Replacement & Spare Purchase	New Project	12.0	0.5	3.8	4.2	3.2
Long Spruce Generator Protection Replacement	New Project	10.8	1.2	3.6	1.4	4.2
Seven Sisters Transformer Banks 5 and 6 Replacement	New Project	6.8	0.2	3.5	3.0	-
Great Falls Flow Augmentation	New Project	4.7	1.7	1.3	1.4	-
Grand Rapids PLC 90-70 Upgrade	New Project	3.9	0.2	1.8	1.9	-
Long Spruce Fire Water System Replacement	New Project	3.7	0.6	2.6	0.3	-
Kettle Fire Protection System Replacement	New Project	3.6	0.6	2.6	0.1	-
Limestone Fire Detection Code Upgrade	New Project	3.5	2.8	0.5	-	-
Seven Sisters Intake Frost Protection	New Project	2.4	0.1	2.2	-	-
Missi Accommodations Upgrade & Replacement	New Project	1.5	0.5	0.9	-	-
Slave Falls 7 Bay Sluiceway Pier 1 Refurbishment	New Project	1.1	1.0	-	-	-
Great Falls Water Supply Connection to RM of Alexander	New Project	1.0	1.0	-	-	-
System Renewal Total			24.4	28.5	15.0	7.9
Mandated Compliance						
Selkirk Generating Station Environmental Enhancement	Executing Project	14.9	0.1	-	-	-
Brandon Unit 5 License Review	Executing Project	11.5	0.6	2.7	2.0	0.3
Gen South PCB Regulation Compliance	Executing Project	4.5	0.4	0.2	1.4	-
Mandated Compliance Total			1.0	2.9	3.5	0.3
System Efficiency						
Kelsey Re-running Project Deficiencies & Lagoon Completion	New Project	6.5	6.4	0.1	-	-
System Efficiency Total			6.4	0.1	-	-
Sustainment Total			31.8	31.6	18.4	8.1

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Generation System						
Business Operations Support						
Townsite Infrastructure						
Trailer Court Sewer Linear Infrastructure	Executing Project	11.0	7.1	-	-	-
Gillam Housing Retrofit Program	Executing Project	10.7	0.3	-	-	-
Wuskwatim - Accommodation & Infrastructure	Executing Project	10.0	1.4	2.6	-	-
Kelsey Airport Upgrade	Executing Project	9.7	3.8	4.9	-	-
Town of Gillam 2016 Sewer and Water	Executing Project	9.1	0.3	-	-	-
Manitoba Infrastructure P280 Upgrade	Executing Project	6.9	3.2	1.4	-	-
Seven Sisters Townsite	Executing Project	4.7	0.3	-	-	-
Gillam Single Detach Housing Upgrade	Executing Project	3.1	2.0	0.2	0.2	0.3
Gillam Fencing Replace and Install	Executing Project	2.7	0.7	-	-	-
Gillam Landscape Upgrade	Executing Project	1.2	0.7	-	-	-
Gillam Apartment Rehabilitation	New Project	6.5	4.2	1.8	-	-
Gillam Outdoor Recreation & Beautification	New Project	4.3	1.8	0.7	0.8	0.8
Gillam Airport Airside Improvement	New Project	2.3	2.2	0.1	-	-
Radisson Apartment Repair	New Project	2.1	0.2	1.9	-	-
Townsite Infrastructure Total			28.3	13.7	1.0	1.1
Business Operations Support Total			28.3	13.7	1.0	1.1
Generation System Total			60.1	45.2	19.4	9.3

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Transmission System						
Capacity & Growth						
System Load Capacity						
Ashern Station Bank Addition	Executing Project	10.5	0.1	0.1	0.1	9.2
Brandon Victoria Avenue Breaker Replacement	Executing Project	5.1	1.1	1.0	-	-
Whiteshell Bank 1 Replacement	Executing Project	3.0	0.6	-	-	-
System Load Capacity Total			1.8	1.0	0.1	9.2
Customer Connections - Residential, Commercial & Industrial						
Poplar Bluff Transmission Project	Executing Project	14.6	12.4	0.4	-	-
Customer Connections - Residential, Commercial & Industrial Total			12.4	0.4	-	-
Capacity & Growth Total			14.1	1.4	0.1	9.2

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Transmission System						
Sustainment						
System Renewal						
HVDC Circuit Breaker Operating Mechanisms Replacement	Executing Project	13.2	0.1	-	-	-
HVDC Fire Protection Projects	Executing Project	7.2	0.1	0.3	2.4	1.4
HVDC Bipole 2 Refurbish Thyristor Module Cooling Components	Executing Project	7.0	0.1	-	-	-
HVDC Transformer Marshalling Kiosk Replacement	Executing Project	7.0	0.9	0.9	0.6	-
Energy Management System Upgrade version 3.2	Executing Project	6.1	3.5	-	-	-
HVDC Auxiliary Power Supply Upgrade	Executing Project	6.1	0.1	0.1	0.5	-
HVDC Bipole 1 Disconnect Replacement	Executing Project	5.5	1.4	1.7	1.0	0.4
HVDC Stations Ground Grid Refurbishment	Executing Project	4.2	0.1	0.5	0.9	-
HVDC Transformer Bushing Draw Rod & Cap Replacement	Executing Project	3.3	-	-	0.4	-
HVDC Domestic Water Treatment Upgrade and Replacement	Executing Project	3.1	1.2	-	-	-
Diesel Upgrade - Brochet	Executing Project	2.5	1.3	0.9	-	-
Dorsey Joint VAR Control Replacement	Executing Project	2.1	0.9	1.0	-	-
Diesel Upgrade - Shamattawa	Executing Project	1.0	0.2	0.5	-	-
Transmission Breaker Sustainment	New Project	13.8	-	0.4	-	3.2
HVDC Bipole 1 Direct Current-Current Transformers Transductor Replacement	New Project	12.2	0.8	1.7	-	6.7
Diesel Upgrade - Lac Brochet	New Project	8.1	0.4	1.8	3.9	1.8
System Renewal Total			11.2	9.9	9.8	13.5
Mandated Compliance						
Line V38R - 230kV Transmission Line Right-Of-Way in Riding Mountain National Park	Executing Project	2.2	1.2	0.2	-	-
230kV Protection Additions	New Project	6.1	-	-	-	5.9
Reston Station New 230kV Ring Breaker	New Project	2.5	0.8	1.0	0.6	-
Mandated Compliance Total			2.0	1.2	0.6	5.9
System Efficiency						
Virden West & Reston 66kV Capacitors	Executing Project	11.5	8.3	0.1	-	-
Hot Line Tagging Replay Replacement	Executing Project	2.5	0.5	-	-	-
HVDC Controls & System Replicas Development	Executing Project	1.6	0.4	0.8	-	-
System Efficiency Total			9.2	0.9	-	-
Sustainment Total			22.4	11.9	10.4	19.4
Transmission System Total			36.5	13.3	10.4	28.6

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Distribution System						
Capacity & Growth						
System Load Capacity						
Heaslip Distribution Supply Centre and 8-25kV Conversion	Executing Project	13.7	8.5	-	-	-
66kV Capacity Additions Stanley Station & Area	Executing Project	8.1	3.7	-	-	-
Norris Road Distribution Supply Centre	Executing Project	4.2	0.1	-	-	-
Norway House Station Bank Addition	Executing Project	4.0	2.5	-	-	-
Shilo Distribution Supply Centre Capacity Increase & Area Voltage	Executing Project	3.5	1.4	-	-	-
Whiteshell 33kV System Improvement	Executing Project	2.4	0.9	-	-	-
Ste Agathe Station Bank Addition	Executing Project	2.3	0.4	-	-	-
LaVerendrye Station 66kV Line 161 Addition	New Project	6.1	2.4	3.6	-	-
Portage la Reine Station Capacity Increase	New Project	4.5	0.1	4.2	-	-
Winkler North Station Bank Addition	New Project	4.3	0.2	4.1	-	-
Morden Cheval Station Bank Addition	New Project	4.0	3.8	-	-	-
Morden Ninth Station Bank Addition	New Project	4.0	0.2	3.8	-	-
Portage Saskatchewan Station Bank Addition & Feeder Relocation	New Project	3.7	3.5	-	-	-
System Load Capacity Total			27.7	15.7	-	-
Customer Connections - Residential, Commercial & Industrial						
University Station Replacement	New Project	7.6	1.0	5.9	0.4	-
Enbridge Gretna Distribution Supply Centre & Capacity Bank	New Project	4.0	1.0	2.9	-	-
Customer Connections - Residential, Commercial & Industrial Total			2.0	8.8	0.4	-
Capacity & Growth Total			29.7	24.5	0.4	-
Sustainment						
Mandated Compliance						
Distribution Hot Line Tag Relay Program	Executing Project	4.9	1.1	-	-	-
Winnipeg Area 66kV Line Upgrade	Executing Project	2.6	0.5	-	-	-
Waverley Underpass	Executing Project	1.0	0.1	-	-	-
Mandated Compliance Total			1.7	-	-	-
System Efficiency						
Advanced Information Management	Executing Project	10.4	5.5	-	-	-
French Station Feeder Upgrade	Executing Project	1.3	0.7	-	-	-
Dunraven Feeder Conversions (DN232/233)	New Project	5.4	5.1	-	-	-
System Efficiency Total			11.4	-	-	-
Sustainment Total			13.1	-	-	-
Distribution System Total			42.8	24.5	0.4	-

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Corporate Infrastructure						
Business Operations Support						
Corporate Facilities						
820 Taylor - Protection of Critical Infrastructure	New Project	12.0	11.5	-	-	-
Corporate Facilities Total			11.5	-	-	-
Information Technology						
Facility Ratings System - 2 projects	Executing Project	1.8	0.8	-	-	-
Banner Forms Upgrade	Executing Project	1.4	1.2	-	-	-
Information Technology Total			1.9	-	-	-
Business Operations Support Total			13.4	-	-	-
Corporate Infrastructure Total			13.4	-	-	-

Project Details (\$ Millions)	Project Status	Total Project Cost	2019	2020	2021	2022 to 2028
Gas Distribution System & Corporate Infrastructure						
Capacity & Growth						
System Load Capacity						
St-Pierre Transmission Pipeline Upgrade	Executing Project	2.7	0.4	-	-	-
Steinbach Natural Gas System Upgrade	New Project	4.5	0.4	1.4	1.9	0.3
Waverley West Upgrade	New Project	3.7	0.9	2.0	0.5	-
System Load Capacity Total			1.7	3.4	2.5	0.3
Capacity & Growth Total			1.7	3.4	2.5	0.3
Sustainment						
System Renewal						
Brandon Primary Generating Station Re-Construction	Executing Project	2.5	1.1	0.5	-	-
System Renewal Total			1.1	0.5	-	-
Mandated Compliance						
Medium Pressure Monitoring System Replacement	Executing Project	2.5	1.2	-	-	-
Winnipeg Natural Gas Transmission Easement Widening	Executing Project	1.4	0.5	-	-	-
Letellier-Red River Transmission Upgrade	New Project	1.6	0.3	1.3	-	-
Mandated Compliance Total			2.0	1.3	-	-
System Efficiency						
Natural Gas Transmission Pipeline System In-Line Inspection	New Project	6.4	2.5	1.6	1.7	0.5
Provision of Secure Gas Supply-Portage	New Project	1.6	0.1	0.4	0.1	1.0
St. Andrews Distribution System Upgrade	New Project	1.3	1.2	-	-	-
System Efficiency Total			3.9	2.1	1.8	1.5
Sustainment Total			6.9	4.0	1.8	1.5
Gas Distribution System & Corporate Infrastructure Total			8.6	7.4	4.3	1.8
Consolidated Business Operations Capital Projects Total			161.5	90.4	34.5	39.6

