

# **Capital Expenditure Forecast** (CEF09-1)

## 2009/10 - 2019/20



**Corporate Controller Division  
Finance & Administration**



# Foreword

The *Capital Expenditure Forecast* (CEF09-1) 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.

The *Capital Expenditure Forecast* is comprised of a number of specifically identified large projects or "major items" as well as numerous unspecified smaller projects referred to as "domestic items." Major items are normally over \$2 million in total cost and the construction period on each major item usually extends beyond one year. Domestic items typically represent the ongoing and recurring capital requirements to meet electricity and natural gas service replacements and expansions throughout the province. All major and domestic capital projects are subjected to a rigorous review and approval process before being included in the *Capital Expenditure Forecast*.

In constructing and maintaining its capital facilities, Manitoba Hydro adheres to the principles of sustainable development. For example, the Corporation is committed to reduce the net emissions from its own facilities and to contribute towards global emission reductions through the export of renewable electricity. Manitoba Hydro exceeded its past voluntary commitment to reduce its average net greenhouse gas (GHG) emissions from 1991 to 2007 to 6% below 1990 levels. Manitoba Hydro also has a separate contractual commitment under its participation in the Chicago Climate Exchange (CCX) to progressively reduce its generation related emissions until 2010. The Corporation is in full compliance with the CCX target.

Manitoba Hydro has one of the most aggressive Demand Side Management (DSM) programs in North America. The target to be achieved by 2025 is for electrical savings of 915 MW and 3,271 GWh, and natural gas savings of 172 million cubic meters. In total, Manitoba Hydro's DSM programs are expected to result in greenhouse gas emission reductions of nearly 2.5 million tonnes annually by 2025.





## Table of Contents

### 1.0 Overview

Capital Expenditure Forecast Summary.....	1
Comparison to CEF-08.....	1
Capital Expenditure Forecast Summary Table.....	3

### 2.0 Project Summaries

#### ELECTRIC OPERATIONS:

#### MAJOR NEW GENERATION & TRANSMISSION:..... 8

Wuskwatim - Generation .....	8
Wuskwatim - Transmission .....	8
Herblet Lake - The Pas 230 kV Transmission .....	9
Keeyask - Generation .....	9
Conawapa - Generation.....	10
Kelsey Improvements & Upgrades .....	10
Kettle Improvements & Upgrades .....	11
Pointe du Bois Improvements & Upgrades.....	11
Pointe du Bois - Transmission .....	12
Bipole 3 .....	12
Riel 230/500 kV Station .....	13
Firm Import Upgrades.....	13
Dorsey - US Border New 500kV Transmission Line .....	14
Brandon Combustion Turbine Pipeline Upgrade .....	14
Demand Side Management .....	15
Planning Study Costs .....	15

#### NEW HEAD OFFICE: ..... 16

#### CORPORATE RELATIONS:..... 16

Waterways Management Program.....	16
-----------------------------------	----

#### POWER SUPPLY: ..... 17

##### HVDC Facilities:

Converter Transformer Bushing Replacement .....	17
Bipole 1 & 2 Electrode Line Monitoring.....	17
Dorsey Synchronous Condenser Refurbishment .....	18
HVDC Bipole 1 Roof Replacement .....	18
HVDC System Transformer & Reactor Fire Protection & Prevention .....	19
HVDC AC Filter PCB Capacitor Replacement .....	19
HVDC Transformer Replacement Program .....	20
Dorsey 230 kV Relay Building Upgrade .....	20
HVDC Stations Ground Grid Refurbishment .....	21
HVDC Bipole 2 230 kV HLR Circuit Breaker Replacement .....	21
HVDC Bipole 1 Pole Differential Protection.....	22
HVDC Bipole 1 By-Pass Vacuum Switch Removal .....	22
HVDC Bipole 2 Refrigerant Condenser Replacement.....	23
HVDC Bipole 1 Smoothing Reactor Replacement .....	23
HVDC Bipole 1 Converter Station, P1 & P2 Battery Bank Separation.....	24

HVDC Bipole 1 DCCT Transductor Replacement .....	24
HVDC BP1 & BP2 DC Converter Transformer Bushing Replacements .....	25
HVDC Bipole 2 Valve Hall Wall Bushing Replacements.....	25
HVDC Bipole 1 CQ Disconnect Replacement.....	26
HVDC Bipole 2 Thyristor Module Cooling Refurbishment .....	26
HVDC Bipole 2 Smoothing Reactor Replacement .....	27
HVDC Bipole 1 Transformer Marshalling Kiosk Replacement.....	27

#### **Hydraulic Rehabilitation:**

Pine Falls Rehabilitation.....	28
Jenpeg Unit Overhauls .....	28
Power Supply Dam Safety Upgrades .....	29
Winnipeg River Riverbank Protection Program .....	29
Power Supply Hydraulic Controls .....	30
Slave Falls Rehabilitation.....	30
Great Falls Unit 4 Overhaul.....	31
Great Falls 115 kV Indoor Station Safety Improvements .....	31
Generation South Transformer Refurbish & Spares.....	32
Water Licenses & Renewals.....	32
Generation South PCB Regulation Compliance .....	33
Kettle Transformer Overhaul Program .....	33
Generation South Breaker Replacements .....	34
Seven Sisters Upgrades .....	34
Generation South Excitation Upgrades.....	35

#### **Thermal Rehabilitation:**

Brandon Unit 5 License Review.....	35
Selkirk Enhancements.....	36

#### **Other Power Supply:**

Laurie River/CRD Communications and Annunciation Upgrades .....	36
Notigi Marine Vessel Replacement & Infrastructure Improvements.....	37
Fire Protection Projects - HVDC .....	37
Halon Replacement Project .....	38
Power Supply Fall Protection Program .....	38
Oil Containment – Power Supply.....	39
Grand Rapids Townsite House Renovations .....	39
Grand Rapids Fish Hatchery .....	40
Generation Townsite Infrastructure.....	40
Site Remediation of Contaminated Corporate Facilities.....	41
High Voltage Test Facility .....	41
Power Supply Security Installations / Upgrades .....	42
Power Supply Sewer & Domestic Water System Install and Upgrade .....	42
Power Supply Domestic.....	43

### **TRANSMISSION: ..... 44**

Winnipeg - Brandon Transmission System Improvements .....	44
Transcona East 230-66 kV Station .....	44
Neepawa 230-66 kV Station .....	45
Pine Falls – Bloodvein 115 kV Transmission Line .....	45
Transmission Line Re-Rating .....	46
St Vital - Steinbach 230 kV Transmission.....	46
Rosser Station 230-115 kV Bank 3 Replacement.....	47
Rosser - Inkster 115 kV Transmission .....	47

**Manitoba Hydro**  
**Consolidated Capital Expenditure Forecast (CEF09-1)**  
For the Years 2009/10 – 2019/20

Transcona Station 66 kV Breaker Replacement .....	48
Transcona & Ridgeway Stations 66 kV Bus Upgrades .....	48
Dorsey 500 kV R502 Breaker Replacement .....	49
13.2kV Shunt Reactor Replacements.....	49
Birtle South - Rossburn 66 kV Line .....	50
Stanley Station 230-66 kV Transformer Addition.....	50
Stanley Station 230-66 kV Hot Standby Installation .....	51
Ashern Station 230 kV Shunt Reactor Replacement .....	51
Tadoule Lake DGS Diesel Tank Farm Upgrade.....	52
Interlake Digital Microwave Replacement.....	52
Communication System - Southern MB (Great Plains).....	53
Communications Upgrade Winnipeg Area .....	53
Pilot Wire Replacement .....	54
Transmission Line Protection & Teleprotection Replacement.....	54
Winnipeg Central Protection Wireline Replacement .....	55
Mobile Radio System Modernization .....	55
Cyber Security Systems .....	56
Site Remediation.....	56
Oil Containment .....	57
Station Battery Bank Capacity & System Reliability Increase.....	57
Red River Floodway Expansion Project.....	58
Waverley Service Centre Oil Tank Farm Replacement .....	58
Transmission Domestic .....	59

**CUSTOMER SERVICE & DISTRIBUTION:..... 60**

Winnipeg Distribution Infrastructure Requirements.....	60
Defective RINJ Cable Replacement.....	60
Brereton Lake Station Area.....	61
Stony Mountain New 115 - 12 kV Station.....	61
Rover Substation Replace 4 kV Switchgear.....	62
Martin New Outdoor Station.....	62
Frobisher Station Upgrade .....	63
Burrows New 66 kV-12 kV Station .....	63
Winnipeg Central District Oil Switch Project.....	64
William New 66 kV-12 kV Station .....	64
Waverley West Sub Division Supply - Stage 1 .....	65
St. James 24 kV System Refurbishment .....	65
Shoal Lake New 33-12.47 kV DSC .....	66
York Station .....	66
Cromer Station Capacity and Reston RE12-4 25 kV Conversion.....	67
Brandon Crocus Plains 115-25 kV Bank Addition .....	67
Winkler Market Feeder M25-13 Conversion .....	68
Neepawa North Feeder NN12-2 & Line 57 Rebuild .....	68
Perimeter South Station Distribution Supply Centre Installation .....	69
Niverville Station 66-12 kV Bank Replacements .....	69
Winnipeg Central District Underground Network Asbestos Removal.....	70
Gas SCADA Replacement.....	70
Customer Service & Distribution Domestic .....	71

**CUSTOMER CARE & MARKETING: ..... 72**

Advanced Metering Infrastructure .....	72
Customer Care & Marketing Domestic .....	72

**FINANCE & ADMINISTRATION:..... 73**

Corporate Buildings .....	73
Workforce Management (Phase 1 to 4) .....	73
Fleet .....	74
Finance & Administration Domestic .....	74

**CUSTOMER SERVICE & DISTRIBUTION:..... 75**

Customer Service & Distribution Domestic .....	75
--	----

**CUSTOMER CARE & MARKETING: ..... 76**

Advanced Metering Infrastructure .....	76
Demand Side Management .....	76
Customer Care & Marketing Domestic .....	77





# Section 1

## Overview

Capital Expenditure Forecast Summary  
Comparison to CEF-08  
Capital Expenditure Forecast Summary Table



# 1.0 Overview

## Capital Expenditure Forecast Summary

This Consolidated Capital Expenditure Forecast (CEF09-1) totals \$16 480 million for the 11 year period to 2019/20. Expenditures for Major New Generation & Transmission and the New Head Office total \$11 763 million, with the balance of \$4 717 million comprised of expenditures for infrastructure renewal, system safety and security, new and increasing load requirements, and efficiency improvements.

## Comparison to CEF08

The Capital Expenditure Forecast (CEF09) for the ten year period ending 2018/19 totals \$15 189 million compared to \$15 358 million for the same ten year period included in last year's Capital Expenditure Forecast (CEF08).

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	10 Year Total
CEF08	1 248	1 127	891	858	1 196	1 864	2 263	2 183	1 790	1 938	15 358
Increase (Decrease)	(144)	(42)	145	167	290	(99)	(107)	(18)	(74)	(287)	(169)
CEF09	1 104	1 085	1 036	1 025	1 486	1 765	2 156	2 165	1 716	1 651	15 189

The decrease of \$169 million in capital expenditures over the ten year forecast period is comprised of the following:

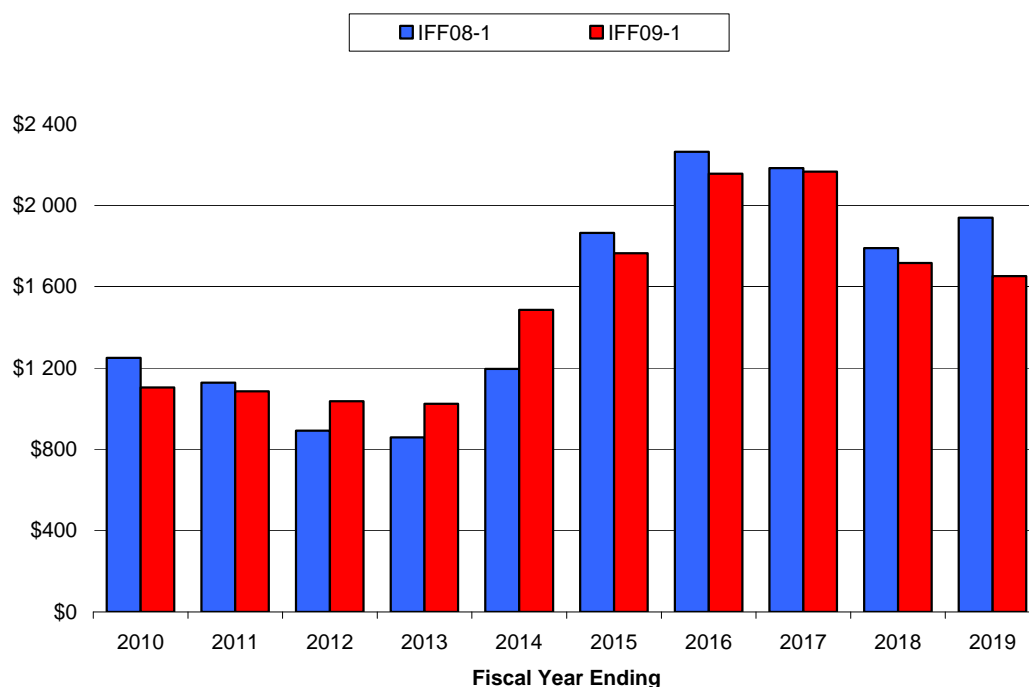
	10 Year Increase
Keeyask Generating Station	\$ 792
Demand Side Management - Electric	57
13.2 kV Shunt Reactor Replacements	33
System Refurbishment and Other Projects	184
Conawapa Generating Station	(224)
Pointe du Bois Improvements & Upgrades	(500)
Target Adjustment	(511)
	\$ (169)

New energy resources are required to meet forecasted domestic requirements by 2022/23. Some of the key assumptions underlying future spending on new generation and transmission include:

- The in-service date (ISD) of the Wuskwatim Generating Station will be September 2011.
- Kelsey generating station to be upgraded by 77 MW by 2012/13.
- Bipole 3 is assumed to follow a route west of the Interlake and this route will require 2 000 MW of converters to operate, with an in-service date of October 2017.
- Manitoba Hydro has signed term sheets with Northern States Power (NSP) for 375/500 MW starting in 2015, Wisconsin Public Service (WPS) for 500 MW starting in 2018, and Minnesota Power (MP) for 250 MW starting in 2022 (for firm power).
- Keeyask and Conawapa are necessary to meet domestic load requirements and export sales commitments and have first power in-service dates of December 2018 and May 2022, respectively.

### Projected Consolidated Capital Expenditures

*millions of dollars*



The following table provides a listing of each capital project with a forecast of expenditures for each year to 2019/20. The subsequent section provides high-level descriptions of each capital project with brief justifications and comparisons to the previously approved capital expenditure forecast.

[illegible]

	Total Project Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	11 Year Total
Power Supply													
Converter Transformer Bushing Replacement	5.9	0.1	0.4	1.9	-	-	-	-	-	-	-	-	2.3
Bipole 1 & 2 Electrode Line Monitoring	1.7	0.0	0.0	1.6	-	-	-	-	-	-	-	-	1.6
Dorsey Synchronous Condenser Refurbishment	32.3	3.0	2.5	3.6	2.5	2.6	2.8	-	-	-	-	-	17.0
HVDC Bipole 1 Roof Replacement	5.9	0.7	-	-	-	-	-	-	-	-	-	-	0.7
HVDC System Transformer & Reactor Fire Protection & Prevention	10.4	0.3	1.3	0.3	-	-	-	-	-	-	-	-	1.9
HVDC AC Filter PCB Capacitor Replacement	34.5	2.4	6.0	-	-	-	-	-	-	-	-	-	8.3
HVDC Transformer Replacement Program	105.7	1.0	1.1	7.3	5.3	1.1	-	-	-	-	-	-	15.8
Dorsey 230 kV Relay Building Upgrade	73.8	1.1	1.9	4.0	16.4	32.1	12.0	4.9	-	-	-	-	72.5
HVDC Stations Ground Grid Refurbishment	4.3	0.6	0.5	0.6	0.6	0.0	-	-	-	-	-	-	2.3
HVDC Bipole 2 230 kV HLR Circuit Breaker Replacement	9.4	2.7	0.4	-	-	-	-	-	-	-	-	-	3.1
HVDC Bipole 1 Pole Differential Protection	3.3	-	1.0	2.3	-	-	-	-	-	-	-	-	3.3
HVDC Bipole 1 Bypass Vacuum Switch Removal	20.4	0.5	4.6	8.2	5.6	1.2	-	-	-	-	-	-	20.1
HVDC Bipole 2 Refrigerant Condenser Replacement	11.0	-	-	2.8	7.2	1.0	-	-	-	-	-	-	11.0
HVDC Bipole 1 Smoothing Reactor Replacement	31.8	0.0	0.1	0.1	4.0	18.0	-	7.2	2.5	-	-	-	31.8
HVDC Bipole 1 Converter Station, P1 & P2 Battery Bank Separation	3.2	-	0.0	1.0	2.2	-	-	-	-	-	-	-	3.2
HVDC Bipole 1 DCCT Transductor Replacement	11.7	-	0.6	2.8	0.8	3.9	1.1	2.3	0.1	-	-	-	11.7
HVDC BP1 & BP2 DC Converter Transformer Bushing Replacements	8.7	-	-	0.5	1.0	1.7	5.2	0.2	-	-	-	-	8.7
HVDC Bipole 2 Valve Hall Wall Bushing Replacements	19.2	-	0.1	3.3	4.5	4.6	4.7	2.0	-	-	-	-	19.2
HVDC Bipole 1 CQ Disconnect Replacement	5.2	-	0.0	1.1	1.5	0.9	1.0	0.6	-	-	-	-	5.2
HVDC Bipole 2 Thyristor Module Cooling Refurbishment	4.7	1.8	1.7	0.8	-	-	-	-	-	-	-	-	4.3
HVDC Bipole 2 Smoothing Reactor Replacement	17.1	0.8	3.5	3.2	5.7	3.8	-	-	-	-	-	-	17.1
HVDC Bipole 1 Transformer Marshalling Kiosk Replacement	6.8	1.0	1.0	1.6	1.6	1.1	0.5	-	-	-	-	-	6.8
Pine Falls Rehabilitation	56.2	2.8	4.2	17.4	12.2	2.1	2.9	3.2	4.8	-	-	-	49.6
Jenpeg Unit Overhauls	128.1	-	-	-	-	-	-	2.3	2.6	18.6	24.5	25.1	73.1
Power Supply Dam Safety Upgrades	34.0	9.7	1.7	-	-	-	-	-	-	-	-	-	11.4
Winnipeg River Riverbank Protection Program	19.7	1.3	1.2	1.2	1.3	1.3	1.3	1.3	1.5	-	-	-	10.4
Power Supply Hydraulic Controls	16.0	3.1	1.9	1.1	-	-	-	-	-	2.2	2.7	0.7	11.7
Slave Falls Rehabilitation	198.3	13.0	4.0	1.1	16.3	11.8	15.6	54.3	59.4	11.8	-	-	187.3
Great Falls Unit 4 Overhaul	19.7	3.0	7.0	7.8	-	-	-	-	-	-	-	-	17.8
Great Falls 115 kV Indoor Station Safety Improvements	11.6	1.6	-	-	-	-	-	-	-	-	-	-	1.6
Generation South Transformer Refurbish & Spares	21.0	0.0	1.5	3.1	5.3	4.4	2.8	2.7	1.1	-	-	-	20.9
Water Licenses & Renewals	40.8	4.4	6.0	6.0	5.7	5.9	4.9	3.2	-	-	-	-	36.1
Generation South PCB Regulation Compliance	4.7	0.2	0.3	0.1	0.1	0.2	3.8	-	-	-	-	-	4.7
Kettle Transformer Overhaul Program	35.6	1.6	6.6	6.5	6.6	6.8	7.4	-	-	-	-	-	35.4
Generation South Breaker Replacements	9.4	1.6	3.1	2.2	2.0	0.4	-	-	-	-	-	-	9.3
Seven Sisters Upgrades	9.5	1.8	5.3	1.2	1.0	-	-	-	-	-	-	-	9.4
Generation South Excitation Upgrades	18.3	-	2.0	1.0	1.1	1.7	1.4	1.3	1.5	0.6	7.7	-	18.3



**CAPITAL EXPENDITURE FORECAST SUMMARY TABLE (CEF09)**  
(in millions of dollars)

	Total Project Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	11 Year Total
<b>Power Supply - continued</b>													
Oil Containment- Power Supply	19.1	0.6	0.4	1.0	0.5	0.3	0.3	0.1	0.9	-	-	-	4.1
Grand Rapids Townsite House Renovations	5.2	0.1	0.4	0.9	1.2	1.3	1.3	-	-	-	-	-	5.2
Grand Rapids Fish Hatchery	2.2	0.1	1.1	0.9	-	-	-	-	-	-	-	-	2.2
Generation Townsite Infrastructure	52.1	7.8	8.4	5.4	-	-	-	-	-	-	-	-	21.6
Site Remediation of Contaminated Corporate Facilities	34.7	2.3	1.2	1.1	1.1	0.2	-	-	-	-	-	-	5.9
High Voltage Test Facility	26.9	10.6	13.5	-	-	-	-	-	-	-	-	-	24.1
Power Supply Security Installations / Upgrades	43.2	9.7	16.0	8.7	2.1	1.5	1.0	1.0	0.5	-	-	-	40.6
Power Supply Sewer & Domestic Water System Install and Upgrade	15.1	7.3	3.4	0.7	-	-	-	-	-	-	-	-	11.4
Power Supply Domestic	NA	19.1	19.3	19.7	20.1	20.5	20.9	21.4	21.8	22.2	22.7	23.1	230.9
		139.5	161.4	157.2	134.6	116.4	108.9	108.1	96.5	55.5	57.5	48.9	1 184.6
<b>Transmission</b>													
Winnipeg - Brandon Transmission System Improvements	40.0	3.1	1.6	3.4	3.6	5.0	21.7	-	-	-	-	-	38.4
Transcona East 230-66 kV Station	31.0	1.1	11.0	13.2	5.1	-	-	-	-	-	-	-	30.5
Neepawa 230 - 66 kV Station	30.0	1.1	14.1	9.5	5.1	-	-	-	-	-	-	-	29.9
Pine Falls - Bloodvein 115 kV Transmission Line	34.1	-	0.3	0.9	4.4	20.6	7.8	-	-	-	-	-	34.1
Transmission Line Re-Rating	24.1	3.2	-	-	-	-	-	-	-	-	-	-	3.2
St Vital-Steinbach 230 kV Transmission	32.2	-	-	-	-	-	-	0.8	0.9	2.6	6.0	9.6	20.0
Rosser Station 230 - 115 kV Bank 3 Replacement	5.8	2.6	-	-	-	-	-	-	-	-	-	-	2.6
Rosser - Inkster 115 kV Transmission	5.1	3.3	1.4	-	-	-	-	-	-	-	-	-	4.7
Transcona Station 66 kV Breaker Replacement	6.0	0.0	3.6	1.8	0.6	-	-	-	-	-	-	-	6.0
Transcona & Ridgeway Stations 66 kV Bus Upgrades	2.8	1.7	0.7	-	-	-	-	-	-	-	-	-	2.4
Dorsey 500 kV R502 Breaker Replacement	2.6	2.3	0.2	-	-	-	-	-	-	-	-	-	2.6
13.2kV Shunt Reactor Replacements	33.0	0.0	0.0	4.1	4.2	4.3	4.4	4.4	4.5	4.6	2.5	-	33.0
Birtle South-Rosburn 66 kV Line	4.9	-	-	-	-	0.1	0.3	4.5	-	-	-	-	4.9
Stanley Station 230-66 kV Transformer Addition	21.1	-	-	-	1.8	8.1	7.6	3.5	-	-	-	-	21.1
Stanley Station 230-66 kV Hot Standby Installation	6.2	4.9	1.2	-	-	-	-	-	-	-	-	-	6.1
Ashern Station 230 kV Shunt Reactor Replacement	2.7	0.0	0.0	-	2.7	-	-	-	-	-	-	-	2.7
Tadoule Lake DGS Tank Farm Upgrade	1.1	0.5	0.5	0.0	-	-	-	-	-	-	-	-	1.0
Interlake Digital Microwave Replacement	19.7	3.5	0.4	-	-	-	-	-	-	-	-	-	3.8
Communication System - Southern MB (Great Plains)	21.9	2.4	-	-	-	-	-	-	-	-	-	-	2.4
Communications Upgrade Winnipeg Area	7.4	0.7	-	-	-	-	-	-	-	-	-	-	0.7
Pilot Wire Replacement	9.6	1.3	1.4	-	-	-	-	-	-	-	-	-	2.7
Transmission Line Protection & Teleprotection Replacement	21.1	1.4	6.1	6.1	2.3	1.1	0.9	-	-	-	-	-	17.9
Winnipeg Central Protection Wireline Replacement	9.3	2.5	0.6	-	-	-	-	-	-	-	-	-	3.1
Mobile Radio System Modernization	30.7	0.3	2.5	9.2	10.6	8.0	-	-	-	-	-	-	30.6
Cyber Security Systems	10.1	3.6	0.4	-	-	-	-	-	-	-	-	-	4.0
Site Remediation	13.3	1.3	3.8	1.1	-	-	-	-	-	-	-	-	6.2
Oil Containment	7.4	0.9	0.5	-	-	-	-	-	-	-	-	-	1.4
Station Battery Bank Capacity & System Reliability Increase	46.5	5.3	4.7	6.4	6.4	6.6	6.3	-	-	-	-	-	35.7
Red River Floodway Expansion Project	1.8	0.3	-	-	-	-	-	-	-	-	-	-	0.3
Waverley Service Centre Oil Tank Farm Replacement	3.0	0.5	1.0	0.6	0.4	0.5	-	-	-	-	-	-	3.0
Transmission Domestic	NA	29.6	30.0	30.6	31.2	31.8	32.4	33.1	33.8	34.4	35.1	35.8	357.7
		77.5	86.0	86.9	78.3	86.2	81.4	46.4	39.2	41.6	43.6	45.4	712.6

**CAPITAL EXPENDITURE FORECAST SUMMARY TABLE (CEF09)**  
(in millions of dollars)

	Total Project Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	11 Year Total
<b>Customer Service &amp; Distribution</b>													
Winnipeg Distribution Infrastructure Requirements	14.9	1.7	-	-	-	-	-	-	-	-	-	-	1.7
Defective RINJ Cable Replacement	8.7	0.5	2.6	-	-	-	-	-	-	-	-	-	3.1
Bereton Lake Station Area	9.0	0.3	-	-	-	-	-	-	-	-	-	-	0.3
Stony Mountain New 115 - 12 kV Station	5.0	0.7	-	-	-	-	-	-	-	-	-	-	0.7
Rover Substation Replace 4 kV Switchgear	12.7	0.4	3.3	3.9	-	-	-	-	-	-	-	-	7.5
Marlin New Outdoor Station	28.2	1.0	14.5	9.1	2.4	-	-	-	-	-	-	-	27.0
Frobisher Station Upgrade	14.4	4.4	0.0	-	-	-	-	-	-	-	-	-	4.5
Burrows New 66 kV-12 kV Station	28.6	9.1	12.2	5.0	-	-	-	-	-	-	-	-	26.3
Winnipeg Central District Oil Switch Project	7.1	1.8	-	-	-	-	-	-	-	-	-	-	1.8
William New 66 kV-12 kV Station	10.3	0.5	3.6	3.1	2.9	-	-	-	-	-	-	-	10.0
Waverley West Sub Division Supply - Stage 1	6.5	4.4	-	-	-	-	-	-	-	-	-	-	4.4
St James 24 kV System Refurbishment	65.9	1.3	14.1	31.6	18.9	-	-	-	-	-	-	-	65.8
Shoal Lake New 33 - 12.47 kV DSC	3.6	3.2	-	-	-	-	-	-	-	-	-	-	3.2
York Station	4.0	2.0	1.8	0.1	-	-	-	-	-	-	-	-	3.9
Cromer North Station & Reston RE12.4 25 kV Conversion	4.3	3.0	0.1	1.2	-	-	-	-	-	-	-	-	4.3
Brandon Crocus Plains 115 - 25 kV Bank Addition	6.3	0.6	3.1	1.9	0.6	-	-	-	-	-	-	-	6.2
Winkler Market Feeder M25-13 Conversion	2.9	0.8	-	-	-	-	-	-	-	-	-	-	0.8
Neepawa North Feeder NN12-2 & Line 57 Rebuild	1.9	1.9	-	-	-	-	-	-	-	-	-	-	1.9
Perimeter South Station Distribution Supply Centre Installation	2.4	0.4	2.0	-	-	-	-	-	-	-	-	-	2.4
Niverville Station 66-12 kV Bank Replacements	2.6	2.6	-	-	-	-	-	-	-	-	-	-	2.6
Winnipeg Central District Underground Network Asbestos Removal	3.0	0.7	-	-	-	-	-	-	-	-	-	-	0.7
Gas SCADA Replacement	4.6	1.0	3.0	0.6	-	-	-	-	-	-	-	-	4.6
Customer Service & Distribution Domestic	NA	115.9	117.5	119.9	122.3	124.7	127.2	129.8	132.4	135.0	137.7	140.5	1 402.9
		158.1	177.8	176.3	147.0	124.7	127.2	129.8	132.4	135.0	137.7	140.5	1 586.4
<b>Customer Care &amp; Marketing</b>													
Advanced Metering Infrastructure	30.9	-	4.0	5.3	5.4	5.6	4.3	4.2	-	-	-	-	28.8
Customer Care & Marketing Domestic	NA	2.5	2.6	2.6	2.7	2.7	2.8	2.8	2.9	2.9	3.0	3.1	30.6
		2.5	6.5	8.0	8.1	8.3	7.1	7.1	2.9	2.9	3.0	3.1	59.5

**CAPITAL EXPENDITURE FORECAST SUMMARY TABLE (CEF09)**  
(in millions of dollars)

	Total Project Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	11 Year Total
<b>Finance &amp; Administration</b>													
Corporate Buildings	NA	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	88.0
Workforce Management (Phase 1 to 4)	11.3	3.9	1.0	-	-	-	-	-	-	-	-	-	4.9
Fleet	NA	13.3	13.5	13.8	14.1	14.3	14.6	14.9	15.2	15.5	15.8	16.2	161.2
Finance & Administration Domestic	NA	24.1	24.4	24.9	25.4	25.9	26.4	27.0	27.5	28.1	28.6	29.2	291.6
		49.2	46.9	46.7	47.5	48.3	49.1	49.9	50.7	51.6	52.5	53.3	545.7
Capital Increase Provision	-	-	-	-	-	-	-	63.1	90.4	82.8	97.3	99.2	432.8
<b>ELECTRIC CAPITAL SUBTOTAL</b>		<b>1 255.0</b>	<b>1 165.5</b>	<b>1 074.5</b>	<b>1 038.6</b>	<b>1 228.0</b>	<b>1 691.7</b>	<b>2 247.6</b>	<b>2 160.5</b>	<b>1 653.3</b>	<b>1 800.3</b>	<b>1 557.9</b>	<b>16 872.9</b>
<b>GAS</b>													
<b>Customer Service &amp; Distribution</b>													
Customer Service & Distribution Domestic	NA	20.7	21.2	21.7	22.1	22.5	23.0	23.4	23.9	24.4	24.9	25.4	253.3
		20.7	21.2	21.7	22.1	22.5	23.0	23.4	23.9	24.4	24.9	25.4	253.3
<b>Customer Care &amp; Marketing</b>													
Advanced Metering Infrastructure	15.0	-	1.0	5.4	8.3	-	-	-	-	-	-	-	14.6
Demand Side Management	NA	13.5	13.1	11.6	11.7	11.1	10.2	10.6	10.3	7.7	5.5	5.1	110.3
Customer Care & Marketing Domestic	NA	2.8	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.2	3.3	3.4	33.5
		16.2	16.9	19.8	22.9	14.1	13.2	13.7	13.5	11.0	8.8	8.4	158.5
Capital Increase Provision	-	-	-	-	-	-	-	-	-	2.3	4.9	5.0	12.1
<b>GAS CAPITAL SUBTOTAL</b>		<b>37.0</b>	<b>38.2</b>	<b>41.5</b>	<b>45.0</b>	<b>36.6</b>	<b>36.2</b>	<b>37.2</b>	<b>37.4</b>	<b>37.6</b>	<b>38.5</b>	<b>38.8</b>	<b>423.9</b>
<b>CONSOLIDATED CAPITAL</b>													
TARGET ADJUSTMENT		<b>1 292.0</b>	<b>1 203.6</b>	<b>1 116.0</b>	<b>1 083.6</b>	<b>1 264.6</b>	<b>1 727.9</b>	<b>2 284.8</b>	<b>2 197.9</b>	<b>1 690.9</b>	<b>1 838.8</b>	<b>1 596.6</b>	<b>17 296.7</b>
		(188.0)	(118.6)	(80.0)	(59.1)	221.4	37.1	(128.8)	(32.7)	25.4	(187.8)	(305.6)	(816.7)
		<b>1 104.0</b>	<b>1 085.0</b>	<b>1 036.0</b>	<b>1 024.5</b>	<b>1 486.0</b>	<b>1 765.0</b>	<b>2 156.0</b>	<b>2 165.2</b>	<b>1 716.3</b>	<b>1 651.0</b>	<b>1 291.0</b>	<b>16 480.0</b>





## Section 2

### Project Summaries

#### Electric

Major New Generation & Transmission . . . . .	8
New Head Office . . . . .	16
Corporate Relations . . . . .	16
Power Supply . . . . .	17
Transmission . . . . .	44
Customer Service & Distribution . . . . .	60
Customer Care & Marketing . . . . .	72
Finance & Administration . . . . .	73

#### Gas

Customer Service & Distribution . . . . .	75
Customer Care & Marketing . . . . .	76





## ELECTRIC OPERATIONS:

### MAJOR NEW GENERATION & TRANSMISSION:

#### Wuskwatim - Generation

**Description:**

Design and build the new Wuskwatim Generating Station with three generators and installed capacity of approximately 200 MW 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 September 2011.

**Revision:**

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 1 274.6	\$ 326.9	\$ 256.4	\$ 126.8	\$ 20.8	\$ -	\$ -
<b>Increase (Decrease)</b>	-	37.5	18.9	(21.7)	(8.7)	-	-
<b>Revised Forecast</b>	\$ 1 274.6	\$ 364.4	\$ 275.3	\$ 105.1	\$ 12.1	\$ -	\$ -

#### Wuskwatim - Transmission

**Description:**

Design and build the associated transmission facilities necessary to integrate the Wuskwatim Generation Station into the Manitoba Hydro 230 kV transmission network.

**Justification:**

The existing 230 kV transission system in Northern Manitoba does not have sufficient capacity to accommodate the additional output of the Wuskwatim Generating Station. This project will increase the ability of the transmission system to carry the full output of Wuskwatim to load anywhere in Manitoba.

**In-Service Date:**

September 2011.

**Revision:**

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 316.3	\$ 52.5	\$ 32.2	\$ 15.5	\$ 0.9	\$ -	\$ -
<b>Increase (Decrease)</b>	-	37.6	(1.7)	3.4	(0.9)	-	-
<b>Revised Forecast</b>	\$ 316.3	\$ 90.1	\$ 30.5	\$ 18.9	\$ -	\$ -	\$ -

## Herblet Lake - The Pas 230 kV Transmission

### Description:

Perform environmental assessments and route selection, design and construct transmission and terminal facilities to provide firm supply to Flin Flon Cliff Lake and The Pas Ralls Island as follows: *Transmission*: 230 kV line 160 km from Herblet Lake to The Pas Ralls Island. *Terminations*: Extend 230 kV facilities at Herblet Lake and The Pas Ralls Island stations. *Communications*: Upgrade and co-ordinate with existing Herblet Lake and The Pas facilities.

### Justification:

The line is required to provide firm supply and voltage support for increasing Flin Flon and The Pas area loads. In addition, this line facilitates the transmission of power from the Wuskwatim Generating Station.

### In-Service Date:

September 2011.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 93.2	\$ 39.3	\$ 29.0	\$ 4.2	\$ -	\$ -	\$ -
Increase (Decrease)	-	2.6	1.4	3.0	1.9	-	-
Revised Forecast	\$ 93.2	\$ 41.9	\$ 30.4	\$ 7.2	\$ 1.9	\$ -	\$ -

## Keeyask - Generation

### Description:

Design and build the Keeyask Generating Station with seven generators and installed capacity of approximately 630 MW on the Nelson River downstream of Thompson. Project costs include activities necessary to obtain approval and community support to proceed with the construction of the future generating station. The estimate is comprised of costs associated with 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 December 2018.

### Revision:

Estimate updated to reflect the acquisition of all necessary licensing, the design and construction of associated transmission facilities, and improvements to access roadways.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 3 700.4	\$ 25.9	\$ 33.1	\$ 36.1	\$ 64.3	\$ 220.3	\$ 2 974.9
Increase (Decrease)	891.2	41.8	51.9	159.2	134.3	(38.0)	504.1
Revised Forecast	\$ 4 591.6	\$ 67.7	\$ 85.0	\$ 195.3	\$ 198.6	\$ 182.3	\$ 3 479.0

## Conawapa - Generation

### Description:

Design and build the Conawapa Generating Station with ten generators and installed capacity of approximately 1,300 MW on the Nelson River downstream from Thompson. Project costs include activities associated with extensive First Nations and other community consultations, pre-project training, environmental studies, impact statement preparations, submissions, regulatory review processes, acquiring all necessary licensing, improvements to access roadways, and detailed pre-engineering required to obtain a license and all necessary approvals to construct the Conawapa Generating Station.

### Justification:

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

### In-Service Date:

First power May 2022.

### Revision:

Estimate updated to reflect current market conditions along with the addition of access roadway improvements.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4 978.4	\$ 60.5	\$ 60.7	\$ 57.7	\$ 62.3	\$ 67.7	\$ 3 705.7
Increase (Decrease)	1 346.4	(0.1)	(0.3)	17.3	49.5	122.4	(634.3)
Revised Forecast	\$ 6 324.8	\$ 60.4	\$ 60.4	\$ 75.0	\$ 111.8	\$ 190.1	\$ 3 071.4

## Kelsey Improvements & Upgrades

### Description:

Overhaul and uprate all Kelsey generating station units (1-7) 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 unit 1 to 7 draft tube modifications, perform unit 1 to 5 intake gate rehabilitation, and upgrade rail spur and overhead crane. Upgrade transmission facilities necessary to integrate the additional Kelsey generation into the Manitoba Hydro system network.

### Justification:

Rerunning 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 11 MW per unit. The transmission upgrade of a portion of the Kelsey 138 and 230 kV buses and the revisions to the Northern AC Cross Trip scheme are required to accommodate the 77 MW of additional Kelsey output.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 189.6	\$ 45.8	\$ 7.4	\$ 0.3	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.7)	(0.6)	0.2	-	-	-
Revised Forecast	\$ 189.6	\$ 45.1	\$ 6.8	\$ 0.5	\$ -	\$ -	\$ -

## Kettle Improvements & Upgrades

### Description:

Rewind stator for units 5-12, and install a new stator frame, core and winding for unit 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. Re-wedging units at Kettle is an opportunity to repair isolated cases of severe slot discharge, necessary to avoid deterioration. Unit 4 requires 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.

### In-Service Date:

October 2022.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 75.6	\$ 7.0	\$ 7.3	\$ 6.4	\$ 6.0	\$ 3.8	\$ 28.0
Increase (Decrease)	-	4.1	11.1	0.2	14.1	14.8	(28.0)
Revised Forecast	\$ 75.6	\$ 11.1	\$ 18.4	\$ 6.6	\$ 20.1	\$ 18.6	\$ -

## Pointe du Bois Improvements & Upgrades

### Description:

Design and build a spillway and earth fill dam to replace the existing spillway structures. Includes engineering and environmental studies, community consultation, obtaining regulatory approval, construction 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 2014.

### Revision:

Project estimate decreased \$500.0 million to reflect scope change to exclude the construction of a new four unit powerhouse, and in-service date advanced three years from October 2017.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 818.0	\$ 13.8	\$ 14.8	\$ 15.5	\$ 91.5	\$ 141.1	\$ 514.5
Increase (Decrease)	(500.0)	-	-	-	(38.5)	(58.0)	(403.8)
Revised Forecast	\$ 318.0	\$ 13.8	\$ 14.8	\$ 15.5	\$ 53.0	\$ 83.1	\$ 110.7

## Pointe du Bois - Transmission

### Description:

Install 17 kms of single circuit 115 kV transmission line with 795 ACSR conductor between Rover and the intersection of GT1/ST2 and the transmission right-of-way near the floodway. Install 43 kms of single circuit 115 kV transmission line with 795 ACSR conductor between Pointe du Bois and GT1/ST2 transmission line south of Lac du Bonnet. The estimate is based on the utilization of the previously vacated transmission line corridor from Pointe du Bois to GT1-ST2 transmission line south of Lac du Bonnet and from Ridgeway station to Rover station. Install a second communications link from Pointe and Slave to the System Control Center.

### Justification:

To address aging infrastructure concerns with the existing 66 kV P Lines, provide adequate outlet transmission for future Pointe du Bois generating station expansion, and to integrate the Winnipeg Central System into the Manitoba Hydro System.

### In-Service Date:

May 2014.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 85.9	\$ 19.1	\$ 12.5	\$ 13.2	\$ 16.4	\$ 13.0	\$ 2.8
<b>Increase (Decrease)</b>	-	(10.1)	13.8	(2.8)	4.2	0.9	0.3
<b>Revised Forecast</b>	\$ 85.9	\$ 9.0	\$ 26.3	\$ 10.4	\$ 20.6	\$ 13.9	\$ 3.1

## Bipole 3

### Description:

Design and build a transmission line (west of Lakes Winnipegosis & Manitoba), conduct environmental impact assessments, select route, acquire property for right of way, and obtain licensing for Riel Station, a +/- 500 kV DC transmission line from proposed line paralleling site near Radisson and proposed Riel Station, and a 230 kV AC line from Riel Station to Dorsey Station (normally operated at +/- 500 kV DC).

Design and build an HVDC transmission line from Riel Converter Station (CS) to Conawapa CS; a converter station with 2000 MW of converters at Conawapa; six AC transmission lines approximately 30 kms long to connect the Conawapa converter station to the Henday converter station; and a converter station with 2000 MW of converters at Riel, including three synchronous compensators.

### 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 at full load, due to decreased line losses (approximately 78 MW).

### In-Service Date:

October 2017.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 2 247.8	\$ 16.6	\$ 21.4	\$ 36.7	\$ 113.4	\$ 266.5	\$ 1 774.4
<b>Increase (Decrease)</b>	-	-	-	-	-	-	(8.7)
<b>Revised Forecast</b>	\$ 2 247.8	\$ 16.6	\$ 21.4	\$ 36.7	\$ 113.4	\$ 266.5	\$ 1 765.7

## Riel 230/500 kV Station

### Description:

Sectionalize Dorsey to the United States 500 kV transmission line D602F at Riel (on the southeast side of Winnipeg), and establish a station including a 230 and 500 kV ring bus, the installation of a 230/ 500 kV transformer bank, and line reactors salvaged from Dorsey 500 kV Station.

### Justification:

The sectionalization of the 500 kV 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 2014.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 267.6	\$ 30.7	\$ 68.8	\$ 75.7	\$ 43.5	\$ 36.4	\$ 4.7
<b>Increase (Decrease)</b>	-	5.4	(10.4)	3.9	1.6	1.8	(0.1)
<b>Revised Forecast</b>	\$ 267.6	\$ 36.1	\$ 58.4	\$ 79.6	\$ 45.1	\$ 38.2	\$ 4.6

## Firm Import Upgrades

### Description:

Reconductor and resag transmission lines R23R, WT34, HS5 and SM26, and replace risers and current transformers for stations at Rosser, Ridgeway, Great Falls, Transcona, Mercy St., and Parkdale.

### Justification:

This project will improve Manitoba Hydro's firm import capability during periods when we are expected to be energy deficient.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 4.8	\$ 0.4	\$ 2.1	\$ 2.1	\$ -	\$ -	\$ -
<b>Increase (Decrease)</b>	-	0.2	-	-	-	-	-
<b>Revised Forecast</b>	\$ 4.8	\$ 0.6	\$ 2.1	\$ 2.1	\$ -	\$ -	\$ -



## Dorsey - US Border New 500kV Transmission Line

### Description:

Design and build a 63 KM 500 kV transmission line between Riel station and Dorsey station, and a 125 KM 500 kV transmission line between Dorsey station and the U.S. border. Acquire property for right-of-way, conduct environmental impact assessment, conduct community consultations, obtain licensing and perform environmental monitoring for all facilities.

### Justification:

Manitoba Hydro has received transmission service requests for more than 750 MW of new import and export service between the U.S. and Manitoba. Term sheets have been signed for a potential 500 MW power sale to Wisconsin and a 250 MW power sale to Minnesota. These additional power sales require the construction of a new high voltage tieline between Manitoba and the U.S.

### In-Service Date:

May 2018.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 204.8	\$ -	\$ -	\$ 0.8	\$ 1.8	\$ 10.7	\$ 191.4
Increase (Decrease)	-	-	0.5	1.1	6.4	6.9	(14.9)
Revised Forecast	\$ 204.8	\$ -	\$ 0.5	\$ 1.9	\$ 8.2	\$ 17.6	\$ 176.5

## Brandon Combustion Turbine Pipeline Upgrade

### Description:

Install 11,403 meters of 12" steel transmission pressure pipeline and one control point valve assembly to assist in supplying the Brandon thermal generating station natural gas turbines.

### Justification:

In order to meet Manitoba Hydro's contractual obligation to KOCH Fertilizer Canada Ltd., as well as the firm service agreement with the Brandon thermal generating station, it is necessary to construct an additional 11,403 meters of 12" pipeline for supply to the Brandon thermal generating station natural gas turbines.

### In-Service Date:

October 2009.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.5	\$ 5.2	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	(0.1)	0.2	-	-	-	-	-
Revised Forecast	\$ 5.4	\$ 5.4	\$ -	\$ -	\$ -	\$ -	\$ -

## Demand Side Management

### Description:

Design, implement and deliver incentive based PowerSmart conservation programs to reduce electricity consumption in Manitoba. When combined with savings realized to-date, total electricity savings of 915 MW and 3,271 GWh are expected to be achieved by 2025.

### Justification:

The electricity Demand Side Management plan is cost effective as a resource option and is included in Manitoba Hydro's *Power Resource 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, and by protecting the environment and promoting sustainable energy supply and service.

### In-Service Date:

Ongoing.

### Revision:

The increase in total expenditures is primarily due to the addition of the Industrial Emergency Preparedness Program, revisions to the Performance Optimization and BioEnergy Optimization Programs resulting in higher program costs, an increase in contingency dollars and the inclusion of another year of expenditures in 2019/20.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 34.6	\$ 33.3	\$ 31.8	\$ 29.4	\$ 26.0	\$ 122.3
Increase (Decrease)		5.7	9.7	10.7	9.0	7.9	36.2
Revised Forecast		\$ 40.3	\$ 43.0	\$ 42.5	\$ 38.4	\$ 33.9	\$ 158.5

## Planning Study Costs

### Description:

Perform assessments, create conceptual designs and planning studies of potential supply options and associated transmission facilities. Areas of study include establishment of design parameters, structure layouts, support facilities, hydraulic model testing, exploration, data collection, environmental assessments and public input, schedules, and cost estimates.

### Justification:

To plan for the orderly development of new sources of generation and related transmission facilities, and to explore supply-side efficiency improvements.

### In-Service Date:

Ongoing.

### Revision:

Ongoing.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 5.9	\$ 4.7	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)		(0.2)	3.3	1.9	-	-	-
Revised Forecast		\$ 5.7	\$ 8.0	\$ 1.9	\$ -	\$ -	\$ -

## NEW HEAD OFFICE:

### Description:

Construction of a 695,742 square foot 22 storey Head Office in downtown Winnipeg.

### Justification:

A new Head Office location is required to consolidate approximately 2,000 staff including management and administrative functions of Manitoba Hydro in a modern, centralized location.

### In-Service Date:

May 2008.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 278.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	14.8	-	-	-	-	-
Revised Forecast	\$ 278.1	\$ 14.8	\$ -	\$ -	\$ -	\$ -	\$ -

## CORPORATE RELATIONS:

### Waterways Management Program

### Description:

Waterways management at Grand Rapids and Lake Winnipeg Regulation / Churchill River Diversion.

### Justification:

The Waterways Management Program (WMP) includes activities related to boat patrols, debris clearing, and supplementary works and is required to ensure ongoing safety and environmental management of waterways.

### In-Service Date:

Ongoing.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 5.3	\$ 5.5	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)		-	(0.1)	-	-	-	-
Revised Forecast		\$ 5.3	\$ 5.4	\$ -	\$ -	\$ -	\$ -

## POWER SUPPLY:

### Converter Transformer Bushing Replacement

**Description:**

Replace converter transformer bushings with NGK bushings, and purchase spares as follows: at Dorsey replace six 230 kV AC, and six 25 kV tertiary bushings; and at Radisson/ Henday replace five 138 kV, two 150 kV, four 230 kV, and three 15 kV tertiary bushings, and purchase two 300 kV and two 450 kV spares.

**Justification:**

The bushing replacement program was undertaken due to failure of a 230 kV bushing in Dorsey T21 A-phase converter transformer that resulted in costly repairs to the transformer, and loss of revenue due to the outage. Also during the repair of the Dorsey T31S converter transformer in Pauwel's Canada plant, two out of two 230 kV bushings that were tested failed at far below the full test voltage. The manufacturer's expected service life is 25 years. These bushings have all been in-service more than 19 years. Replacement cost is justified when compared to transformer damage due to an in-service failure.

**In-Service Date:**

October 2011.

**Revision:**

Cost flow revision, and in-service date deferred 12 months from October 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.9	\$ 1.3	\$ 1.0	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.2)	(0.6)	1.9	-	-	-
Revised Forecast	\$ 5.9	\$ 0.1	\$ 0.4	\$ 1.9	\$ -	\$ -	\$ -

### Bipole 1 & 2 Electrode Line Monitoring

**Description:**

Install a Siemens pulse-echo electrode line fault detection system on Dorsey Bipole 1 and 2, Radisson Bipole 1, and Henday Bipole 2 Electrode lines.

**Justification:**

There is a need for detection of open circuit, faulted, or partially down electrode line conductors based on public safety concerns, possible damage to equipment, and the security of Bipole 1 and 2.

**In-Service Date:**

September 2012.

**Revision:**

Cost flow revision, and in-service date deferred 24 months from September 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 1.7	\$ 1.5	\$ 0.1	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.5)	(0.1)	1.6	-	-	-
Revised Forecast	\$ 1.7	\$ -	\$ -	\$ 1.6	\$ -	\$ -	\$ -

## Dorsey Synchronous Condenser Refurbishment

### Description:

Major inspection, re-wedging and overhaul of synchronous condensers SC7Y, SC8Y, SC9Y, SC21Y, and SC23Y. Replace coolers to restore original thermal performance on SC21Y, and SC23Y. Repair corrosion problems and replace GEM80 PLC on SC7Y, SC8Y and SC9Y. Modify the 600 V transfer scheme for SC8Y, SC7Y & SC9Y.

### 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 2015.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 32.3	\$ 4.5	\$ 2.8	\$ 3.8	\$ 2.6	\$ 2.7	\$ 3.4
Increase (Decrease)	-	(1.5)	(0.3)	(0.2)	(0.1)	(0.1)	(0.6)
Revised Forecast	\$ 32.3	\$ 3.0	\$ 2.5	\$ 3.6	\$ 2.5	\$ 2.6	\$ 2.8

## HVDC Bipole 1 Roof Replacement

### Description:

Remove existing roofs over Bipole 1, valve groups 11, 12, 13, 21, 22, and 23 at Dorsey and Radisson stations. Design, supply, install and test replacement roofs, simultaneously, and during pre-planned outages. The new roofs are to be two-ply modified bitumen membrane with R20 insulating values, and meeting FM Global fire spread and wind uplift requirements.

### Justification:

The existing asphalt roofs were installed in 1970, and with maintenance have exceeded their life expectancy of 15 years. Damage to equipment due to water leaks, fire spread within a roof system, or high wind uplift and/or possible lost export sales could be very costly. Each of the six valve halls contains equipment valued at \$7.0 M.

### In-Service Date:

June 2009.

### Revision:

In-service date advanced four months from October 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.9	\$ 0.7	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	-	-	-	-	-	-
Revised Forecast	\$ 5.9	\$ 0.7	\$ -	\$ -	\$ -	\$ -	\$ -

## HVDC System Transformer & Reactor Fire Protection & Prevention

### Description:

The supply and installation of fire protection upgrades on 33 converter transformers and eight smoothing reactors. The re-design and replacement of the deluge system on the Dorsey converter building south wall and the Henday converter building north east wall, and the construction of a fire response building in a safe location at Dorsey converter station.

### Justification:

To minimize the high risk of fire spread and catastrophic damage throughout the AC and DC switchyards, and a potential transformer and revenue loss of an estimated \$30 to \$50 million. To provide adequate fire protection for personnel in accordance with National Fire Protection Association (NFPA) Life Safety Code 101.

### In-Service Date:

December 2011.

### Revision:

Cost flow revision, and in-service date deferred 14 months from October 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 10.4	\$ 1.1	\$ 0.6	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.8)	0.7	0.3	-	-	-
Revised Forecast	\$ 10.4	\$ 0.3	\$ 1.3	\$ 0.3	\$ -	\$ -	\$ -

## HVDC AC Filter PCB Capacitor Replacement

### Description:

Replace all Bipole 1 & 2 AC PCB filled high power capacitors at the Dorsey, Radisson, and Henday Converter Stations, with non-PCB replacement capacitors.

### Justification:

Numerous PCB filled capacitor failures at HVDC converter stations have resulted in requests for outages via the System Control Centre to allow for repairs. The catastrophic failure of a capacitor in an AC filter bank of B2 would result in a pole outage. Manitoba Hydro is committed to being PCB free as outlined in corporate policy statement CP486B. The capacitors will be 27 years old and are approaching the end of their usable life.

### In-Service Date:

November 2010.

### Revision:

Cost flow revision, and in-service date deferred 18 months from May 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 34.5	\$ 3.0	\$ 4.7	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.6)	1.3	-	-	-	-
Revised Forecast	\$ 34.5	\$ 2.4	\$ 6.0	\$ -	\$ -	\$ -	\$ -



## HVDC Transformer Replacement Program

### Description:

Maintain an inventory of eight spare converter transformers for use at Radisson, Henday and Dorsey converter stations.

### Justification:

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

### In-Service Date:

October 2013.

### Revision:

Cost flow revision, and in-service date deferred 19 months from March 2012.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 105.7	\$ 4.5	\$ 10.0	\$ (0.2)	\$ 0.3	\$ -	\$ -
<b>Increase (Decrease)</b>	-	(3.5)	(8.9)	7.5	5.0	1.1	-
<b>Revised Forecast</b>	\$ 105.7	\$ 1.0	\$ 1.1	\$ 7.3	\$ 5.3	\$ 1.1	\$ -

## Dorsey 230 kV Relay Building Upgrade

### Description:

Upgrade the 230 kV relay building at Dorsey and provide mobile protection and control trailers.

### Justification:

Upgrades to the building will reduce the risk of damage from weather related perils and limit the consequence of a Bipole failure due to fire related perils. Mobile protection and control trailers will facilitate the quick restoration of service in the case of a catastrophic event to this or other relay buildings.

### In-Service Date:

March 2016.

### Revision:

Cost flow revision, and in-service date deferred seven months from August 2015.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 73.8	\$ 2.8	\$ 3.5	\$ 1.7	\$ 15.8	\$ 32.9	\$ 15.8
<b>Increase (Decrease)</b>	-	(1.7)	(1.6)	2.3	0.6	(0.8)	1.1
<b>Revised Forecast</b>	\$ 73.8	\$ 1.1	\$ 1.9	\$ 4.0	\$ 16.4	\$ 32.1	\$ 16.9

## HVDC Stations Ground Grid Refurbishment

### Description:

Upgrade the existing ground grid systems at Dorsey, Radisson and Henday Stations.

### Justification:

These upgrades improve the safety of employees and contractors working in and around the HVDC converter stations, by ensuring that touch and step potential are within safe levels.

### In-Service Date:

October 2013.

### Revision:

Cost flow revision, and in-service date deferred seven months from March 2013.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4.3	\$ 0.4	\$ 0.3	\$ 0.4	\$ 0.5	\$ -	\$ -
Increase (Decrease)	-	0.2	0.2	0.2	0.1	-	-
Revised Forecast	\$ 4.3	\$ 0.6	\$ 0.5	\$ 0.6	\$ 0.6	\$ -	\$ -

## HVDC Bipole 2 230 kV HLR Circuit Breaker Replacement

### Description:

Replace the existing 34 HLR operating mechanisms with new operating mechanisms, evaluate five HLR breaker and drive mechanisms, purchase one spare HLR operating mechanism, rebuild 126 AHMA drives, purchase six AHMA drives, remove 203 600V arc chutes and rebuild the associated 600V breakers, and the replacement of all 600V breaker hydraulic overloads with electronic overloads.

### Justification:

System reliability will be improved. BLG1002A breaker operating mechanisms are designed to handle the frequent switching experienced by these 16 breakers, reduce repair and maintenance frequency, and reduce the risk of failure. A breaker failure results in a bus outage and single contingency of the 230 kV bus. There is a Bipole outage risk, if bus B1 or B2 at Dorsey is out of service for any reason.

### In-Service Date:

December 2013.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 9.4	\$ 1.3	\$ 0.8	\$ 0.3	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.4	(0.4)	(0.3)	-	-	-
Revised Forecast	\$ 9.4	\$ 2.7	\$ 0.4	\$ -	\$ -	\$ -	\$ -

## HVDC Bipole 1 Pole Differential Protection

### Description:

Prepare an engineering report to determine all possible options, scope of work, cost analysis, and detailed cost estimate. Implement the preferred option at both Dorsey and Radisson stations.

### Justification:

Upgrading Bipole 1 pole differential protection is necessary to eliminate healthy pole blocks, thus reducing outages and increasing availability.

### In-Service Date:

December 2011.

### Revision:

Cost flow revision, and in-service date deferred 24 months from December 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 3.3	\$ 3.3	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(3.3)	1.0	2.3	-	-	-
Revised Forecast	\$ 3.3	\$ -	\$ 1.0	\$ 2.3	\$ -	\$ -	\$ -

## HVDC Bipole 1 By-Pass Vacuum Switch Removal

### Description:

Remove the existing By-Pass Vacuum Switch (BPVS) and By-Pass Switch (BPS) and replace both with a single BPS at Dorsey and Radisson stations (Bipole 1 valve halls). In addition, Radisson will have its AC line switch (ACCO) removed.

### Justification:

The equipment is nearing the end of its service life and requires substantial maintenance. By-pass vacuum switches were part of the replaced mercury arc valves switching scheme. The new thyristor valves may be more reliably served by other types of switches, thus reducing the forced outage rate.

### In-Service Date:

March 2014.

### Revision:

Cost flow revision, and in-service date deferred one year from March 2013.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 20.4	\$ 4.7	\$ 5.4	\$ 4.4	\$ 5.8	\$ -	\$ -
Increase (Decrease)	-	(4.2)	(0.8)	3.8	(0.2)	1.2	-
Revised Forecast	\$ 20.4	\$ 0.5	\$ 4.6	\$ 8.2	\$ 5.6	\$ 1.2	\$ -

## HVDC Bipole 2 Refrigerant Condenser Replacement

### Description:

Remove and replace existing air conditioning systems in the Bipole 2 valve halls, maintenance blocks and administration areas at both Dorsey and Henday converter stations.

### Justification:

The present systems are nearing the end of their service life. Maintenance is increasing, along with the likelihood of costly valve outages. In addition, the present systems contain R-22 (an ozone depleting substance).

### In-Service Date:

April 2013.

### Revision:

Cost flow revision, and in-service date deferred one year from April 2012.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 11.0	\$ -	\$ 2.9	\$ 7.2	\$ 0.9	\$ -	\$ -
<b>Increase (Decrease)</b>	-	-	(2.9)	(4.4)	6.3	1.0	-
<b>Revised Forecast</b>	\$ 11.0	\$ -	\$ -	\$ 2.8	\$ 7.2	\$ 1.0	\$ -

## HVDC Bipole 1 Smoothing Reactor Replacement

### Description:

Remove existing oil-filled Bipole 1 smoothing reactors at Dorsey and Radisson, and replace with new air core reactors.

### Justification:

Existing Bipole 1 smoothing reactors are approaching the end of their service life. Replacement will ensure continued availability and reliable operation of the HVDC system. Removal of oil-filled reactors will reduce the risk of oil spills and fires within the work place.

### In-Service Date:

October 2018.

### Revision:

Cost flow revision, and in-service date deferred six years from October 2012.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 31.8	\$ 3.1	\$ 10.5	\$ 12.8	\$ 5.1	\$ -	\$ -
<b>Increase (Decrease)</b>	-	(3.1)	(10.4)	(12.7)	(5.0)	4.0	27.7
<b>Revised Forecast</b>	\$ 31.8	\$ -	\$ 0.1	\$ 0.1	\$ 0.1	\$ 4.0	\$ 27.7

## HVDC Bipole 1 Converter Station, P1 & P2 Battery Bank Separation

### Description:

Separate Pole 1 & Pole 2 battery banks at Dorsey and Radisson converter stations. Upgrade the battery banks and charger ratings to comply with current Manitoba Hydro design criteria.

### Justification:

Pole 1 & Pole 2 battery banks have to be physically separated in order to provide a reliable first grade supply to the HVDC controls and protection and communication system.

### In-Service Date:

February 2013.

### Revision:

Cost flow revision, and in-service date deferred one year from February 2012.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 3.2	\$ -	\$ 1.0	\$ 2.2	\$ -	\$ -	\$ -
Increase (Decrease)	-	-	(1.0)	(1.2)	2.2	-	-
Revised Forecast	\$ 3.2	\$ -	\$ -	\$ 1.0	\$ 2.2	\$ -	\$ -

## HVDC Bipole 1 DCCT Transductor Replacement

### Description:

Replace existing oil-filled DC transductors with optical transductors at Dorsey and Radisson stations.

### Justification:

Existing BP1 DCCT transductors are reaching the end of service life and spares are no longer available. Failure of a transductor to transmit a required signal to protective and controls equipment at Dorsey and Radisson stations can cause a lengthy pole outage. A fire in the existing oil-filled transductors could result in irreparable damage to adjacent equipment and a lengthy pole outage. Replacement will contribute to reliable operation of the HVDC system. Removal of the oil-filled transductors will reduce the risk of oil spills and fires within the workplace.

### In-Service Date:

October 2016.

### Revision:

Cost flow revision, and in-service date deferred two years from October 2014.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 11.7	\$ 2.5	\$ 1.2	\$ 3.5	\$ 1.3	\$ 1.8	\$ 0.7
Increase (Decrease)	-	(2.5)	(0.6)	(0.7)	(0.5)	2.1	2.8
Revised Forecast	\$ 11.7	\$ -	\$ 0.6	\$ 2.8	\$ 0.8	\$ 3.9	\$ 3.5

## HVDC BP1 & BP2 DC Converter Transformer Bushing Replacements

**Description:**

Remove and replace transformer bushings on all converter transformers over 25 years old.

**Justification:**

Bushings on converter transformers over 25 years old are reaching the end of their service life. A bushing failure while in-service would cause a costly valve group outage to repair or replace the bushing and could cause irreparable damage to a converter transformer.

**In-Service Date:**

March 2015.

**Revision:**

Cost flow revision, and in-service date deferred 18 months from September 2013.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 8.7	\$ 0.5	\$ 1.0	\$ 1.6	\$ 5.1	\$ 0.5	\$ -
<b>Increase (Decrease)</b>	-	(0.5)	(1.0)	(1.1)	(4.1)	1.2	5.4
<b>Revised Forecast</b>	\$ 8.7	\$ -	\$ -	\$ 0.5	\$ 1.0	\$ 1.7	\$ 5.4

## HVDC Bipole 2 Valve Hall Wall Bushing Replacements

**Description:**

Replace all oil-filled wall bushings in the Bipole 2 valve halls with new solid core bushings or SF6 filled bushings.

**Justification:**

Existing wall bushings in the Bipole 2 valve halls are over 20 years old and are reaching the end of their service life. The risk of bushing failure and fire in a valve hall increases as the bushings age. Replacing the bushings will ensure reliable operation of the valve group well into the future, and provide a safer working environment for employees at the converter stations.

**In-Service Date:**

June 2015.

**Revision:**

Cost flow revision, and in-service date deferred two years from June 2013.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 19.2	\$ 3.4	\$ 4.6	\$ 4.7	\$ 4.8	\$ 1.8	\$ -
<b>Increase (Decrease)</b>	-	(3.4)	(4.5)	(1.4)	(0.3)	2.8	6.7
<b>Revised Forecast</b>	\$ 19.2	\$ -	\$ 0.1	\$ 3.3	\$ 4.5	\$ 4.6	\$ 6.7

## HVDC Bipole 1 CQ Disconnect Replacement

### Description:

Replace the existing Radisson and Dorsey DC disconnects, and Dorsey AC disconnects with new disconnects.

### Justification:

Major failures of CQ disconnects cause costly pole outages, and these disconnects are reaching the end of their service life. They have been in-service for 36 years, their failure rate is increasing, and spare parts are no longer available.

### In-Service Date:

April 2014.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.2	\$ -	\$ 1.2	\$ 1.6	\$ 0.9	\$ 1.1	\$ 0.3
Increase (Decrease)	-	-	(1.2)	(0.5)	0.6	(0.2)	1.3
Revised Forecast	\$ 5.2	\$ -	\$ -	\$ 1.1	\$ 1.5	\$ 0.9	\$ 1.6

## HVDC Bipole 2 Thyristor Module Cooling Refurbishment

### Description:

Refurbish 1 566 thyristor module cooling components in Bipole 2 by replacing the manifolds, connectors and cooling tubes.

### Justification:

The cooling components are reaching the end of their life, and are starting to leak, resulting in forced outages. Refurbishing the module cooling components will improve the reliability of the cooling system and extend its life until the replacement of the Bipole 2 system equipment, which is in approximately 10 - 15 years.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4.7	\$ 1.8	\$ 1.8	\$ 0.8	\$ -	\$ -	\$ -
Increase (Decrease)	-	-	(0.1)	-	-	-	-
Revised Forecast	\$ 4.7	\$ 1.8	\$ 1.7	\$ 0.8	\$ -	\$ -	\$ -

## HVDC Bipole 2 Smoothing Reactor Replacement

### Description:

Replace four existing oil-filled Bipole 2 smoothing reactors with air core smoothing reactors at Dorsey and Henday.

### Justification:

The smoothing reactors have already exceeded their estimated useful life of 25 years. Each DC line fault and AC system fault in the southern AC system results in sudden current surges in the smoothing reactors resulting in physical shaking and contraction of the windings. As a result, the blockings in the winding become loose and have to be retightened. The reactors have been subject to these faults for many years. When the reactors do eventually fail, the units will be replaced with air core reactors. Replacing them with an air core reactor now would alleviate the environmental and fire concerns, and provide a reliable system for the future and reduce maintenance and protection systems requirements.

### In-Service Date:

September 2013.

### Revision:

Cost flow revision, and in-service date advanced one year from September 2014.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 17.1	\$ -	\$ -	\$ 7.0	\$ 6.5	\$ 3.0	\$ 0.6
Increase (Decrease)	-	0.8	3.5	(3.8)	(0.8)	0.8	(0.6)
Revised Forecast	\$ 17.1	\$ 0.8	\$ 3.5	\$ 3.2	\$ 5.7	\$ 3.8	\$ -

## HVDC Bipole 1 Transformer Marshalling Kiosk Replacement

### Description:

Replace nine Bipole 1 transformer marshalling kiosks with insulated Programmable Logic Controllers (PLC) monitoring marshalling kiosks, and upgrade 19 control boxes at the transformer with a quick disconnect system.

### Justification:

The new control boxes will remove the 600V from the controls and monitoring section of the panel which will eliminate the present safety concerns that site workers face while performing maintenance or trouble shooting.

### In-Service Date:

November 2014

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	6.8	1.0	1.0	1.6	1.6	1.1	0.5
Revised Forecast	\$ 6.8	\$ 1.0	\$ 1.0	\$ 1.6	\$ 1.6	\$ 1.1	\$ 0.5



## Pine Falls Rehabilitation

### Description:

Rehabilitation, replacement of and addition to various electrical and mechanical equipment and systems such as spillway mechanical components, station service upgrade, station lighting, 11 kV cable replacement, spillway electrical distribution, water system, air system, transformer lightning arrestors, and station drawings. Replace unit 1 and 2 turbine runners with more efficient new design runners, rebuild existing servomotors for increased wicket gate opening allowing more discharge, and rewind the generator stators utilizing modern insulating materials. Conduct a model test and up-rate study. Replace potential transformers, synchronizers, annunciators, generator breakers, excitation and governor systems, step-up transformers and electrical back-up systems.

### Justification:

Assessment of the electrical and 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:

March 2015.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 56.2	\$ 4.6	\$ 24.5	\$ 5.2	\$ 3.8	\$ 3.2	\$ 6.6
<b>Increase (Decrease)</b>	-	(1.8)	(20.3)	12.2	8.4	(1.1)	4.3
<b>Revised Forecast</b>	\$ 56.2	\$ 2.8	\$ 4.2	\$ 17.4	\$ 12.2	\$ 2.1	\$ 10.9

## Jenpeg Unit Overhauls

### Description:

Major overhaul of all generating units (1-6) to inspect, repair, modify, and replace components of the turbine/generator. Areas of concern include journal bearings, thrust bearings, turbine seals, servo motors, wicket gate seals and bushings, waterhead and oil head, stator and rotor, and auxiliary systems.

### Justification:

A complete overhaul is required to ensure reliable operation of the units when maximum power requirements on the system are essential.

### In-Service Date:

December 2021.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 128.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 49.2
<b>Increase (Decrease)</b>	-	-	-	-	-	-	23.9
<b>Revised Forecast</b>	\$ 128.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 73.1

## Power Supply Dam Safety Upgrades

### Description:

Perform necessary engineering design and remedial construction to upgrade generating stations to present day dam safety standards: 1) Kettle generating station – upgrade main and saddle dams for freeboard; 2) Kelsey generating station – armour plating at spillway rollways, erection of heated hoist housing, insulating of spillway gates, upgrading of dikes, upgrading of spillway feeders and electrical systems at the spillway, and upgrading of the station service transformers due to increased loading; and 3) southern generating stations - capital works identified in the dam safety certification process or identified through observation and discussion with staff.

### Justification:

Work is required to correct deficiencies to all the plants, in order to operate in a safe and reliable manner.

### In-Service Date:

March 2016.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 34.0	\$ 3.5	\$ 1.2	\$ 1.2	\$ 1.2	\$ 1.3	\$ 3.2
Increase (Decrease)	-	6.2	0.5	(1.2)	(1.2)	(1.3)	(3.2)
Revised Forecast	\$ 34.0	\$ 9.7	\$ 1.7	\$ -	\$ -	\$ -	\$ -

## Winnipeg River Riverbank Protection Program

### Description:

Placement of rock protection and construction of slope stabilization to reduce the erosion of riverbanks along the Winnipeg River. The work includes inspection, design, mapping, land acquisition, and remedial construction at priority locations along reaches of the Winnipeg River affected by Manitoba Hydro hydraulic operations.

### Justification:

Provision of riverbank protection and stabilization work along the Winnipeg River between Seven Sisters forebay and Manitou rapids to protect private property from erosion partially due to hydraulic operations.

### In-Service Date:

March 2017.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 19.7	\$ 1.1	\$ 1.2	\$ 1.2	\$ 1.2	\$ 1.3	\$ 4.0
Increase (Decrease)	-	0.2	-	-	0.1	-	0.1
Revised Forecast	\$ 19.7	\$ 1.3	\$ 1.2	\$ 1.2	\$ 1.3	\$ 1.3	\$ 4.1

## Power Supply Hydraulic Controls

### Description:

Install an optimization system to run all 39 units at Kelsey, Kettle, Long Spruce, and Limestone at their most efficient gate opening. Install a Decision Support System (DSS) to provide accurate short-term Hydro scheduling (water resource management) and feedback information. Install required automation, remote control, and protective devices for unmanned operation.

### Justification:

By increasing unit efficiency, the Corporation can reduce or delay the need for capital expenditures for new plant, increase export net revenues, improve financial strength, and protect the environment.

### In-Service Date:

March 2020.

### Revision:

Cost flow revision, and in-service date deferred 63 months from December 2014.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 16.0	\$ 1.8	\$ 0.9	\$ 2.5	\$ 2.4	\$ 0.9	\$ 1.0
Increase (Decrease)	-	1.3	1.0	(1.3)	(2.4)	(0.9)	4.6
Revised Forecast	\$ 16.0	\$ 3.1	\$ 1.9	\$ 1.2	\$ -	\$ -	\$ 5.6

## Slave Falls Rehabilitation

### Description:

Perform major overhaul for all eight units at Slave Falls Generating Station, including spillway improvements/replacements, excitation upgrades, and the addition of a Unit Control and Monitoring System (UCMS) Framework.

### Justification:

Many safety, reliability, environmental, efficiency, operational & dam safety issues have been identified relating to the Slave Falls infrastructure. Extensive repairs, modifications and/or replacements will be required to ensure the serviceability of the plant and spillway infrastructure. Economics of this work may suggest that a new spillway be constructed to replace existing spill infrastructure. Current operating procedures include ice load reduction activities at the spilling structures to ensure structural stability. A dam safety concern has been identified with respect to the minimal remote spilling capability at Slave Falls.

### In-Service Date:

December 2017.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 198.3	\$ 13.7	\$ 10.4	\$ 8.9	\$ 23.6	\$ 29.9	\$ 96.5
Increase (Decrease)	-	(0.7)	(6.4)	(7.8)	(7.3)	(18.1)	44.6
Revised Forecast	\$ 198.3	\$ 13.0	\$ 4.0	\$ 1.1	\$ 16.3	\$ 11.8	\$ 141.1

## 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:

December 2011.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 19.7	\$ 4.1	\$ 8.1	\$ 5.4	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.1)	(1.1)	2.4	-	-	-
Revised Forecast	\$ 19.7	\$ 3.0	\$ 7.0	\$ 7.8	\$ -	\$ -	\$ -

## Great Falls 115 kV Indoor Station Safety Improvements

### Description:

Improve electrical safety clearance in the 115 kV switching gallery by replacing the air blast breakers with separate current transformers (CTs) with smaller dead tank SF<sub>6</sub> breakers with integral CTs, raise potential transformer (PT) equipment, install Lexan insulating panels to improve the separation between buses, improve grounding provisions, and add safety screens around disconnects.

### Justification:

The indoor switching gallery has many instances of electrical clearances that are less than the absolute minimum limit of approach, and do not meet the minimum standard outlined in the Manitoba Hydro safety book.

### In-Service Date:

April 2009.

### Revision:

Cost flow revision, and in-service date advanced seven months from November 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 11.6	\$ 0.9	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.7	-	-	-	-	-
Revised Forecast	\$ 11.6	\$ 1.6	\$ -	\$ -	\$ -	\$ -	\$ -

## Generation South Transformer Refurbish & Spares

### Description:

Purchase a spare generator step-up transformer and refurbish the existing generator step-up transformers at Jenpeg GS; purchase a spare three phase generator step-up transformer at Pine Falls GS; refurbish ten generator step-up transformers at Grand Rapids GS; and purchase two 3-phase generator step-up transformers and install one in Bank 6 at Great Falls GS.

### Justification:

To minimize the occurrence and duration of transformer-related forced outages, it is imperative that spare transformers are available.

### In-Service Date:

March 2017.

### Revision:

Cost flow revision, and in-service date deferred two years from March 2015.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 21.0	\$ 2.9	\$ 5.3	\$ 4.5	\$ 3.1	\$ 2.6	\$ 1.6
Increase (Decrease)	-	(2.9)	(3.8)	(1.4)	2.2	1.8	5.0
Revised Forecast	\$ 21.0	\$ -	\$ 1.5	\$ 3.1	\$ 5.3	\$ 4.4	\$ 6.6

## Water Licenses & 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 the Corporation's hydraulic plants.

### Justification:

All hydraulic generating 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:

May 2016.

### Revision:

Cost flow revision, and in-service date deferred two months from March 2016.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 40.8	\$ 5.1	\$ 5.6	\$ 4.9	\$ 4.8	\$ 4.6	\$ 9.5
Increase (Decrease)	-	(0.7)	0.4	1.1	0.9	1.3	(1.4)
Revised Forecast	\$ 40.8	\$ 4.4	\$ 6.0	\$ 6.0	\$ 5.7	\$ 5.9	\$ 8.1

## Generation South PCB Regulation Compliance

### Description:

Replace equipment identified as containing polychlorinated biphenyl (PCB) content > 50 ppm at generation south generating stations.

### Justification:

Required to comply with Federal legislation regarding the replacement of equipment in non-sensitive areas with PCB content > 50 ppm.

### In-Service Date:

March 2015.

### Revision:

Cost flow revision, and in-service date deferred three months from December 2014.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4.7	\$ 2.0	\$ 1.6	\$ 0.4	\$ 0.4	\$ 0.2	\$ -
Increase (Decrease)	-	(1.8)	(1.3)	(0.3)	(0.3)	-	3.8
Revised Forecast	\$ 4.7	\$ 0.2	\$ 0.3	\$ 0.1	\$ 0.1	\$ 0.2	\$ 3.8

## Kettle Transformer Overhaul Program

### Description:

Purchase two spare transformers, one for the Kettle GS and one for the Long Spruce/Limestone generating stations. Subsequent to receiving the new transformers, the remaining 12 step-up transformers will be overhauled.

### Justification:

Kettle step-up transformers have been in operation for 37 years, with a life expectancy of between 30 and 50 years. During this time frame there have been more transformer winding failures at the Kettle GS than anywhere else in Manitoba Hydro.

### In-Service Date:

April 2014.

### Revision:

Cost flow revision, and in-service date advanced two years from April 2016.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 35.6	\$ 3.3	\$ 3.8	\$ 4.6	\$ 4.9	\$ 5.7	\$ 12.4
Increase (Decrease)	-	(1.7)	2.8	1.9	1.7	1.1	(5.0)
Revised Forecast	\$ 35.6	\$ 1.6	\$ 6.6	\$ 6.5	\$ 6.6	\$ 6.8	\$ 7.4

## Generation South Breaker Replacements

### Description:

Remove the four existing 115 kV current transformers and breakers at McArthur Falls GS, and replace with new 115 kV breakers with internal current transformers, and replace the fourteen 115 kV breakers at the Pine Falls GS.

### Justification:

The breakers at both stations require replacing as spare parts are no longer available. In addition, the breakers at both stations are PCB contaminated. Proposed federal PCB regulation currently states that all equipment with a concentration >50ppm must be removed from service by December 31, 2014.

### In-Service Date:

October 2013.

### Revision:

Cost flow revision, and in-service date deferred seven months from March 2013.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 9.4	\$ 2.5	\$ 0.9	\$ 2.8	\$ 1.6	\$ -	\$ -
Increase (Decrease)	-	(0.9)	2.2	(0.6)	0.4	0.4	-
Revised Forecast	\$ 9.4	\$ 1.6	\$ 3.1	\$ 2.2	\$ 2.0	\$ 0.4	\$ -

## Seven Sisters Upgrades

### Description:

Rewind and rehabilitate Seven Sisters Unit 5 to maintain station MW output and prevent a high probability stator in-service failure through a planned generator rewind outage. Replace and upgrade generator and transformer protection on units 1, 2, 3, 4 and 6 to a redundant multifunction system with breaker fail protection, transient fault recording, and metering replacement.

### Justification:

Seven Sisters Unit 5 stator winding has been identified as a candidate for potential failure through electrical condition assessment. The stator condition has deteriorated such that normal operation now contributes to accelerating the stator failure. In addition, transmission line events (115 kV faults) have been identified which would cause generator damage for the station. The existing protection system is incapable of detecting and interrupting these specific events, and is of a similar vintage to the replaced Kelsey electro-mechanical system, but with a longer operating history. Original electro-mechanical relay manufacturers no longer exist and replacement parts are currently salvaged from other recently upgraded generating stations.

### In-Service Date:

August 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 9.5	\$ 3.5	\$ 2.5	\$ 1.2	\$ 1.0	\$ -	\$ -
Increase (Decrease)	-	(1.7)	2.8	-	-	-	-
Revised Forecast	\$ 9.5	\$ 1.8	\$ 5.3	\$ 1.2	\$ 1.0	\$ -	\$ -

## Generation South Excitation Upgrades

### Description:

Implement a generator excitation system replacement program to phase out unsupported and obsolete equipment at the Great Falls, Grand Rapids and McArthur Falls generating stations.

### Justification:

Original excitation systems on the Winnipeg River have a frequent failure rate which has negative effects on export revenue. Spare parts for the excitation systems at these GSs are no longer available, and the salvage inventory from Seven Sisters GS and Laurie River GS are exhausted. The current systems cannot be tuned due to physical wear and have failing rotating exciter insulation systems, which will render the generators inoperable in the event of an exciter failure.

### In-Service Date:

February 2019.

### Revision:

Cost flow revision, and in-service date deferred 34 months from April 2016.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 18.3	\$ -	\$ 2.0	\$ 3.2	\$ 3.9	\$ 3.3	\$ 6.0
Increase (Decrease)	-	-	-	(2.2)	(2.8)	(1.6)	6.5
Revised Forecast	\$ 18.3	\$ -	\$ 2.0	\$ 1.0	\$ 1.1	\$ 1.7	\$ 12.5

## Brandon Unit 5 License Review

### Description:

Renewal of Brandon Generating Station Unit 5 (Manitoba Environment Act license) is required for continuing operation. License renewal requires minor plant refurbishment. The timing and extent of additional future environmental regulatory changes is uncertain. The base case conservatively assumes that environmental controls must be installed. Should the need for additional controls be identified during the licensing process or subsequently thereafter, the economic viability of such controls will be assessed accordingly. Per the Manitoba Climate Change and Emissions Reductions Act (Bill 15), Manitoba Hydro must not use coal to generate power after December 31, 2009, except to support emergency operations.

### Justification:

Unit 5 plays an important role in Manitoba Hydro's system, contributing economic generation and enhancing system reliability.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision, and in-service date deferred one year from March 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 18.7	\$ 6.2	\$ 7.7	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(5.9)	(5.2)	11.1	-	-	-
Revised Forecast	\$ 18.7	\$ 0.3	\$ 2.5	\$ 11.1	\$ -	\$ -	\$ -



## Selkirk Enhancements

### Description:

Perform environmental enhancements in accordance with the revised license terms and conditions approved by the Province of Manitoba on April 30, 2008. The approval was based on continuing operation of the once-through cooling system with modifications to the cooling water intake fish screen, lube oil cooling system and condenser re-tubing.

### Justification:

Provides assurance that the station will be able to operate as planned with the addition of the cooling tower, and provides long-term southern system reliability benefits.

### In-Service Date:

August 2010.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 14.2	\$ 4.9	\$ 2.8	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.9	2.4	-	-	-	-
Revised Forecast	\$ 14.2	\$ 5.8	\$ 5.2	\$ -	\$ -	\$ -	\$ -

## Laurie River/CRD Communications and Annunciation Upgrades

### Description:

Upgrade the communications infrastructure and replace the annunciation systems with Programmable Logic Controller (PLC) based Unit Control Monitoring Systems (UCMS) at Laurie River, Missi Falls and Notigi.

### Justification:

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. In addition, the maintenance costs will be reduced significantly with the implementation of the new system.

### In-Service Date:

August 2012.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	4.8	0.2	3.5	-	1.1	-	-
Revised Forecast	\$ 4.8	\$ 0.2	\$ 3.5	\$ -	\$ 1.1	\$ -	\$ -

## Notigi Marine Vessel Replacement & Infrastructure Improvements

### Description:

Replace the existing Notigi marine vessels with one self-propelled unit and upgrade the vessel tramway to prevent damaging vessels when removing them from the water.

### Justification:

The marine vessels are over 30 years old and in need of numerous repairs and upgrades, including hull repairs which are very difficult to weld repair. In addition, changes in Canadian Coast Guard regulations will require stability tests, and it is expected that at least one of the vessels will not pass this test, and will be deemed unsuitable for operation.

### In-Service Date:

June 2011.

### Revision:

New Item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	2.6	-	1.3	1.3	-	-	-
Revised Forecast	\$ 2.6	\$ -	\$ 1.3	\$ 1.3	\$ -	\$ -	\$ -

## Fire Protection Projects - HVDC

### Description:

The replacement of the existing Incipient Fire Detection (IFD) panels at all HVDC Stations with new Fenwal Fire Detection Systems, the replacement of the Radisson station building fire piping and fire pumps, and the installation of a fire water backup system at Henday Station.

### Justification:

More than half of the existing IFD panels have failed. They are costly to maintain and parts are difficult to obtain. The backup fire protection does not meet the fire code. The Radisson fire piping and pumps are inadequate and have no water left to fight fire spread should a transformer fail and deluge be activated. The current Henday fire water backup system is inadequate and runs dry up to 30 minutes prior to the fire department's arrival at site. New tanks will ensure fire containment and prevent spreading until the fire department's arrival.

### In-Service Date:

October 2012.

### Revision:

Cost flow revision, and in-service date deferred 23 months from November 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.2	\$ 2.5	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(2.0)	0.4	1.6	1.7	-	-
Revised Forecast	\$ 5.2	\$ 0.5	\$ 0.4	\$ 1.6	\$ 1.7	\$ -	\$ -

## Halon Replacement Project

### Description:

Remove and replace the existing Halon fire protection systems with approved state-of-the-art alternative technologies such as water and gaseous based systems.

### Justification:

Replacing the existing Halon fire protection systems with approved alternative technologies improves the HVDC, hydraulic, and diesel systems availability, minimizes the risk of extremely expensive outage and repair costs, and minimizes lost revenue. Halon replacement is becoming a mandatory requirement through Federal and Provincial environmental regulations and legislation. National Fire Protection Association (NFPA) Life Safety Code 101 requires the adequate provision of fire protection where, in addition to equipment, the human element is also involved.

### In-Service Date:

March 2011.

### Revision:

Cost flow revision, and in-service date deferred nine months from June 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 42.5	\$ 19.2	\$ 11.0	\$ 0.4	\$ -	\$ -	\$ -
Increase (Decrease)	-	(4.6)	2.1	8.7	-	-	-
Revised Forecast	\$ 42.5	\$ 14.6	\$ 13.1	\$ 9.1	\$ -	\$ -	\$ -

## Power Supply Fall Protection Program

### Description:

Implement fall protection for Power Supply stations (excludes switchyards), including four diesel sites, in compliance with Provincial Regulation 189/85, under Workplace Safety and Health Act W210.

### Justification:

Provincial regulation requires employers to establish fall protection systems for work performed where there is danger of falling more than 2.5 meters into unprotected operating machinery or in/onto hazardous substances and objects.

### In-Service Date:

March 2009.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 13.5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.2	-	-	-	-	-
Revised Forecast	\$ 13.5	\$ 0.2	\$ -	\$ -	\$ -	\$ -	\$ -

## Oil Containment – Power Supply

### Description:

Modifications and/or additions are required to prevent and contain oil spills: 1) *southern and northern hydraulic generating stations*: install oil/ water separators, modify drainage systems, and upgrade sump, fuel storage facilities and dyking systems; 2) *converter stations*: install an oil containment system to collect and recover any oil spilled within the station and encapsulate oil filled transformers/smoothing reactors at the three HVDC stations to stop gasket leaks.

### Justification:

Previous experience with oil spills requires the Corporation to demonstrate due diligence with respect to containing and minimizing the potential for any further occurrences.

### In-Service Date:

May 2017.

### Revision:

Cost flow revision, and in-service date deferred one year from May 2016.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 19.1	\$ 2.1	\$ 0.5	\$ 0.1	\$ 0.1	\$ 0.3	\$ 0.3
Increase (Decrease)	-	(1.5)	(0.1)	0.9	0.4	-	1.0
Revised Forecast	\$ 19.1	\$ 0.6	\$ 0.4	\$ 1.0	\$ 0.5	\$ 0.3	\$ 1.3

## Grand Rapids Townsite House Renovations

### Description:

Renovate 26 homes within the Grand Rapids Hybord Townsite, over a five year construction period.

### Justification:

Providing adequate and modern housing is critical to attracting employees to fill job vacancies at Grand Rapids.

### In-Service Date:

March 2015.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	5.2	0.1	0.4	0.9	1.2	1.3	1.3
Revised Forecast	\$ 5.2	\$ 0.1	\$ 0.4	\$ 0.9	\$ 1.2	\$ 1.3	\$ 1.3

## Grand Rapids Fish Hatchery

### Description:

Rehabilitate the main hatchery building, the aeration building, the east and west pump houses, shops building, the exterior tanks and grounds, and replace the water meter.

### Justification:

Provide for the benefits of environmental protection, employee safety and the modernization of obsolete and high maintenance assets.

### In-Service Date:

March 2012.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	2.2	0.1	1.1	0.9	-	-	-
Revised Forecast	\$ 2.2	\$ 0.1	\$ 1.1	\$ 0.9	\$ -	\$ -	\$ -

## Generation Townsite Infrastructure

### Description:

*Gillam townsite:* 1) interior and exterior retrofit of 66 corporate houses; 2) replace 40 doublewide trailers on basements with ready-to-move (RTM) homes and construct 32 new housing units over eight years; and 3) construct a new shopping centre (possibly in partnership).

### Justification:

Gillam infrastructure evaluation lists the following as substandard: water quality, sewage treatment, water and sewer lines, asphalt repairs, recreation facility, trailer park improvements, and town office building renovations.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 52.1	\$ 9.6	\$ 5.3	\$ 4.5	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.8)	3.1	0.9	-	-	-
Revised Forecast	\$ 52.1	\$ 7.8	\$ 8.4	\$ 5.4	\$ -	\$ -	\$ -

## Site Remediation of Contaminated Corporate Facilities

### Description:

Conduct geotechnical investigation of the various contaminated corporate facilities and remediate contaminated areas to environmentally acceptable limits.

### Justification:

Environmental concerns and/or regulations require that corporate facilities be investigated and remediated to restore them to a level which permits unrestricted use of the site.

### In-Service Date:

March 2013.

### Revision:

Additional funds allocated for the clean-up of construction era debris and remediation of the South Bay Channel.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 30.9	\$ 0.7	\$ 0.5	\$ 0.4	\$ 0.3	\$ -	\$ -
Increase (Decrease)	3.8	1.6	0.7	0.7	0.8	0.2	-
Revised Forecast	\$ 34.7	\$ 2.3	\$ 1.2	\$ 1.1	\$ 1.1	\$ 0.2	\$ -

## High Voltage Test Facility

### Description:

Build a new high voltage test facility at 1840 Chevrier Blvd., including a high voltage hall with rail access, supporting labs, shop, storage, and office and receiving space.

### Justification:

This facility will enable Manitoba Hydro to adequately meet present industry standards (CAN/CSA C88.1-96, CAN3-C13-M83, CAN/CSA C225-00, and the recently adopted IEC 619361-1) for the testing of all bushings, instrument transformers and aerial lift devices, while improving the efficiency and safety of our insulation testing practices. Testing extra high voltage equipment to industry standards is the optimal way to avoid costly forced outages and life threatening and environmentally damaging failures, safeguard the reliability of our power supply, and enhance safety during live line work.

### In-Service Date:

June 2011.

### Revision:

Cost flow revision, and in-service date deferred three months from March 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 26.9	\$ 15.9	\$ 5.7	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(5.3)	7.8	-	-	-	-
Revised Forecast	\$ 26.9	\$ 10.6	\$ 13.5	\$ -	\$ -	\$ -	\$ -

## Power Supply Security Installations / Upgrades

### Description:

Install, upgrade and enhance security systems, such as fencing, close circuit TV, and card access systems at Power Supply HVDC and generating stations. Implement of a comprehensive "Public Water Safety Around Dams" program, which is generally compliant with the draft Canadian Dam Association (CDA) 2007 technical bulletin for Public Safety and Security Around Dams.

### Justification:

The scope of work is intended to raise the security standards of the stations to the levels outlined in the Security Readiness Report and to be compliant with NERC standards.

### In-Service Date:

March 2016.

### Revision:

Increased project scope to include the implementation of a comprehensive "Public Water Safety Around Dams" program. In-service date deferred 62 months from January 2011.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 36.3	\$ 21.4	\$ 7.4	\$ -	\$ -	\$ -	\$ -
<b>Increase (Decrease)</b>	6.9	(11.7)	8.6	8.7	2.1	1.5	2.5
<b>Revised Forecast</b>	\$ 43.2	\$ 9.7	\$ 16.0	\$ 8.7	\$ 2.1	\$ 1.5	\$ 2.5

## Power Supply Sewer & Domestic Water System Install and Upgrade

### Description:

Upgrade or replace domestic water and waste water systems at southern plants, northern plants, converter stations, and an extension of the water distribution main from Rosser including a line that will run past the Dorsey station.

### Justification:

Ensure safety and compliance with legislation. The lack of filtration systems result in organic and other matter reacting with chlorine treatment to create possible carcinogenic substances.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 15.1	\$ 4.1	\$ 1.6	\$ 1.3	\$ -	\$ -	\$ -
<b>Increase (Decrease)</b>	-	3.2	1.8	(0.6)	-	-	-
<b>Revised Forecast</b>	\$ 15.1	\$ 7.3	\$ 3.4	\$ 0.7	\$ -	\$ -	\$ -

## Power Supply Domestic

### Description:

This program consists of projects whose individual costs are of a relatively small amount. These projects are required to provide safe, reliable, efficient power supply, and to replace plant facilities which are at the end of their useful life.

### Justification:

Enhancements or rehabilitation to the power supply facilities will ensure a safe reliable and efficient source of energy.

### In-Service Date:

Ongoing.

### Revision:

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 19.4	\$ 19.8	\$ 20.2	\$ 20.6	\$ 21.0	\$ 135.0
Increase (Decrease)		(0.3)	(0.5)	(0.5)	(0.5)	(0.5)	(2.9)
Revised Forecast		\$ 19.1	\$ 19.3	\$ 19.7	\$ 20.1	\$ 20.5	\$ 132.1



## TRANSMISSION:

### Winnipeg - Brandon Transmission System Improvements

#### Description:

Perform environmental assessments and route selection, design and construct transmission and terminal facilities to provide firm supply to Portage South as follows: *Transmission:* 230 kV line 70 km Dorsey - Portage South, 230 kV double circuit line with only one side strung. *Terminations:* Extend 230 kV facilities at Dorsey and Portage South. Install three 10 MVAR, 66 kV capacitor banks at Portage South. Extend the 66 kV facilities with the addition of one breaker, one selector switch, three circuit switchers, three disconnect switches, and associated equipment. Replace one existing 66 kV breaker. Install a fourth 54 MVAR 115 kV capacitor at Brandon GS to match the existing installation of capacitors, including the associated circuit switcher and disconnects. *Communications:* Integrate with existing facilities at Dorsey and Portage South stations.

#### Justification:

These facilities provide improvements required to supply Western Manitoba area future load growth.

#### In-Service Date:

October 2014.

#### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 40.0	\$ 1.4	\$ 1.6	\$ 3.6	\$ 3.7	\$ 5.2	\$ 22.0
Increase (Decrease)	-	1.7	-	(0.2)	(0.1)	(0.2)	(0.3)
Revised Forecast	\$ 40.0	\$ 3.1	\$ 1.6	\$ 3.4	\$ 3.6	\$ 5.0	\$ 21.7

### Transcona East 230-66 kV Station

#### Description:

Design and build a new 230-66 kV station adjacent to the existing Transcona station. Make provision for a second bank and ring buses.

#### Justification:

This station is required to supply increased load to East Winnipeg.

#### In-Service Date:

March 2013.

#### Revision:

Cost flow revision, and in-service date deferred one year from March 2012.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 31.0	\$ 8.6	\$ 11.9	\$ 9.4	\$ -	\$ -	\$ -
Increase (Decrease)	-	(7.5)	(0.9)	3.8	5.1	-	-
Revised Forecast	\$ 31.0	\$ 1.1	\$ 11.0	\$ 13.2	\$ 5.1	\$ -	\$ -

## Neepawa 230-66 kV Station

### Description:

Perform environmental assessments and route selection, design and construct terminal facilities to provide firm supply to Neepawa as follows: *Transmission*: Sectionalize 230 kV T/L D54C into Neepawa 230 kV station, creating Dorsey - Neepawa and Neepawa - Cornwallis 230 kV circuits. Build a 66 kV tie line between the new 66 kV terminal and the existing 115/66 kV station. *Terminations*: Establish Neepawa 230-66 kV station, including three 230 kV circuit breakers, a 50/66/83.3/93.3 MVA, 230-66 kV LTC transformer, six 66 kV circuit breakers and associated equipment. Adjust line protection equipment at Dorsey and Cornwallis 230 kV stations. Terminate two 230 kV transmission lines to Dorsey and Cornwallis. *Communications*: Integrate with existing facilities at Neepawa, Dorsey, and Cornwallis 230 kV stations. *System Control*: automate control, protection, equipment communications and software programming.

### Justification:

These facilities provide transmission improvements required to supply Neepawa and related Western Region future load growth.

### In-Service Date:

November 2012.

### Revision:

Cost flow revision, and in-service date deferred 13 months from October 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 30.0	\$ 5.8	\$ 11.3	\$ 12.8	\$ -	\$ -	\$ -
Increase (Decrease)	-	(4.7)	2.8	(3.3)	5.1	-	-
Revised Forecast	\$ 30.0	\$ 1.1	\$ 14.1	\$ 9.5	\$ 5.1	\$ -	\$ -

## Pine Falls – Bloodvein 115 kV Transmission Line

### Description:

Perform environmental assessments and route selection, design and construct transmission and terminal facilities to provide 115 kV supply to Bloodvein station as follows: *Transmission*: Construct 115 kV line 80 km Pine Falls - L48 to L5 Tap near Manigotagan. Disconnect L48 from L5 at tap location and connect L48 to new line, converting L48 from 66 kV to 115 kV operation up to Bloodvein. *Terminations*: Extend 115 kV facilities at Pine Falls. Replace 66 kV transformers at Loon Straits with two 115-7.2 kV 500 kVA transformers, and modify station for 115 kV supply. Construct 115-66 kV station at Bloodvein, including two 115-66 kV 28 MVA transformers.

### Justification:

This project provides increased transmission capacity required to supply Lake Winnipeg East area load increases.

### In-Service Date:

October 2014.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 34.1	\$ -	\$ 0.3	\$ 0.9	\$ 4.5	\$ 21.2	\$ 7.1
Increase (Decrease)	-	-	-	-	(0.1)	(0.6)	0.7
Revised Forecast	\$ 34.1	\$ -	\$ 0.3	\$ 0.9	\$ 4.4	\$ 20.6	\$ 7.8

## Transmission Line Re-Rating

### Description:

Refurbish 292.6 km of double circuit and 120.7 km of single circuit 230 and 110 kV transmission lines in the Winnipeg area. Refurbish 16.9 km of double circuit and 49.2 km of single circuit 63.5 kV subtransmission lines in the Winnipeg area. Upgrade the Winnipeg River transmission line system to 100 °C. The refurbishment will correct insufficient ground clearances of line conductors. Using resagging, reconductoring, and tower extensions where required, the lines are to be upgraded to maintain safe ground clearances under thermal conductor loading. Estimate increase reflects costs for project scope increase to address all high risk, all medium risk and certain low risk spans of four 115 kV and five 230 kV transmission lines, in order to minimize public safety concerns associated with line sag violations.

### Justification:

Lines in the Winnipeg area built pre-1970 cannot accommodate thermal conductor loading without violating required ground clearances. The refurbishment program will increase line to ground clearances to allow higher conductor temperatures under all potential heavy current line loads.

### In-Service Date:

October 2012.

### Revision:

Cost flow revision, and in-service date deferred 19 months from March 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 24.1	\$ 0.4	\$ 0.4	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	2.8	(0.4)	-	-	-	-
Revised Forecast	\$ 24.1	\$ 3.2	\$ -	\$ -	\$ -	\$ -	\$ -

## St Vital - Steinbach 230 kV Transmission

### Description:

Build a new 230 kV line between St. Vital and Steinbach stations.

### Justification:

Provides a 230 kV supply into the Steinbach area which will support load growth in south eastern Manitoba.

### In-Service Date:

October 2020.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 32.2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 19.5
Increase (Decrease)	-	-	-	-	-	-	0.4
Revised Forecast	\$ 32.2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 19.9

## Rosser Station 230-115 kV Bank 3 Replacement

### Description:

Replace Rosser bank 3 with a 150/200/250 MVA transformer similar to bank 1. Replace the 13.8 kV tertiary reactor supply circuit breaker and if necessary the bus. Upgrade protection as required.

### Justification:

With continued load growth on the North Winnipeg and Selkirk 115 kV systems due to summer peak loads, low water conditions on the Winnipeg River and exports to Ontario; additional capacity will be required. In addition, this replacement will prevent equipment overloads in the event of a failure to bank 1 at Rosser station, and maintain export power.

### In-Service Date:

March 2010.

### Revision:

Cost flow revision, and in-service date deferred nine months from June 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.8	\$ 2.4	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.2	-	-	-	-	-
Revised Forecast	\$ 5.8	\$ 2.6	\$ -	\$ -	\$ -	\$ -	\$ -

## Rosser - Inkster 115 kV Transmission

### Description:

Build a second 8.2 km 115 kV line between Rosser and Inkster stations.

### Justification:

A second line between Rosser and Inkster stations will alleviate contingency overloading issues on the St. James to Tylehurst 115 kV underground cable, in the event of the failure of the existing Rosser – Inkster circuit.

### In-Service Date:

October 2010.

### Revision:

Cost flow revision, and in-service date deferred seven months from March 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.1	\$ 2.2	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.1	1.4	-	-	-	-
Revised Forecast	\$ 5.1	\$ 3.3	\$ 1.4	\$ -	\$ -	\$ -	\$ -

## Transcona Station 66 kV Breaker Replacement

### Description:

Replace nine 66 kV breakers and one disconnect at 115/66 kV Transcona station.

### Justification:

The breakers are being replaced based on fault levels that exceed 95% of the breaker interrupting rating. These breakers are old (34-37 years), were made by a company that is no longer in business (Canadian General Electric) and cannot be certified for a higher interrupting rating. Failure of one of these lines or bank breakers will cause a transformer or line outage and lost supply power to customers between 7.3 MW and 42.8 MW, which would affect more than 10 000 customers.

### In-Service Date:

February 2014.

### Revision:

Cost flow revision, and in-service date deferred 15 months from November 2012.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 6.0	\$ 1.0	\$ 2.9	\$ 1.7	\$ 0.3	\$ -	\$ -
Increase (Decrease)	-	(1.0)	0.7	0.1	0.3	-	-
Revised Forecast	\$ 6.0	\$ -	\$ 3.6	\$ 1.8	\$ 0.6	\$ -	\$ -

## Transcona & Ridgeway Stations 66 kV Bus Upgrades

### Description:

Perform the following upgrades to the 230-66 kV Ridgeway station: upgrade section of the existing 66 kV ring bus between bank 1 and liner 93 to 2500 AMPS of summer rating, replace R24 breaker and associated selector switches, upgrade section of the existing 66 kV ring bus between bank 2 and liner 95 to 2500 AMPS of summer rating, replace R28 breaker and associated selector switches, and make necessary protection and communication system changes.

### Justification:

A study was undertaken to identify overloads of sections of the 66 kV ring bus at 230-66 kV Ridgeway station. Loading on the 66 kV ring bus at Ridgeway is limited by ring bus sections that are rated only 948A. In 2009, single contingencies caused unacceptable overloads on breakers R24 and R28 (107.9%), and sections of the Ridgeway ring buses (136.6%).

### In-Service Date:

October 2009.

### Revision:

Cost flow revision, and in-service date advanced seven months from May 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 2.8	\$ 1.5	\$ 0.3	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.2	0.4	-	-	-	-
Revised Forecast	\$ 2.8	\$ 1.7	\$ 0.7	\$ -	\$ -	\$ -	\$ -

## Dorsey 500 kV R502 Breaker Replacement

### Description:

Replace the Dorsey 500 kV R502 breaker with a new 500 kV SF6 filled breaker complete with pre-insertion resistors, remove the GE ATB-80 air blast circuit breaker, remove the 3000 PSI compressor system, and purchase one spare breaker pole.

### Justification:

The R502 breaker is now operating beyond its expected useful life cycle, without an option to rebuild. Two 3000 PSI compressors work simultaneously to supply the breaker with compressed air, and are now at the end of their useful lives and need to be replaced. Without replacement, breaker failure could result in cleanup, outage and damage costs that would exceed \$1.0 million. Additionally, should a second breaker fail at the same time that a breaker was being replaced; there would be a significant reduction in export power.

### In-Service Date:

October 2009.

### Revision:

Cost flow revision, and in-service date deferred six months from April 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 2.6	\$ 0.4	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.9	0.2	-	-	-	-
Revised Forecast	\$ 2.6	\$ 2.3	\$ 0.2	\$ -	\$ -	\$ -	\$ -

## 13.2kV Shunt Reactor Replacements

### Description:

Purchase and install fifteen 13.2kV, 20MVA oil-type shunt reactors to replace all of the Ferranti Packard reactors currently in the system.

### Justification:

Ferranti Packard reactors are installed at six stations throughout Manitoba (Cornwallis, Rosser, Raven Lake, Overflow River, Mystery Lake and LaVerendrye). These reactors are 45 years old and now 15 years past their estimated useful life. There are currently no replacements on hand to replace a failed reactor, which would affect system operation.

### In-Service Date:

October 2018.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	33.0	-	-	4.1	4.2	4.3	20.4
Revised Forecast	\$ 33.0	\$ -	\$ -	\$ 4.1	\$ 4.2	\$ 4.3	\$ 20.4

## Birtle South - Rossburn 66 kV Line

### Description:

Build a new 66 kV line from the 66 kV Birtle Queen station to Rossburn station. The new line will be terminated at Birtle South station with a new 66 kV breaker.

### Justification:

This new transmission line will increase reliability for the Birtle South 230-66 kV station area by reducing the occurrence of line outages. In addition, voltage levels on the Birtle South 66 kV system will become adequate to maintain acceptable voltage levels at regulated distribution stations.

### In-Service Date:

October 2015.

### Revision:

No change.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4.9	\$ -	\$ -	\$ -	\$ -	\$ 0.1	\$ 4.8
Increase (Decrease)	-	-	-	-	-	-	-
Revised Forecast	\$ 4.9	\$ -	\$ -	\$ -	\$ -	\$ 0.1	\$ 4.8

## Stanley Station 230-66 kV Transformer Addition

### Description:

Purchase and install a 230-66 kV transformer and associated equipment for the Stanley Station, install transformer protection equipment, relocate 230 kV towers for line S60L outside of the station to allow for the desired 230 kV bus ring configuration, and re-terminate three lines (S60L, Line3 and Line 51).

### Justification:

The absence of firm transformation capacity at Stanley station requires the station's load to be transferred to St. Leon, Portage South, and Morden Corner stations. This load transfer creates unacceptably low sub-transmission and distribution voltages, which negatively impacts customer equipment and automated processes in Morden, Winkler and the surrounding areas. This project is high risk as more than 15,000 customers could be affected.

### In-Service Date:

October 2015.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 21.1	\$ -	\$ -	\$ -	\$ 1.9	\$ 8.4	\$ 10.8
Increase (Decrease)	-	-	-	-	(0.1)	(0.3)	0.3
Revised Forecast	\$ 21.1	\$ -	\$ -	\$ -	\$ 1.8	\$ 8.1	\$ 11.1

## Stanley Station 230-66 kV Hot Standby Installation

### Description:

Install an 84/112/140 MVA, 230-66 kV transformer and associated equipment at Stanley station as a hot standby, along with transformer protection equipment.

### Justification:

The low sub-transmission and distribution voltages created by transferring Stanley station load will negatively impact customer equipment and their automated processes in the towns of Morden and Winkler and the surrounding areas, potentially affecting customer service to more than 15 000 customers. Deferral will place quality of supply to local customers at risk. Customer equipment and product will be damaged, and automated (voltage sensitive) processes will be halted. In addition, one of Manitoba Hydro's major customers will be adding significant new load in 2009, also necessitating this installation.

### In-Service Date:

October 2010.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 6.2	\$ 3.8	\$ 0.8	\$ 0.1	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.1	0.4	(0.1)	-	-	-
Revised Forecast	\$ 6.2	\$ 4.9	\$ 1.2	\$ -	\$ -	\$ -	\$ -

## Ashern Station 230 kV Shunt Reactor Replacement

### Description:

Purchase a 230 kV, 50MVAR shunt reactor to replace the existing Ashern station reactor.

### Justification:

The Ashern reactor was installed in 1972 and has now reached the end of useful life, and is now considered a risk to the area's transmission and distribution system. When this reactor is down, one unit at Grand Rapids has to be switched from generator to synchronous condenser for the duration of the outage. Additionally, Manitoba Hydro currently does not have a system spare reactor that will support the 230 kV class.

### In-Service Date:

December 2012.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	2.7	-	-	-	2.7	-	-
Revised Forecast	\$ 2.7	\$ -	\$ -	\$ -	\$ 2.7	\$ -	\$ -



## Tadoule Lake DGS Diesel Tank Farm Upgrade

### Description:

Design and install four 500 000 litre single wall above ground vertical diesel fuel tanks and associated piping, spill containment dyke modifications to accommodate the new tanks, and a fuel tank level monitoring system. Project also includes salvaging the existing 30 above ground horizontal diesel fuel tanks.

### Justification:

The current permit to operate a petroleum storage facility at Tadoule Lake will expire on December 31, 2010. Of the 30 tanks, 11 are not built to Underwriters Laboratories of Canada S601 standards, and must be withdrawn from service by December 31, 2010. Additionally, the remaining 19 tanks require replacement by December 31, 2012, to be compliant with Canadian Council of Ministers of the Environment PN 1326.

### In-Service Date:

December 2010.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	1.1	0.1	0.1	-	-	-	-
Revised Forecast	\$ 1.1	\$ 0.1	\$ 0.1	\$ -	\$ -	\$ -	\$ -

## Interlake Digital Microwave Replacement

### Description:

Build a modern communications system between the Dorsey transmission station and the Lower Nelson River. The existing Interlake Digital Microwave system is approximately 30 years old, is one of two communications systems used to operate the DC power system, and requires replacement by a modern, highly dependable communications system.

### Justification:

A replacement communications system is required for dependable communications to operate the DC power system, and to provide for the continued supply of reliable power to Manitoba Hydro's domestic and export customers.

### In-Service Date:

October 2010.

### Revision:

Cost flow revision, and in-service date deferred ten months from December 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 19.7	\$ 3.9	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.4)	0.4	-	-	-	-
Revised Forecast	\$ 19.7	\$ 3.5	\$ 0.4	\$ -	\$ -	\$ -	\$ -

## Communication System - Southern MB (Great Plains)

### Description:

Replace part of the Great Plains microwave system with an optical fiber cable communication system. The route includes Letellier TS, Stanley TS and Crocus Plains TS; as well as the existing Great Plains microwave stations of St. Leon TS and Glenboro TS. The system will carry the Reston TS and Virden TS traffic as far as the Brandon South microwave site.

### Justification:

Required to provide continuous supply of reliable power to all of Manitoba Hydro's customers.

### In-Service Date:

November 2009.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 21.9	\$ 1.6	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.8	-	-	-	-	-
Revised Forecast	\$ 21.9	\$ 2.4	\$ -	\$ -	\$ -	\$ -	\$ -

## Communications Upgrade Winnipeg Area

### Description:

Replace part of the Winnipeg area system with optical fiber cable and electronics, in order to provide increased communication capacity to carry rural power system and administrative data traffic from the Winnipeg perimeter terminal stations to the Dovercourt system control centre and to 820 Taylor; as well as to carry increased local Winnipeg area traffic between stations.

### Justification:

This communication capacity is required to carry modern high speed data traffic on Manitoba Hydro's Wide Area Network (WAN), as required by modern corporate operations. This project will provide more secure communications and replace cable that is nearing the end of useful life.

### In-Service Date:

March 2010.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 7.4	\$ 0.8	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.1)	-	-	-	-	-
Revised Forecast	\$ 7.4	\$ 0.7	\$ -	\$ -	\$ -	\$ -	\$ -

## Pilot Wire Replacement

### Description:

Replace existing Pilot Wire protection schemes to provide redundancy to major industrial and residential customers that are either running without protection or must be subject to an outage because of repairs on Pilot Wire schemes that generally have no alternative routes.

### Justification:

The current equipment is no longer manufactured or supported by vendors.

### In-Service Date:

October 2009.

### Revision:

Cost flow revision, and in-service date advanced 22 months from August 2011.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 9.6	\$ 0.4	\$ 1.1	\$ 0.9	\$ -	\$ -	\$ -
<b>Increase (Decrease)</b>	-	0.9	0.3	(0.9)	-	-	-
<b>Revised Forecast</b>	\$ 9.6	\$ 1.3	\$ 1.4	\$ -	\$ -	\$ -	\$ -

## Transmission Line Protection & Teleprotection Replacement

### Description:

Replace obsolete protection and associated communications equipment for 30 transmission lines with phase comparison protection schemes. The new protection will provide "A" and "B" redundant relay schemes, and all communication signals will provide "A" and "B" teleprotection units and shall have redundant channels.

### Justification:

The difficulty experienced in repairing and restoring existing failed teleprotection equipment. There is concern that the remaining spare parts, which are the same vintage as the failing in-service equipment, may not be functional, and cannot be repaired. Loss of the teleprotection equipment means the loss of the high-speed primary protection for these important lines. The backup protection for these lines has been identified as too slow by system performance. The availability of these lines has a direct impact on how much power Manitoba Hydro is able to import or export.

### In-Service Date:

August 2014.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 21.1	\$ 2.0	\$ 5.7	\$ 6.4	\$ 2.4	\$ 1.2	\$ 0.3
<b>Increase (Decrease)</b>	-	(0.6)	0.4	(0.3)	(0.1)	(0.1)	0.6
<b>Revised Forecast</b>	\$ 21.1	\$ 1.4	\$ 6.1	\$ 6.1	\$ 2.3	\$ 1.1	\$ 0.9

## Winnipeg Central Protection Wireline Replacement

### Description:

Migrate the former Winnipeg Hydro area communications from metallic wireline to optical fibre cables.

### Justification:

Wireline communications cables are unsuitable for most modern power system control and protection equipment applications; and therefore, retention of such cables has little future value. This project also minimizes or eliminates the need for hazardous work adjacent to high voltage cables.

### In-Service Date:

September 2011.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 9.3	\$ 2.4	\$ 1.2	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.1	(0.6)	-	-	-	-
Revised Forecast	\$ 9.3	\$ 2.5	\$ 0.6	\$ -	\$ -	\$ -	\$ -

## Mobile Radio System Modernization

### Description:

Replace the VHF mobile radio system with a modern digital system of increased capability.

### Justification:

Manitoba Hydro requires a very dependable mobile radio communication system under its own control and independent of any public system, as public systems cannot guarantee service under adverse conditions and are affected by peak public traffic which can overload the system.

### In-Service Date:

December 2013.

### Revision:

Cost flow revision, and in-service date deferred 21 months from March 2012.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 30.7	\$ 0.5	\$ 13.9	\$ 16.2	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.2)	(11.4)	(7.0)	10.6	8.0	-
Revised Forecast	\$ 30.7	\$ 0.3	\$ 2.5	\$ 9.2	\$ 10.6	\$ 8.0	\$ -

## Cyber Security Systems

### Description:

Install or upgrade security and network systems for secure remote access, industrial data network installations, and compliance to NERC standards CIP-002-1 to CIP-009-1.

### Justification:

The Cyber Security Standards CIP-002-1 are part of NERC reliability standards, which Manitoba Hydro is obligated to comply with, or be subject to penalties or sanctions as per contractual arrangements with MISO.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 10.1	\$ 2.8	\$ 0.6	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.8	(0.2)	-	-	-	-
Revised Forecast	\$ 10.1	\$ 3.6	\$ 0.4	\$ -	\$ -	\$ -	\$ -

## Site Remediation

### Description:

Conduct geotechnical investigations and remediate any hydrocarbon contaminated sites at the remaining former isolated diesel generating stations in Little Grand Rapids, Manigotogan, The Pas, Moose Lake, Norway House, Wanless, Cormorant, Cranberry Portage, Shamattawa, Berens River, and Churchill. Conduct geotechnical investigation for the various contaminated corporate facilities, prepare a report with cleanup recommendations, remediate any contaminated areas identified, and issue a final report confirming the facility and surrounding area were remediated and all areas of the work were left in accordance with applicable environmental regulations.

### Justification:

Due to concerns, and in compliance with current environmental regulations and standards applicable to unrestricted use of abandoned former diesel sites, the sites must be investigated, remediated, and restored to equivalency of the surrounding area.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision, and in-service date deferred one year from March 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 13.3	\$ 3.1	\$ 2.0	\$ 0.3	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.8)	1.8	0.8	-	-	-
Revised Forecast	\$ 13.3	\$ 1.3	\$ 3.8	\$ 1.1	\$ -	\$ -	\$ -

## Oil Containment

### Description:

Design and construct oil containment systems to collect and recover any oil spilled within the system.

### Justification:

Minimize environmental impact of oil spills.

### In-Service Date:

March 2011.

### Revision:

Cost flow revision, and in-service date deferred one year from March 2010.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 7.4	\$ 1.3	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.4)	0.5	-	-	-	-
Revised Forecast	\$ 7.4	\$ 0.9	\$ 0.5	\$ -	\$ -	\$ -	\$ -

## Station Battery Bank Capacity & System Reliability Increase

### Description:

Conduct individual studies, replace and/or upgrade battery bank capacity and chargers in 156 transmission and distribution stations (over the next ten years) and seven stand-alone communications sites to meet the North American Electric Reliability Council's (NERC) battery bank sizing criteria. Includes AC service upgrades and building extension costs required to complete this project.

### Justification:

Present battery banks were designed to an eight hour standard (normal DC loads), and there are concerns many may no longer meet the standard, due to additional DC loads and age related deterioration. Current corporate simulations indicate that system restoration will be inhibited if a black start situation should occur. NERC's requirements are to have a workable system restoration plan, with 12 hours capacity, dual battery systems and multiple chargers where practical, or without a restoration plan capacity for 16 hours duration. This project provides the battery bank systems for a workable system restoration plan into the future, and offers a coordinated means of changing the banks as they reach their end-of-life.

### In-Service Date:

March 2015.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 46.5	\$ 6.9	\$ 7.0	\$ 6.7	\$ 6.7	\$ 3.9	\$ 3.6
Increase (Decrease)	-	(1.6)	(2.3)	(0.3)	(0.3)	2.7	2.7
Revised Forecast	\$ 46.5	\$ 5.3	\$ 4.7	\$ 6.4	\$ 6.4	\$ 6.6	\$ 6.3

## Red River Floodway Expansion Project

### Description:

Complete communications, distribution, and transmission utility crossing work required along the Red River Floodway to accommodate the Manitoba Floodway Authority's floodway expansion. The project budget of \$1.8 million represents 50% of the total estimated costs, with the other 50% to be received in contributions from the Manitoba Floodway Authority.

### Justification:

Cost sharing in accordance with the agreement with the Province of Manitoba, which applies to all construction costs including: planning, design, project management, and any other associated costs required to complete the changes required to electricity and supporting communication equipment.

### In-Service Date:

December 2009.

### Revision:

Cost flow revision, and in-service date deferred 16 months from August 2008.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 1.8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.3	-	-	-	-	-
Revised Forecast	\$ 1.8	\$ 0.3	\$ -	\$ -	\$ -	\$ -	\$ -

## Waverley Service Centre Oil Tank Farm Replacement

### Description:

Replacement of all remaining single wall oil tanks at the Waverley Service Centre Oil Tank Farm.

### Justification:

The tanks at this tank farm have reached their end of life and must be removed from service to ensure compliance with all environmental regulations. The tanks cannot be repaired due to the standard imposed by the Province of Manitoba. Failure to replace the tanks will significantly restrict the ability to provide clean processed oil for maintenance requirements.

### In-Service Date:

November 2013.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	3.0	0.5	1.0	0.6	0.4	0.5	-
Revised Forecast	\$ 3.0	\$ 0.5	\$ 1.0	\$ 0.6	\$ 0.4	\$ 0.5	\$ -

## Transmission Domestic

### Description:

This program consists of projects whose individual costs are of a relatively small amount. The majority of projects consist of additions, improvements and maintenance of transmission lines; replacement, development and upgrades to communication systems; additions and replacement of field maintenance equipment; as well as station upgrades.

### Justification:

This program ensures the reliability of transmission with respect to load, outages, and import/export requirements; as well as addresses safety issues and provides the necessary support for the operation and maintenance of the transmission system.

### In-Service Date:

Ongoing.

### Revision:

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	NA	\$ 30.1	\$ 30.7	\$ 31.4	\$ 32.0	\$ 32.6	\$ 210.0
<b>Increase (Decrease)</b>		(0.5)	(0.7)	(0.8)	(0.8)	(0.8)	(5.4)
<b>Revised Forecast</b>		\$ 29.6	\$ 30.0	\$ 30.6	\$ 31.2	\$ 31.8	\$ 204.6



## CUSTOMER SERVICE & DISTRIBUTION:

### Winnipeg Distribution Infrastructure Requirements

**Description:**

Complete assessment and emergency replacement as required of distribution underground equipment in the City of Winnipeg, including plant previously associated with Winnipeg Hydro.

**Justification:**

As the Underground Assessment (UGA) project progresses throughout Winnipeg, the number of failures caused by transformers has decreased. Other benefits of the UGA project include: decreased potential for employee accidents, decreased potential for public contact, extending transformer life, decreased outage duration, and increased customer satisfaction.

**In-Service Date:**

March 2010.

**Revision:**

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 14.9	\$ 1.8	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.1)	-	-	-	-	-
Revised Forecast	\$ 14.9	\$ 1.7	\$ -	\$ -	\$ -	\$ -	\$ -

### Defective RINJ Cable Replacement

**Description:**

Replace approximately 62,500 metres of underground distribution 5kV and 15kV copper rubber insulated neoprene jacketed (RINJ) concentric neutral cable (also known as or "Red Jacket" cable) installed in the Winnipeg area between 1955 and 1965.

**Justification:**

RINJ underground cable installed between 1955 and 1965 failed at a rate of 9.6 failures per 100 kilometers, which was three times higher than the failure rate at which cable replacement is recommended by the CEA. Replacement of the cable reduces the number of underground cable failures and the negative impacts on customer reliability.

**In-Service Date:**

March 2011.

**Revision:**

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 8.7	\$ 1.1	\$ 1.0	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.6)	1.6	-	-	-	-
Revised Forecast	\$ 8.7	\$ 0.5	\$ 2.6	\$ -	\$ -	\$ -	\$ -

## Brereton Lake Station Area

### Description:

Build a new 124-12/25 kV steel station complete with two 7.5/10 MVA 124-12/25 kV LTC transformers and two 560A WVE 12 kV OCRs; 0.5 km 266.8 MCM ACSR single circuit two 124 kV line taps (consisting of steel tap-off and dead end structures) between line SK1 and the new Brereton Lake Station; and two feeder exits from the new Station to PR307. Convert 33 kV line 29 and underbuilt circuit to be operated at 12 kV. Salvage 33 kV line 29 from Rennie to Elma Tap and convert 8 km to 7.2 kV single phase.

### Justification:

The existing 33 kV line from SW 293 to White Lake Station, Rennie Station and SW 1810 is at the end of its useful life. In addition, there are deficiencies associated with White Lake and Rennie stations. A new station complete with a rebuilt distribution system will provide more acceptable customer service reliability, and fewer disruptions to Ontario Hydro.

### In-Service Date:

March 2010.

### Revision:

Cost flow revision, and in-service date deferred 11 months from April 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 9.0	\$ 0.2	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.1	-	-	-	-	-
Revised Forecast	\$ 9.0	\$ 0.3	\$ -	\$ -	\$ -	\$ -	\$ -

## Stony Mountain New 115 - 12 kV Station

### Description:

Build a new Stony Mountain Station, and 1.5 miles of line to supply Bristol. Salvage existing Stony Mountain and Rockwood Stations, 33 kV lines 15 and 35, and 33 kV breakers 150 & 350 at Parkdale Station.

### Justification:

The station equipment and supply lines are in a deteriorated condition and must be replaced. The 115-66-33 kV transformers that supply these stations from Parkdale are over 50 years old and reaching the end of their life expectancy. Load forecasts indicate Stony Mountain will also require a capacity increase and the only other 33 kV feed from Parkdale Station, Garson Station will require 115 kV supply by 2013. It is not economically viable to maintain a 33 kV source to only supply Stony Mountain and Rockwood Stations.

### In-Service Date:

October 2009.

### Revision:

Cost flow revision, and in-service date deferred seven months from March 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 5.0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.7	-	-	-	-	-
Revised Forecast	\$ 5.0	\$ 0.7	\$ -	\$ -	\$ -	\$ -	\$ -

## Rover Substation Replace 4 kV Switchgear

### Description:

Remove existing 4 kV switchgear and supervisory protection equipment and replace with new equipment capable of withstanding fault levels at this site. Install a current limiting reactor. Modify one feeder and relocate two others. Build a new substation building, replace three 66-4 kV transformer banks, extend the distribution ductline system and feeders to the new building, salvage the carpenter shop building, and the 4 kV building and its transformer banks.

### Justification:

This equipment has been in-service since 1950 and its safe operation requires inefficient procedures and fault levels exceed its rating. Protective relaying, local control and metering functions are provided via electro-mechanical relays, manual switches, and analog meters located in a separate building, and provide decreasing reliability due to mechanical deterioration. During removal of the existing concrete surfacing (after removal of the first section of switchgear), it was determined that the floor could not withstand the stresses and no further floor repair can be undertaken.

### In-Service Date:

November 2011.

### Revision:

Cost flow revision, and in-service date deferred two months from September 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 12.7	\$ 5.9	\$ 1.1	\$ 0.4	\$ -	\$ -	\$ -
Increase (Decrease)	-	(5.5)	2.2	3.5	-	-	-
Revised Forecast	\$ 12.7	\$ 0.4	\$ 3.3	\$ 3.9	\$ -	\$ -	\$ -

## Martin New Outdoor Station

### Description:

Install a new 3 bank outdoor station complete with 18 feeder positions and protection to replace the existing Martin station.

### Justification:

Martin station is a 50 year old, two bank 12.47/4.16 kV station that has exceeded firm capacity. It is supplied from Rover station which is also being upgraded. Neither bank can be relied on as backup for the other, and there is no mobile backup available or external tie to neighbouring stations. Without improvements, 7,500 customers including residential, apartment blocks, heavy industry, and commercial businesses could be without power for an unacceptable period (48 hours minimum) in the event of an emergency, such as a transformer failure at Rover.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 28.2	\$ 12.6	\$ 9.0	\$ 5.4	\$ -	\$ -	\$ -
Increase (Decrease)	-	(11.6)	5.5	3.7	2.4	-	-
Revised Forecast	\$ 28.2	\$ 1.0	\$ 14.5	\$ 9.1	\$ 2.4	\$ -	\$ -

## Frobisher Station Upgrade

### Description:

Replace both 7.5/10 MVA transformer banks with 18/24/30 MVA banks complete with 66 kV and 12.47 kV breakers, including eight new 12 kV feeder positions and two 4.5 MVAR capacitor banks. Upgrade six existing feeder automatic circuit re-closers (ACRs). Salvage banks 1 and 2 - 7.5/10 MVA transformers. Construct a new building, install a Remote Terminal Unit (RTU), communications, security system and fire protection.

### Justification:

Two fully utilized 12 kV stations serving the south St Vital area were loaded to a combined 8.1 MVA over firm capacity in the summer of 2003. Load has grown an average of 2.25 MVA per year for the last ten years, and is projected to grow another 46.3 MVA over the next 16 years. Land acquisition problems prevented building a new station north of the perimeter highway.

### In-Service Date:

March 2010.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 14.4	\$ 2.9	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.5	-	-	-	-	-
Revised Forecast	\$ 14.4	\$ 4.4	\$ -	\$ -	\$ -	\$ -	\$ -

## Burrows New 66 kV-12 kV Station

### Description:

Build a new two bank 66 kV-12 kV indoor station, complete with 12 feeder positions and protection to replace the Alfred and Charles stations.

### Justification:

Most of the equipment in this part of Winnipeg has been in service for 75 years. Alfred Station (which supplies Charles Station) lacks access to a satisfactory alternate supply in the event of a 12 kV interruption out of Rover Station. Remedial action was recommended for both stations in the Due Diligence Report. It indicated the 4 kV switchgear lineups at Alfred and Charles Stations lack arc-resistance and at Alfred Station are sometimes underrated for the available fault current during normal operating conditions. It also had concerns that neither station has an appropriate battery room, all station transformers have patched leaks, they contain asbestos materials, and that spare parts are in short supply.

### In-Service Date:

March 2012.

### Revision:

Cost flow revision, and in-service date deferred three months from December 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 28.6	\$ 10.7	\$ 10.2	\$ 2.4	\$ -	\$ -	\$ -
Increase (Decrease)	-	(1.6)	2.0	2.6	-	-	-
Revised Forecast	\$ 28.6	\$ 9.1	\$ 12.2	\$ 5.0	\$ -	\$ -	\$ -

## Winnipeg Central District Oil Switch Project

### Description:

Remove the remaining 26 oil switches located in various manhole sites throughout Winnipeg Central District. Install pad-mount switchgear and/or pad-mount transformers, and reroute existing primary feeder and customer service cables as required.

### Justification:

The oil switches are corroding and are not rated for the maximum available fault current on the system. If a failure occurs or the oil must be replaced, a lengthy shutdown will be required. Replacement will alleviate the risks associated with switching primary feeders in confined spaces. Pad-mount equipment allows adequate clearances and efficiency for switching, maintaining, and upgrading for future customer load additions.

### In-Service Date:

November 2009.

### Revision:

Cost flow revision, and in-service date deferred five months from June 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 7.1	\$ 0.5	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	1.3	-	-	-	-	-
Revised Forecast	\$ 7.1	\$ 1.8	\$ -	\$ -	\$ -	\$ -	\$ -

## William New 66 kV-12 kV Station

### Description:

Build a new two bank 66-12 kV indoor station, on Manitoba Hydro owned property, with protection and communication capability to the Central District Control Centre (CDCC) and the System Control Centre (SCC) for ten feeder positions. Costs associated with the potential installation of new 12 kV feeders to the new William Station are not included.

### Justification:

This project will allow for load transfers from King station, which will alleviate overloading as a result of operating limits imposed by cooling problems. Load transfers from Sherbrook station will allow for redundant feeds from different stations to supply critical services reducing the implication of a contingency equipment failure. Improvements in service reliability and accommodation for future distribution automation can be realized from new equipment. Manitoba Hydro already owns land at the south east corner of William Avenue and Tecumseh Street for a new station.

### In-Service Date:

October 2012.

### Revision:

Cost flow revision, and in-service date deferred ten months from December 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 10.3	\$ 2.8	\$ 3.9	\$ 3.3	\$ -	\$ -	\$ -
Increase (Decrease)	-	(2.3)	(0.3)	(0.2)	2.9	-	-
Revised Forecast	\$ 10.3	\$ 0.5	\$ 3.6	\$ 3.1	\$ 2.9	\$ -	\$ -

## Waverley West Sub Division Supply - Stage 1

### Description:

Install 20MVA capacity complete with pad mounted voltage regulators, 24 kV-2400 kVAR capacitor banks, S&C automated switching cubicles and fibre optic communication link.

### Justification:

Waverley West subdivision is a new development in an area predominantly supplied by 12 and 24 kV feeders. The 12 kV feeders cannot support more load. The nearest viable 24 kV feeder does not allow standard distribution equipment to be used due to high available fault currents. In addition, by using the 24 kV feeders, reliability to existing customers is reduced. This project is required to ensure the Waverley West subdivision customers have reliable service.

### In-Service Date:

December 2009.

### Revision:

Cost flow revision, and in-service date deferred two months from October 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 6.5	\$ 1.4	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	3.0	-	-	-	-	-
Revised Forecast	\$ 6.5	\$ 4.4	\$ -	\$ -	\$ -	\$ -	\$ -

## St. James 24 kV System Refurbishment

### Description:

Terminate a new 24 kV Feeder (J54) at the St. James station to supply the Winnipeg Airport Authority load expansion. Install a gang operated switch between feeders J25 and J54 at the Ferry Road and Ness Avenue stations, and transfer 3.7 MVA of load from J25 to J54. Convert Berry station BY612, 4 kV customers to 24 kV along Ferry Road. Build a new 115-24 kV St. James Station, new and upgraded feeders, and conversion of St. James, Ness, Berry and King Edward station feeders from 4 kV to 24 kV.

### Justification:

This project is required to ensure firm supply and a reliable system in the St. James area, and to ensure the Winnipeg Airport Authority continues to experience reliable service following a planned load expansion at the facility.

### In-Service Date:

March 2013.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 65.9	\$ 19.1	\$ 11.1	\$ 22.5	\$ 12.5	\$ -	\$ -
Increase (Decrease)	-	(17.8)	3.0	9.1	6.4	-	-
Revised Forecast	\$ 65.9	\$ 1.3	\$ 14.1	\$ 31.6	\$ 18.9	\$ -	\$ -

## Shoal Lake New 33-12.47 kV DSC

**Description:**

Build a two bank Distribution Supply Centre (DSC) and rebuild and convert the town distribution system.

**Justification:**

The existing station is 48 years old and requires re-building. The distribution system has encountered problems with voltage drops. This project represents the least cost alternative for the restoration of reliable, quality service in the foreseeable future.

**In-Service Date:**

September 2009.

**Revision:**

No change.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 3.6	\$ 3.2	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	-	-	-	-	-	-
Revised Forecast	\$ 3.6	\$ 3.2	\$ -	\$ -	\$ -	\$ -	\$ -

## York Station

**Description:**

Add a transformer bank and switchgear for nine feeder positions.

**Justification:**

Increasing capacity at York station alleviates loading problems at King station and interim relief at Sherbrook, and provides for future new loads that cannot be adequately supplied by existing King, Edmonton, and York capacity.

**In-Service Date:**

September 2010.

**Revision:**

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4.0	\$ 1.1	\$ 2.7	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.9	(0.9)	0.1	-	-	-
Revised Forecast	\$ 4.0	\$ 2.0	\$ 1.8	\$ 0.1	\$ -	\$ -	\$ -

## Cromer Station Capacity and Reston RE12-4 25 kV Conversion

### Description:

Convert the westerly portion of Reston Feeder RE12-4 from 12 kV to 25 kV by November 30, 2009, and install one 66-25 kV transformer in Cromer North Station by September 2011.

### Justification:

A new five mile feeder and 25 kV feeder conversion is required at Reston to address the increased demand due to oilfield exploration.

### In-Service Date:

September 2011.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	4.3	3.0	0.1	1.2	-	-	-
Revised Forecast	\$ 4.3	\$ 3.0	\$ 0.1	\$ 1.2	\$ -	\$ -	\$ -

## Brandon Crocus Plains 115-25 kV Bank Addition

### Description:

Install two 15/20/25 MVA OLTC 115-25 kV transformers. Install one 115 kV breaker to connect the transformers to line BF52. Install 3x25 kV breakers, four reclosers and associated equipment to connect the transformers, and provide four additional 25 kV feeders into the industrial park.

### Justification:

To supply the load growth and the industrial loads in the south Brandon area.

### In-Service Date:

October 2011.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 6.3	\$ 0.8	\$ 3.1	\$ 1.8	\$ 0.4	\$ -	\$ -
Increase (Decrease)	-	(0.2)	-	0.1	0.2	-	-
Revised Forecast	\$ 6.3	\$ 0.6	\$ 3.1	\$ 1.9	\$ 0.6	\$ -	\$ -



## Winkler Market Feeder M25-13 Conversion

### Description:

Rebuild and convert the 8 kV portion of Winkler Market Feeder WM25-13 (WM08-13) to 25 kV standards, and salvage the 3 x 500 kVA Hochfeld interchange banks.

### Justification:

The load growth in the Winkler area is above Manitoba's average, and is experiencing a five year average load growth rate of 6%. This feeder is supplied by a 25 kV feeder and stepped down to 8 kV at Hochfeld. The 8 kV portion of this feeder is over 56 years old and has reached the end of its useful life. The increased load current has made it increasingly difficult to protect the 8 kV feeder ends due to lack of reach. It will soon not be possible to adequately protect the existing plant. The load has also caused feeder end voltage levels to fall below acceptable (CSA) limits.

### In-Service Date:

August 2009.

### Revision:

Cost flow revision, and in-service date deferred ten months from October 2008.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 2.9	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.8	-	-	-	-	-
Revised Forecast	\$ 2.9	\$ 0.8	\$ -	\$ -	\$ -	\$ -	\$ -

## Neepawa North Feeder NN12-2 & Line 57 Rebuild

### Description:

Rebuild the main portion of feeder NN12-2 and a 16 km section of line 57.

### Justification:

The poles have reached the end of their useful life and pole replacements must now be made or the entire line must be rebuilt. A section of line 57 that contains feeders NN12-4 and NN12-2 was built in 1953 and is over 55 years old. A field report indicates that 75% of the line is in poor condition. Larger under-build wire on feeder NN12-2 is required to improve voltage and losses, and a larger 66 kV wire is recommended to improve voltage fluctuations and losses.

### In-Service Date:

February 2010.

### Revision:

In-service date deferred four months from October 2009.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 1.9	\$ 1.9	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	-	-	-	-	-	-
Revised Forecast	\$ 1.9	\$ 1.9	\$ -	\$ -	\$ -	\$ -	\$ -

## Perimeter South Station Distribution Supply Centre Installation

### Description:

Install one 10 MVA, 66 12 kV distribution supply centre, three 7.2 kV, single-phase 585 A padmount regulators, one 15 kV three-phase padmount recloser, one 15 kV S&C automated Vistagear switching cubicle, motorized bank 12 kV switches B10 & B20, MOV lightning arresters on 66 kV and 12 kV sides of banks 1 & 2, the distribution supply centre, and all 12 kV feeders. Salvage existing manual 12 kV bank switches and gap-type lightning arresters.

### Justification:

This station supplies both the south Fort Garry and La Salle communities (both fast growing) and provides a back-up supply to St. Norbert single bank station. This option addresses the non-firm capacity issues at a significantly lower cost than the initial plan, provides superior system reliability and its automatic load transfer feature offers recovery in minutes versus hours when a transformer fails.

### In-Service Date:

October 2010.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 2.4	\$ 0.3	\$ 2.0	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	0.1	-	-	-	-	-
Revised Forecast	\$ 2.4	\$ 0.4	\$ 2.0	\$ -	\$ -	\$ -	\$ -

## Niverville Station 66-12 kV Bank Replacements

### Description:

Replace two existing 66-12kV, 3.75/5.0 MVA transformers at Niverville station with two new 66-12kV, 7.5/10/12.5 MVA transformers.

### Justification:

This project was initiated as last year's peak load readings indicated that the capacity of this station has been exceeded. In addition, the Town of Niverville is planning to develop a total of 600 residential subdivision lots over the next three years. To date, approximately 200 lots have been serviced and a request to service 160 more lots has been received.

### In-Service Date:

October 2009.

### Revision:

New item.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	2.6	2.6	-	-	-	-	-
Revised Forecast	\$ 2.6	\$ 2.6	\$ -	\$ -	\$ -	\$ -	\$ -

## Winnipeg Central District Underground Network Asbestos Removal

### Description:

Remove or encapsulate asbestos wrap from high voltage cables currently present in approximately 1,800 manholes within the central Winnipeg area.

### Justification:

Asbestos must be in a condition that does not pose a health risk to anyone in the workplace. As a result, the current exposure control plan requires the asbestos be properly sealed with a sealant, encapsulated or removed to eliminate the risk of exposure.

### In-Service Date:

March 2010.

### Revision:

Cost flow revision only.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 3.0	\$ 0.8	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.1)	-	-	-	-	-
Revised Forecast	\$ 3.0	\$ 0.7	\$ -	\$ -	\$ -	\$ -	\$ -

## Gas SCADA Replacement

### Description:

Replace the current Gas Supervisory Control and Data Acquisition (SCADA) system with a vendor-supported SCADA system.

### Justification:

Replacement of the current gas SCADA system is required as product support is being discontinued by the vendor, and vendor alternative product does not meet the complete system requirements for Manitoba Hydro.

### In-Service Date:

June 2011.

### Revision:

Cost flow revision, and in-service date deferred three months from March 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 4.6	\$ 1.1	\$ 3.1	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	(0.1)	(0.1)	0.6	-	-	-
Revised Forecast	\$ 4.6	\$ 1.0	\$ 3.0	\$ 0.6	\$ -	\$ -	\$ -

## Customer Service & Distribution Domestic

### Description:

This program consists of projects whose individual costs are of a relatively small amount. These projects are required to extend sub-transmission, distribution, and transformation facilities to supply service to residential, farm, commercial and industrial customers, and to replace plant facilities whose useful life has been exceeded. Specific types of expenditures that make up electric domestic items include station and line additions, modifications and rebuilds, bank additions, breaker replacements, defective cable replacement, highway changes, field maintenance equipment, and ice melting requirements. These costs are spread over many facility locations throughout the Province.

### Justification:

The residential, farm, commercial and industrial loads are expected to grow at an average rate in excess of 1.5% per annum and will require a program of additions to the system to accommodate these anticipated loads.

### In-Service Date:

Ongoing.

### Revision:

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	NA	\$ 118.2	\$ 120.6	\$ 123.0	\$ 125.5	\$ 128.0	\$ 823.4
<b>Increase (Decrease)</b>		(2.3)	(3.1)	(3.1)	(3.2)	(3.3)	(20.8)
<b>Revised Forecast</b>		\$ 115.9	\$ 117.5	\$ 119.9	\$ 122.3	\$ 124.7	\$ 802.6

## CUSTOMER CARE & MARKETING:

### Advanced Metering Infrastructure

**Description:**

Purchase and install an automated metering infrastructure (AMI) communication network to remotely read and electronically disseminate electric meter readings and other relevant customer information to appropriate departments and divisions.

**Justification:**

Satisfies the ongoing need for routine, periodic meter readings in customer billing as well as provides 'on demand' readings to respond to customer inquiries. Other benefits include: increased customer satisfaction due to greater billing accuracy; better detection of theft of service, meter tampering and defective meters; greater flexibility in the timing and consolidation of billings; and improved detection of customer and system power outages with shortened restoration times.

**In-Service Date:**

March 2015.

**Revision:**

Cost flow revision, and in-service date advanced one year from March 2016.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	\$ 30.9	\$ 3.9	\$ 4.0	\$ 4.0	\$ 4.1	\$ 4.3	\$ 8.8
<b>Increase (Decrease)</b>	-	(3.9)	-	1.3	1.3	1.3	(0.3)
<b>Revised Forecast</b>	\$ 30.9	\$ -	\$ 4.0	\$ 5.3	\$ 5.4	\$ 5.6	\$ 8.5

### Customer Care & Marketing Domestic

**Description:**

This program covers the additions and replacements of electric meters.

**Justification:**

As required for the connection of new customers to the system, as well as replacement of existing time expired or faulty meters.

**In-Service Date:**

Ongoing.

**Revision:**

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	NA	\$ 2.6	\$ 2.6	\$ 2.7	\$ 2.7	\$ 2.8	\$ 18.0
<b>Increase (Decrease)</b>		(0.1)	(0.0)	(0.1)	(0.0)	(0.1)	(0.5)
<b>Revised Forecast</b>		\$ 2.5	\$ 2.6	\$ 2.6	\$ 2.7	\$ 2.7	\$ 17.5

## FINANCE & ADMINISTRATION:

### Corporate Buildings

**Description:**

Cyclical acquisitions, refurbishments, and/or replacement of corporate facilities throughout the Province.

**Justification:**

Enables a safe, efficient, and productive environment for staff and customers.

**In-Service Date:**

Ongoing.

**Revision:**

No change.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 8.0	\$ 8.0	\$ 8.0	\$ 8.0	\$ 8.0	\$ 40.0
Increase (Decrease)		-	-	-	-	-	-
Revised Forecast		\$ 8.0	\$ 8.0	\$ 8.0	\$ 8.0	\$ 8.0	\$ 40.0

### Workforce Management (Phase 1 to 4)

**Description:**

Implement a Workforce Management solution to integrate and automate the Customer Care & Marketing planning and dispatch functions, as well as provide for in-truck computing.

**Justification:**

Facilitates the integration of field processes to improve customer service and field productivity; as well as, reducing clerical functions and employee travel time.

**In-Service Date:**

June 2011.

**Revision:**

Cost flow revision, and in-service date deferred 27 months to June 2011.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 11.3	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Increase (Decrease)	-	3.9	1.0	-	-	-	-
Revised Forecast	\$ 11.3	\$ 3.9	\$ 1.0	\$ -	\$ -	\$ -	\$ -

## Fleet

**Description:**

Cyclical procurement, refurbishment and/or replacement of corporate fleet vehicles and equipment.

**Justification:**

To provide a fleet of safe, reliable and efficient corporate vehicles and equipment.

**In-Service Date:**

Ongoing.

**Revision:**

No change.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 13.3	\$ 13.5	\$ 13.8	\$ 14.1	\$ 14.3	\$ 92.2
Increase (Decrease)		-	-	-	-	-	-
Revised Forecast		\$ 13.3	\$ 13.5	\$ 13.8	\$ 14.1	\$ 14.3	\$ 92.2

## Finance & Administration Domestic

**Description:**

The programs consist primarily of information technology hardware, software, application development, and associated services to the corporation. In addition, there are programs to provide for property easements and to a lesser degree equipment for fleet, property and materials management.

**Justification:**

Computer system enhancements are required throughout the corporation to achieve ongoing improvements in resource productivity and reliability. Property easements and equipment purchases are required for supporting the appropriate areas of the corporation.

**In-Service Date:**

Ongoing.

**Revision:**

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 24.6	\$ 25.1	\$ 25.6	\$ 26.1	\$ 26.6	\$ 171.1
Increase (Decrease)		(0.5)	(0.7)	(0.7)	(0.7)	(0.7)	(4.3)
Revised Forecast		\$ 24.1	\$ 24.4	\$ 24.9	\$ 25.4	\$ 25.9	\$ 166.8

## GAS OPERATIONS:

## CUSTOMER SERVICE & DISTRIBUTION:

### Customer Service & Distribution Domestic

**Description:**

This program consists of projects whose individual costs are of a relatively small amount. These projects are required to extend, rebuild or upgrade: transmission pipelines, distribution pipelines, regulating stations, and customer service lines.

**Justification:**

Required to provide ongoing safe and reliable supply of natural gas to customers.

**In-Service Date:**

Ongoing.

**Revision:**

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 21.4	\$ 21.8	\$ 22.2	\$ 22.7	\$ 23.1	\$ 148.8
Increase (Decrease)		(0.7)	(0.6)	(0.5)	(0.6)	(0.6)	(3.8)
Revised Forecast		\$ 20.7	\$ 21.2	\$ 21.7	\$ 22.1	\$ 22.5	\$ 145.0



## CUSTOMER CARE & MARKETING:

### Advanced Metering Infrastructure

**Description:**

Purchase and install an automated metering infrastructure (AMI) communication network to remotely read and electronically disseminate gas meter readings and other relevant customer information to appropriate departments and divisions.

**Justification:**

Satisfies the ongoing need for routine, periodic meter readings in customer billing as well as provides 'on demand' readings to respond to customer inquiries. Other benefits include: increased customer satisfaction due to greater billing accuracy; better detection of theft of service, meter tampering, defective meters and leaks; and greater flexibility in the timing and consolidation of billings.

**In-Service Date:**

March 2015.

**Revision:**

Cost flow revision, and in-service date deferred two years from March 2013.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	\$ 15.0	\$ 3.7	\$ 3.7	\$ 3.5	\$ 3.8	\$ -	\$ -
Increase (Decrease)	-	(3.7)	(2.7)	1.9	4.5	-	-
Revised Forecast	\$ 15.0	\$ -	\$ 1.0	\$ 5.4	\$ 8.3	\$ -	\$ -

### Demand Side Management

**Description:**

Design, implement and deliver incentive based PowerSmart conservation programs to reduce gas consumption and greenhouse gas emissions in Manitoba. When combined with savings realized to-date, total natural gas savings of 172 million cubic meters are expected to be achieved by 2025.

**Justification:**

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 implementing cost-effective energy conservation and alternative energy programs, protects the environment, and promotes sustainable energy supply and service.

**In-Service Date:**

Ongoing.

**Revision:**

Refinements to existing programs to reflect current information.

	Total	2010	2011	2012	2013	2014	2015-20
Previously Approved	NA	\$ 14.2	\$ 13.3	\$ 12.4	\$ 11.5	\$ 10.7	\$ 40.2
Increase (Decrease)		(0.7)	(0.2)	(0.8)	0.2	0.4	9.2
Revised Forecast		\$ 13.5	\$ 13.1	\$ 11.6	\$ 11.7	\$ 11.1	\$ 49.4

## Customer Care & Marketing Domestic

**Description:**

This program covers the additions and replacements of gas meters.

**Justification:**

As required for the connection of new customers to the system, as well as replacement of existing time expired or faulty meters.

**In-Service Date:**

Ongoing.

**Revision:**

Revised escalation rates.

	Total	2010	2011	2012	2013	2014	2015-20
<b>Previously Approved</b>	NA	\$ 2.8	\$ 2.9	\$ 2.9	\$ 3.0	\$ 3.1	\$ 19.7
<b>Increase (Decrease)</b>		(0.0)	(0.1)	(0.0)	(0.1)	(0.1)	(0.5)
<b>Revised Forecast</b>		\$ 2.8	\$ 2.8	\$ 2.9	\$ 2.9	\$ 3.0	\$ 19.2