Q. Provide electronic copies of all storm restoration reports submitted to the Public Utilities Board related to major storm outage events (especially Hurricane Igor in 2010) since 2004.

A. Copies of all storm restoration reports submitted to the Public Utilities Board related to major storm outage events since 2004 are included as Attachments A through D of this response. Storm restoration reports for Tropical Storm Leslie and Winter Storm November 2013 have been previously filed as Attachments C and E in the response to Request for Information PUB-NP-166.

Attachment	Storm	Report Title
Attachment A	Ice Storm March 2010	Transmission and Distribution Line Rebuilds March 2010 Ice Storm
Attachment B	Hurricane Igor September 2010	Transmission, Distribution and Generation Infrastructure Rebuilds Due to Hurricane Igor
Attachment C	Hurricane Igor September 2010	Port Union and Lawn Rehabilitation
Attachment D	Winter Storm December 2007	Pages 5 to 10 of Newfoundland Power's Q4/07 Quarterly Regulatory Report
See PUB-NP-166, Attachment C	Tropical Storm Leslie September 2012	Tropical Storm Leslie Unforeseen Capital Expenditures
See PUB-NP-166, Attachment E	Winter Storm November 2013	November 2013 Winter Storm Central Newfoundland

Ice Storm, March 2010

Transmission and Distribution Line Rebuilds
March 2010 Ice Storm

Transmission and Distribution Line Rebuilds
March 2010 Ice Storm

April 30, 2010

Prepared by:

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PROVINCE OF NEWFOUNDLAND

NEWFOUNDLAND POWER
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Table of Contents

1.0 Introduction

On March 5th and 6th, 2010, an intense ice storm swept over eastern Newfoundland. The harsh weather conditions caused extensive damage to a number of transmission lines and distribution feeders serving the Bonavista Peninsula, Avalon Peninsula and Bonavista North areas. At one time or another, the resulting outages affected approximately 12,000 customers.

In order to minimize the duration of service interruptions, repair work was started immediately. While the completion of this essential capital work on an urgent basis is in accordance with the terms that govern the normal operation of the Allowance for Unforeseen Items, the cost of repairing the damaged transmission and distribution lines quickly exceeded the approved expenditure of $750,000. To ensure a reliable supply of electricity was restored to customers as quickly as possible, this expenditure was unavoidable.

This report summarizes the damage to the transmission and distribution infrastructure and provides information on the costs incurred to rebuild the damaged lines, as well as an estimate of the cost to complete any remaining work.

2.0 Background

Damage Assessment

The March ice storm caused heavy ice build-up on poles and conductors throughout eastern Newfoundland. This caused support structures to fail and large sections of transmission and distribution lines to collapse.

Due to severe ice loading and high winds, a total of 8 transmission lines sustained extensive damage. The damaged transmission lines are as follows:

<u>Bonavista Peninsula</u>

- 123L connecting Clarenville Substation to Catalina Substation;
- 110L connecting Clarenville Substation to Lockston Plant; and
- 111L connecting Lockston Plant to Catalina Substation.

<u>Avalon Peninsula</u>

- 41L connecting Heart's Content Plant to Carbonear Substation;
- 80L connecting Blaketown Substation to Heart's Content Plant;
- 65L connecting New Chelsea Plant to Old Perlican Substation; and
- 55L connecting Blaketown Substation to Clarke's Pond Substation.

<u>Bonavista North</u>

- 116L connecting Hare Bay Substation to Wesleyville Substation.

In addition to the transmission line damage, several distribution feeders were also damaged. Significant damage was experienced on the Old Perlican feeders on the Bay de Verde Peninsula (northwest Avalon Peninsula), the Summerville feeders on the Bonavista Peninsula, and the Greenspond feeders in Bonavista North.

On Saturday, March 6th, a thorough assessment of the damage to the electricity system was conducted. In order to restore power to customers as quickly as possible, work immediately commenced on reconstruction of the damaged lines. Sections 3.0, 4.0 and 5.0 of this report provide a detailed outline of the damage.

Customer Impact

The first outage resulting from the ice storm occurred at 1:03 a.m. on Friday, March 5th. By the afternoon of Thursday, March 11th, electricity had been restored to all affected customers. During this 7-day period, Newfoundland Power, with the assistance of contractors and crews from other utilities, carried out electricity restoration activities as safely and as quickly as possible. Local and mobile generation was utilized to assist with the restoration effort. This enabled rotation of electricity to customers while the damaged transmission and distribution lines were being rebuilt.

A total of 12,538 customers were impacted as a result of the storm. Customer outage minutes totalled 43.4 million. Table 1 outlines the customer outage minutes and the number of customers affected in each area.

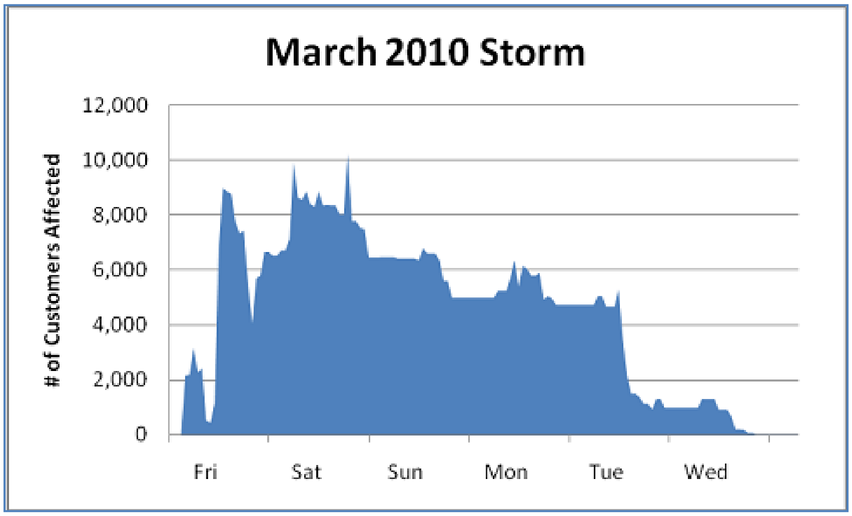
Table 1
Outage Data

	Customer Minutes (Millions)	**Customers Affected**
Bonavista Peninsula	29.6	5,003
Avalon Peninsula	12.1	3,364
Central Newfoundland[1]	1.4	1,671
Other	0.3	2,500
	43.4	**12,538**

[1] Principally, Bonavista North, but also includes some smaller outages in the Gander and Grand Falls-Windsor areas.

Graph 1 illustrates the numbers of customers without electricity from time to time throughout the 6 days from Friday, March 5th, to Wednesday, March 10th. At the storm's peak, a total of 10,246 customers were without electricity. By Thursday, March 11th, only 15 customers supplied by a feeder from the Old Perlican Substation were still without electricity.

Graph 1
March Storm – Customers Affected



Design Standards

Newfoundland Power designs and builds transmission and distribution lines in accordance with Canadian Standards Association Standard CAN/CSA C22.3. This design standard is issued under the Canadian Electrical Code, Part III, and provides specifications for the construction of overhead electrical systems.

Appendix A shows the ice and wind loading districts for the island of Newfoundland as designated by the CSA design standard.

For areas with a *severe* ice loading designation, the C22.3 standard requires more substantial construction. The Avalon and Bonavista Peninsula areas have been designated under the C22.3 standard as areas where severe ice loading occurs. As a result of experience with severe ice loading on the Burin Peninsula, Newfoundland Power has chosen also to apply that designation to transmission lines in that area.

The C22.3 standard sets minimum specifications for new construction. However, these minimum specifications may be exceeded when engineering judgement suggests a higher standard is called for. On occasion, Newfoundland Power has employed more robust designs in areas with a history of severe ice loading.

Following a December 2007 ice storm that resulted in heavy damage to transmission lines on the Bonavista Peninsula, some *non-tension* dead-end structures were replaced with structures that met the design standard for *full tension* dead-end structures. This was done in an effort to avoid a cascading failure of structures that could, in certain circumstances, follow the initial failure of a single structure. During the latest ice storm, one of the structures that had been upgraded to this higher standard successfully limited the extent of a cascading failure on transmission line 123L.

3.0 Avalon Peninsula Damage

Sequence of Events

Significant damage on the Avalon Peninsula was confined to the Bay de Verde Peninsula, and the Holyrood and Placentia areas. Minor damage on transmission and distribution lines elsewhere on the Avalon was repaired with only brief interruptions in service.

The first community on the Bay de Verde Peninsula to lose electricity was Sibley's Cove, between New Chelsea and Old Perlican. This happened when a section of distribution conductor fell to the ground at 1:03 am on Friday, March 5th. Later on Friday, transmission lines 41L and 65L tripped, affecting an additional 2,588 customers. In the early morning hours of Saturday, March 6th, a section of transmission line 80L collapsed between Islington and Heart's Content. This resulted in a power outage from Heart's Content to Old Perlican affecting 3,022 customers.

On Saturday, March 6th, Newfoundland Power stationed a mobile diesel generator in the community of Old Perlican to support the local hydro generating plants at New Chelsea and Heart's Content in carrying the local load. On Thursday, March 11th, additional portable generation was installed at Old Perlican Substation.

Once the damage assessment was completed, restoration efforts focused mainly on rebuilding transmission line 80L from Islington to Heart's Content. The completion of this work restored power to customers in Heart's Content, New Chelsea and Old Perlican areas at 3:32 pm on Sunday, March 14th.

While the transmission lines were being rebuilt, local load was supplied by the mobile diesel generator and the hydroelectric plants at New Chelsea, Pitman's Pond and Heart's Content. This limited the duration of customer outages in these areas.

Reconstruction of the distribution infrastructure began on March 6th, and was completed by March 11th. With the exception of 41L, which is a redundant supply route, the rebuilding of damaged transmission lines on the Avalon Peninsula was completed, and electricity restored to all affected customers, by Sunday, March 14th.

Transmission Damage

Four transmission lines on the Bay de Verde Peninsula (55L, 41L, 65L and 80L) were damaged during the storm. Some of the heaviest ice loading was experienced on transmission line 41L. Foot-long samples of ice taken from this line weighed 7.5 lbs. This is equivalent to 2.4 radial inches of ice. Newfoundland Power has not experienced ice loading of this magnitude since the devastating ice storm of 1984.

A total of 106 transmission line poles was damaged and required replacement on the Avalon Peninsula. Fifty-five of those poles were on 41L.

The rebuild of the damaged sections of transmission lines 55L, 65L and 80L has been completed.

Transmission line 41L, which extends between Heart's Content to Carbonear Substation, is a redundant supply route for the communities on both sides of the Bay de Verde Peninsula. The tender for the rebuilding of 41L will be released in April, with work scheduled to be completed by the end of the 2nd Quarter. In the meantime, the transmission feed to the communities on the north shore of Conception Bay and the south shore of Trinity Bay will remain in a radial configuration.

Distribution Damage

Nine distribution feeders on the Bay de Verde Peninsula sustained damage. A total of 87 distribution poles required replacement, and approximately 123 spans of conductor were on the ground. Damage was most extensive in the northern areas of the Bay de Verde Peninsula, particularly in the communities of Bay de Verde, Grates Cove and Red Head Cove.

Isolated damage also occurred in other areas. Notably, the Hawke Hill radio tower site near Holyrood sustained extensive damage, with 51 poles requiring replacement.

4.0 Bonavista Peninsula Damage

Sequence of Events

Transmission line 123L tripped at 1:00 pm on Friday, March 5th, interrupting the supply of electricity to 4,530 customers in the Lockston, Bonavista and Catalina areas. Over the next 5 days, a total of 5,003 customers on the Bonavista Peninsula experienced outages.

By mid-day on Friday, March 5th, based on observed weather conditions and ice loading in the area, a decision had been made to relocate the Mobile Gas Turbine ("MGT") from Port Aux Basques to Catalina. The MGT was placed online at Catalina Substation on Sunday, March 7th. This enabled customers in the Catalina, Port Union and Bonavista areas to be supplied on a rotating basis for the next 2 days, while transmission lines 110L and 111L were being rebuilt.

Subsequent to the installation of the MGT, restoration efforts were primarily focused on rebuilding transmission lines 110L and 111L from Clarenville Substation to Catalina Substation. The portable substation ("P4") was mobilized to Princeton Pond Substation on March 7th. With P4 online, a temporary transmission line configuration allowed Catalina Substation to be energized using 123L from Clarenville Substation to Princeton Pond Substation and 111L from Princeton Pond Substation to Catalina Substation. Reconstruction of the transmission lines was completed on Tuesday, March 9th, restoring electricity to the Catalina and Bonavista areas.

With the exception of the section of 123L between Princeton Pond and Catalina Substations, all damaged structures were rebuilt by March 9th and electricity restored to all customers.

Transmission Damage

Three transmission lines on the Bonavista Peninsula (123L, 110L and 111L) were damaged during the ice storm. A total of 90 poles required replacement.

On 123L, which sustained the most damage, 58 poles required replacement. A helicopter assessment of the line was conducted on Sunday, March 7th. It was subsequently determined that the primary cause of failure of this section of line was a guy failure on structure 247. Subsequent to the guy failure, 123L cascaded from structure 247 to structure 227 and, in the other direction, from structure 247 to structure 252, a total distance of 6.1 kilometres. In addition, there was conductor and structural damage on 15 other structures in 8 locations.

Work on transmission lines 110L, 111L and 123L is now complete.

Distribution Damage

Extensive distribution system damage on the Bonavista Peninsula was confined to communities north of Summerville Substation, including Sweet Bay and King's Cove; although, there were isolated areas of lesser damage in the vicinity of Catalina and Bonavista. Similar to the experience on the Avalon Peninsula, distribution lines serving radio tower sites on higher elevations sustained extensive damage. However, these radio sites were able to continue to operate using their own standby generators until repairs to lines serving residential communities had been completed.

5.0 Bonavista North Damage

Sequence of Events

On Friday, March 5th, heavy ice loading was experienced on transmission and distribution lines in the Bonavista North area, particularly in the communities of Greenspond, Trinity and Lumsden.

Initially, customers in the Bonavista North area experienced only intermittent outages associated with the removal of ice from distribution lines and the repair of damaged conductor. On Friday evening, at approximately 9:00 pm, transmission line 116L faulted. This interrupted service to the communities of New-Wes-Valley, Greenspond, Lumsden and Cape Freels. The majority of the damage on 116L occurred between the Greenspond tap and Wesleyville Substation. The main three-phase distribution feeder on the island of Greenspond was also extensively damaged. In addition, sections of distribution lines in the communities of Lumsden, Cape Freels and New-Wes-Valley were heavily loaded with ice.

By Monday, March 8th, transmission line 116L had been rebuilt and returned to service. In the interim, customers were supplied from the Wesleyville Gas Turbine.

Transmission Damage

Transmission line 116L was the only transmission line damaged in the Bonavista North area. Nineteen structures were damaged, but only 1 pole required replacement. All repair work on 116L is complete.

Distribution Damage

Most of the damage to the Bonavista North distribution system occurred in the island portion of Greenspond. Ten poles were broken on the main three-phase line serving the community. To temporarily restore service to the island, a single-phase line was re-routed to bypass the damaged area.

6.0 Project Description

This capital project involves the rebuilding of sections of transmission lines and distribution feeders damaged by the severe ice storm on March 5th and 6th. This work was necessary to reconnect customers to the electrical system in the affected areas. With the exception of transmission line 41L, the rebuilding of all transmission and distribution infrastructure is now complete.

To expeditiously restore electricity to affected customers, it was necessary to complete most of the work prior to receiving Public Utilities Board ("PUB") approval. The work was completed in accordance with the terms of the 2010 Allowance for Unforeseen Items capital project, with the exception that the total cost of the work completed to date has exceeded the approved expenditure of $750,000. Delaying the work until PUB approval was obtained would have resulted in extended power outages for customers in the affected areas.

Table 2 summarizes the structural work required to rebuild the damaged transmission and distribution infrastructure as described in Sections 3.0, 4.0 and 5.0. The cost to complete this work is outlined in Section 7.0.

Table 2
Structural Damage Summary

	Poles Replaced	Structures Damaged
Transmission Lines		
41L	55	29
55L	5	6
65L	8	12
80L	38	22
110L	7	17
111L	25	45
123L	58	40
116L	1	19
Distribution Feeders		
Eastern Region	160	
Western Region	10	

7.0 Project Cost

Transmission Cost

The estimated cost to complete all work associated with rebuilding the damaged transmission lines is $3,138,000. Table 3 provides a detailed breakdown of the costs incurred in rebuilding the transmission lines.

Table 3
Transmission System Cost Estimates

Transmission Line	Material	Labour Internal	Labour Contract	Engineering	Other	Total
Avalon						
41L	$295,000	33,000	465,000	14,500	42,500	**$850,000**
55L	$11,000	11,000	19,000	4,000	5,000	**$50,000**
65L	$13,000	29,000	22,000	4,000	8,000	**$76,000**
80L	$193,000	72,000	357,000	29,000	17,000	**$668,000**
Bonavista						
110L	$22,000	54,000	43,000	9,000	18,000	**$146,000**
111L	$66,000	45,000	147,000	10,000	15,000	**$283,000**
123L	$319,000	150,000	400,000	47,000	26,000	**$942,000**
Bonavista North						
116L	$12,000	26,000	76,000	3,000	6,000	**$123,000**
Total	**$931,000**	**420,000**	**1,529,000**	**120,500**	**137,500**	**$3,138,000**

Distribution Cost

The estimated costs to complete all work associated with rebuilding the damaged distribution system is $1,062,000. Table 4 provides a detailed breakdown of the cost to rebuild the distribution system by region.

Table 4
Distribution System Cost Estimates

Region	Material	Labour Internal	Labour Contract	Engineering	Other	Total
Eastern	$206,000	367,000	318,000	45,000	41,000	**$977,000**
Western	$6,000	39,000	21,000	2,000	17,000	**$85,000**
Total	**$212,000**	**406,000**	**339,000**	**47,000**	**58,000**	**$1,062,000**

Table 5 shows the total estimated cost to complete all work related to the March 2010 ice storm.

Table 5
Total Cost Estimates

Class	Material	Labour Internal	Labour Contract	Engineering	Other	Total
Transmission	$931,000	420,000	1,529,000	120,500	137,500	$3,138,000
Distribution	$212,000	406,000	339,000	47,000	58,000	$1,062,000
Total	**$1,143,000**	**826,000**	**1,868,000**	**167,500**	**195,500**	**$4,200,000**

8.0 Project Schedule

With the exception of transmission line 41L, the rebuilding of the damaged transmission and distribution infrastructure has been completed.

The tender for the rebuilding of transmission line 41L will be released in April 2010. That work is scheduled to be completed by the end of June.

9.0 Concluding

Rebuilding the storm-damaged transmission lines and distribution feeders on an urgent basis was necessary to restore electricity service to customers affected by the March 2010 ice storm. It would not have been practical to delay the work completed to date until Board approval was obtained, as this would have resulted in prolonged service interruptions to customers in the affected areas.

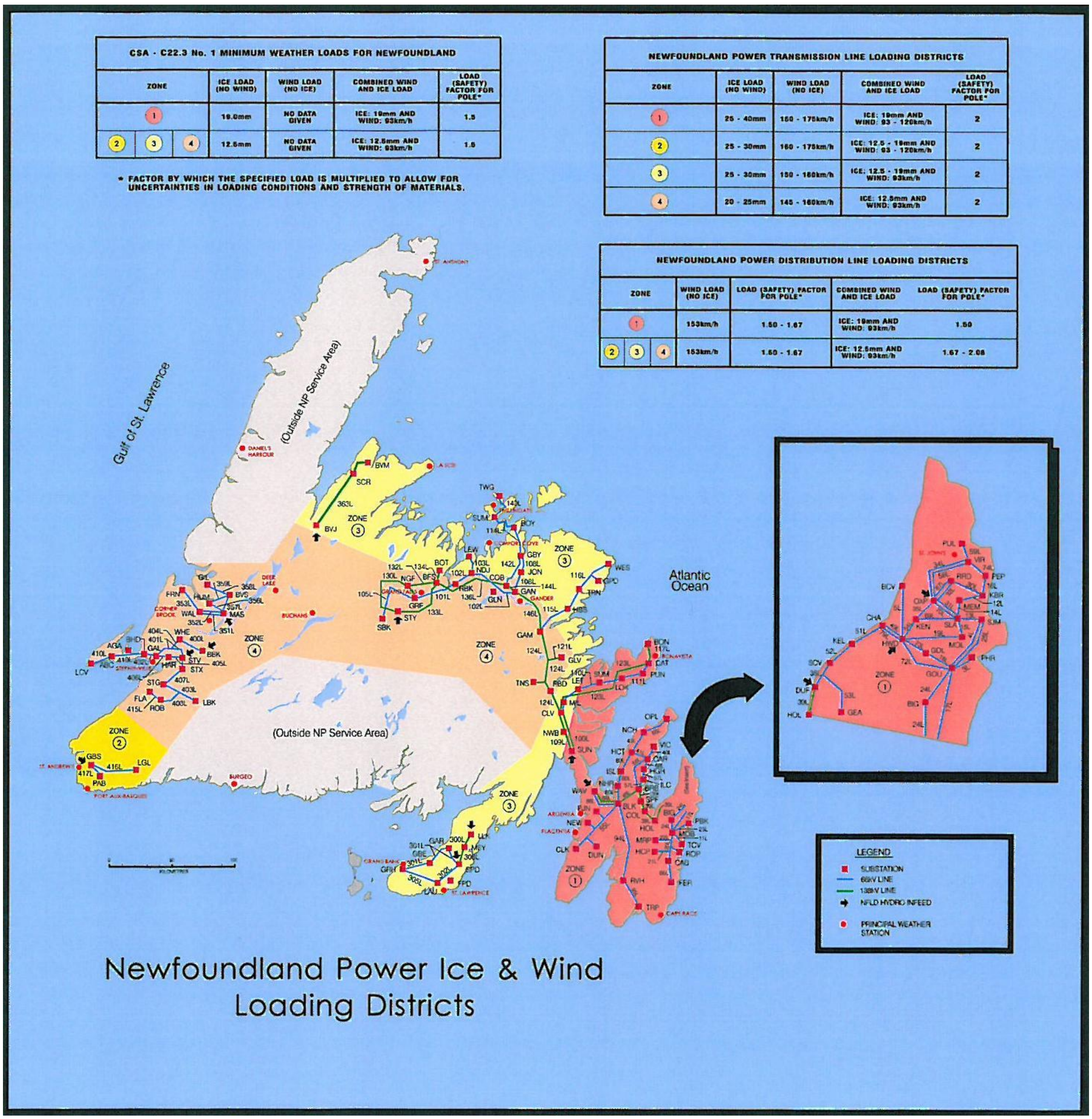
The remaining work on transmission line 41L should proceed in 2010. Returning 41L to service will re-establish the loop feed connecting the Trinity Bay and Conception Bay North transmission systems. Completing this work as soon as possible will ensure that the security of the electricity supply to the Avalon Peninsula is not compromised.

Appendix A

Ice and Wind Loading Districts

Newfoundland Power

Ice and Wind Loading Districts



CSA - C22.3 No. 1 MINIMUM WEATHER LOADS FOR NEWFOUNDLAND

ZONE	ICE LOAD (NO WIND)	WIND LOAD (NO ICE)	COMBINED WIND AND ICE LOAD	LOAD (SAFETY) FACTOR FOR POLE*
1	19.0mm	NO DATA GIVEN	ICE: 19mm AND WIND: 93km/h	1.5
2, 3, 4	12.5mm	NO DATA GIVEN	ICE: 12.5mm AND WIND: 93km/h	1.5

* FACTOR BY WHICH THE SPECIFIED LOAD IS MULTIPLIED TO ALLOW FOR UNCERTAINTIES IN LOADING CONDITIONS AND STRENGTH OF MATERIALS.

NEWFOUNDLAND POWER TRANSMISSION LINE LOADING DISTRICTS

ZONE	ICE LOAD (NO WIND)	WIND LOAD (NO ICE)	COMBINED WIND AND ICE LOAD	LOAD (SAFETY) FACTOR FOR POLE*
1	25 - 40mm	160 - 175km/h	ICE: 19mm AND WIND: 93 - 120km/h	2
2	25 - 30mm	160 - 175km/h	ICE: 12.5 - 19mm AND WIND: 93 - 120km/h	2
3	25 - 30mm	150 - 160km/h	ICE: 12.5 - 19mm AND WIND: 93km/h	2
4	20 - 25mm	145 - 160km/h	ICE: 12.5mm AND WIND: 93km/h	2

NEWFOUNDLAND POWER DISTRIBUTION LINE LOADING DISTRICTS

ZONE	WIND LOAD (NO ICE)	LOAD (SAFETY) FACTOR FOR POLE*	COMBINED WIND AND ICE LOAD	LOAD (SAFETY) FACTOR FOR POLE*
1	153km/h	1.50 - 1.67	ICE: 19mm AND WIND: 93km/h	1.50
2, 3, 4	153km/h	1.50 - 1.67	ICE: 12.5mm AND WIND: 93km/h	1.67 - 2.08

Appendix B

Pictures

Cracked Pole

Contractor Crews Working

Rebuilding Feeder to Radio Sites

Refuelling MGT

Distribution Structure Leaning Heavily

Crews Dressing Poles

Distribution Structure Covered in Ice

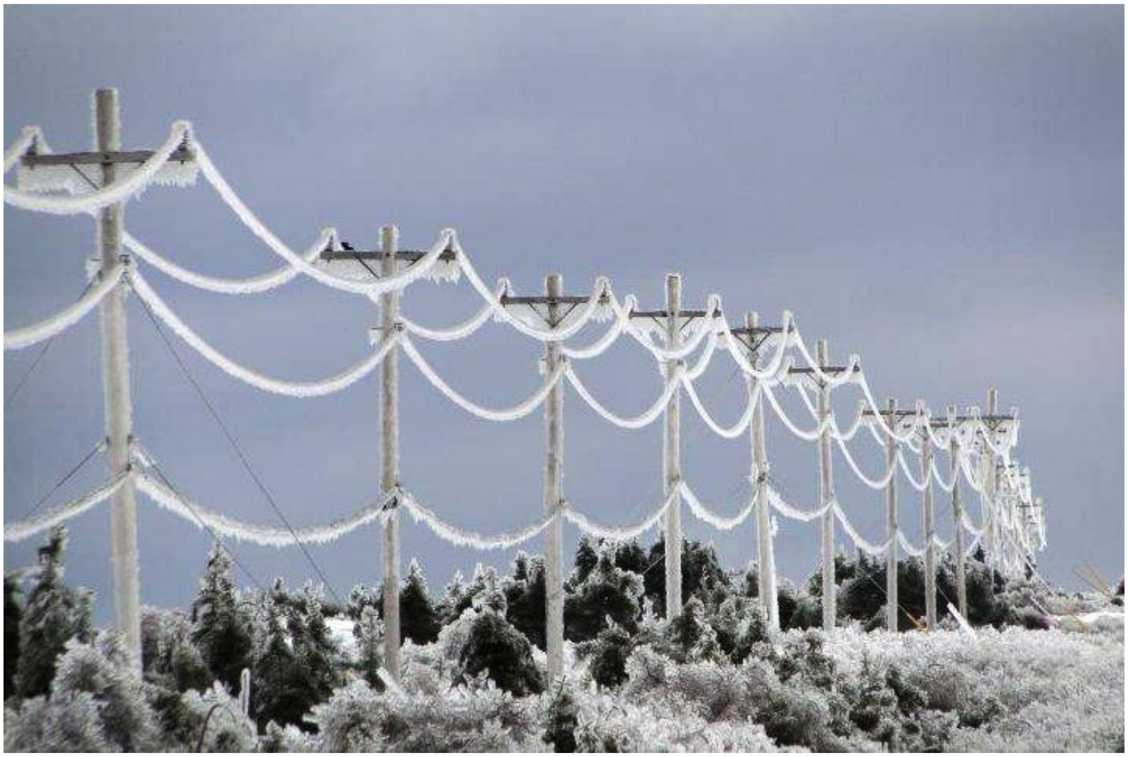
Ice Thickness is Apparent at Base of Poles

Distribution Structure Covered in Ice

Poles bending Under Ice Load

Structure Damage 41L

Measuring Ice Thickness



Ice on Conductors Near New Chelsea

Broken Crossarms on 41L Across the Hearts Content Barrens

Rebuilding Distribution Feeder Near Greenspond

Rebuilding Distribution Feeder to Greenspond

Broken Conductor on 116L

Crew Replacing Crossarm on 116L

Hurricane Igor, September 2010

Transmission, Distribution and Generation
Infrastructure Rebuilds Due to Hurricane Igor

Transmission, Distribution and Generation Infrastructure Rebuilds Due to Hurricane Igor

September 2010

November 30, 2010

Prepared by:

Jack Casey, P. Eng.

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Table of Contents

A. BACKGROUND

Introduction

Eastern Newfoundland experienced an extreme weather event related to Hurricane Igor on the evening of Monday September 20th and throughout the day on Tuesday September 21st, 2010. This event caused damage throughout most of Eastern Newfoundland to public infrastructure such as roads and bridges, along with buildings, private homes and businesses. It also caused damage to Newfoundland Power's electricity system.

The damage to Newfoundland Power's electricity system resulted in immediate service outages to Newfoundland Power's customers. The timely restoration of service was the primary focus of Newfoundland Power's response to Hurricane Igor. The timely restoration of service required the Company to make material operating and capital expenditures. In addition, Hurricane Igor also resulted in material damage to Newfoundland Power's transmission and generation assets.

The Company has incurred capital costs of $1.9 million for repair of damage to the electricity system caused by Hurricane Igor.[1] This cost has been expensed in the 2010 Allowance for Unforeseen Items capital project. This application requests that the 2010 Allowance for Unforeseen Items be increased by this amount to restore the balance to its original $750,000.

The costs incurred rebuilding the hurricane-damaged infrastructure on an urgent basis were necessary to (i) restore electricity service to customers affected by Hurricane Igor, and (ii) to maintain the engineering integrity and public safety of the civil works associated with the Company's hydroelectric generating facilities. It would not have been practical to delay the work completed to date until Board approval was obtained, as this would have resulted in either (i) prolonged service interruptions to customers in the affected areas or (ii) undue risk to public safety and/or the Company's assets.

This report summarizes the customer impacts and the damage to the electricity system caused by Hurricane Igor. It also provides (i) information on the capital costs incurred to repair the damage in 2010, and (ii) an estimate of the cost to complete remaining work in 2011.

Hurricane Igor

On the afternoon of Tuesday, September 21st, 2010, Hurricane Igor passed east of the Avalon Peninsula maintaining hurricane status until the centre of the storm was located northeast of St. John's, at which time it was downgraded to post-tropical status. This storm caused severe flooding and wind damage due to the combined effect of Hurricane Igor and a stationary front that had previously developed to the north of the hurricane as it approached Newfoundland.

Environment Canada has described the storm as the worst in memory and has no records of hurricanes or post tropical events of this magnitude striking Newfoundland in the modern era. It was effectively a 50 to 100 year storm. Rainfall of 238 mm at St. Lawrence on the Burin

[1] In addition, the Company has incurred operating costs of $1.8 million in 2010 and anticipates further capital expenditures of $1.6 million in 2011.

Peninsula during Hurricane Igor is unprecedented, amounting to a 100 year plus rainfall event. Maximum recorded wind speed on the Avalon Peninsula was 172 km/hr.[2]

The combination of heavy rainfall and high winds associated with Hurricane Igor impacted Newfoundland Power's electricity system in a number of ways.

The heavy rainfall experienced in advance of the high winds tended to saturate the ground, reducing the capability of aerial structures, such as transmission and distribution lines, to withstand the force of the high winds. In addition, the saturated soil condition reduced the capability of vegetation, particularly large trees, to withstand the force of the high winds.[3] This contributed to a large number of vegetation related distribution system failures, particularly on the Northeast Avalon Peninsula.

In addition, the record rainfalls caused flooding which eroded civil works, such as roads used to provide access to Company facilities. These flood conditions also damaged the Company's Port Union hydroelectric plant, which was extensively flooded, and the Lawn hydroelectric plant, which sustained dam and penstock damage. In addition, civil structures employed to provide stability to dams and spillways associated with a number of hydroelectric plants in Eastern Newfoundland sustained damage.

The immediate impact of the damage to Newfoundland Power's electricity system caused by Hurricane Igor was the loss of service to a large number of Newfoundland Power's customers.

B. CUSTOMER IMPACTS

The first significant outage resulting from Hurricane Igor occurred at 10:52 a.m. on Tuesday, September 21st, with approximately 700 customers losing electricity in the St. Lawrence area of the Burin Peninsula. Within 2 hours, service outages were being experienced from Port aux Basques to St. John's.

Table 1 details the customer outage minutes and the number of customers affected in each area.

Table 1
Customers Affected by Outages
Due to Hurricane Igor

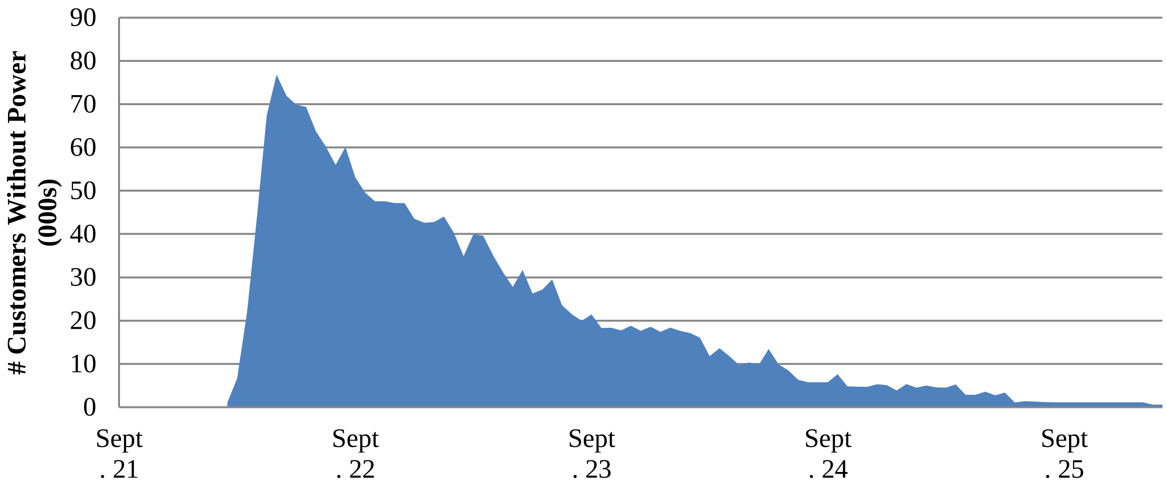
	Customer Minutes (Millions)	Customers Affected
Avalon Peninsula	72	74,000
Bonavista Peninsula	31	13,000
Burin Peninsula	1	2,000
Other	7	17,000
Total	**111**	**106,000**

2 A summary of Environment Canada weather data is included in Appendix A.
3 High winds in September when trees still have leaves result in greater wind loading and forces placed upon the trees.

Approximately 106,000 customers were impacted as a result of the storm. Approximately 77,000 customers were without electricity at the peak of the storm on the evening of Tuesday, September 21st. A total of 111 million minutes of customer outage were experienced.

Graph 1 illustrates the number of customers without electricity service throughout the 5 days from Tuesday, September 21st, to Saturday, September 25th.

Graph 1
Customer Outages Due to Hurricane Igor



On the morning of Wednesday September 22nd, 42,600 customers were without electricity. Approximately 25,000 customers had their electricity restored on Wednesday, leaving approximately 17,400 customers without service on the morning of Thursday, September 23rd. The number of customers without electricity was reduced to approximately 3,800 by the morning of Friday September 24th; and only 1,100 were without electricity on Saturday morning, September 25th.

By Sunday, September 26th, electricity service to customers was substantially restored with approximately 100 isolated customer trouble calls unresolved.

From Tuesday, September 21st, until midnight Saturday, September 25th, Newfoundland Power's customer contact centre was in continuous operation. The Company responded to approximately 5,300 storm-related calls from customers on Tuesday, September 21st, and a total of approximately 22,000 storm-related customer calls during the week. This compares to a normal volume of approximately 6,500 customer calls per week at the Company's customer contact centre.

From the onset of the storm and throughout the week, Newfoundland Power communicated to customers the latest information on progress with restoration efforts. The Company used traditional media channels such as radio, television, print and the Company web site.

Newfoundland Power also introduced social networking as a means to communicate with customers and the media by establishing a *Twitter* feed.[4]

C. SYSTEM DAMAGE

Customer Service Restoration

Twelve of the Company's 104 transmission lines were impacted by Hurricane Igor, while 138 of the Company's 303 distribution lines were impacted by the storm.[5]

Overall, the Company's restoration efforts were organized to restore service to the greatest number of customers as soon as possible. Typically, this involves reinstating failed transmission circuits first. A transmission circuit generally serves a greater number of customers than a distribution circuit. For reinstating failed distribution circuits, distribution feeder trunks are typically the first order of priority, followed by failed distribution feeder taps, then failed transformers, and finally individual customer service connections.

The response effort was complicated to a degree by road conditions. In the Bonavista Peninsula area, a number of roads were impassable. Until late Thursday, September 23rd, the Trans Canada Highway to Eastern Newfoundland was closed due to washouts. These conditions presented a number of limitations. On the Bonavista Peninsula, personnel and equipment had to be airlifted to work sites.[6]

On the Northeast Avalon Peninsula, the high concentration of vegetation-related distribution damage required a labour intensive response. The closure of the Trans Canada Highway limited the ability to transport personnel and, particularly, equipment, to the Northeast Avalon in a timely way.

The extent of the impact of Hurricane Igor on the Company's transmission and distribution systems, together with the complicated response, indicated that a large contingent of technical personnel would be required to effect a timely response.[7]

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4 *Twitter* is a social network and micro-blogging service enabling users to send and receive short text messages called tweets. Users subscribe to other user's tweets, with subscribers referred to as *followers*. These tweets are typically received by follower's smart phones.

5 These impacts were varied. They included failed transmission structures on some transmission lines. For some distribution lines, the impact was limited to distribution transformers, broken conductor, or damaged services. In some cases, impacts included electrical faults that did not involve physical damage to the transmission or distribution line.

6 Helicopters were used to move crews and material to isolated communities on Random Island and other locations on the Burin and Bonavista Peninsulas that were inaccessible due to road damage.

7 For example, 138 of the Company's 303 distribution feeders were impacted by Hurricane Igor. This obviously would require significant line and technical staff to effect the necessary repairs to damaged feeders. In many cases, even when no physical damage to feeders occurred, line and/or technical staff were required to patrol feeders to ensure safe reinstatement of service. And, in some cases, even when there were no apparent impacts to a distribution feeder, inspection by line and/or technical staff was required to ensure public safety.

Table 2 summarizes the personnel deployed by Newfoundland Power as part of its service restoration efforts.

Table 2
Service Restoration
Personnel Deployed

Position	Quantity
Power Line Technicians	240
Technicians and Inspectors	75
Support Staff [8]	105
Total Personnel	**420**

In addition to Newfoundland Power's own personnel, the Company drew upon personnel from inside and outside the province. This included crews and equipment from the Company's contractors, Newfoundland and Labrador Hydro, Maritime Electric and Fortis Alberta.[9]

Damage Assessment

The damage caused by Hurricane Igor was primarily sustained by the distribution system and hydroelectric generation facilities.[10] The distribution system damage principally resulted from the combination of heavy rainfall and high winds, particularly in urban areas where mature trees are in close proximity to aerial distribution circuits. The hydroelectric generation facility damage principally resulted from flood conditions caused by heavy rainfall.

The total cost to reinstate the damage caused by Hurricane Igor is estimated to be approximately $5.3 million.[11] Approximately $3.0 million has been expended on the distribution system. Approximately 60% of distribution expenditures were related to operating repairs.[12] Approximately $2.1 million has been expended, or will be required to be expended in 2011, on the Company's hydroelectric generation facilities. The hydroelectric generation facilities expenditures are expected to be substantially covered by the Company's insurance program.[13] Finally, approximately $150,000 has been expended in 2010 on the transmission system, principally to reinstate 19 failed transmission structures.

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8 Support staff included personnel involved in (i) answering and following up on customer calls; (ii) electrical system control, prioritization, coordination and dispatch of work; and (iii) delivery of materials, equipment and meals. Support staff included a variety of staff, typically diverted from their normal duties to assist in the restoration effort.

9 Newfoundland and Labrador Hydro provided 13 employees, and Maritime Electric and Fortis Alberta provided 5 employees each.

10 Appendix B provides a series of pictures of electricity system damage resulting from Hurricane Igor.

11 This amount does not include the costs associated with call center operations or the costs associated with support staff diverted from their normal duties to assist in the restoration effort.

12 Much of the damage caused to distribution systems by Hurricane Igor resulted from trees in contact with aerial distribution circuits. Most often the necessary repairs required cutting trees and reconnecting broken electrical conductor. Such repairs are, in accounting terms, considered an operating expense.

13 The Company's insurance program coverage for the damage to hydroelectric generation facilities is subject to a $200,000 deductible.

2010 Capital Costs

Distribution System
The damage to the distribution system throughout Eastern Newfoundland was extensive, with the Northeast Avalon area sustaining the most damage due to high winds and falling trees. The capital cost of replacing distribution poles, transformers, service wires and streetlights was approximately $1.25 million.[14]

Transmission System
The damage to the transmission system was much less extensive than that to the distribution system. Transmission line 123L on the Bonavista Peninsula, 55L on the Avalon Peninsula, and 4 lines in the St. John's area sustained structural damage. A total of 19 transmission structures required replacement, along with 37 additional storm guys installed on structures to add additional strength to those that were leaning. The capital cost of transmission reinstatement was approximately $150,000.

Generation System
The damage to the civil works associated with the Company's hydroelectric facilities on the Avalon, Burin and Bonavista peninsulas was also extensive. Dam and spillway structures were overtopped by the large volumes of rainwater which caused washouts and undermined areas downstream. Many roads used to access plants, dams and spillways were also washed out. In 2010, a total capital cost of approximately $500,000 was required to repair civil works associated with hydroelectric facilities. Of this amount, 70% was required to perform repairs on dams associated with the Company's Lawn and Port Union hydroelectric facilities.[15] The remaining 30% was principally required to perform smaller capital jobs necessary to restore access roads and spillway structures to safe condition.

D. PROJECT

2010 Hurricane Igor Restoration

This capital project involves the 2010 rebuilding of Company infrastructure damaged by Hurricane Igor on September 20th and 21st.

This includes all of the capital work to be completed in 2010 on the transmission, distribution and generation infrastructure damaged as a result of the hurricane. All work under this project will be completed in 2010.

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14 Appendix C includes the outage data broken down by feeder, in chronological order for Tuesday, September 21st, through Saturday, September 25th.

15 The Lawn plant on the Burin Peninsula and the Port Union plant on the Bonavista Peninsula experienced the most severe damage. At Lawn the forebay dam overtopped resulting in erosion of the downstream rockfill ballast and undermining of the penstock support structures. Significant capital work is required to reinstate these structures. At Port Union three dams experienced severe damage from overtopping and the powerhouse was flooded causing extensive damage to the electrical and mechanical systems within the powerhouse. The engineering review of electrical and mechanical systems at Port Union plant is ongoing.

The repair of damaged generation systems will require some work to be completed in 2011, which is not included in this project. It is expected that the work to be completed in 2011 will be related to (i) forebay dam and penstock supports at Lawn plant, and (ii) electrical and mechanical systems damaged by the flooding of Port Union plant. This work is expected to be the subject of a 2011 supplementary capital budget application.

Project Cost

Table 3 shows the estimated capital expenditures associated with this project.[16]

Table 3
Capital Expenditure Estimates

Class	**2010 Allowance for Unforeseen Items**
Distribution	$1,250,000
Transmission	$150,000
Generation	$500,000
Total	**$1,900,000**

Total capital expenditures associated with Hurricane Igor restoration are expected to be in the order of $3.5 million. This includes approximately $1.9 million in 2010 Hurricane Igor restoration costs and an estimated $1.6 million in 2011 expenditures.[17]

The 2010 capital expenditures associated with Hurricane Igor restoration have been undertaken in accordance with the Allowance for Unforeseen Items capital project approved as part of the Company's 2010 capital budget. This effectively depletes the approved allowance. To address unforeseen events that may arise during the remainder of 2010, this application requests that the balance of the 2010 Allowance for Unforeseen Items be restored to $750,000.

Project Schedule

The rebuilding of the damaged transmission, distribution and generation infrastructure within the scope of this project has been substantially completed. Some work remains to be completed on the generation infrastructure. This work is expected to be completed by the end of 2010.

[16] Although not all contractor and supplier invoices have yet been finalized, reasonable estimates have been made for the purpose of determining storm-related capital expenditure requirements.

[17] This is a preliminary estimate of work which will be required in 2011 in relation to the Company's Lawn and Port Union generation plants. Engineering review of the work required is currently ongoing. Therefore this estimate may be subject to material change.

Appendix A

Weather Data

Environment Canada's Follow-up Summary of Hurricane Igor

September 23, 2010 6:28 PM
AWCN16 CWHX 231857

Selected items from the *Special Weather Summary Message* for Newfoundland and Labrador issued by Environment Canada at 4:27 PM NDT Thursday September 23, 2010

Table B1 includes data for rainfall experienced during Hurricane Igor.

Table B1

Total Rainfalls from Official and Other Sources

Location	Amount (millimetres)	Note
St. Lawrence	238	
Bonavista	200+	Stopped recording rainfall at 1:30 PM Tuesday
Lethbridge	194	Private station
St. Pierre and Miquelon	160	
Pouch Cove	142	HAM Radio network
St. John's West	134	
Bay D'Espoir	124	Hydro Generating Station
Gander Airport	124	
St. John's Airport	120	
Burgeo	41	

In statistical terms Hurricane Igor was effectively a 50 to 100 year event, depending upon how one chooses to define it. The rainfall of 238 mm at St. Lawrence during Igor is unprecedented for that location. Many of the other stations reporting 150+ mm set new records, amounting to a 100 year rainfall event.

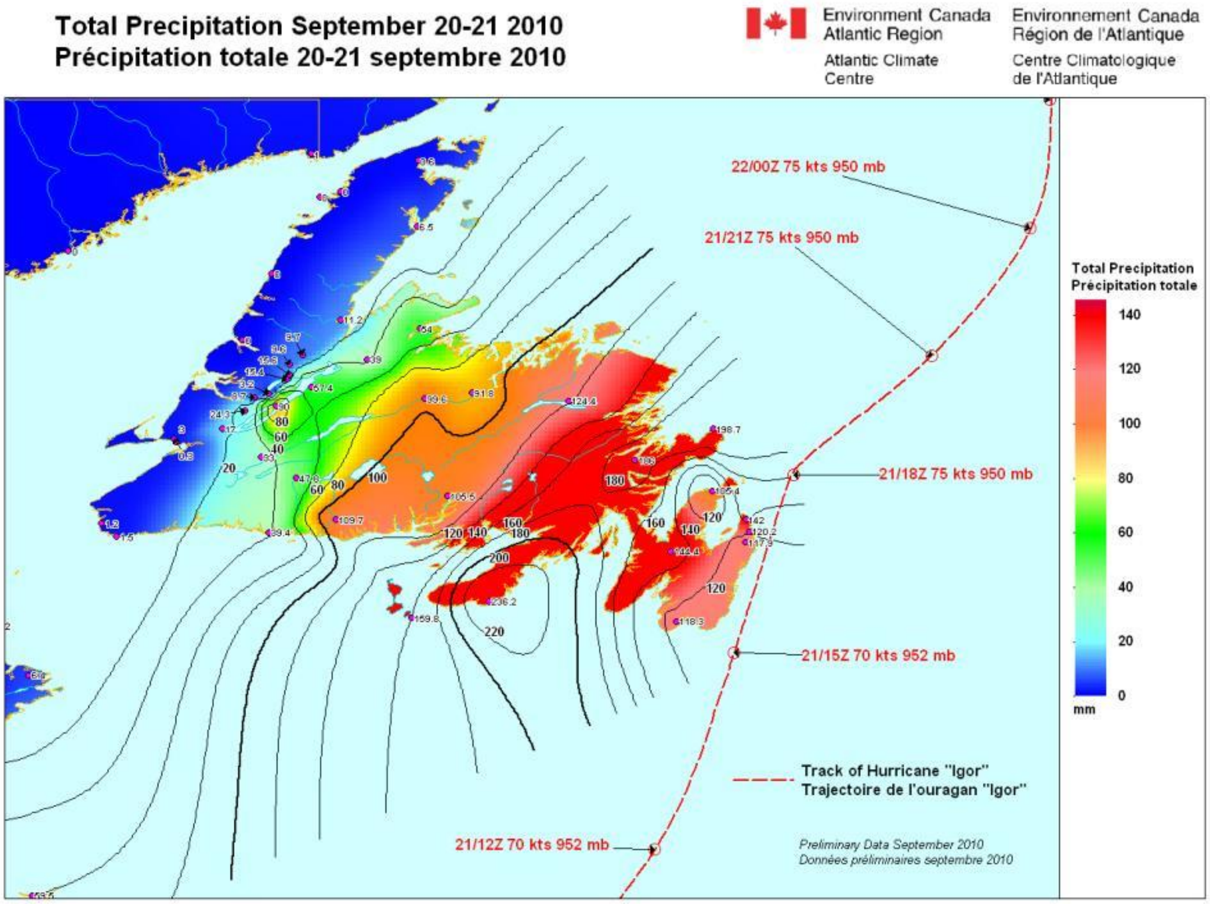

Total Precipitation September 20-21 2010
Précipitation totale 20-21 septembre 2010
Environment Canada
Atlantic Region
Atlantic Climate Centre
Environnement Canada
Région de l'Atlantique
Centre Climatologique de l'Atlantique
22/00Z 75 kts 950 mb
21/21Z 75 kts 950 mb
21/18Z 75 kts 950 mb
21/15Z 70 kts 952 mb
21/12Z 70 kts 952 mb
Total Precipitation
Précipitation totale
140
120
100
80
60
40
20
0
mm
Track of Hurricane "Igor"
Trajectoire de l'ouragan "Igor"
Preliminary Data September 2010
Données préliminaires septembre 2010

Table B2 includes data for wind speed experienced during Hurricane Igor.

Table B2

Peak Wind Speeds from Official and Other Sources

Location	Wind Speed (km/h)	Note
Cape Pine	172	122+ km/h sustained
Sagona Island	163	113 km/h sustained
Bonavista	155	122 km/h sustained
Pouch Cove	147	HAM Radio Network
Pool’s Island	146	104 km/h sustained
St. John’s Airport	137	92 km/h sustained
Grate’s Cove	135	
St. Pierre	135	91 km/h sustained
Argentia	132	
Twillingate	131	
St. Lawrence	124	
St. John’s West	117	
Winterland	111	
Englee	111	
Gander	109	
Cape Race	106	
Burgeo	100	
Stephenville	98	
Port aux Basques	95	
St. Anthony	81	

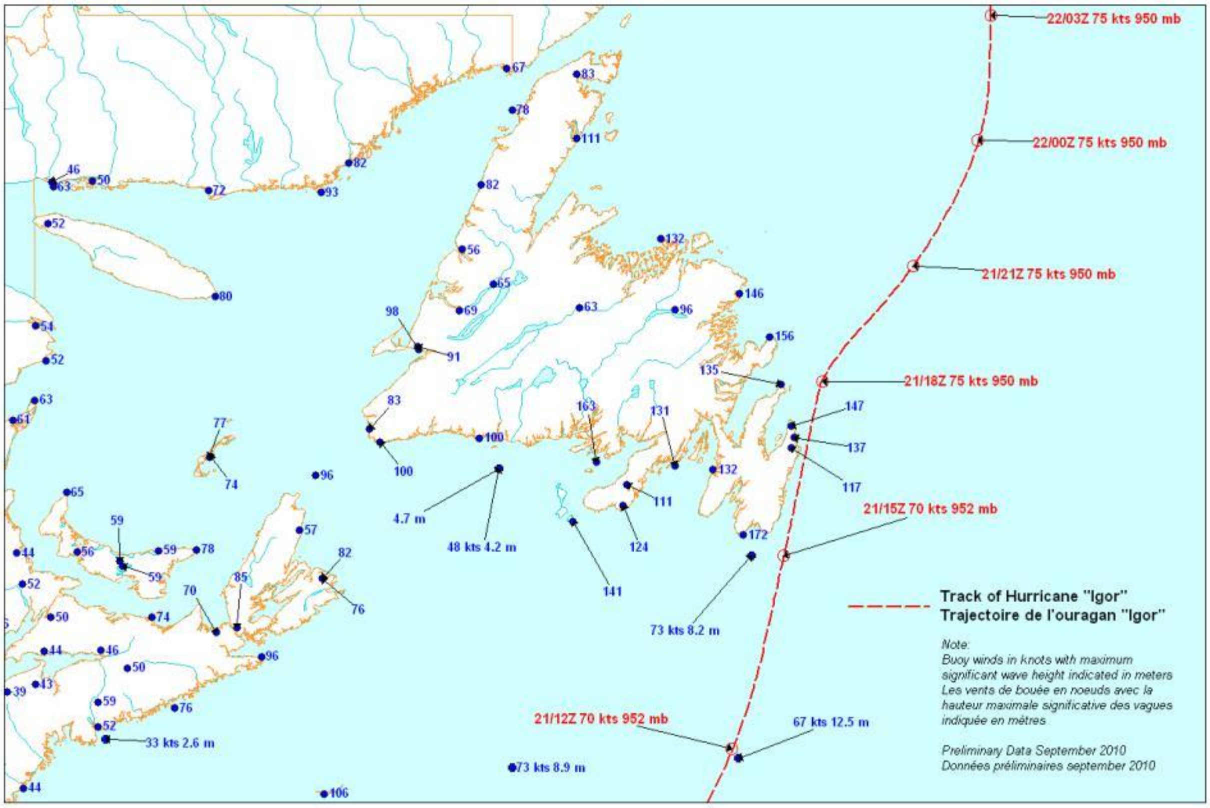
Note: Sustained wind is the average wind speed over a 10 minute period

In terms of wind speed, no all-time records were broken, however the wind speeds were rare for September and the broad area of these extreme winds was even more rare for this time of year. Winds of this magnitude occur about once every 5 to 10 years in Eastern Newfoundland including intense winter storms.

Maximum Wind Gusts (km/h) September 20-21 2010
Rafale maximum de vent (km/h) 20-21 septembre 2010

Environment Canada
Atlantic Region
Atlantic Climate Centre

Environnement Canada
Région de l'Atlantique
Centre Climatologique de l'Atlantique



Appendix B

Pictures

Streetlight Pole Cracked at Base

Tree in Line on Military Road, St. John’s

Trees Take Down Line, St. John's

Service Truck, Waterford Bridge Road, St. John's

Lawn Spillway

Lawn Plant Forebay Dam and Penstock

Lawn Plant, Burin Peninsula

Fall Pond Plant, Little St. Lawrence, Burin Peninsula

Port Union Plant Exterior

Port Union Plant Interior

Petty Harbour Spillway

Petty Harbour Penstock

Petty Harbour Spillway

Highway Outside Port Rexton

Streetlight Hanging from Broken Pole

Princeton Pond Substation, Bonavista Peninsula

Metering Tank with Broken Pole, Fish Meal Plant, Carbonear

Broken Distribution Structures and Transformer on Ground, Fish Meal Plant, Carbonear

Appendix C

Outage Data

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
Avalon	BRB-05	21-Sep-2010	12:01 AM	21-Sep-2010	12:15 AM
St. John's	CHA-01	21-Sep-2010	12:01 AM	21-Sep-2010	12:16 AM
St. John's	HWD-01	21-Sep-2010	12:01 AM	21-Sep-2010	12:16 AM
St. John's	VIR-07	21-Sep-2010	12:07 AM	24-Sep-2010	3:08 AM
Burin	LAU-01	21-Sep-2010	10:52 AM	21-Sep-2010	1:42 PM
Stephenville	LGL-02	21-Sep-2010	11:46 AM	21-Sep-2010	6:18 PM
St. John's	KBR-04	21-Sep-2010	11:50 AM	21-Sep-2010	1:05 PM
Bonavista	BVA-01	21-Sep-2010	11:55 AM	21-Sep-2010	1:43 PM
Stephenville	PAB-03	21-Sep-2010	12:04 PM	22-Sep-2010	2:08 PM
Stephenville	PAB-05	21-Sep-2010	12:04 PM	22-Sep-2010	2:08 PM
Avalon	BLA-01	21-Sep-2010	12:21 PM	21-Sep-2010	8:14 PM
Avalon	BLK-01	21-Sep-2010	12:43 PM	21-Sep-2010	1:49 PM
Bonavista	PBD-01	21-Sep-2010	12:59 PM	21-Sep-2010	7:45 PM
Avalon	BRB-03	21-Sep-2010	1:05 PM	21-Sep-2010	1:36 PM
Gander	GAM-01	21-Sep-2010	1:16 PM	21-Sep-2010	2:42 PM
Gander	HBS-01	21-Sep-2010	1:16 PM	21-Sep-2010	2:42 PM
Gander	HBS-02	21-Sep-2010	1:16 PM	21-Sep-2010	2:42 PM
Bonavista	LET-01	21-Sep-2010	1:29 PM	21-Sep-2010	1:31 PM
Bonavista	MIL-01	21-Sep-2010	1:29 PM	21-Sep-2010	1:31 PM
Bonavista	MIL-02	21-Sep-2010	1:29 PM	21-Sep-2010	1:31 PM
Avalon	CLK-02	21-Sep-2010	1:32 PM	22-Sep-2010	10:15 PM
Avalon	CLK-03	21-Sep-2010	1:32 PM	23-Sep-2010	12:25 AM
Avalon	CLK-04	21-Sep-2010	1:32 PM	22-Sep-2010	10:21 PM
Avalon	DUN-01	21-Sep-2010	1:32 PM	23-Sep-2010	1:35 AM
Avalon	DUN-02	21-Sep-2010	1:32 PM	22-Sep-2010	9:19 PM
Avalon	PJN-01	21-Sep-2010	1:32 PM	22-Sep-2010	9:13 PM
Avalon	QTZ-01	21-Sep-2010	1:32 PM	22-Sep-2010	9:13 PM
Bonavista	CLV-01	21-Sep-2010	1:33 PM	21-Sep-2010	10:40 PM
Burin	LAU-01	21-Sep-2010	1:42 PM	21-Sep-2010	5:42 PM
Bonavista	SMV-01	21-Sep-2010	1:45 PM	24-Sep-2010	6:14 PM
St. John's	CAB-01	21-Sep-2010	1:59 PM	21-Sep-2010	2:03 PM
St. John's	FER-01	21-Sep-2010	1:59 PM	21-Sep-2010	2:03 PM
St. John's	MOB-01	21-Sep-2010	1:59 PM	21-Sep-2010	4:22 PM
St. John's	MOB-02	21-Sep-2010	1:59 PM	21-Sep-2010	4:22 PM
St. John's	CAR-01	21-Sep-2010	2:02 PM	21-Sep-2010	4:11 PM
Gander	COB-01	21-Sep-2010	2:18 PM	21-Sep-2010	4:13 PM
Avalon	ILC-01	21-Sep-2010	2:18 PM	23-Sep-2010	11:03 AM
Gander	GAN-02	21-Sep-2010	2:26 PM	21-Sep-2010	3:18 PM
Gander	GBY-01	21-Sep-2010	2:26 PM	21-Sep-2010	8:23 PM
Gander	GBY-02	21-Sep-2010	2:26 PM	21-Sep-2010	8:24 PM
Gander	GBY-03	21-Sep-2010	2:26 PM	22-Sep-2010	5:50 PM
Bonavista	LOK-01	21-Sep-2010	2:26 PM	23-Sep-2010	11:56 AM

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
St. John's	SLA-08	21-Sep-2010	2:27 PM	22-Sep-2010	3:34 AM
Avalon	NCH-02	21-Sep-2010	2:28 PM	22-Sep-2010	10:09 AM
St. John's	KBR-03	21-Sep-2010	2:29 PM	21-Sep-2010	5:39 PM
Gander	COB-03	21-Sep-2010	2:31 PM	21-Sep-2010	6:18 PM
Avalon	HGR-01	21-Sep-2010	2:33 PM	21-Sep-2010	5:35 PM
Stephenville	GBS-02	21-Sep-2010	2:34 PM	21-Sep-2010	3:34 PM
St. John's	SLA-13	21-Sep-2010	2:34 PM	23-Sep-2010	7:47 PM
St. John's	KBR-01	21-Sep-2010	2:36 PM	22-Sep-2010	9:45 AM
St. John's	KEN-04	21-Sep-2010	2:36 PM	21-Sep-2010	8:58 PM
Gander	HBS-01	21-Sep-2010	2:37 PM	24-Sep-2010	1:22 PM
Gander	TNS-01	21-Sep-2010	2:40 PM	23-Sep-2010	4:37 PM
St. John's	GOU-01	21-Sep-2010	2:43 PM	21-Sep-2010	6:19 PM
Avalon	HGR-02	21-Sep-2010	2:43 PM	21-Sep-2010	6:44 PM
St. John's	VIR-05	21-Sep-2010	2:43 PM	23-Sep-2010	7:22 PM
St. John's	SLA-05	21-Sep-2010	2:44 PM	23-Sep-2010	11:17 AM
St. John's	GOU-02	21-Sep-2010	2:45 PM	22-Sep-2010	9:36 AM
St. John's	KBR-09	21-Sep-2010	2:46 PM	22-Sep-2010	8:54 PM
St. John's	CHA-02	21-Sep-2010	2:51 PM	21-Sep-2010	2:56 PM
St. John's	FER-01	21-Sep-2010	2:51 PM	22-Sep-2010	2:42 PM
St. John's	VIR-08	21-Sep-2010	2:51 PM	22-Sep-2010	10:59 PM
Corner Brook	WAL-05	21-Sep-2010	2:54 PM	21-Sep-2010	3:14 PM
Bonavista	CLV-02	21-Sep-2010	2:55 PM	21-Sep-2010	7:13 PM
St. John's	GOU-03	21-Sep-2010	3:00 PM	22-Sep-2010	10:57 AM
Bonavista	CAT-03	21-Sep-2010	3:04 PM	23-Sep-2010	6:13 PM
St. John's	KBR-11	21-Sep-2010	3:04 PM	24-Sep-2010	1:35 AM
St. John's	BCV-02	21-Sep-2010	3:05 PM	21-Sep-2010	4:55 PM
Gander	GAM-01	21-Sep-2010	3:06 PM	21-Sep-2010	3:21 PM
Gander	HBS-01	21-Sep-2010	3:06 PM	21-Sep-2010	3:21 PM
Gander	HBS-02	21-Sep-2010	3:06 PM	21-Sep-2010	3:21 PM
Gander	COB-02	21-Sep-2010	3:08 PM	21-Sep-2010	3:21 PM
St. John's	RRD-03	21-Sep-2010	3:12 PM	22-Sep-2010	3:42 PM
St. John's	MOL-09	21-Sep-2010	3:14 PM	22-Sep-2010	2:50 PM
St. John's	CHA-03	21-Sep-2010	3:21 PM	22-Sep-2010	6:14 AM
St. John's	MOL-06	21-Sep-2010	3:22 PM	22-Sep-2010	10:31 AM
St. John's	PEP-02	21-Sep-2010	3:22 PM	22-Sep-2010	12:05 PM
St. John's	PUL-01	21-Sep-2010	3:25 PM	22-Sep-2010	2:11 AM
St. John's	VIR-01	21-Sep-2010	3:25 PM	23-Sep-2010	5:14 PM
St. John's	GDL-01	21-Sep-2010	3:26 PM	23-Sep-2010	10:50 AM
St. John's	VIR-07	21-Sep-2010	3:26 PM	21-Sep-2010	12:07 AM
St. John's	SLA-11	21-Sep-2010	3:29 PM	22-Sep-2010	6:54 AM
St. John's	SLA-12	21-Sep-2010	3:29 PM	23-Sep-2010	1:14 PM
St. John's	SLA-10	21-Sep-2010	3:30 PM	21-Sep-2010	7:32 PM
Gander	GPD-01	21-Sep-2010	3:33 PM	21-Sep-2010	3:34 PM

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
Avalon	RVH-01	21-Sep-2010	3:33 PM	21-Sep-2010	5:03 PM
Avalon	RVH-02	21-Sep-2010	3:33 PM	21-Sep-2010	5:03 PM
Avalon	SCT-01	21-Sep-2010	3:33 PM	21-Sep-2010	5:03 PM
Avalon	SCT-02	21-Sep-2010	3:33 PM	21-Sep-2010	5:03 PM
Gander	TRN-01	21-Sep-2010	3:33 PM	21-Sep-2010	3:34 PM
Gander	TRN-02	21-Sep-2010	3:33 PM	21-Sep-2010	3:34 PM
Avalon	TRP-01	21-Sep-2010	3:33 PM	21-Sep-2010	5:03 PM
Avalon	TRP-02	21-Sep-2010	3:33 PM	21-Sep-2010	5:03 PM
Gander	GPD-01	21-Sep-2010	3:34 PM	21-Sep-2010	3:49 PM
Gander	TRN-01	21-Sep-2010	3:34 PM	21-Sep-2010	3:48 PM
Gander	TRN-02	21-Sep-2010	3:34 PM	21-Sep-2010	3:48 PM
Bonavista	LET-01	21-Sep-2010	3:36 PM	22-Sep-2010	7:50 PM
Bonavista	MIL-01	21-Sep-2010	3:36 PM	21-Sep-2010	6:54 PM
Bonavista	MIL-02	21-Sep-2010	3:36 PM	21-Sep-2010	6:54 PM
Bonavista	SUN-03	21-Sep-2010	3:36 PM	24-Sep-2010	10:42 AM
Avalon	NCH-01	21-Sep-2010	3:41 PM	21-Sep-2010	7:00 PM
Avalon	NCH-03	21-Sep-2010	3:41 PM	21-Sep-2010	7:08 PM
Avalon	OPL-01	21-Sep-2010	3:41 PM	21-Sep-2010	7:10 PM
Avalon	OPL-02	21-Sep-2010	3:41 PM	21-Sep-2010	7:10 PM
Avalon	OPL-03	21-Sep-2010	3:41 PM	21-Sep-2010	8:50 PM
St. John's	CHA-02	21-Sep-2010	3:42 PM	21-Sep-2010	5:49 PM
Corner Brook	HUM-09	21-Sep-2010	3:48 PM	21-Sep-2010	4:23 PM
St. John's	VIR-01	21-Sep-2010	3:48 PM	23-Sep-2010	2:15 AM
Gander	TRN-02	21-Sep-2010	3:51 PM	21-Sep-2010	6:48 PM
Gander	GPD-01	21-Sep-2010	3:55 PM	21-Sep-2010	6:28 PM
Gander	TRN-01	21-Sep-2010	3:55 PM	21-Sep-2010	6:28 PM
Gander	GAN-04	21-Sep-2010	4:04 PM	21-Sep-2010	7:23 PM
Gander	GAN-02	21-Sep-2010	4:08 PM	21-Sep-2010	7:59 PM
St. John's	SLA-09	21-Sep-2010	4:08 PM	22-Sep-2010	3:32 AM
Gander	COB-02	21-Sep-2010	4:10 PM	21-Sep-2010	8:40 PM
St. John's	PEP-01	21-Sep-2010	4:10 PM	23-Sep-2010	2:19 PM
Gander	WES-01	21-Sep-2010	4:10 PM	21-Sep-2010	8:02 PM
Avalon	BLK-01	21-Sep-2010	4:13 PM	21-Sep-2010	4:17 PM
Gander	COB-01	21-Sep-2010	4:15 PM	21-Sep-2010	7:38 PM
Avalon	BLK-01	21-Sep-2010	4:18 PM	21-Sep-2010	4:31 PM
St. John's	MOL-02	21-Sep-2010	4:18 PM	21-Sep-2010	6:32 PM
St. John's	KBR-02	21-Sep-2010	4:20 PM	23-Sep-2010	2:49 AM
St. John's	KBR-06	21-Sep-2010	4:21 PM	23-Sep-2010	8:58 PM
Bonavista	CAT-01	21-Sep-2010	4:22 PM	23-Sep-2010	10:00 AM
St. John's	GDL-04	21-Sep-2010	4:23 PM	22-Sep-2010	10:42 AM
St. John's	GDL-06	21-Sep-2010	4:23 PM	22-Sep-2010	11:10 AM
St. John's	RRD-09	21-Sep-2010	4:26 PM	24-Sep-2010	12:35 AM
Bonavista	BVA-01	21-Sep-2010	4:30 PM	23-Sep-2010	11:55 AM

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
Bonavista	BVA-02	21-Sep-2010	4:30 PM	23-Sep-2010	10:36 AM
Bonavista	BVA-03	21-Sep-2010	4:30 PM	23-Sep-2010	1:09 PM
Bonavista	CAT-02	21-Sep-2010	4:30 PM	23-Sep-2010	9:58 AM
Avalon	BLK-01	21-Sep-2010	4:31 PM	21-Sep-2010	8:26 PM
St. John's	PEP-03	21-Sep-2010	4:57 PM	23-Sep-2010	7:17 PM
Avalon	RVH-01	21-Sep-2010	5:04 PM	21-Sep-2010	6:28 PM
St. John's	CHA-02	21-Sep-2010	5:49 PM	24-Sep-2010	5:23 AM
St. John's	PUL-02	21-Sep-2010	6:03 PM	22-Sep-2010	5:54 AM
St. John's	PUL-03	21-Sep-2010	6:03 PM	21-Sep-2010	9:13 PM
Gander	TRN-01	21-Sep-2010	6:28 PM	22-Sep-2010	9:09 AM
St. John's	MOB-01	21-Sep-2010	6:29 PM	21-Sep-2010	7:18 PM
St. John's	MOB-02	21-Sep-2010	6:29 PM	22-Sep-2010	11:40 AM
Bonavista	MIL-02	21-Sep-2010	6:54 PM	22-Sep-2010	1:25 PM
Avalon	OPL-02	21-Sep-2010	7:10 PM	22-Sep-2010	4:58 PM
Corner Brook	WAL-05	21-Sep-2010	7:28 PM	21-Sep-2010	8:02 PM
Gander	COB-01	21-Sep-2010	7:38 PM	21-Sep-2010	7:41 PM
Gander	COB-01	21-Sep-2010	7:41 PM	21-Sep-2010	8:14 PM
St. John's	HWD-07	21-Sep-2010	7:42 PM	22-Sep-2010	8:29 PM
St. John's	BCV-04	21-Sep-2010	7:49 PM	22-Sep-2010	9:48 PM
Gander	GAN-02	21-Sep-2010	7:59 PM	21-Sep-2010	11:25 PM
Avalon	SCV-01	21-Sep-2010	8:00 PM	22-Sep-2010	10:03 AM
St. John's	MOL-02	21-Sep-2010	8:13 PM	21-Sep-2010	9:39 PM
Gander	COB-01	21-Sep-2010	8:14 PM	21-Sep-2010	11:04 PM
Avalon	SCT-02	21-Sep-2010	8:20 PM	22-Sep-2010	10:42 AM
Gander	WES-02	21-Sep-2010	8:23 PM	21-Sep-2010	8:36 PM
Avalon	BLK-01	21-Sep-2010	8:26 PM	21-Sep-2010	8:28 PM
Gander	COB-02	21-Sep-2010	8:40 PM	22-Sep-2010	10:05 AM
Avalon	OPL-03	21-Sep-2010	8:50 PM	22-Sep-2010	12:09 PM
Avalon	VIC-02	21-Sep-2010	9:10 PM	21-Sep-2010	9:19 PM
Avalon	VIC-02	21-Sep-2010	9:19 PM	22-Sep-2010	2:00 PM
St. John's	MOB-01	21-Sep-2010	9:35 PM	21-Sep-2010	9:37 PM
St. John's	MOL-02	21-Sep-2010	9:39 PM	24-Sep-2010	5:53 AM
St. John's	CAB-01	21-Sep-2010	9:46 PM	21-Sep-2010	9:50 PM
St. John's	MOB-01	21-Sep-2010	9:46 PM	21-Sep-2010	10:20 PM
Avalon	NHR-02	21-Sep-2010	9:55 PM	22-Sep-2010	10:45 AM
Avalon	WAV-02	21-Sep-2010	9:55 PM	22-Sep-2010	1:28 PM
Corner Brook	WAL-05	21-Sep-2010	10:09 PM	21-Sep-2010	10:13 PM
Gander	TRN-02	21-Sep-2010	10:11 PM	21-Sep-2010	10:17 PM
Corner Brook	WAL-05	21-Sep-2010	10:13 PM	21-Sep-2010	11:58 PM
Gander	COB-01	21-Sep-2010	11:04 PM	21-Sep-2010	11:12 PM
Gander	GAN-02	21-Sep-2010	11:25 PM	21-Sep-2010	11:26 PM
Gander	GAN-02	21-Sep-2010	11:29 PM	21-Sep-2010	11:38 PM
Gander	GAN-02	21-Sep-2010	11:38 PM	22-Sep-2010	11:57 AM

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Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
St. John's	CAB-01	21-Sep-2010	11:59 PM	21-Sep-2010	12:12 AM
St. John's	MOB-01	21-Sep-2010	11:59 PM	21-Sep-2010	12:03 AM
St. John's	CHA-01	22-Sep-2010	12:16 AM	22-Sep-2010	1:55 PM
St. John's	MOB-01	22-Sep-2010	12:20 AM	22-Sep-2010	12:32 AM
St. John's	KBR-07	22-Sep-2010	7:16 AM	22-Sep-2010	9:44 AM
St. John's	RRD-04	22-Sep-2010	8:36 AM	22-Sep-2010	6:45 PM
St. John's	HWD-01	22-Sep-2010	9:04 AM	22-Sep-2010	10:18 AM
St. John's	GOU-02	22-Sep-2010	9:36 AM	22-Sep-2010	12:51 PM
Gander	GAM-01	22-Sep-2010	9:38 AM	22-Sep-2010	9:49 AM
Avalon	SCV-01	22-Sep-2010	10:03 AM	22-Sep-2010	9:20 PM
St. John's	GOU-03	22-Sep-2010	10:58 AM	22-Sep-2010	3:18 PM
St. John's	GDL-06	22-Sep-2010	11:10 AM	23-Sep-2010	8:00 PM
St. John's	KEN-02	22-Sep-2010	11:37 AM	22-Sep-2010	1:44 PM
St. John's	RRD-02	22-Sep-2010	12:00 PM	22-Sep-2010	4:32 PM
St. John's	PEP-02	22-Sep-2010	12:08 PM	23-Sep-2010	6:00 PM
Avalon	OPL-03	22-Sep-2010	12:09 PM	22-Sep-2010	8:28 PM
Stephenville	GBS-01	22-Sep-2010	12:20 PM	22-Sep-2010	12:22 PM
Stephenville	GBS-02	22-Sep-2010	12:20 PM	22-Sep-2010	12:22 PM
Stephenville	LGL-01	22-Sep-2010	12:20 PM	22-Sep-2010	12:22 PM
Stephenville	LGL-02	22-Sep-2010	12:20 PM	22-Sep-2010	12:22 PM
St. John's	GOU-01	22-Sep-2010	12:51 PM	22-Sep-2010	1:01 PM
St. John's	GOU-02	22-Sep-2010	12:51 PM	22-Sep-2010	12:55 PM
Avalon	SCT-02	22-Sep-2010	1:08 PM	22-Sep-2010	4:08 PM
St. John's	GOU-02	22-Sep-2010	1:17 PM	22-Sep-2010	1:19 PM
St. John's	RRD-07	22-Sep-2010	1:20 PM	22-Sep-2010	6:33 PM
Gander	SUM-02	22-Sep-2010	1:23 PM	22-Sep-2010	2:16 PM
Bonavista	MIL-02	22-Sep-2010	1:25 PM	22-Sep-2010	2:05 PM
St. John's	CHA-01	22-Sep-2010	1:55 PM	22-Sep-2010	1:57 PM
St. John's	CHA-01	22-Sep-2010	1:57 PM	24-Sep-2010	1:00 AM
St. John's	CHA-03	22-Sep-2010	1:57 PM	23-Sep-2010	1:39 AM
Bonavista	MIL-02	22-Sep-2010	2:05 PM	22-Sep-2010	2:50 PM
Bonavista	LET-01	22-Sep-2010	2:40 PM	22-Sep-2010	6:18 PM
Bonavista	MIL-02	22-Sep-2010	2:50 PM	22-Sep-2010	4:21 PM
St. John's	GOU-03	22-Sep-2010	3:18 PM	22-Sep-2010	3:58 PM
Burin	WBC-01	22-Sep-2010	3:35 PM	22-Sep-2010	5:40 PM
Bonavista	MIL-01	22-Sep-2010	4:21 PM	22-Sep-2010	4:28 PM
Bonavista	MIL-02	22-Sep-2010	4:21 PM	22-Sep-2010	4:28 PM
Bonavista	MIL-02	22-Sep-2010	4:28 PM	23-Sep-2010	7:50 PM
St. John's	BCV-03	22-Sep-2010	5:09 PM	22-Sep-2010	5:45 PM
St. John's	MOB-01	22-Sep-2010	5:28 PM	22-Sep-2010	5:39 PM
St. John's	MOB-02	22-Sep-2010	5:28 PM	22-Sep-2010	5:39 PM
St. John's	HWD-01	22-Sep-2010	5:38 PM	22-Sep-2010	5:54 PM
St. John's	BCV-01	22-Sep-2010	6:47 PM	22-Sep-2010	8:39 PM

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
Bonavista	LET-01	22-Sep-2010	7:50 PM	22-Sep-2010	9:25 PM
St. John's	SLA-10	22-Sep-2010	8:25 PM	22-Sep-2010	8:57 PM
St. John's	HWD-07	22-Sep-2010	8:29 PM	22-Sep-2010	8:59 PM
St. John's	KBR-09	22-Sep-2010	8:54 PM	22-Sep-2010	9:14 PM
St. John's	HWD-07	22-Sep-2010	8:59 PM	23-Sep-2010	4:21 AM
St. John's	KBR-09	22-Sep-2010	9:14 PM	23-Sep-2010	12:05 AM
Avalon	DUN-02	22-Sep-2010	9:19 PM	23-Sep-2010	11:25 AM
Bonavista	LET-01	22-Sep-2010	9:25 PM	23-Sep-2010	2:40 PM
St. John's	BCV-04	22-Sep-2010	9:48 PM	23-Sep-2010	4:55 PM
St. John's	KBR-09	23-Sep-2010	12:05 AM	23-Sep-2010	12:09 AM
St. John's	KBR-09	23-Sep-2010	12:09 AM	23-Sep-2010	3:59 AM
Avalon	DUN-01	23-Sep-2010	1:35 AM	23-Sep-2010	11:05 AM
St. John's	KBR-02	23-Sep-2010	2:49 AM	23-Sep-2010	10:53 AM
St. John's	KBR-09	23-Sep-2010	3:59 AM	23-Sep-2010	4:05 AM
St. John's	KBR-09	23-Sep-2010	4:05 AM	23-Sep-2010	6:22 AM
St. John's	KBR-09	23-Sep-2010	6:22 AM	23-Sep-2010	6:24 AM
St. John's	KBR-09	23-Sep-2010	6:23 AM	23-Sep-2010	10:15 AM
St. John's	KBR-09	23-Sep-2010	6:24 AM	23-Sep-2010	8:25 AM
St. John's	MOL-05	23-Sep-2010	6:44 AM	23-Sep-2010	7:54 AM
St. John's	KBR-09	23-Sep-2010	8:25 AM	23-Sep-2010	8:26 AM
St. John's	KBR-09	23-Sep-2010	8:26 AM	24-Sep-2010	6:21 AM
Bonavista	CAT-01	23-Sep-2010	9:00 AM	24-Sep-2010	9:00 AM
Bonavista	CAT-02	23-Sep-2010	9:58 AM	23-Sep-2010	6:13 PM
Bonavista	LET-01	23-Sep-2010	11:35 AM	23-Sep-2010	1:24 PM
Bonavista	LOK-01	23-Sep-2010	11:56 AM	23-Sep-2010	4:25 PM
Bonavista	BVA-03	23-Sep-2010	1:09 PM	23-Sep-2010	4:07 PM
Avalon	RVH-01	23-Sep-2010	1:13 PM	23-Sep-2010	2:07 PM
St. John's	SLA-12	23-Sep-2010	1:14 PM	23-Sep-2010	8:52 PM
Bonavista	LET-01	23-Sep-2010	1:24 PM	23-Sep-2010	1:26 PM
Bonavista	LET-01	23-Sep-2010	1:26 PM	23-Sep-2010	6:43 PM
St. John's	GDL-05	23-Sep-2010	1:33 PM	23-Sep-2010	2:59 PM
Bonavista	BVA-01	23-Sep-2010	1:43 PM	23-Sep-2010	1:50 PM
Bonavista	BVA-01	23-Sep-2010	1:50 PM	23-Sep-2010	1:56 PM
Bonavista	BVA-01	23-Sep-2010	1:56 PM	23-Sep-2010	2:26 PM
St. John's	PEP-01	23-Sep-2010	2:19 PM	23-Sep-2010	7:30 PM
Bonavista	BVA-01	23-Sep-2010	2:26 PM	23-Sep-2010	2:34 PM
Burin	LAU-01	23-Sep-2010	2:30 PM	23-Sep-2010	6:34 PM
Bonavista	BVA-01	23-Sep-2010	2:34 PM	23-Sep-2010	2:41 PM
Bonavista	BVA-01	23-Sep-2010	2:41 PM	23-Sep-2010	6:13 PM
Avalon	RVH-01	23-Sep-2010	2:46 PM	24-Sep-2010	12:12 PM
St. John's	GDL-05	23-Sep-2010	2:59 PM	23-Sep-2010	7:35 PM
Bonavista	BVA-03	23-Sep-2010	4:07 PM	23-Sep-2010	6:13 PM
Bonavista	LOK-01	23-Sep-2010	4:25 PM	23-Sep-2010	7:20 PM

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
Gander	GPD-01	23-Sep-2010	4:26 PM	23-Sep-2010	5:27 PM
St. John's	KBR-03	23-Sep-2010	5:30 PM	23-Sep-2010	5:33 PM
St. John's	KBR-04	23-Sep-2010	5:30 PM	23-Sep-2010	5:33 PM
Bonavista	BVA-01	23-Sep-2010	6:13 PM	23-Sep-2010	6:33 PM
Bonavista	BVA-02	23-Sep-2010	6:13 PM	23-Sep-2010	6:33 PM
Bonavista	BVA-03	23-Sep-2010	6:13 PM	23-Sep-2010	6:33 PM
Bonavista	CAT-01	23-Sep-2010	6:13 PM	23-Sep-2010	6:33 PM
Bonavista	CAT-02	23-Sep-2010	6:13 PM	23-Sep-2010	6:33 PM
Bonavista	CAT-03	23-Sep-2010	6:13 PM	23-Sep-2010	6:33 PM
Bonavista	LET-01	23-Sep-2010	6:18 PM	24-Sep-2010	8:35 AM
Bonavista	BVA-01	23-Sep-2010	6:33 PM	24-Sep-2010	5:08 PM
Bonavista	BVA-03	23-Sep-2010	6:33 PM	24-Sep-2010	9:30 AM
Bonavista	CAT-01	23-Sep-2010	6:33 PM	23-Sep-2010	9:00 PM
Bonavista	CAT-02	23-Sep-2010	6:33 PM	23-Sep-2010	6:45 PM
Bonavista	CAT-03	23-Sep-2010	6:33 PM	24-Sep-2010	2:35 PM
Bonavista	CAT-02	23-Sep-2010	6:45 PM	23-Sep-2010	8:15 PM
Bonavista	LOK-01	23-Sep-2010	7:20 PM	24-Sep-2010	4:01 PM
St. John's	PEP-01	23-Sep-2010	7:30 PM	23-Sep-2010	7:35 PM
St. John's	PEP-01	23-Sep-2010	7:35 PM	23-Sep-2010	9:00 PM
Bonavista	PBD-01	23-Sep-2010	7:45 PM	24-Sep-2010	4:20 PM
St. John's	SLA-13	23-Sep-2010	7:47 PM	23-Sep-2010	12:20 PM
Bonavista	MIL-02	23-Sep-2010	7:50 PM	24-Sep-2010	6:00 PM
St. John's	GDL-06	23-Sep-2010	8:00 PM	23-Sep-2010	8:06 PM
Bonavista	CAT-02	23-Sep-2010	8:15 PM	23-Sep-2010	8:40 PM
St. John's	SLA-12	23-Sep-2010	8:52 PM	23-Sep-2010	9:07 PM
St. John's	CHA-03	24-Sep-2010	1:39 AM	24-Sep-2010	1:44 AM
St. John's	MOL-08	24-Sep-2010	5:31 AM	24-Sep-2010	5:33 AM
St. John's	MOL-08	24-Sep-2010	5:33 AM	24-Sep-2010	7:00 AM
St. John's	KBR-09	24-Sep-2010	6:21 AM	24-Sep-2010	6:23 AM
St. John's	VIR-03	24-Sep-2010	8:00 AM	24-Sep-2010	12:00 PM
St. John's	OXP-01	24-Sep-2010	8:26 AM	24-Sep-2010	1:25 PM
Gander	COB-02	24-Sep-2010	9:00 AM	24-Sep-2010	11:00 AM
St. John's	VIR-04	24-Sep-2010	9:05 AM	24-Sep-2010	3:15 PM
St. John's	SJM-08	24-Sep-2010	10:05 AM	24-Sep-2010	1:00 PM
St. John's	SJM-06	24-Sep-2010	10:35 AM	24-Sep-2010	12:57 PM
Gander	COB-03	24-Sep-2010	10:40 AM	24-Sep-2010	11:00 AM
Bonavista	SUN-03	24-Sep-2010	10:42 AM	24-Sep-2010	1:17 PM
Burin	LLK-03	24-Sep-2010	10:50 AM	24-Sep-2010	11:40 AM
St. John's	SLA-05	24-Sep-2010	11:45 AM	24-Sep-2010	1:02 PM
Avalon	BLK-02	24-Sep-2010	11:59 AM	25-Sep-2010	4:00 PM
St. John's	KBR-11	24-Sep-2010	2:05 PM	24-Sep-2010	6:54 PM
Bonavista	PBD-01	24-Sep-2010	4:20 PM	24-Sep-2010	6:23 PM
Bonavista	LOK-01	24-Sep-2010	4:29 PM	24-Sep-2010	5:20 PM

		Time Off		Time Restored	
Region	**Feeder**	**Date**	**Time**	**Date**	**Time**
Bonavista	BVA-01	24-Sep-2010	5:08 PM	24-Sep-2010	9:15 PM
St. John's	SLA-09	24-Sep-2010	5:11 PM	24-Sep-2010	5:52 PM
Bonavista	LOK-01	24-Sep-2010	5:20 PM	24-Sep-2010	10:30 PM
Bonavista	MIL-02	24-Sep-2010	6:00 PM	24-Sep-2010	9:07 PM
Bonavista	SMV-01	24-Sep-2010	6:14 PM	24-Sep-2010	8:17 PM
Bonavista	PBD-01	24-Sep-2010	6:23 PM	24-Sep-2010	7:17 PM
Bonavista	LET-01	24-Sep-2010	6:43 PM	25-Sep-2010	9:09 AM
Bonavista	SMV-01	24-Sep-2010	8:17 PM	25-Sep-2010	10:55 AM

Hurricane Igor, September 2010

Port Union and Lawn Rehabilitation

Port Union and Lawn Rehabilitation

April 2011

Prepared By:

Gary Murray, P. Eng.
Gary Humby, P. Eng.
Jeremy Decker, P. Eng.

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GARY L. MURRAY
SIGNATURE
April 2011
DATE
NEWFOUNDLAND & LABRADOR

NEWFOUNDLAND POWER
A FORTIS COMPANY

Table of Contents

A. BACKGROUND

Introduction

Eastern Newfoundland experienced an extreme weather event related to Hurricane Igor on the evening of Monday September 20th and throughout the day on Tuesday September 21st, 2010. This event caused damage throughout most of Eastern Newfoundland to public infrastructure such as roads and bridges, along with buildings, private homes and businesses. It also caused damage to the Newfoundland Power ("the Company") electricity system.

Damage to the electricity system resulted in immediate service outages to Newfoundland Power's customers. The timely restoration of service was the primary focus of Newfoundland Power's response to Hurricane Igor. The timely restoration of service required the Company to make material operating and capital expenditures in 2010.

The cost and scope of work associated with the timely restoration of service to customers was the subject of an application for supplementary capital expenditure under the Allowance for Unforeseen Items filed by the Company on November 17, 2010 and subsequently approved in Board Order No. P. U. 35 (2010). This urgent service restoration work was completed in 2010.

Hurricane Igor also resulted in material damage to two of Newfoundland Power's hydroelectric generating facilities that was not addressed in 2010. Rainfall in excess of 200 mm which accompanied Hurricane Igor caused extensive damage to both the Port Union and Lawn hydroelectric generating facilities. Flood levels experienced at these two plants exceeded those established by the latest Canadian Dam Association ("CDA") Dam Safety Guidelines.

The rehabilitation work required at these two generating plants was so extensive that complete and immediate restoration was not possible. Temporary work was completed to secure both sites before winter.[1] Port Union plant remains out of service awaiting restoration work to be completed. This report addresses the damage sustained and the work necessary to fully restore both the Port Union and Lawn facilities and to return Port Union plant to service. The report also addresses the abandonment of the 46 year old diesel electric generator at Port Union.

The total capital expenditure associated with the 2011 project is estimated to be $ 1.8 million.

Hurricane Igor

On the afternoon of Tuesday, September 21st, 2010, Hurricane Igor passed east of the Avalon Peninsula maintaining hurricane status until the centre of the storm was located northeast of St. John's, at which time it was downgraded to post-tropical status. This storm caused severe flooding and wind damage due to the combined effect of Hurricane Igor and a stationary front that had previously developed to the north of the hurricane as it approached Newfoundland.

[1] Tenders were issued for the work at Lawn Spillway in October 2010 with only 1 bidder providing a quote. Upon review it was determined that the tender price was not reflective of the work involved. A decision was therefore made to carry out temporary repairs in 2010, and re-tender the work in the spring of 2011 when more competitive bids are anticipated.

Environment Canada has described the storm as the worst in memory and has no records of hurricanes or post tropical events of this magnitude striking Newfoundland in the modern era. It was effectively a 50 to 100 year storm. Rainfall of 238 mm at St. Lawrence on the Burin Peninsula during Hurricane Igor was unprecedented, amounting to a 1-in-10,000 year rainfall event.[2] Maximum recorded wind speed on the Avalon Peninsula was 172 km/hr.

The combination of heavy rainfall and high winds associated with Hurricane Igor impacted Newfoundland Power's electricity system in a number of ways. There were a large number of vegetation related distribution system failures, particularly on the Northeast Avalon Peninsula.

In addition, the record rainfalls caused flooding which eroded civil works, such as roads used to provide access to Company facilities, as well as civil structures employed to provide stability to dams and spillways associated with a number of hydroelectric plants in Eastern Newfoundland. These flood conditions caused material damage to the Company's hydroelectric generating facilities at Port Union and Lawn.

B. SYSTEM DAMAGE

Port Union Hydroelectric Development

Newfoundland Power's Port Union hydroelectric generating facility is located in the community of Port Union on the Bonavista Peninsula. The facility contains three generating units producing approximately 2.3 GWh annually.

Two of these generating units (G1 and G2) are 280 kW hydro units which are supplied by a single woodstave penstock and concrete intake. The penstock is 137 meters long with a diameter of 1.37 meters. Storage reservoirs and diversions are provided by structures located at Whirl Pond, Long Pond, Well's Pond and Halfway Pond.

The third generating unit at Port Union is a 500 kW diesel electric generator.[3] In 1945, Union Electric installed a diesel electric generator at Port Union to backup the hydroelectric generators at times of low water in the reservoir. In 1965, this original diesel generator was replaced by the Caterpillar D398A unit which is being abandoned at this time.

Flood Damage – Port Union

During Hurricane Igor, the Port Union area received more than 200mm of rainfall. As a result, water overtopped the Port Union forebay dam and flooded the powerhouse. The maximum depth of water inside the powerhouse was approximately 2 meters. The water and floating debris caused extensive damage to the generators, switchgear, protection and control equipment, and the building structure including windows, doors and an office inside the powerhouse.

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2 Based on the Canadian Dam Association Dam Safety Guidelines.

3 The 500kW Port Union diesel electric generator is similar in size to the emergency stand-by generator serving the Company's Kenmount Road office building.

As water levels rose in the river adjacent to the plant, extensive damage was caused to the downstream plant access road. The flood waters also caused extensive damage to the Whirl Pond dam, the three Whirl Pond Freeboard dams and the Long Pond outlet structure.

Figure 1 shows water inside the Port Union powerhouse. Figure 2 shows water levels in the river adjacent to the plant.

Figure 1 - 2m of water in the powerhouse
(Note: Turbine still spinning)

Figure 2 - Flood Flows at Port Union Plant

The generators, governors, switchgear, control panels, metering panel, battery bank, battery charger, DC distribution panel and AC distribution panel were partially or completely submerged by the approximate 2 metres of water that flowed through the powerhouse.

Flood conditions prevented operation of control systems which would have shut down the two hydroelectric generating units. The water interfered with the operation of the belt-driven governors, resulting in the wicket gates remaining open. The units continued to rotate until the following day when personnel were able to safely enter the plant. The rotation of the generators compounded the damage sustained to the stator windings, rotor windings and exciters by drawing debris into the units.

The damage to generator G2 was more severe as this unit is located closer to the windows where the debris was entering. Eventually the large door in the downstream end of the plant gave way under the pressure of the water inside the building. This resulted in a sudden flow of water out of the powerhouse. This dislodged the wood-frame walls of the interior office space, causing it to strike the manual control wheel for the governor on generator G1. The manual control wheel shaft was bent by the impact.

The diesel electric generator also suffered considerable damage while it was submerged. Water and silt entered the crank case of the Caterpillar D398A engine and alternator. The diesel generator breaker and controls were damaged beyond repair.

Figure 3 - Whirl Pond Dam

Storage structures on Whirl Pond and Long Pond also overtopped causing extensive damage. High flows eroded the abutments at the control gate on Long Pond. At Whirl Pond, the spillway capacity was exceeded by the flood flows that were 2.5 times the 1-in-1000 year flows. As a result Whirl Pond Dam overtopped eroding the crest and downstream side of the dam to the steel core as shown in Figure 3. The three freeboard dams on Whirl Pond were also damaged, with two being significantly eroded with overtopping flows and one receiving minor damage from wave action.

Appendix A contains an engineering assessment of the damage incurred at the Port Union facility as well as the rehabilitation work required.

Lawn Hydroelectric Development

Newfoundland Power's Lawn hydroelectric generating facility, located in the community of Lawn, on the Burin Peninsula, contains one 625 kW generating unit producing approximately 2.5 GWh annually.

The generating unit is supplied by a woodstave penstock fed through an intake in the forebay dam. The penstock is 286 meters long with a diameter of 1.07 meters. The forebay dam is constructed of rock masonry with a concrete base and an upstream and downstream concrete face. The downstream face is covered with a layer of mesh reinforced shotcrete. Additional rockfill was added in 1995 to stabilize the dam.

Flood Damage – Lawn

During Hurricane Igor, rain gauges in nearby St. Lawrence recorded 238 mm of rainfall. Flood water flow at the Lawn development peaked at 284 m^3/s, or 1.5 times the 1-in-1000 year flows. As a result, the Lawn forebay dam was overtopped by 0.45 meters of water.

This overtopping damaged the mesh reinforced shotcrete on the crest and downstream face of the dam and completely washed away the dam's downstream rockfill. The flood water also undermined the penstock, washing away several timber supports, leaving portions of the penstock suspended in the air. The multi-plate culvert along with its concrete foundation, which had protected the woodstave penstock from the downstream rockfill, was also undermined and significantly damaged.[4]

[4] Pictures of the woodstave penstock and culvert are included in Appendix B.

Other damage around the forebay included a bent support strut and damaged cladding on the gatehouse, damaged and missing sections of guard rail and security fence, and partial washouts at the abutments.

Appendix B contains an engineering assessment of the damage incurred at the Lawn facility as well as the rehabilitation work required.

C. PROJECT

Engineering assessments carried out by Newfoundland Power personnel and technical personnel representing the Company's insurers have identified the following work to be completed in 2011.

Project Scope – Port Union

The project in 2011 to rehabilitate the Port Union hydroelectric facility consists of the following scope of work:

1. Civil restoration of the powerhouse building and downstream retaining wall,
2. Mechanical overhaul of the two generators,
3. Replacement of hydraulic governors,
4. Replacement of the generator stator windings, rotor windings and exciter on G1,
5. Refurbishment of the generator stator windings, rotor windings and exciter on G2,
6. Refurbishment of the switchgear and circuit breakers,
7. Replacement of the G1 and G2 control panels, and
8. Replacement of the battery bank and charger.

The new equipment will be consistent with standards employed in the Company's recent hydroelectric facility upgrades. The functionality of the plant will be restored using modern components to replace the damaged equipment.

It has been determined that refurbishing the diesel electric generator would not be cost-effective. Due to its inadequate size and location relative to the Island interconnected system, the diesel electric generator is no longer suited to its original role as a source of standby electricity in the event of an extended outage.. Because it was no longer required for backup generation, and due to its deteriorated condition, the diesel electric generator was already under consideration for retirement before it sustained damage during the flooding associated with Hurricane Igor. The unit was last operated in 2007.[5]

The diesel unit was decommissioned while contractors working on behalf of the Company's insurers were onsite completing flood damage cleanup, and was shipped to a metal recycling facility for disposal.

[5] The estimated cost to refurbish the unit to pre-flood conditions is $131,000. Returning the diesel electric generator to pre-flood condition would involve dismantling the unit, cleaning the engine and generator, and replacing bearings and seals. Also all of the protection and control equipment would need to be replaced. Additional expenditures with respect to the fuel system, breaker and controls would be required to return the unit to service.

Cost Estimate - Port Union

Table 1 provides a breakdown of the estimated cost to rehabilitate the Port Union hydroelectric facility.

Table 1
2011 Port Union Plant Refurbishment
($000's)

Cost Category	Total
Material	630
Labour – Internal	90
Labour – Contractor	510
Engineering	70
Other	50
Total	**1,350**

The estimated project cost in 2011 to refurbish the Port Union plant is $1.3 million.

The Company's total estimate to repair damage incurred at Port Union plant is $1.65 million. This includes approximately $320,000 in 2010 costs related to the refurbishment of various dams, site cleanup and securing the site for the winter. A significant portion of the cost of the project is covered by insurance. This insured loss is subject to a $100,000 deductible.[6]

The total project cost includes several items not fully covered by the Company's insurance. They include items, such as a programmable logic controller, that are necessary for the efficient operation of the plant and are considered as betterment. The net expenditure not covered by the Company's insurance claim is estimated to be $250,000.

Appendix C provides an economic feasibility analysis for the continued operation of the Port Union hydroelectric development. The results of the analysis show that the continued operation of Port Union hydroelectric development is economical over the long term. Investing in the return to service of Port Union plant ensures the continued availability of 2.3 GWh of energy annually to the Island interconnected system.

The estimated levelized cost of energy from the Port Union facility over the next 50 years, including estimated future capital expenditures of $3,532,000, is 7.81¢/kWh. This energy is lower in cost than replacement energy from sources such as new hydroelectric developments or additional Holyrood thermal generation.[7]

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6 Newfoundland Power's insurance coverage is subject to a $200,000 deductible per event. Because Hurricane Igor is considered one event, the deductible is apportioned between the Port Union and Lawn refurbishments.

7 The cost of electricity from the Holyrood thermal generating station is estimated at 11.63¢ per kWh. This is based upon a 630 kWh/barrel conversion efficiency and oil price forecast from Hydro of $73.30 per barrel for 2010 as per Newfoundland Hydro 2010 Capital Budget Application, Generation Planning Issues 2009 Mid Year Report dated July 2009.

Project Scope – Lawn

The project in 2011 to rehabilitate the Lawn hydroelectric facility consists of the following scope of work:

1. Construct new penstock supports,
2. Replace the mesh reinforced concrete decking and walkway, and
3. Reinstate the downstream rockfill and multi-plate culvert.

The remediation work will take into account the latest CDA Dam Safety Guidelines and the most recent published hydrometric data. These repairs are required to ensure the long term stability and safety of the Lawn Forebay dam.

Cost Estimate - Lawn

The estimated cost in 2011 to rehabilitate the Lawn hydroelectric facility is provided in Table 2.

Table 2
2011 Lawn Plant Refurbishment
($000's)

Cost Category	Total
Material	280
Labour – Internal	-
Labour – Contractor	145
Engineering	15
Other	10
Total	**450**

The total project cost is estimated to be $450,000, all of which is covered by insurance. This insurance coverage is subject to a $100,000 deductible. [8]

Appendix D provides an economic feasibility analysis for the continued operation of Lawn hydroelectric development. The results of the analysis show that the continued operation of Lawn hydroelectric development is economical over the long term. Investing in the return to service of Lawn plant ensures the continued availability of 2.6 GWh of energy annually to the Island interconnected system.

[8] Newfoundland Power's insurance coverage is subject to a $200,000 deductible per event. Because Hurricane Igor is considered one event, the deductible will be split between the Port Union and Lawn facilities rehabilitation.

The estimated levelized cost of energy from the Lawn facility over the next 50 years, including estimated future capital expenditures of $4,547,000, is 6.17 ¢/kWh. This energy is lower in cost than replacement energy from sources such as new hydroelectric developments or additional Holyrood thermal generation.[9]

Project Schedule

The necessary engineering and design work has been ongoing since Hurricane Igor occurred in September 2010. It is anticipated that work at the Port Union site will be completed in September 2011. Work at the Lawn site is anticipated to be completed in August 2011.

[9] See footnote 7.

Appendix A

Damage Assessment
Port Union Plant

Table of Contents

1.0 General

Hurricane Igor brought more than 200mm of rain to the Port Union area resulting in a flood flow that was 1.4 times the 1-in-10,000 year event for that location. As water rose in the river adjacent to the plant, extensive damage was caused to the downstream plant access road. The high waters and associated debris entered the plant through several windows causing extensive damage to the plant equipment and the interior of the powerhouse. Most of the windows and doors will require replacement and an office inside the plant was destroyed.

This engineering assessment identifies the various electrical, civil and mechanical engineering systems that were damaged by the storm and resulting flood conditions.[1]

New equipment identified to replace flood damaged equipment will be consistent with standards employed in the Company's recent hydroelectric facility upgrades. The pre-loss functionality of the plant will be restored using modern components to replace the existing equipment. A significant portion of the cost of the project is covered by insurance.

2.0 Electrical Engineering

Various electrical systems were damaged by the flood waters that entered the powerhouse. Some equipment can be refurbished and returned to service; other systems were damaged so extensively that they will require replacement. The assessment focuses on the six main electrical subsystems that comprise the hydroelectric generating systems.

2.1 Generators

The two generators, G1 and G2, were disassembled, inspected and tested by a third party to determine the extent of the damage.[2] The stators have wood and grass embedded between the laminations. This damage is more extensive on G2 than G1. The G2 stator winding has short circuited to the steel casing. The G2 rotor poles and slip rings were damaged by impact with debris floating in the water. The G2 exciter windings are in poor shape with heat damage and visible burn marks suggesting the unit was energized as water levels rose. The commutator on the exciter has extensive copper damage.

Figure 1 - Damage to G1 Stator and Rotor

1 An engineering assessment of the civil infrastructure was completed by Gary Humby, P.Eng. and Bill Titford, CET on September 28, 2010. An engineering assessment of the damage to protection and control and electrical systems was completed by Jeremy Decker P. Eng. on October 1, 2010.

2 The inspection of the 2 generators was completed by Weir Canada, Inc. of LaSalle Quebec.

It was determined that G2 stator winding, rotor winding and exciter will require complete rewinding. As less damage was experienced on generator G1 an overhaul of the stator winding, rotor winding and exciter will be sufficient to refurbish G1. Power cables for the stator and exciter on G1 require replacement. Figure 1 shows damage to the stator and rotor on G1.

2.2 Governors

When the powerhouse became flooded, the water interfered with the normal operation of the belt-driven governors on both units, resulting in the failure of the governor to close the wicket gates as required. While submerged, both generators continued to rotate, damaging various governor components.

The manual control wheel for the governor on G1 was damaged by collision with the plant office structure, which had been dislodged by the flow of water exiting the powerhouse.

These governors are original to the plant's 1917 construction, and replacement parts are no longer available from the manufacturer, the Pelton Water Wheel Company. It is recommended that the governors be removed and replaced with a programmable logic controller-based system to control the speed of the units during synchronizing and loading.

2.3 Switchgear

The generator breakers were completely submerged and will require refurbishment at a facility with the specialized test equipment, parts and skills to complete this work. All switchgear compartments and control wiring will be cleaned and dried on site. The CTs were submerged but are sealed units that will be reused after cleaning, drying and testing. The generator PTs are located in the top compartments of the switchgear and were not submerged. They will be reused. The bus PT is located in the bottom of the metering cubicle that was completely submerged. It will be tested and reused if possible. If not, it will be replaced by the generator PT that is currently on the diesel unit, generator G3, which is being retired.

Figure 2 - Damaged Switchgear

2.4 Protection and Control

Figure 3 - Damaged Protection and Control

The protective relays, voltage regulators, controls switches and bottom row of meters were all submerged causing the mechanisms and electrical contacts in this equipment to corrode. As a result, they are no longer serviceable. Figure 3 shows the high water mark relative to the equipment mounted in the panels.

Panels will be replaced with new cabinets and installed in a location away from the switchgear.[3]

The new control panels will contain digital voltage regulators incorporated into Combination Generator Control Modules (CGCMs). The CGCM modules will also provide synchronizing and metering functionality.

The original generator protection scheme included only a voltage restrained overcurrent element. Generator multifunction relays will be used to provide increased generator protection. This will include instantaneous overcurrent, under-voltage, over-voltage, loss of potential, reverse power, under frequency, volts per hertz, loss of field and thermal protection elements in addition to voltage-restrained overcurrent protection.[4]

A new plant revenue meter will be installed to replace the existing unit that was submerged. A programmable logic controller (PLC) with interactive display will be installed to provide metering information, unit instrumentation data, to automate plant control functions and provide water management to maximize and improve the efficiency of the plant. All the existing metering will be replaced by the CGCM module and the PLC.

2.5 AC Distribution

The AC panel and distribution system has been cleaned, dried and returned to service. The panel is currently energized, and is providing electricity to some of the equipment in the powerhouse. There will be no additional work associated with refurbishing the AC panel and distribution system.

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[3] The Company locates equipment panels that require operator intervention away from switchgear cubicles to minimize the exposure of employees to arc flash hazards.

[4] These protection elements are consistent with similar protection schemes put in place for generators of similar size during recent refurbishment projects.

2.6 DC System

Figure 4 - DC Distribution Panel and Battery Charger

The DC panel and distribution system has been cleaned, dried and returned to service.

Water damage to the battery bank and battery charger equipment was substantial. These components will require replacement.

A gel-type battery bank, which eliminates the environmental and safety concerns associated with lead-acid wet-cell batteries, will be used.

3.0 Civil Engineering

Damage from the flood waters was experienced by various civil engineering systems, both inside the powerhouse and elsewhere on the site. The powerhouse building windows, doors and office were extensively damaged and require replacement.

3.1 Building Damage

The powerhouse windows are used for ventilation when the generators are running. Flood waters entering the powerhouse damaged the lower portion of 15 windows as water passed through the plant. These wooden windows range in size from 1100 mm x 1400 mm to 1490 mm x 2775 mm. They were constructed in place with panes of glass measuring approximately 300 mm x 300 mm.

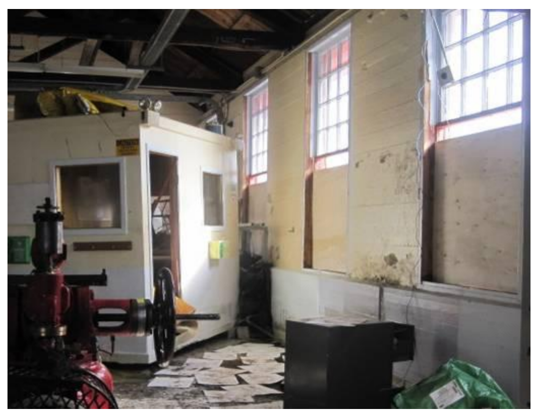

Figure 5 - Damaged Plant Windows

Immediately after the flood, the windows were temporarily boarded up to secure the plant and make it weather tight. The damaged windows are not repairable and therefore require complete replacement. The new sliding windows will be of vinyl construction.

The exterior door of the powerhouse was damaged beyond repair and was replaced immediately after the flood to secure the plant.

The interior office was also damaged beyond repair. It will be rebuilt to include the control room for the plant.

3.2 Site Damage

Figure 6 - Erosion, Plant Access Road (Downstream of Plant)

The high flood waters in the channel adjacent to the powerhouse caused severe erosion of the access road. The road has been temporarily restored to allow access to the plant during the winter season. Additional work is required to permanently stabilize the road and provide long term access to the plant.

The required work includes the widening of the road to its previous width, slope stabilization using gabions and rip rap, and the reinstatement of the security fence.

4.0 Mechanical Engineering

4.1 Mechanical Work

Figure 7 - Turbine guide bearing showing filiform corrosion. Depth of defect is about 0.0005"

Figure 8 – Scoring on Babbitt

Figure 9 – Delaminating of Babbitt

As a result of the high water levels present, both units ran with no oil in the bearings for an extended period. Both units were disassembled, inspected and tested by a third party to determine the extent of the damage. Inspections revealed that water entered the bearings and caused corrosion and scoring. The bearings will be refurbished and bored to an adequate size. Bearing housings also show radial cracking of the threaded bolt holes, which will be repaired.

Some bearings were found to be misaligned by amounts that approach the allowable clearance. Bearing housings will be machined to correct alignment issues.

Both units will be reassembled using modern laser alignment techniques. This will ensure continued reliability of the refurbished components.

4.2 Diesel Electric Generator

The diesel electric generator at Port Union was installed by Union Electric in 1945 as a backup to the hydroelectric generators when water levels in the reservoir were low. In 1965, the original unit was replaced by a Caterpillar D398A engine and a General Electric 675 kVA generator. It is this equipment which is now being retired from service.

When it was installed in 1945, the Port Union diesel generator was an adequate source of standby electricity in the event of unavailability of the local hydroelectric plant. Since the development of the Island interconnected grid, a backup generator is no longer required, and the cost of refurbishing the Port Union diesel is not justified. The unit was already being considered for abandonment before it sustained damage during Hurricane Igor.

Several refits of the unit have been completed, with the most recent being in 1998. The 1998 refit replaced four of the six cylinder heads and the engine fuel lines. Repairs were also made at the time to the starboard turbo charger, and the UG8 Woodward governor was overhauled. The two remaining heads and four pistons had been replaced in 1986 during a previous refit. The off-engine controls, instrumentation, and unit breaker were replaced in 1987 as part of a plant switchgear replacement.

Inspections completed prior to the flood identified deficiencies with the diesel generator. The photographs on the next page were taken during a site inspection in February 2010.

The February 2010 inspection identified oil leaks due to cracks in the cylinder head and oil pump housing, which required containment and absorbent materials in close proximity with the hot sections of the engine. Corrosion was prevalent, particularly on the exhaust system. Originally the engine cooling system used a mixture of water and glycol. Due to environmental concerns regarding the release of glycol into the local water system, the cooling system had previously been modified to use only water cooling. The modified cooling water system had experienced regular failures. The unit was last operated in 2007, at which time it had approximately 800 operating hours.

Fuel Leaks in the Engine Vee

Corroded Exhaust Muffler

Hole In Muffler

Engine Tube Cooler

The inspection completed following the September 2010 flood identified water damage and silt contamination in the alternator, engine, generator breaker, and controls. The two options investigated with respect to the diesel generator involved either returning the unit to pre-flood condition or decommissioning it.

The estimated cost to return the unit to pre-flood condition was $131,000.[5] Additional work estimated at approximately $150,000 would be required to ensure the unit's operational reliability.[6] In light of the age and condition of the unit, and because it was no longer required as a backup to the hydroelectric plant, it was determined that refurbishing the diesel electric generator would not be cost-effective. The diesel unit was decommissioned while contractors working on behalf of the Company's insurers were onsite completing flood damage cleanup.

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5 Returning the diesel electric generator to pre-flood condition would involve dismantling the unit, cleaning the engine and generator, and replacing the bearings and seals and all of the protection and control equipment.

6 This additional work included engine overhaul, exhaust replacement and fuel system replacement.

Appendix B

Damage Assessment
Lawn Plant

Table of Contents

Page

1.0 General

During Hurricane Igor, rain gauges in nearby St. Lawrence recorded 238 mm of rain. The Lawn hydroelectric development saw a peak flood flow of 284 m^3/s. This flood flow was 1.5 times the 1-in-10,000 year flood for the Lawn dam.[1] As water levels rose in the Lawn forebay, spillway capacity was exceeded and water began to overtop the dam.

The Lawn Forebay Dam was overtopped by 0.45 meters of water, causing damage to the concrete face of the dam, erosion of the downstream rockfill, undermining of the woodstave penstock and destruction of the multi-plate culvert protecting the penstock. This damage must be repaired to ensure the long term stability and safety of the Lawn Forebay Dam.

This engineering assessment identifies the various systems that were affected by the storm and resulting flood conditions.[2]

2.0 Work Completed in 2010

Shortly after the storm, measures were taken to begin the process of rehabilitating the Lawn Forebay dam and penstock. Several timber penstock supports were washed out, leaving the penstock unsupported and sagging. Temporary stabilization was provided by timber cribbing, allowing the operation of the plant to continue while plans for permanent repairs were being developed.

In the fall of 2010, an effort was made to tender the rehabilitation project. However, the proposed costs were significantly over budget, due in part to the construction climate following Hurricane Igor as well as the plan to complete the work prior to the onset of winter.

Ice load is the governing load on the design of this dam. With winter approaching and rehabilitation work not complete, a decision was made to install a temporary water recirculation system that would ensure there is no ice build-up in the water nearest the dam. This type of remediation is only temporary, as it requires significant monitoring and maintenance to ensure the system continues to function properly. Permanent work to reinstate the dam will be completed after the spring runoff in 2011.

[1] In accordance with CDA Dam Safety Guidelines, the dam is classified as a low consequence structure. The spillway and dam would therefore be designed to handle a 100 year return period storm.

[2] An engineering assessment of the damage was completed on September 29, 2010 by Perry Mitchelmore, P.Eng. of Mitchelmore Engineering Company Ltd. (MECO), Gary Humby, P.Eng. of Newfoundland Power and Bill Titford, CET of Newfoundland Power.

3.0 Civil Engineering

3.1 Penstock Supports

Figure 1 - Undermined Penstock

The flood washed out six of the original timber penstock supports and eroded the underlying fill. Immediately after the flood, the penstock was temporarily supported with timber cribbing, stabilizing the penstock and allowing the plant to operate safely.

The temporary timber cribbing will be replaced in 2011 with timber supports replicating the original design. The subgrade will be returned to its pre-storm elevation. These repairs will ensure the long term stability of the penstock.

3.2 Rockfill and Culvert

Rockfill was placed downstream at this dam in 1995 to provide extra sliding and overturning resistance in accordance with Canadian Dam Association guidelines. The multi-plate culvert was constructed to protect the woodstave penstock from the rockfill.

Figure 2 - Damaged multi-plate culvert (Rust indicates extent of the rockfill)

As the flood waters overtopped the Lawn dam, the rockfill was washed away and the culvert's concrete foundations were undermined, causing them to be displaced and damaging the culvert. The damaged concrete and culvert were removed as part of the temporary repair work in 2010.

In 2011, new downstream rockfill and a new multi-plate culvert will be installed. The material used for the rockfill will be of sufficient size to withstand the wave overtopping that would result from a 1-in-500 year return period storm.

3.3 Concrete Overlay and Walkway

The reinforced concrete overlay on the downstream side of the Lawn dam was damaged when 0.45 metres of water overtopped the dam. The loose concrete poses a safety hazard to the other components of this project, and will be removed as part of the rehabilitation work in 2011.

The concrete walkway on the dam crest is damaged and loose in several places. The concrete will be rehabilitated by chipping and grouting the loose concrete, and placing a reinforced concrete overlay along the crest. This will provide a safe walking surface on the crest of the dam.

3.4 Miscellaneous

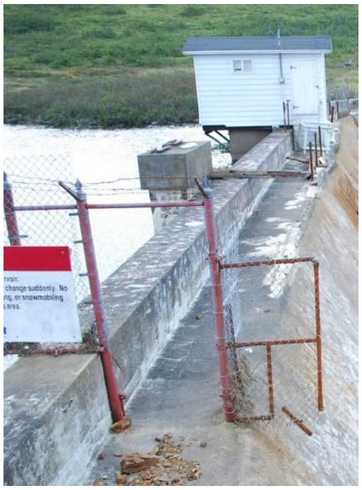

Figure 3 - Damage to Fence

The overtopping waters caused erosion at the abutments. Repairs to the abutments will be completed at the same time as the rockfill is being replaced.

The gatehouse support struts and cladding were damaged by the force of the water. The gatehouse will be refurbished to return it to structurally sound and weathertight condition. The security fence that limits public access to the dam was damaged and will require replacement.

Appendix C

Feasibility Analysis
Port Union

Table of Contents

Page

1.0 Introduction

This feasibility analysis examines the future viability of generation at Newfoundland Power's Port Union hydroelectric plant (the "Plant"). The continued long-term operation of the Plant is reliant on the completion of capital improvements in 2011.

With investment required in 2011 to permit the continued reliable operation of the Plant, an economic analysis of this development was completed. The analysis includes all costs and benefits for the next 50 years to determine the levelized cost of energy from the Plant.

2.0 Capital Costs

All significant capital expenditures for the Plant over the next 25 years have been identified. The capital expenditures required to maintain the safe and reliable operation of the facilities are summarized in Table 1.

Table 1
Port Union
Hydroelectric Plant
Capital Expenditures

Year	($000s)
2011	350[1]
2013	100
2022	250
2026	181
2031	1,190
2036	680
Total	**$2,751**

The total capital expenditure for the Plant until 2036 is $2,751,000 in 2011 dollars. A more comprehensive breakdown of capital costs is provided in Attachment A.

[1] Estimated capital expenditures in 2011 include the cost of betterment (approximately $250,000) and the deductible payable to the Company's insurer (approximately $100,000).

3.0 Operating Costs

Operating costs for the Plant are estimated to be approximately $60,624 per year.[2] This estimate is based primarily upon recent historical operating experience. The operating cost represents both direct charges for operations and maintenance at the Plant as well as indirect costs such as those related to managing the environment, safety, dam safety inspections and staff training. A summary of operating costs is provided in Attachment B.

The annual operating cost also includes a water power rental rate of $ 0.80 per MWh. This fee is paid annually to the Provincial Department of Environment and Conservation based on yearly hydro plant generation/output.

4.0 Benefits

The maximum output from the Plant is 0.6 MW. The Plant normally operates at this load to maximize the energy from the water.

The estimated long-term normal production at the Plant under present operating conditions is 2.3 GWh per year. This estimate is based on the results of the Water Management Study completed by SGE Acres in 2005.

5.0 Financial Analysis

An overall financial analysis of combined costs and benefits has been completed using the levelized cost of energy approach. The levelized cost of energy is representative of the revenue requirement to support the combined capital and operating costs associated with the development.

The estimated levelized cost of energy from the Plant over the next 50 years is 7.81¢/kWh. This figure includes all projected capital and operating costs necessary to operate and maintain the facility. Energy from Port Union can be produced at a lower price than the cost of electricity currently supplied from Newfoundland and Labrador Hydro's Holyrood thermal generating station at 11.63¢/kWh.[3]

The future capacity benefits of the continued availability of the Plant have not been considered in this analysis. If factored into the feasibility analysis, the financial benefit associated with system capacity would further support the viability of continued plant operations.

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2 2011 dollars.

3 The cost of electricity from the Holyrood thermal generating station is estimated at 11.63¢ per kWh. This is based upon a 630 kWh/barrel conversion efficiency and oil price forecast from Hydro of $73.30 per barrel for 2010 as per Newfoundland Hydro 2010 Capital Budget Application, Generation Planning Issues 2009 Mid Year Report dated July 2009.

6.0 Recommendation

The results of this feasibility analysis show that the continued operation of the Plant is economically viable. Investing in the return to service of Port Union plant ensures the continued availability of low cost energy to Newfoundland Power's electricity customers. Otherwise, the annual production of 2.3 GWh would be replaced by more expensive energy sources. The project will benefit the Company and its customers by providing least cost, reliable energy for years to come.

Attachment A
Summary of Capital Costs

Port Union Feasibility Analysis
Summary of Capital Costs in 2011 Dollars
($000s)

Description	2011	2013	2022	2026	2031	2036
Rebuild, Deductible & Betterment	350					
Civil						
Dams & Control Structures		100	250		100	
Penstock					500	
Powerhouse				100	50	
Mechanical						
Mechanical Refurbishment					100	150
Turbine					300	
Governor					50	
Electrical						
Controls				30	50	200
AC/DC Systems				51	40	
Switchgear						330
Substation						
Annual Totals	**350**	**100**	**250**	**181**	**1,190**	**680**

Attachment B
Summary of Operating Costs

Port Union Feasibility Analysis
Summary of Operating Costs

Actual Annual Operating Costs

Year	**Amount**
2005	$ 66,396
2006	$ 43,858
2007	$ 52,897
2008	$ 54,708
2009	$ 76,060
Average	**$ 58,784**

Forecast Annual Operating Cost Estimate

5 -Year Average Operating Cost	$58,784[1]
Water Power Rental Rate	$ 1,840[2]
Total Forecast Annual Operating Cost	**$ 60,624**

[1] 2011 dollars.
[2] Provincial Department of Environment and Conservation annual fee based on $ 0.80 per MWh.

Attachment C
Calculation of Levelized Cost of Energy

Present Worth Analysis

Weighted Average Incremental Cost of Capital						**7.68%**				
PW Year						**2,010**				
YEAR	**Generation Hydro** 64.4yrs 8% CCA	**Generation Hydro** 64.4yrs 50% CCA	**Capital Revenue Requirement**	**Operating Costs**	**Operating Benefits**	**Net Benefit**	**Present Worth Benefit**	**Cumulative Present Worth Benefit**	**Rev Rqmt (¢/kWhr)**	**Levelized Rev Rqmt (¢/kWhr) 50 years**
2011	350,000	0	31,489	60,624	0	-92,113	-85,544	-85,544	4.112	7.813
2012	0	0	30,263	61,908	0	-92,171	-79,492	-165,036	4.115	7.813
2013	104,381	0	39,924	63,280	0	-103,203	-82,659	-247,694	4.607	7.813
2014	0	0	39,757	64,474	0	-104,231	-77,528	-325,222	4.653	7.813
2015	0	0	39,972	65,726	0	-105,699	-73,012	-398,234	4.719	7.813
2016	0	0	40,107	66,892	0	-106,999	-68,639	-466,873	4.777	7.813
2017	0	0	40,168	68,112	0	-108,280	-64,506	-531,379	4.834	7.813
2018	0	0	40,161	69,360	0	-109,521	-60,592	-591,971	4.889	7.813
2019	0	0	40,091	70,662	0	-110,752	-56,903	-648,875	4.944	7.813
2020	0	0	39,963	71,972	0	-111,935	-53,409	-702,284	4.997	7.813
2021	0	0	39,782	73,325	0	-113,107	-50,119	-752,403	5.049	7.813
2022	307,996	0	67,263	74,688	0	-141,951	-58,414	-810,817	6.337	7.813
2023	0	0	65,910	76,078	0	-141,988	-54,262	-865,079	6.339	7.813
2024	0	0	65,832	77,458	0	-143,290	-50,854	-915,933	6.397	7.813
2025	0	0	65,654	78,926	0	-144,579	-47,652	-963,585	6.454	7.813
2026	240,044	0	86,980	80,400	0	-167,380	-51,232	-1,014,817	7.472	7.813
2027	0	0	85,785	81,887	0	-167,672	-47,661	-1,062,479	7.485	7.813
2028	0	0	85,538	83,416	0	-168,954	-44,600	-1,107,079	7.543	7.813
2029	0	0	85,171	84,994	0	-170,165	-41,716	-1,148,795	7.597	7.813
2030	0	0	84,694	86,622	0	-171,316	-39,003	-1,187,798	7.648	7.813
2031	1,004,783	728,104	172,923	88,281	0	-261,204	-55,226	-1,243,024	11.661	7.813
2032	0	0	144,596	89,972	0	-234,567	-46,057	-1,289,081	10.472	7.813
2033	0	0	199,108	91,695	0	-290,803	-53,026	-1,342,107	12.982	7.813
2034	0	0	225,459	93,451	0	-318,910	-54,004	-1,396,112	14.237	7.813
2035	0	0	237,611	95,240	0	-332,852	-52,345	-1,448,456	14.859	7.813
2036	1,088,740	0	340,510	97,064	0	-437,574	-63,906	-1,512,362	19.535	7.813
2037	0	0	337,935	98,923	0	-436,858	-59,251	-1,571,613	19.503	7.813
2038	0	0	338,072	100,818	0	-438,889	-55,281	-1,626,894	19.593	7.813
2039	0	0	336,933	102,748	0	-439,681	-51,431	-1,678,324	19.629	7.813
2040	0	0	334,988	104,716	0	-439,704	-47,765	-1,726,089	19.630	7.813
2041	142,591	0	345,312	106,721	0	-452,033	-45,602	-1,771,691	20.180	7.813
2042	0	0	341,885	108,765	0	-450,650	-42,220	-1,813,911	20.118	7.813
2043	0	0	338,723	110,848	0	-449,571	-39,115	-1,853,026	20.070	7.813
2044	0	0	335,240	112,971	0	-448,211	-36,215	-1,889,241	20.009	7.813
2045	0	0	331,472	115,134	0	-446,606	-33,512	-1,922,753	19.938	7.813
2046	0	0	327,448	117,339	0	-444,787	-30,995	-1,953,748	19.857	7.813
2047	0	0	323,191	119,586	0	-442,778	-28,654	-1,982,402	19.767	7.813
2048	0	0	318,722	121,877	0	-440,598	-26,480	-2,008,882	19.670	7.813
2049	0	0	314,057	124,211	0	-438,268	-24,461	-2,033,343	19.566	7.813
2050	417,622	0	346,787	126,589	0	-473,376	-24,536	-2,057,879	21.133	7.813
2051	0	0	340,315	129,014	0	-469,329	-22,591	-2,080,470	20.952	7.813
2052	0	0	335,477	131,484	0	-466,962	-20,874	-2,101,344	20.847	7.813
2053	0	0	330,417	134,002	0	-464,419	-19,280	-2,120,624	20.733	7.813
2054	0	0	325,151	136,569	0	-461,720	-17,801	-2,138,425	20.612	7.813
2055	0	0	319,696	139,184	0	-458,880	-16,429	-2,154,854	20.486	7.813
2056	0	0	314,068	141,849	0	-455,918	-15,159	-2,170,013	20.353	7.813
2057	0	0	308,281	144,566	0	-452,847	-13,983	-2,183,996	20.216	7.813
2058	0	0	302,346	147,335	0	-449,680	-12,895	-2,196,891	20.075	7.813

Port Union and Lawn Rehabilitation

Feasibility Analysis
Major Inputs and Assumptions

Specific assumptions include:

Income Tax: Income tax expense reflects a statutory income tax rate of 32%.

Operating Costs: Operating costs were assumed to be in 2011 dollars escalated yearly using the GDP Deflator for Canada.

Average Incremental Cost of Capital:

	Capital Structure	Return	Weighted Cost
Debt	55.00%	6.61%	3.63%
Common Equity	45.00%	9.0%	4.05%
Total	**100.00%**		**7.68%**

CCA Rates:

Class	Rate	Details
17	8.00%	Expenditures related to the betterment of electrical generating facilities.
43.2	50.00%	Equipment designed to produce energy in a more efficient way.

Escalation Factors: Conference Board of Canada GDP deflator, February 16, 2010.

Appendix D

Feasibility Analysis
Lawn

Table of Contents

1.0 Introduction

This feasibility analysis examines the future viability of generation at Newfoundland Power's Lawn hydroelectric plant (the "Plant"). The continued long-term operation of the Plant is reliant on the completion of capital improvements in 2011.

With investment required in 2011 to permit the continued reliable operation of the Plant, an economic analysis of this development was completed. The analysis includes all costs and benefits for the next 50 years to determine the levelized cost of energy from the Plant.

2.0 Capital Costs

All significant capital expenditures for the Plant over the next 25 years have been identified. The capital expenditures required to maintain the safe and reliable operation of the facilities are summarized in Table 1.

Table 1
Lawn
Hydroelectric Plant
Capital Expenditures

Year	($000s)
2011	100[1]
2018	27
2022	100
2025	1,370
2030	1,700
2035	650
Total	**3,947**

The total capital expenditure for the Plant until 2036 is $3,947,000 in 2011 dollars. A more comprehensive breakdown of capital costs is provided in Attachment A.

[1] Estimated capital expenditures in 2011 include the cost of the deductible payable to the Company's insurer (approximately $100,000).

3.0 Operating Costs

Operating costs for the Plant are estimated to be approximately $36,732 per year.[2] This estimate is based primarily upon recent historical operating experience. The operating cost represents both direct charges for operations and maintenance at the Plant as well as indirect costs such as those related to managing the environment, safety, dam safety inspections and staff training. A summary of operating costs is provided in Attachment B.

The annual operating cost also includes a water power rental rate of $ 0.80 per MWh. This fee is paid annually to the Provincial Department of Environment and Conservation based on yearly hydro plant generation/output.

4.0 Benefits

The maximum output from the Plant is 0.6 MW. The Plant normally operates at this load to maximize the energy from the water.

The estimated long-term normal production at the Plant under present operating conditions is 2.6 GWh per year. This estimate is based on the results of the Water Management Study completed by SGE Acres in 2005.

5.0 Financial Analysis

An overall financial analysis of combined costs and benefits has been completed using the levelized cost of energy approach. The levelized cost of energy is representative of the revenue requirement to support the combined capital and operating costs associated with the development.

The estimated levelized cost of energy from the Plant over the next 50 years is 6.17¢/kWh. This figure includes all projected capital and operating costs necessary to operate and maintain the facility. Energy from Lawn can be produced at a lower price than the cost of electricity currently supplied from Newfoundland and Labrador Hydro's Holyrood thermal generating station at 11.63¢/kWh.[3]

The future capacity benefits of the continued availability of the Plant have not been considered in this analysis. If factored into the feasibility analysis, the financial benefit associated with system capacity would further support the viability of continued plant operations.

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2 2011 dollars.

3 The cost of electricity from the Holyrood thermal generating station is estimated at 11.63¢ per kWh. This is based upon a 630 kWh/barrel conversion efficiency and oil price forecast from Hydro of $73.30 per barrel for 2010 as per Newfoundland Hydro 2010 Capital Budget Application, Generation Planning Issues 2009 Mid Year Report dated July 2009.

6.0 Recommendation

The results of this feasibility analysis show that the continued operation of the Plant is economically viable. Investing in the current upgrades of the facilities at Lawn plant ensures the continued availability of low cost energy to Newfoundland Power's electricity customers. Otherwise, the annual production of 2.6 GWh would be replaced by more expensive energy sources. The project will benefit the Company and its customers by providing least cost, reliable energy for years to come.

Attachment A
Summary of Capital Costs

Lawn Feasibility Analysis
Summary of Capital Costs in 2011 Dollars
($000s)

Description	2011	2018	2022	2025	2030	2035
Rebuild, Deductible & Betterment	100					
Civil						
Dams & Control Structures						200
Penstock					1,700	
Powerhouse			100			
Mechanical						
Mechanical Refurbishment						250
Turbine				300		
Governor				100		
Electrical						
Controls				400		
Generator Rewind				500		
AC/DC Systems		27		70		
Switchgear						200
Annual Totals	**100**	**27**	**100**	**1,370**	**1,700**	**650**

Attachment B
Summary of Operating Costs

Lawn Feasibility Analysis
Summary of Operating Costs

Actual Annual Operating Costs

Year	Amount
2005	$ 29,864
2006	$ 42,510
2007	$ 28,223
2008	$ 30,002
2009	$ 42,660
Average	**$ 34,652**

Forecast Annual Operating Cost Estimate

5 -Year Average Operating Cost	$34,652[26]
Water Power Rental Rate	$ 2,080[27]
Total Forecast Annual Operating Cost	**$ 36,732**

26 2011 dollars.
27 Provincial Department of Environment and Conservation annual fee based on $ 0.80 per MWh.

Attachment C
Calculation of Levelized Cost of Energy

Port Union and Lawn Rehabilitation **Schedule A**

Present Worth Analysis

Weighted Average Incremental Cost of Capital 7.68%
PW Year 2,010

YEAR	Generation Hydro 64.4yrs 8% CCA	Generation Hydro 64.4yrs 50% CCA	Capital Revenue Requirement	Operating Costs	Operating Benefits	Net Benefit	Present Worth Benefit	Cumulative Present Worth Benefit	Rev Rqmt (¢/kWhr)	Levelized Rev Rqmt (¢/kWhr) 50 years
2011	100,000	0	8,997	36,732	0	-45,729	-42,468	-42,468	1.686	6.167
2012	0	0	8,647	37,510	0	-46,157	-39,807	-82,275	1.702	6.167
2013	0	0	8,724	38,341	0	-47,065	-37,696	-119,970	1.735	6.167
2014	0	0	8,781	39,065	0	-47,845	-35,588	-155,558	1.764	6.167
2015	0	0	8,819	39,824	0	-48,643	-33,600	-189,158	1.793	6.167
2016	0	0	8,841	40,530	0	-49,371	-31,671	-220,829	1.820	6.167
2017	0	0	8,846	41,269	0	-50,115	-29,856	-250,685	1.848	6.167
2018	30,891	0	11,617	42,025	0	-53,643	-29,678	-280,362	1.978	6.167
2019	0	0	11,487	42,814	0	-54,301	-27,899	-308,262	2.002	6.167
2020	0	0	11,477	43,608	0	-55,085	-26,283	-334,545	2.031	6.167
2021	0	0	11,450	44,427	0	-55,877	-24,760	-359,305	2.060	6.167
2022	123,198	0	22,490	45,253	0	-67,743	-27,877	-387,182	2.498	6.167
2023	0	0	22,000	46,096	0	-68,096	-26,023	-413,205	2.511	6.167
2024	0	0	22,023	46,932	0	-68,955	-24,472	-437,678	2.542	6.167
2025	1,783,590	0	182,479	47,821	0	-230,300	-75,904	-513,582	8.491	6.167
2026	0	0	176,179	48,714	0	-224,894	-68,836	-582,418	8.292	6.167
2027	0	0	177,474	49,616	0	-227,089	-64,551	-646,969	8.373	6.167
2028	0	0	178,381	50,542	0	-228,923	-60,431	-707,400	8.440	6.167
2029	0	0	178,932	51,498	0	-230,430	-56,490	-763,890	8.496	6.167
2030	0	2,429,034	173,840	52,484	0	-226,325	-51,527	-815,417	8.345	6.167
2031	0	0	93,249	53,489	0	-146,738	-31,025	-846,441	5.410	6.167
2032	0	0	274,696	54,514	0	-329,210	-64,640	-911,081	12.138	6.167
2033	0	0	362,875	55,558	0	-418,433	-76,299	-987,380	15.428	6.167
2034	0	0	404,313	56,622	0	-460,934	-78,055	-1,065,435	16.995	6.167
2035	1,021,152	0	514,154	57,706	0	-571,860	-89,932	-1,155,367	21.084	6.167
2036	0	0	516,718	58,811	0	-575,529	-84,054	-1,239,420	21.220	6.167
2037	0	0	517,652	59,937	0	-577,590	-78,338	-1,317,759	21.296	6.167
2038	0	0	515,306	61,085	0	-576,392	-72,600	-1,390,358	21.251	6.167
2039	0	0	511,164	62,255	0	-573,419	-67,074	-1,457,433	21.142	6.167
2040	172,730	0	521,519	63,447	0	-584,967	-63,545	-1,520,977	21.568	6.167
2041	0	0	515,075	64,662	0	-579,737	-58,485	-1,579,462	21.375	6.167
2042	0	0	508,920	65,901	0	-574,821	-53,853	-1,633,316	21.194	6.167
2043	0	0	502,394	67,163	0	-569,557	-49,554	-1,682,870	20.999	6.167
2044	0	0	495,564	68,449	0	-564,013	-45,572	-1,728,442	20.795	6.167
2045	0	0	488,474	69,760	0	-558,234	-41,888	-1,770,330	20.582	6.167
2046	0	0	481,154	71,096	0	-552,250	-38,483	-1,808,813	20.361	6.167
2047	0	0	473,627	72,457	0	-546,085	-35,340	-1,844,153	20.134	6.167
2048	0	0	465,913	73,845	0	-539,758	-32,439	-1,876,592	19.901	6.167
2049	0	0	458,027	75,259	0	-533,286	-29,764	-1,906,356	19.662	6.167
2050	417,622	0	487,557	76,700	0	-564,258	-29,247	-1,935,603	20.804	6.167
2051	0	0	477,906	78,169	0	-556,076	-26,767	-1,962,370	20.502	6.167
2052	0	0	469,908	79,666	0	-549,574	-24,567	-1,986,937	20.263	6.167
2053	0	0	461,703	81,192	0	-542,895	-22,538	-2,009,474	20.016	6.167
2054	0	0	453,310	82,747	0	-536,057	-20,667	-2,030,141	19.764	6.167
2055	0	0	444,742	84,332	0	-529,074	-18,943	-2,049,083	19.507	6.167
2056	0	0	436,014	85,947	0	-521,961	-17,355	-2,066,439	19.245	6.167
2057	0	0	427,139	87,593	0	-514,731	-15,894	-2,082,333	18.978	6.167
2058	0	0	418,128	89,270	0	-507,398	-14,550	-2,096,883	18.708	6.167

Feasibility Analysis
Major Inputs and Assumptions

Specific assumptions include:

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	Capital Structure	Return	Weighted Cost
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43.2	50.00%	Equipment designed to produce energy in a more efficient way.

Escalation Factors: Conference Board of Canada GDP deflator, February 16, 2010.

Winter Storm, December 2007

Pages 5 to 10 of Newfoundland Power's
Q4/07 Quarterly Regulatory Report

3 System Performance

≋ *December 2nd storm* accounted for 55% of annual customer minutes of outage.

A. System Reliability

System Reliability [1]				
	4th Quarter		Annual	
	Actual 2007	Actual 2006	Actual 2007	Plan 2007
Customer Minutes of Outage [2]	53.1	10.8	79.7	47.7
SAIDI (Outage hours per customer)	3.95	0.81	5.94	3.57
SAIFI (Outages per customer)	0.86	0.54	2.46	2.63

[1] Excludes Hydro outages.
[2] In millions of minutes.

During the 1st weekend of December, a winter storm hit eastern Newfoundland. This storm significantly impacted quarterly and annual reliability performance.

B. December Storm

On December 2nd, a storm bringing high winds, wet snow and ice caused significant trouble on the Newfoundland Power electrical system. In the Bonavista area, winds gusted to 160 km/h and the ice load on the transmission lines reached as much as 1.5 inches Equivalent Radial Ice.[1]

During the storm, a problem on Hydro's electrical system resulted in a power interruption of up to 2.5 hours for 93,000 customers in the greater St. John's area. Damage to the Newfoundland Power system impacted over 19,500 customers, many for up to several days.

By December 3rd, all damage was assessed and planned for repair. Damage ranged from toppled transmission structures to downed individual service wires. Damage was most significant in the Bonavista Peninsula and New-Wes-Valley areas. In the Bonavista Peninsula area, two transmission lines had damage to poles, cross arms, insulators, and conductor. There was also damage to distribution feeders and individual service wires. In the New-Wes-Valley area, a small section of transmission line was severely damaged, along with 4 distribution feeders.

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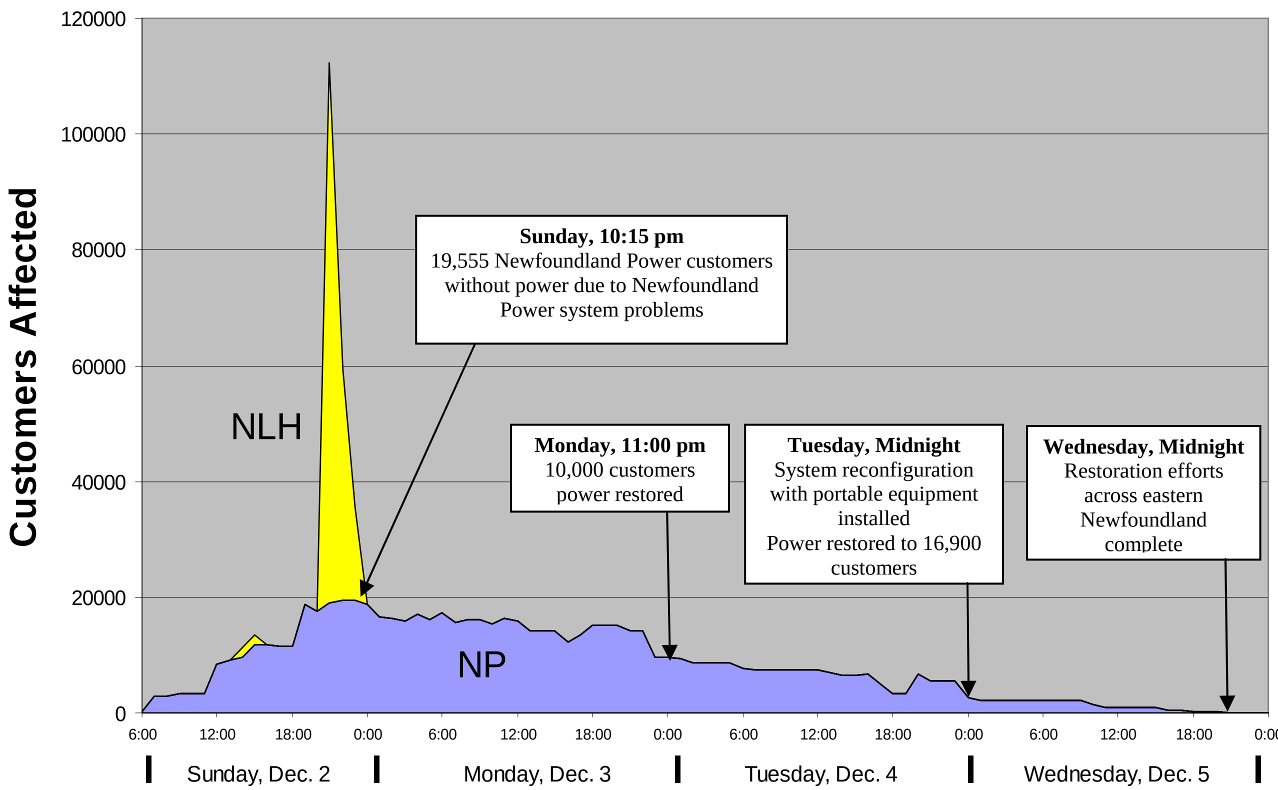
[1] *Equivalent Radial Ice* is a term to describe the field conditions of ice load on wires. It refers to the uniform radial thickness of ice on a conductor.

The Company mobilized a portable substation and two large mobile generators to the Bonavista Peninsula. This equipment allowed the Company to accelerate restoration time by allowing an electrical system reconfiguration which permitted power to be restored while repairs were completed.

Throughout the storm, the Company consulted frequently with local community representatives. The representatives were kept informed of the extent of damage and were consulted on restoration efforts including provision of temporary generation to heat community centers.

The restoration effort required nearly 200 field and office employees. Additional personnel were provided by Hydro and contractors. The total cost of the storm was approximately $1.7 million.

The power restoration effort took nearly a week. The chart below shows the number of customers without power over the period from Sunday, December 2nd through Wednesday, December 5th.



C. Bonavista Area December Storm photos

1. Section of transmission 110L that was rebuilt during 2006-2007. The ice build up did not damage this section of line.

2. Double pole structure (vintage 1976) snapped on transmission line 123L on Bonavista Peninsula.

3. Distribution feeder pole snapped on Random Island Causeway.

4. Repair on distribution feeder on Bonavista Peninsula.

5. Repairing individual customer service wires.

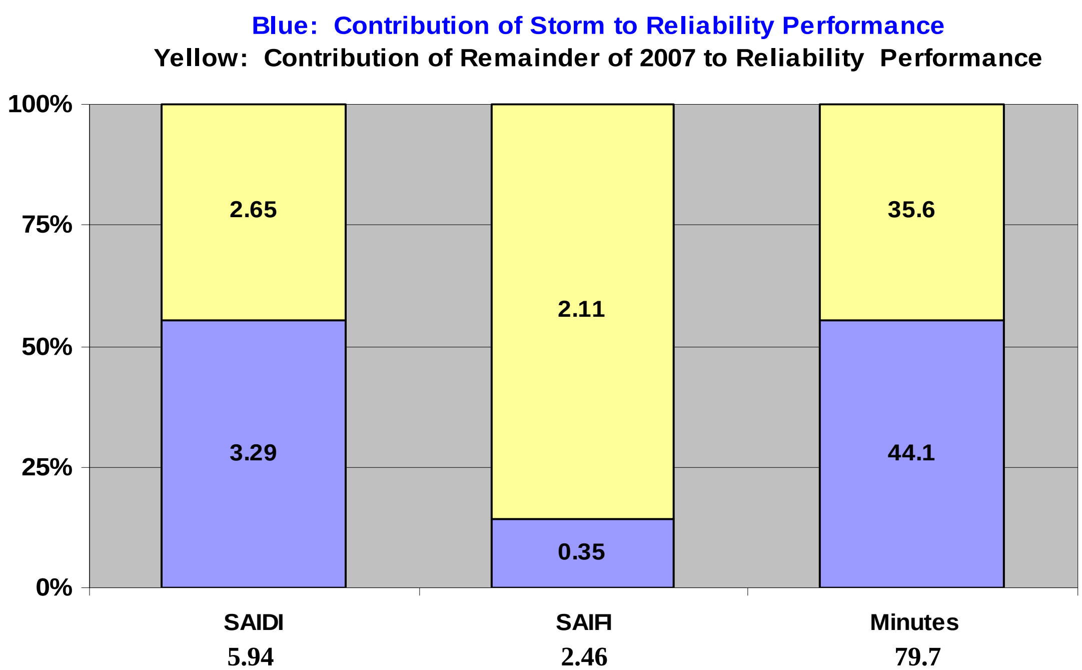
D. Other Power Interruptions

Customers experienced a total of 53.1 million minutes of outage in the 4th quarter. The December 2nd storm was the largest contributor to unplanned interruptions. Other significant unplanned interruptions during the quarter were as follows:

1. *Nov 4th:* Hurricane Noel hit the west coast of Newfoundland causing over 1.5 million customer minutes of outages for customers on many feeders in the area. Downed trees and broken poles were the largest contributor to the power interruptions.
2. *Nov 17th*: An insulator failure caused a fault on transmission line 308L and affected feeders from Marystown and Linton Lake substations for a total of 217,000 customer minutes of outage.
3. *Dec 15th:* Damaged insulators on transmission line 123L caused 932,779 customer minutes of outage for customers on the Bonavista Peninsula. It appeared that the insulators were damaged intentionally, and the incident was reported to the RCMP.

E. Reliability

The following chart illustrates the impact of the December 2nd storm on overall reliability performance for 2007. The contribution of the storm to each annual reliability index is shown in blue. The contribution of the remaining interruptions for the year is shown in yellow.



Average duration of outages (SAIDI) and customer minutes of outage experienced by customers in the 4th quarter of 2007 was almost 5 times that experienced in the 4th quarter of 2006 due to the contribution of the December storm. Excluding the December 2nd storm, annual SAIDI was 2.65 in 2007 compared to annual SAIDI of 2.89 in 2006.