NEWFOUNDLAND POWER
A FORTIS COMPANY

Newfoundland Power Inc.

55 Kenmount Road
P.O. Box 8910
St. John's, NL A1B 3P6
Business: (709) 737-5600
Facsimile: (709) 737-2974
www.newfoundlandpower.com

DELIVERED BY HAND

March 24, 2014

Board of Commissioners
of Public Utilities
P.O. Box 21040
120 Torbay Road
St. John's, NL A1A 5B2

Attention: G. Cheryl Blundon
Director of Corporate Services
and Board Secretary

Ladies and Gentlemen:

Re: The Board's Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System

Further to Order No. P.U. 3 (2014), please find enclosed the original and 12 copies of Newfoundland Power's Interim Report in relation to the above-noted matter.

A copy of this letter, together with enclosures, has been forwarded directly to those listed below.

If you have any questions regarding the enclosed, please feel free to contact the Company.

Yours very truly,

Peter Alteen, QC
Vice President,
Regulation & Planning

Enclosures

c. Geoffrey Young
Newfoundland and Labrador Hydro

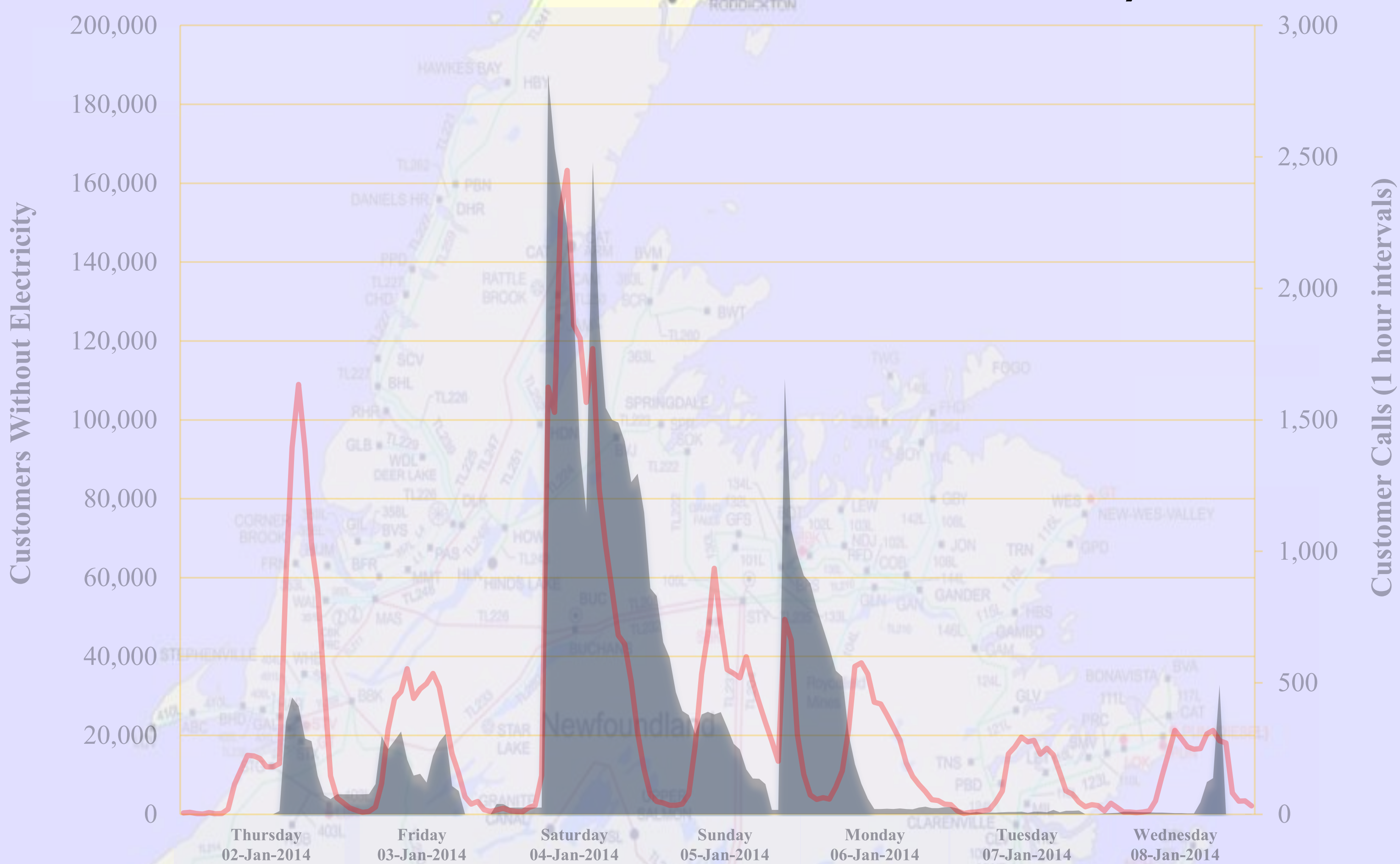
Paul Coxworthy
Stewart McKelvey

Thomas Johnson
O'Dea Earle Law Offices

Danny Dumaresque

INTERIM REPORT

March 24th, 2014



An Investigation and Hearing Into Supply Issues and Power Outages on the Island Interconnected System by the Board of Commissioners of Public Utilities of Newfoundland and Labrador.

NEWFOUNDLAND POWER
A FORTIS COMPANY

TABLE OF CONTENTS

Page

Page

A. INTRODUCTION

A.1 Executive Summary

During the period January 2-8, 2014, the Island Interconnected System which provides electrical service to the vast majority of Newfoundlanders and Labradorians came under significant distress. This, in turn, translated into significant distress for the customers of Newfoundland Power Inc. ("Newfoundland Power" or the "Company").

Commencing on January 2nd, shortages in available generation resulted in rotating power outages to customers which continued throughout the period. A blizzard which commenced on January 3rd also contributed to service disruptions for customers served by the Island Interconnected System. Finally, a series of major electrical system disruptions commencing on January 4th had an even more dramatic impact on customers.

Approximately 75% of Newfoundland Power's customers lost electrical service during the January 2-8, 2014 period. On average, Newfoundland Power customers were without power for about 12 hours over this time span. In total, almost 80% of the time customers of Newfoundland Power were without service was due to the major electrical system disruptions; 15% was due to rotating power outages; and just over 5% was due to damage caused by the blizzard.

Severe weather events such as blizzards are routine occurrences on the island of Newfoundland. They typically occur every year. Major disruptions on the bulk electrical system are less routine but not unknown. Shortages in available generation on the Island Interconnected System requiring the rotation of electrical service to customers are unprecedented.

A year prior to the events of January 2014, a major disruption on Newfoundland and Labrador Hydro's ("Hydro") bulk electrical system caused an extended outage for Newfoundland Power's customers. Following this January 2013 event, reserve margins on the Island Interconnected System were reduced due to damage to a generating unit at Hydro's Holyrood Thermal Generating Station ("Holyrood").

January 2nd, 2014 was the first time Newfoundland Power was required to conduct rotating power outages on a sustained basis to respond to a *forecast* generation shortfall on the Island Interconnected System. These outages would be required throughout the January 2-8, 2014 period. Newfoundland Power has assessed its performance in conducting rotating power outages. The Company's rotating outage performance improved through the period due to a combination of better management of the process and experience. The Company identified changes to its electrical system to improve future performance should further rotating power outages be necessary to maintain stability on the Island Interconnected System.

Newfoundland Power distributes electricity to the vast majority of customers served by the Island Interconnected System.[1] Communication with customers is most critical in situations of electrical system distress. For this reason, following major electrical system disruptions, it is typical for Newfoundland Power to reassess its performance to identify areas of potential improvement. The reassessment following the electrical system events of January 2013 resulted in changes to the Company's customer communication technology, overall outage response processes, and human resource deployment. The Company's customer service performance in the January 2-8, 2014 period was improved as a result of these changes.

Newfoundland Power is the primary distribution utility and Hydro is the primary generation utility on the Island Interconnected System. Routine operational coordination between the utilities is good. However, the events of December 2013 to January 2014 were not routine. Newfoundland Power assessed its coordination with Hydro during the period and has concluded that improved information flow between the utilities would allow the Company to better serve its customers in situations of electrical system distress.

Planning responsibility for reliable generation supply on the Island Interconnected System clearly rests with Hydro under the existing regulatory framework. The Board of Commissioners Public Utilities of Newfoundland and Labrador (the "Board") has oversight responsibility in respect of this; however, this oversight responsibility can be limited by Provincial Cabinet

[1] Of the approximately 280,000 customers served by the Island Interconnected System, approximately 255,000 receive their service from Newfoundland Power.

directives. Recent regulatory practice has not provided an opportunity for Newfoundland Power, or the public, to participate meaningfully in matters related to overall supply planning on the Island Interconnected System. This practice may not have had a direct impact on, or been a root cause of, the events of January 2-8, 2014; however, it forms part of the public policy context of the Board's investigation into those events.

Newfoundland Power has undertaken a preliminary assessment of real-time and forecast electrical system information availability in other jurisdictions. This assessment indicates that the provision of industry standard forward-looking information regarding supply and demand on the Island Interconnected System will contribute to improved transparency. This will also allow Newfoundland Power to better inform its customers in situations of possible system generation shortage.

The Company has also undertaken a preliminary assessment of regulatory protocols in other jurisdictions relating to customer notice in situations of possible system generation shortage. This assessment indicates that the establishment of clear regulatory guidelines governing when and how customers will be advised of the adequacy of forecast generation supply would be consistent with sound public utility practice in North America.

The events of January 2-8, 2014 on the Island Interconnected System were extraordinary. The Company has assessed its performance and completed or initiated near-term actions that would benefit customers if similar circumstances were to occur in the 2014-2015 winter season. However, these actions will not directly affect the reliability of generation supply on the Island Interconnected System.

The events of January 2-8, 2014 raises questions concerning the reliability of generation supply on the Island Interconnected System for the longer term. The adequacy and location of generation supply, including backup generation, is a long-term issue. The effectiveness of protection and control systems in ensuring the continued integrity of the Island Interconnected System is also a prominent issue.

A.2 Scope and Organization of Interim Report

On January 17th, 2014, Newfoundland Power was informed by the Board that sufficient grounds existed to warrant an investigation and hearing into the supply issues and power outages on the Island Interconnected System in late December 2013 and early January 2014 (the "Investigation"). The Board also informed Newfoundland Power that it would be considered a party to this investigation and hearing.

In Order No. P.U. 3 (2014), the Board established a procedure for the Investigation (the "Procedural Order"). The Procedural Order outlined the issues to be addressed in the Board's interim report (the "Interim Issues") and established a process for the Investigation which included a requirement for Newfoundland Power to file a report addressing the Interim Issues by March 24th, 2014 (the "Interim Report"). By letter of February 28th, 2014, the Board informed Newfoundland Power of a list of issues to be addressed by the Company in the Interim Report. This report is filed in compliance with the Procedural Order and, to the extent Newfoundland Power is able, addresses the Interim Issues identified in that Order.

The primary subject matter of the Investigation is generation supply and bulk transmission operations on the Island Interconnected System. These matters are principally the responsibility of Hydro. Newfoundland Power has limited knowledge of the details surrounding Hydro's current generation supply planning and bulk transmission operations. Hydro, which is also a party to the Investigation, and The Liberty Consulting Group ("Liberty"), which is providing the Board with expertise and assistance in the Investigation, are in a better position to inform the Board of how these matters affected the supply issues and power outages on the Island Interconnected System in late December 2013 and early January 2014. Accordingly, the Interim Report of Newfoundland Power will not consider Hydro's generation supply planning and bulk transmission operations in any detail.

This Interim Report will be primarily concerned with (i) an explanation of the events of, and leading to, the supply issues and power outages of December 2013 – January 2014, including the customer impacts; and (ii) Newfoundland Power's customer communications and response to the supply issues and power outages, including the rotating power outages which took place over the

January 2-8, 2014 period. In addition, this Interim Report will consider the operational relationship between Newfoundland Power and Hydro and how this relationship impacted Newfoundland Power and its customers during the period. Section B of this Interim Report specifically addresses each of these issues.

One of the Interim Issues identified by the Board in the Procedural Order was the evaluation of possible Island Interconnected System changes to enhance preparedness for 2014-2016. Section C of this Interim Report specifically addresses this Interim Issue.

Newfoundland Power is in a unique position in the Investigation. Newfoundland Power is the primary distributor of electrical service on the Island Interconnected System. So, the Company's conduct is a subject matter of the Investigation. Newfoundland Power accepts that it is required to account publicly to its customers for its response to the events of December 2013 – January 2014. The Company's participation in the Investigation, including its Interim Report, is part and parcel of that public accountability.

Newfoundland Power and its customers are both dependent upon the reliability of electricity supplied by Hydro. This, combined with the Company's limited knowledge of the details surrounding Hydro's supply planning and bulk transmission operations, also places Newfoundland Power in the practical position of being a party inquiring into the causes and circumstances of December 2013 – January 2014. Given this, the Company expects that it shall be given a reasonable opportunity to inquire into and comment upon the Interim Reports of both Hydro and Liberty once they become available.

B. WHAT HAPPENED

B.1 Chronology of Electrical System Events

B.1.1 Prior to December 2013

On January 11th, 2013, an equipment problem at Holyrood caused the plant to disconnect from the Island Interconnected System.[2] This disturbance resulted in approximately 173,000 Newfoundland Power customers losing electrical service. Service was fully restored to customers by January 13th, 2013. As a result of this system event, the 170 MW generating unit #1 at Holyrood was damaged and unavailable for service for the remainder of the 2012-2013 winter season.[3]

The loss of generating unit #1 at Holyrood reduced available capacity on the Island Interconnected System for the remainder of the 2012-2013 winter season. However, available capacity was sufficient to serve load. The Board approved supplemental capital expenditures of $12.8 million on April 24th, 2013 for refurbishment and repairs to generating unit #1 at Holyrood.[4]

The outages experienced on January 11th, 2013 were longer than what they would otherwise have been due to a lack of blackstart capability at Holyrood.[5] The contingency plan Hydro implemented using the Hardwoods gas turbine to blackstart Holyrood proved to be inadequate in the circumstances experienced on January 11th, 2013. On November 29th, 2013, the Board approved supplemental capital expenditures of approximately $1.3 million for the installation of diesel units at Holyrood for the purpose of blackstart generating units and for the deferral of

---

[2] The equipment problem at Holyrood involved B1L17 breaker. This breaker would also contribute to a major system disruption on January 5th, 2014. See the response to Request for Information PUB-NLH-045.

[3] The 170 MW Holyrood generating unit #1 represents approximately 10% of Hydro's system generating capacity including purchases. See Attachment A to Hydro's response to Request for Information PUB-NLH-001.

[4] See Order No. P.U. 14 (2013).

[5] *Blackstart* refers to starting a generator without power supply from the electrical system. Blackstart capability at Holyrood was also considered by the Board following a system event in December 1994 after which customer outages were significantly extended due to the lack of blackstart capability. Following the January 2013 system event it was revealed that the blackstart capability installed at Holyrood was no longer operational.

associated lease costs estimated by Hydro to total $5.8 million.[6]

In addition to capital expenditures for refurbishment and repairs to Holyrood generating unit #1 and Holyrood blackstart capability, the Board approved over $12 million in other 2013 capital expenditures for Holyrood.[7]

In January 2013, it was also determined that the Hardwoods gas turbine should only be used in emergency conditions as parts may be near failure.[8] The concerns were identified based upon findings related to the rewind of the stator and rotor in the similar gas turbine plant located in Stephenville.[9] On May 16th, 2013, the Board approved supplemental capital expenditures of approximately $8.0 million to replace the alternator on the Hardwoods gas turbine.[10]

On May 1st, 2013, Newfoundland Power and Hydro held their first of 2 Inter-Utility System Planning and Reliability Committee (the "Committee") meetings of 2013.[11] During the meeting, Hydro indicated that repair work on the Holyrood generating unit #1 was progressing and that the unit was expected to be back in service in July 2013. Hydro also indicated that the Stephenville gas turbine, which was undergoing a planned alternator replacement, was expected to be back in service by the end of May 2013.

In June 2013, while the Stephenville gas turbine was undergoing a planned alternator refurbishment, it was determined that there was deterioration of the insulation blankets on End B

---

6 See Order No. P.U. 38 (2013). In its November 22nd, 2013 application, Hydro proposed the installation of infrastructure to enable eight 1.825 MW diesel generation units to be leased during the winter months of 2014 up to the time of installation of a new 60 MW combustion turbine. Hydro's proposed capital expenditure was approved with recovery of costs to be determined by the Board in a future order.

7 On February 26th, 2013, the Board approved, in Order No. P.U. 4 (2013), Hydro's 2013 Capital Budget Application, which included capital expenditures of approximately $7 million related to Holyrood. On April 11th, 2013, the Board approved, in Order No. P.U. 12 (2013), supplemental capital expenditures of approximately $5.2 million for the refurbishment of the Marine Terminal at Holyrood.

8 See Hydro's April 24th, 2013 application for approval of a capital project to replace the alternator on the Hardwoods gas turbine.

9 On August 16th, 2012, the Board approved, in Order No. P.U. 25 (2012), a supplemental capital expenditure of approximately $5.2 million to complete a full stator and rotor rewind of the Stephenville gas turbine alternator due to a stator winding fault in December 2011.

10 See Order No. P.U. 20 (2013) Amended.

11 The Committee includes senior operations and engineering management from Newfoundland Power and Hydro. It meets twice a year to consider matters related to system reliability, including reliability targets, system contingency and restoration planning, generation availability and peak load management preparedness.

of the unit. This caused a 20 MW de-rating from the gas turbine's rated output of 50 MW. Hydro initiated steps to obtain replacement insulating blankets in July 2013.[12]

On November 1st, 2013, Newfoundland Power and Hydro held their second Committee meeting of 2013. The availability of generation to meet peak demand on the Island Interconnected System for the 2013-2014 winter season was considered. During the meeting, Hydro indicated that Holyrood generating unit #1 was operational. Hydro also indicated that the Hardwoods gas turbine was on a planned outage to replace the generator and was expected to return to service in mid-December, and that the Stephenville gas turbine would be fully capable by the end of November. The information available at that time indicated that sufficient system generation capacity would be available to meet the peak demand for the upcoming winter as of December 15th, 2013.

Newfoundland Power forecast a peak for the 2013-2014 winter season on its electrical system of 1348 MW.[13]

B.1.2 December 1st, 2013 to January 1st, 2014

Hydro established a seasonal peak of 1501 MW on its electrical system on December 14th, 2013. At the time of peak, Hydro had reductions in available generating capacity with the Hardwoods and Stephenville gas turbines.[14] There were no customer outages as a result of this peak.

Between December 15th and December 25th, 2013, Hydro experienced further generation capacity limitations on the Island Interconnected System. On December 15th, 2013, Exploits generation capacity was reduced by 50 MW and on December 16th, 2013, Granite Canal generating station was reduced by 8 MW. On December 25th, 2013, generating unit #2 at

[12] See Hydro's response to Request for Information PUB-NLH-072.
[13] Newfoundland Power's electrical system accounts for approximately 85% of demand on the Island Interconnected System. See the responses to Requests for Information PUB-NP-002 and PUB-NP-006.
[14] See Hydro's January 8th, 2014 presentation to the Public Utilities Board, *Island Interconnected System Supply Disruptions – January 2 to 6, 2014*. On December 14th, 2013, Hardwoods gas turbine was unavailable for this period and Stephenville gas turbine was reduced to 25 MW.

Holyrood was reduced by 25 MW. These generating capacity reductions impacted Hydro's ability to sustain its contingency reserve criteria during the forecast high demand periods.[15]

On the morning of December 26th, 2013, Hydro made Newfoundland Power aware that the power output of the 150 MW generating unit #3 at Holyrood was de-rated by 100 MW due to failure of a forced draft fan motor.[16] At the same time, Newfoundland Power was informed that the generating capacity limitations on Stephenville and Hardwoods gas turbines were not resolved.

On the evenings of December 29th and 30th, 2013, Hydro requested Newfoundland Power to run its thermal generating units, exercise customer load curtailment, and carry out system voltage reduction to reduce peak loading on the electrical system in response to low system generation reserve margins.[17]

On December 31st, 2013, Newfoundland Power was informed of the load reduction arrangements Hydro had made with Corner Brook Pulp and Paper to provide additional system generating capacity. This load reduction arrangement was first put to use on January 1st, 2014.[18]

Due to its capacity limitations during this period, Hydro determined that there could be difficulty in supplying the required customer demand based on the cold weather forecast and short-term daily customer load forecasts.[19]

---

[15] See Hydro's response to Request for Information PUB-NLH-002. Contingency reserve criteria refers to the amount of additional generation available to meet demand in the event of equipment damage or capacity reductions.

[16] This was communicated to Newfoundland Power's System Control Centre ("SCC") by Hydro's Energy Control Centre ("ECC") personnel. The following day, Hydro's Vice-President informed Newfoundland Power's Vice-President of Customer Operations and Engineering that the problem with generating unit #3 could take several weeks to correct.

[17] These are routine steps when forecast limitations on the availability of generation to serve customer demand exist. See the response to Request for Information PUB-NP-002.

[18] These load reduction arrangements consisted of capacity assistance from Corner Brook Pulp and Paper of 40 MW during the January 1st, 2014 system peak. See Hydro's response to Request for Information PUB-NLH-002.

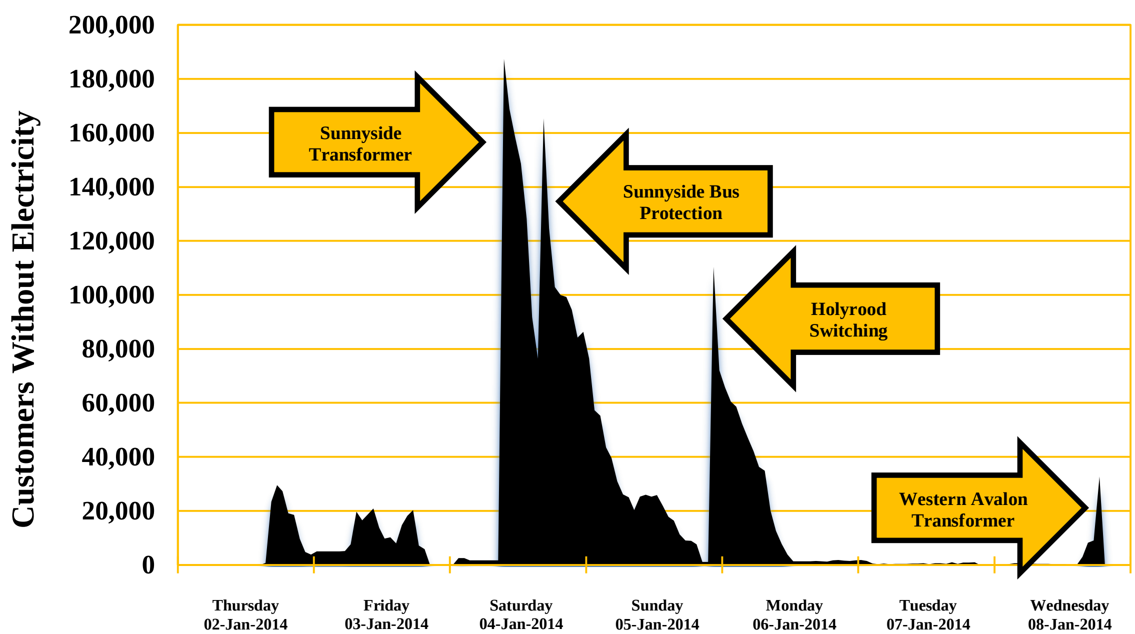
[19] See Hydro's response to Request for Information PUB-NLH-002 and Attachment 1 of Hydro's response to Request for Information PUB-NLH-034.

B.1.3 January 2-8, 2014

The period of January 2-8, 2014 included continuing generation supply shortages and successive major electrical system disruptions. The generation supply shortages resulted in rotating power outages which caused as many as 33,529 Newfoundland Power customers to be without electricity at one time. The impact of the major electrical system disruptions was more dramatic for Newfoundland Power's customers. They resulted in as many as 187,501 Newfoundland Power customers being without electricity at one time.

Figure 1 shows Newfoundland Power customer outages and major system disruptions for the January 2-8, 2014 period.

Figure 1
Customer Outages & Major System Disruptions
January 2-8, 2014



On the morning of January 2nd, 2014, it was evident that there was an increased likelihood that there would be insufficient generation available to meet the forecast evening peak on the Island Interconnected System. At approximately 2:00 pm on January 2nd, 2014, a public advisory was made by Hydro to request customers served by the Island Interconnected System to take steps to conserve electricity where possible.[20]

Hydro requested Newfoundland Power to commence rotating power outages shortly after 4:00 pm on January 2nd, 2014. The loss of Hydro's Granite Canal generating station shortly after the planned rotating outages commenced complicated the exercise. Rotating power outages were carried out throughout the day on January 3rd and 5th, 2014, and throughout the morning and afternoon of January 6th and 8th, 2014, respectively.[21]

At the time rotating power outages were commenced on January 2nd, 2014, the demand on Newfoundland Power's electrical system was 1378 MW. This demand was 2.2% higher than Newfoundland Power's forecast of 1348 MW for the 2013-2014 winter season.[22]

Overnight on January 3-4, 2014, a blizzard hit the island portion of the province and affected operations on the Island Interconnected System. To prepare for this severe weather event, Newfoundland Power deployed line crews from the western portion of the island to the Avalon Peninsula.[23] While the response to this severe weather event overlapped with the rotating power outages caused by generation shortfall on the system and the subsequent major system disruptions, actual damage to Newfoundland Power's electrical system was relatively modest.

In total, the blizzard resulted in 2 broken poles, 5 damaged insulators, 1 broken guy wire and 11 incidents of conductor damage on Newfoundland Power's primary distribution system. There were 464 incidents of damage at the secondary distribution system and service level.[24] The

[20] Hydro took the lead on the issuing of public advisories related to the status of the Island Interconnected System throughout the January 2-8, 2014 period.

[21] For details on Newfoundland Power's preparations for rotating power outages please refer to **B.2: Rotating Power Outages**, page 16.

[22] See the response to Request for Information PUB-NP-006.

[23] On January 2nd, 2014, Newfoundland Power line crews travelled from Port-aux-Basques, Stephenville, Corner Brook and Gander to the Avalon Peninsula.

[24] The secondary distribution and service level of Newfoundland Power's electrical system is the portion of the system between distribution transformers and customers' service connections.

capital cost to reinstate the damage on Newfoundland Power's electrical system caused by the blizzard was approximately $100,000.[25]

The impact of this damage accounted for approximately 5.7% of the outage time experienced by Newfoundland Power's customers over the January 2-8, 2014 period. The timing of the blizzard complicated some of the Company's response efforts to the ongoing supply issues of the Island Interconnected System.[26]

Beginning on the morning of January 4th, 2014, a series of major system disruptions occurred on the Island Interconnected System. At approximately 9:00 am, a transformer caught fire at Hydro's Sunnyside Terminal Station. This triggered a near collapse of the Island Interconnected System and caused an outage to approximately 188,000 Newfoundland Power customers. Newfoundland Power began restoring power to customers once Hydro began to re-establish the Island Interconnected System.[27] Prior to Newfoundland Power restoring service to all customers, at approximately 3:30 pm on January 4th, 2014, a second major system disruption occurred at Hydro's Sunnyside Terminal Station. This second disruption resulted in approximately 165,000 Newfoundland Power customers being without service. Following this disruption, Newfoundland Power again began restoring power to customers as Hydro again began to re-establish the Island Interconnected System. Newfoundland Power had substantially restored service to its customers by approximately 8:30 pm on January 5th, 2014.

---

[25] By comparison, damage caused by a severe winter storm in central parts of the Company's service territory on November 20-21, 2013 required approximately $500,000 in capital expenditures to repair. (See *November 2013 Winter Storm Central Newfoundland*, March 2014 filed March 21st, 2014).

[26] These complications had varying impacts on system operations and customer service. For example, Newfoundland Power's 20 MW Greenhill Gas Turbine was shut down because of lack of fuel for 39.5 hours on January 3-5, 2014 because blizzard conditions closed highway access to the facility for fuel delivery. On the other hand, staffing of Customer Contact Centre operations was unaffected by the blizzard as the Company was able to arrange safe transportation for its employees where necessary.

[27] The January 4th, 2014 Sunnyside Terminal transformer fire resulted in the loss of all 3 Holyrood generating units. Generating units #2 and #3 were brought back online by 1:40 am on January 5th, 2014. Generating unit #1 was brought back online on January 8th, 2014. See Hydro's January 8th, 2014 Presentation to the Public Utilities Board, *Island Interconnected System Supply Disruptions – January 2-6, 2014*.

At approximately 9:30 pm on January 5th, 2014, an electrical fault at Holyrood resulted in loss of supply to over 100,000 Newfoundland Power customers.[28] Power was substantially restored to customers by noon on January 6th, 2014.

A fourth major system disruption occurred at approximately 5:45 pm on January 8th, 2014. At that time, Hydro experienced an overload condition which caused a trip on a transformer at its Western Avalon Terminal Station. This resulted in the loss of supply to approximately 29,000 Newfoundland Power customers in the Trinity-Conception area. In order to restore service, Newfoundland Power reconfigured its transmission system to minimize transformer load at Hydro's Western Avalon Terminal Station.[29] This had the effect of restoring service to customers within approximately ½ hour.

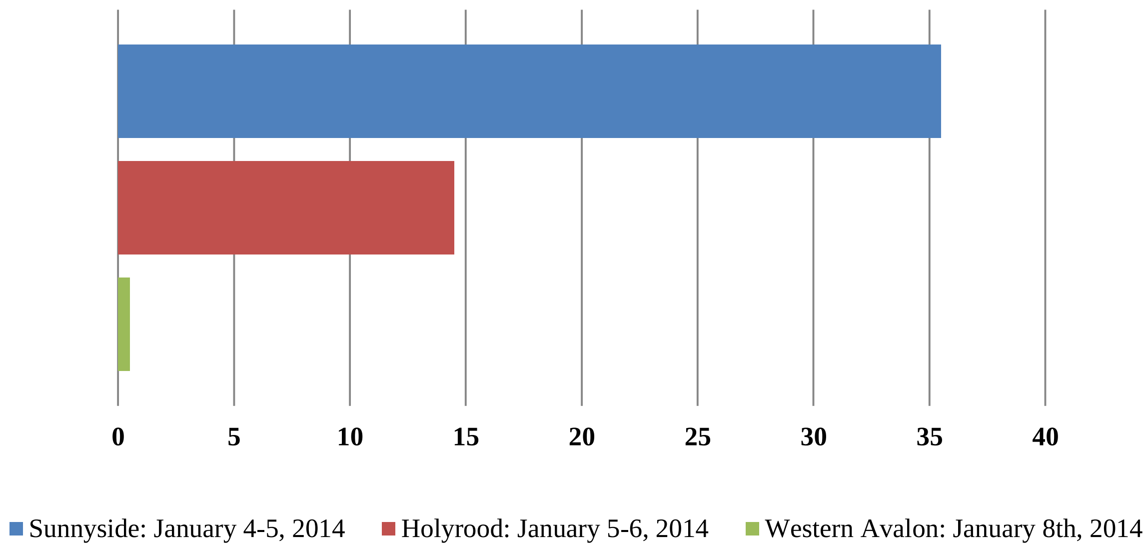
[Purposefully Left Blank]

[28] The January 5th, 2014 Holyrood electrical fault resulted in the loss of generating units #2 and #3 (generating unit #1 had not been brought online following the January 4th, 2014 Sunnyside Terminal Station transformer fire). Generating units #2 and #3 were brought back online by 7:17 am on January 6th, 2014. See Hydro's January 8th, 2014 Presentation to the Public Utilities Board, *Island Interconnected System Supply Disruptions – January 2-6, 2014*.

[29] Newfoundland Power's 138 kV transmission line (64L) tripped as the result of the operation of Hydro's transformer overload protection. This caused an immediate overload trip on a second Newfoundland Power 66kV transmission line (86L). See the response to Request for Information PUB-NP-052.

Chart 1 shows the comparative recovery times for the major disruptions on the Island Interconnected System in the January 4-8, 2014 period.[30]

Chart 1
Major System Disruptions
Recovery Time
January 4-8, 2014
(Hours)



It took 35.5 hours to reinstate service to the approximately 188,000 affected customers following the Sunnyside Terminal transformer incident which occurred on January 4th, 2014. It took 14.5 hours to reinstate service to the approximately 100,000 affected customers following the Holyrood electrical fault which occurred on January 5th, 2014. It took approximately ½ hour to fully reinstate service to the approximately 29,000 affected customers following the Western Avalon transformer overload.

The primary contributor to the relatively longer recovery times associated with the Sunnyside and Holyrood incidents was the length of time before Holyrood generation was available.[31]

---

[30] Recovery time from a major system event is the number of hours from (i) the point when service to Newfoundland Power's customers was interrupted by the major system disruption to (ii) the point when service interrupted by the event was restored.

[31] See footnotes 27 and 28.

Recovery from the Western Avalon incident was quicker because Holyrood generation was unaffected by the incident itself.

Newfoundland Power improved its efficiency in system recovery for major system events from January 2013 to January 2014.[32] Over the past few years, Newfoundland Power has deployed mobile computing in all of its line trucks, implemented a computerized operations dispatch system, and expanded its use of geographic information systems for its vehicles and electrical system assets. This has improved the overall efficiency of the Company's field operations, including its response capabilities to system distress.[33]

When the system disruptions occurred during the January 4-8, 2014 period, Newfoundland Power implemented its normal electrical system restoration procedures, which included communication and coordination with Hydro as generation was re-established and available for distribution.

B.1.4 Post January 8th, 2014

Newfoundland Power did not implement any further rotating power outages beyond January 8th, 2014. However, supply limitations on the Island Interconnected System did present themselves after the January 2-8, 2014 period.[34]

At approximately 11:00 pm on February 17th, 2014, a 230 kV Hydro transmission line tripped due to faulted insulators outside its Western Avalon Terminal Station. This line is one of the two 230 kV transmission lines that transmit power from Central Newfoundland to the Avalon Peninsula.[35] The loss of either line reduces the transmission capacity and increases the risk of a

---

32 In the 4 days following the January 11th, 2013 system event resulting from equipment problems at Hydro's Holyrood plant, Newfoundland Power made 798 specific line crew responses to customer outages. In the 4 days following the January 5th, 2014 Holyrood switching event, Newfoundland Power made 862 specific line crew responses to customer outages. In 2013, approximately 40% of the responses were completed in the first 2 days. In 2014, approximately 75% of the responses were completed in the first 2 days.

33 In 2013, the Company dispatched approximately 60% of all line crew responses to customer outages through computerized dispatch. To March 13th, 2014, approximately 93% of all line crew responses to customer outages were dispatched by computer.

34 See Attachment 1 to Hydro's response to Request for Information PUB-NLH-034.

35 TL237 connects the Come by Chance Terminal Station and the Western Avalon Terminal Station. TL203 connects the Sunnyside Terminal Station and the Western Avalon Terminal Station.

supply shortfall on the Avalon Peninsula. When Newfoundland Power became aware of the transmission line outage on the morning of February 18th, 2014, it considered issuing a public advisory to inform customers of the supply vulnerability for the Avalon Peninsula. Hydro made the necessary repairs by approximately 1 pm on February18th, 2014, so no public advisory was issued.

Hydro's daily system status report dated March 2nd, 2014, indicated that Hydro's forecast daily demand was 1500 MW for March 4th through March 6th, while Hydro's current available system supply was 1575 MW.[36] The report also indicated supply limitations at Hydro's Holyrood, Bay d'Espoir, Stephenville and Hardwoods generating facilities.[37] Newfoundland Power issued a public advisory on March 3rd, 2014 to inform customers of the possibility of supply shortages and to request that customers conserve during peak times starting on Tuesday, March 4th and ending on Thursday, March 6th, 2014. At the same time, Newfoundland Power informed its Curtailable Service Option ("CSO") customers of the likelihood that they would be called upon to curtail.[38]

B.2 Rotating Power Outages

B.2.1 General

When Hydro foresees a shortage of available generation on the Island Interconnected System it invokes its 14 step system operating instruction T-001 *Generation Load Sequence And Generation Shortages*.[39] Step 14 in this operating instruction is the request to Newfoundland

[36] On January 10th, 2014, the Board requested Hydro file, by 9:00 am each morning, a report on the status of the Island Interconnected System providing, at a minimum, (i) the previous day peak demand; (ii) the previous day's total available generation from Hydro's sources only; (iii) the previous day's total available generation from all sources and (iv) the forecast peak for the current day. In addition, Hydro was required to report any change in the status of generation capacity serving the Island Interconnected System, including the return to service or increase in rating of any generating unit, the loss of any generating unit from any source for any reason, and any reduction in generation capacity of any unit equivalent to 25% or greater of the unit's capacity.

[37] These limitations included Holyrood generating unit #1 being de-rated from 170 MW to 140 MW; Bay d'Espoir generating unit #6 (75 MW) being unavailable for service; Stephenville gas turbine being de-rated from 50 MW to 38 MW and Hardwoods gas turbine being de-rated from 50 MW to 25 MW.

[38] Newfoundland Power also completed reviews of potential feeder rotation and its critical customer list in preparation for the possibility of rotating power outages at this time. Additional technical and communications staff were stationed at the Company's SCC during peak periods in the event rotating power outages became necessary.

[39] A copy of this system operating instruction is Attachment 1 to Hydro's response to Request for Information PUB-NLH-033.

Power to shed its customer load by rotating distribution feeders. The rotating power outages which were commenced by Newfoundland Power on January 2nd, 2014, were in response to a Hydro request made under this operating instruction.[40]

Newfoundland Power serves approximately 255,000 customers via 306 distribution feeders. A distribution feeder is an electrical circuit which originates in a substation, and along its route connects customer premises to the electrical system. Distribution feeders vary in length, voltage and number of customers served. Some distribution feeders are only a few hundred metres in length while others are over 100 kilometres in length. Some feeders serve only a handful of customers while others serve thousands.

By operation of substation switching equipment, Newfoundland Power's distribution feeders can be disconnected from and reconnected to the electrical system.[41] Rotating power outages are the systematic disconnection and reconnection of distribution feeders, and the customers served by them, to maintain the overall balance of electricity supply and demand where there is a generation shortage. Rotating power outages are sometimes referred to as *rolling blackouts*.

When the possibility of a system wide generation shortfall on the Island Interconnected System became evident on January 2nd, 2014, Newfoundland Power prepared for possible rotating power outages. This included the review of distribution feeders eligible for rotation and the deployment of field staff.

Newfoundland Power commenced rotating power outages at 4:13 pm on January 2nd, 2014. In total, the Company undertook rotating power outages in 5 of the 7 days from January 2-8, 2014. On January 2nd, 2014, the average duration of rotating power outages was 88 minutes. From January 3-8, 2014, the average duration was less than 1 hour.

[40] This request was the first such request made due to an expected system wide generation shortfall on the Island Interconnected System.

[41] For Newfoundland Power, approximately 60% of its distribution feeders can be remotely operated from the Company's SCC located at Mount Pearl. The remaining distribution feeders can only be disconnected from or reconnected to the electrical system by manual intervention at the substation.

Most of the rotating power outages affected Newfoundland Power customers on the Avalon, Bonavista and Burin Peninsulas.[42] This is largely a reflection of the current configuration of the Island Interconnected System. Electrical system demand on the Island Interconnected System is concentrated on the eastern portion of the system. Generation resources, on the other hand, are concentrated on the central and western portion of the system. These features of the Island Interconnected System can present restrictions when there are insufficient generation resources available on the eastern portion of the system.[43]

The maximum number of Newfoundland Power customers which were disconnected at one time as a result of rotating power outages during January 2-8, 2014 was 33,529. This occurred during the evening of January 2nd, 2014 and represents just over 13% of Newfoundland Power's total number of customers. By comparison, the maximum number of Newfoundland Power customers who were without service during the January 2-8, 2014 period was 187,501, or just over 73%. These customers were without service as a result of the major system disruption originating at Hydro's Sunnyside Terminal Station on January 4th, 2014.

[Purposefully Left Blank]

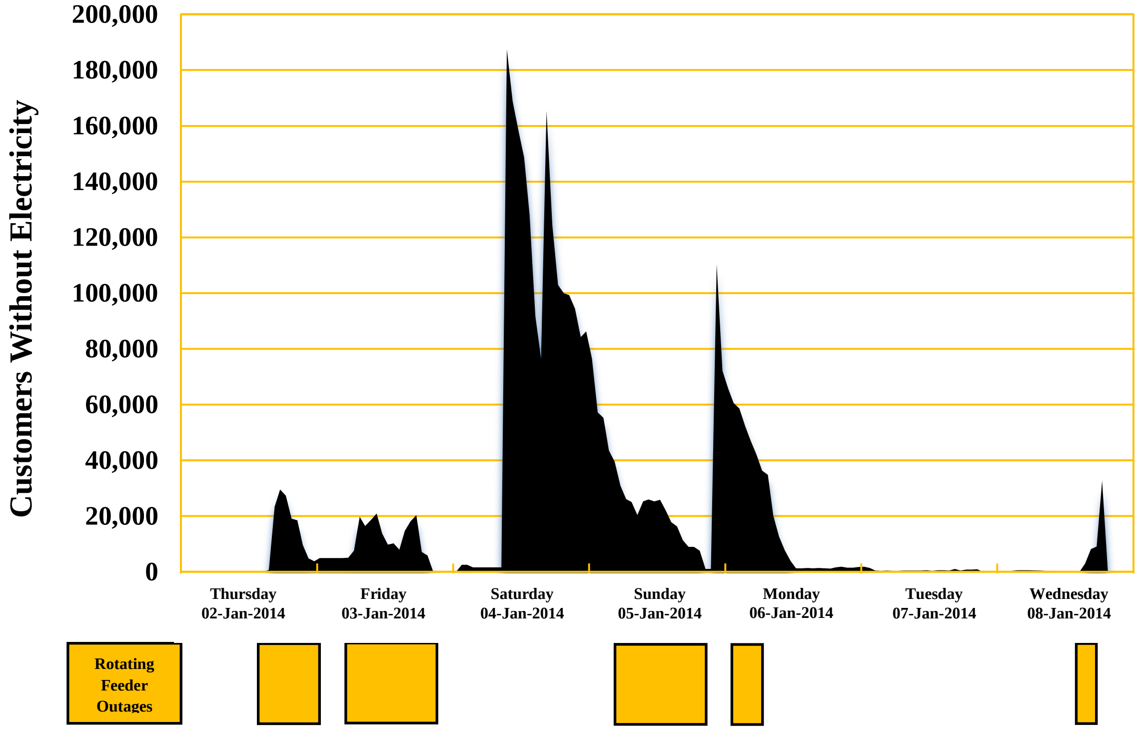
[42] 382 of the 447, or 85%, Newfoundland Power rotating power outages during the January 2-8, 2014 period occurred on the Avalon, Bonavista and Burin Peninsulas.

[43] One such restriction arises when voltage drop occurs as electricity is transmitted over long distances. This restriction is particularly prominent on the Island Interconnected System when generation at Holyrood is not available. The loss of Holyrood generation tends to restrict the capacity of Hydro's 230 kV transmission systems which transmit electricity from the central to the eastern portion of the Island Interconnected System. Such transmission capacity restrictions were encountered during January 11-13, 2013 and January 2-8, 2014.

B.2.2 The Rotating Power Outages: January 2-8, 2014

Figure 2 shows the times in the period January 2-8, 2014 during which Newfoundland Power rotated power supply to its customers.

Figure 2
Customer Outages & Rotating Power Outages
January 2-8, 2014



Newfoundland Power compiled a list of distribution feeders to be considered for feeder rotation based on experience in the January 2013 loss of supply event.[44] This list includes information for each distribution feeder such as peak load, critical customers served, and whether the feeder has remote control capability.[45]

[44] On January 11-12, 2013, Hydro's Holyrood Thermal Generating Station was unavailable for 21 hours. As part of the system recovery from this event, Newfoundland Power implemented limited rotating power outages to its customers. The January 2013 rotating power outages were undertaken in recovery from a major system event as opposed to the rotating power outages during January 2-8, 2014 which were undertaken to respond to a forecast shortage of generation resources on the Island Interconnected System.

[45] Distribution feeders with remote control capability can be turned on and off from the Company's SCC without needing to have personnel on site at the substation. Remote control of feeders also includes the ability to remotely adjust safety protection settings, as may be required when cold load pick-up or other abnormal conditions are anticipated.

Prior to implementing rotating power outages, the distribution feeder list was reviewed for accuracy and was prioritized to minimize impact of feeder rotation to critical customers. Critical customers included, but were not limited to, hospitals, fire and police stations, seniors' homes, and water pumping stations.

In total, 247 of Newfoundland Power's 306 distribution feeders were considered eligible for rotating power outages. Not all of the eligible feeders were necessarily included in the rotation of power outages for technical or operational reasons. For example, particularly large feeders with higher loads were more difficult to rotate due to a combination of their relative size and the effect of cold load pickup.[46] The Company tried to ensure that distribution feeders were not disconnected multiple times.

The list of distribution feeders considered for rotation was adjusted based on operating experience and consultation with customers and other stakeholders. For example, following the system disruption associated with the Sunnyside transformer fire on January 4th, 2014 and after communication with municipalities, the Company modified the feeder rotation list to exclude feeders serving community warming centres and fuel supply depots.[47]

Newfoundland Power tried to limit rotating power outages to one hour during the period January 2-8, 2014. A one-hour target was thought to be a reasonable compromise of customer inconvenience and the technical complications associated with rotating power outages, including cold load pickup.

During the first day of rotating power outages on January 2nd, 2014 Newfoundland Power and Hydro discussed each feeder rotation immediately prior to implementation. Following a review

[46] See footnote 54 for information on cold load pickup. Other technical reasons for excluding distribution feeders from rotating outages would include the location of available generation and customer demand (see page 18, lines 1 to 7). For these reasons, more rotating outages were required on the Avalon Peninsula than were required in, say, Western Newfoundland. Operational reasons would include resource limitations. For example, Newfoundland Power might choose not to rotate an outage to a small rural distribution feeder without remote control capability where the rotation would require a dispatch of technical or line resources for a relatively small system impact.

[47] A total of 59 of Newfoundland Power's 306 distribution feeders were designated critical feeders for the purposes of the events from January 2-8, 2014.

on January 3rd, 2014, it was determined by Newfoundland Power that the discussion of which feeders were to be rotated between control centres was extending the length of customer outages. As a result of this review, it was agreed that, beginning on January 3rd, 2014, Newfoundland Power would monitor system frequency and voltage, and carry out the rotating power outages within agreed maximum load change thresholds.[48] Coordination with Hydro was to be limited to determining when to start and when to cease rotating power outages.

Table 1 shows the date, time, and number of distribution feeder rotations completed together with the average duration of customer outage from January 2-8, 2014.[49]

Table 1
Rotating Outages
Feeder Rotations and Duration
January 2-8, 2014

Date	Time	Feeder Rotations	Average Duration (minutes)
January 2, 2014	4:13 pm to 10:46 pm	77	88
January 3, 2014	6:57 am to 7:36 pm	141	44
January 5, 2014	7:23 am to 8:29 pm	158	54
January 6, 2014	5:17 am to 10:48 am	39	47
January 8, 2014	3:23 pm to 5:42 pm	32	25

On January 2nd, 2014, the average duration of rotating power outages was 88 minutes, which was materially in excess of the Company's one hour target. From January 3rd, 2014, Newfoundland Power was able to achieve an average duration of rotating power outages of less than one hour.[50] The improvement in effectiveness of Newfoundland Power's efforts reflected a combination of better management of the process and experience.[51]

48 System frequency and voltage levels at Hydro's supply points to Newfoundland Power are indications of the matching of system load to available generation.

49 Table 1 does not include the outages which occurred as a result of the various system events described in footnote 27.

50 On January 2nd, 2014, 14 of 77, or just over 18%, of rotating power outages lasted for 2 hours or more. From January 3-8, 2014, 6 of 370, or just under 2%, of rotating power outages lasted for 2 hours or more.

51 A primary component of improved management of the process was the result of a review of the coordination process between Newfoundland Power and Hydro on January 3rd, 2014 which is described in more detail in the response to Request for Information PUB-NP-020.

Table 2 shows the number of Newfoundland Power customers which were affected by rotating power outages from January 2-8, 2014.

Table 2
Rotating Outages
Number of Customers Affected
January 2-8, 2014

Date	Time	Average	Maximum	Total
January 2, 2014	4:13 pm to 10:46 pm	17,777	33,529	73,925
January 3, 2014	6:57 am to 7:36 pm	8,150	17,254	90,587
January 5, 2014	7:23 am to 8:29 pm	11,203	21,889	93,744
January 6, 2014	5:17 am to 10:48 am	4,760	14,222	36,136
January 8, 2014	3:23 pm to 5:42 pm	6,292	11,047	32,931

On January 2nd, 2014, the maximum number of Newfoundland Power customers which were disconnected from the system at any point in time was 33,529, or just over 13% of Newfoundland Power's total number of customers.[52] On January 8th, 2014, the maximum number of Newfoundland Power's customers which were disconnected from the system at any point in time due to rotating outages was 11,047, or just over 4% of Newfoundland Power's total number of customers.[53]

[Purposefully Left Blank]

[52] 33,529/255,618 = 0.1312, or 13.1%.
[53] 11,047/255,618 = 0.0432, or 4.3%.

Table 3 shows the number of times that individual Newfoundland Power customers were exposed to rotating power outages from January 2-8, 2014.

Table 3
Rotating Outages
Number of Times Customers Affected
January 2-8, 2014

		Times Affected		
Date	**Time**	**1**	**2**	**3**
January 2, 2014	4:13 pm to 10:46 pm	73,925	4,564	-
January 3, 2014	6:57 am to 7:36 pm	90,587	44,219	6,953
January 5, 2014	7:23 am to 8:29 pm	93,744	57,944	4,919
January 6, 2014	5:17 am to 10:48 am	36,136	-	-
January 8, 2014	3:23 pm to 5:42 pm	32,931	-	-

On January 2^{nd}, 3^{rd} and 5^{th}, some Newfoundland Power customers had their electrical service disconnected and reconnected more than once as part of the Company's rotating power outages. One of the primary reasons for this was the length of time over which rotating power outages were required to maintain the balance of the supply and demand on the Island Interconnected System. On each of these 3 days rotating power outages were required from periods of 6 ½ hours to 13 hours. In addition, most of the rotating power outages were required to be undertaken on the Avalon Peninsula which has 160 distribution feeders. So the pool of the available distribution feeders for rotating power outages was limited. Increases in the number of critical feeders due to requirements such as service to warming centres further reduced the pool of distribution feeders available on January 5^{th}, 2014.

B.2.3 Field Operations

When it became evident that there could be rotating power outages as a result of a supply shortage on January 2^{nd}, 2014, Newfoundland Power made preparations and deployed its operations staff accordingly. These preparations included:

(i) deploying field operations staff to a number of the Company's substations to ensure that un-automated distribution feeders could be manually disconnected and reconnected if necessary;

(ii) positioning generation maintenance personnel at thermal and hydro plants to ensure their reliable operation;

(iii) readying electrical maintenance personnel to respond to any equipment damage; and

(iv) preparing line crews and technologists for localized trouble on transmission and distribution lines and *cold load pickup* issues.[54]

One of the challenges in matching supply and demand in a power rotation process is that larger amounts of load must be disconnected to enable the reconnection of previously disconnected distribution feeders. For Newfoundland Power, demand at reconnection could be as high as twice that at disconnection.[55] To enable the reconnection of a distribution feeder which was disconnected with 10 MW of customer load could require the disconnection of distribution feeders with as much as 20 MW of customer load. This type of situation presented itself repeatedly during the January 2-8, 2014 period.

Another technical challenge in a power rotation process is the risk of overloading electrical equipment and conductors. Relays which serve to protect substation equipment will operate to protect that equipment in circumstances of increased demand.[56]

---

[54] 26 line crews were in the field on January 2nd, 2014 when rotating power outages commenced. *Cold load pickup* is simply the additional electrical demand which presents itself when a disconnected feeder is reconnected. The electrical demand which can be expected upon reconnection will be higher than that which existed at disconnection. This is the result of a lack of diversity of demand at the time of reconnection. Prior to disconnection, a distribution feeder normally has a degree of diversity (randomness of electrical devices on at any given time). When that distribution feeder is disconnected and later reconnected, or “picked up”, this diversity is lost (all electrical devices are on at the moment of reconnection). This serves to increase the demand on the feeder at the moment of reconnection from what it was at the moment of disconnection.

[55] This is consistent with broader electrical engineering observations (see, for example, *Stepwise Restoration of Power Distribution Network under Cold Load Pickup*, Kumar, Gupta and Gupta, IEEE, where it is estimated that post-outage demand is up to 2 to 5 times diversified load.)

[56] Electrical system relays are typically set to operate under normal electrical system operating conditions. Readjusting settings on relays which protect electrical equipment in circumstances of electrical system distress requires application of engineering judgment. For example, overload conditions on a substation transformer may be acceptable in certain circumstances depending on the duration of the overload condition, the impact of the overload on the transformer, and ambient temperatures.

Field engineering options are available to address potential overload conditions on distribution feeders. Firstly, feeder restoration can be accomplished by sectionalizing the feeder into multiple smaller loads and reconnecting those loads sequentially. Secondly, a part of the load served by the distribution feeder may be capable of being offloaded onto an adjacent feeder. [57] Thirdly, temporary adjustments to protection settings on substation equipment may be available.[58] Distribution system overload conditions caused modest damage to Newfoundland Power's electrical system during the January 2-8, 2014 period.[59]

There were 9 substation breakers or reclosers which failed to operate correctly during the rotating power outages during January 2-8, 2014. These failures prolonged the duration of customer outages. The majority of the failures were due to the cold temperatures affecting the operating mechanisms. In each of these cases, field staff was dispatched and either made required repairs immediately or completed switching to temporarily transfer the customers to another distribution feeder while the repairs were completed.[60] Overall, during the rotating power outages over the January 2-8, 2014 period Newfoundland Power's breaker and recloser operations were successful 99% of the time.[61]

B.2.4 The Issue of Advance Customer Notice

The rotating power outage protocol adopted by Newfoundland Power in the period from January 2-8, 2014 was intended to maximize the use of available supply. As customer demand approached the limit of available generation, small blocks of customer load were rotated off and on the electrical system so that, to the extent practicable, the load matched *all* available

---

[57] Sectionalizing and offloading distribution feeders occurred frequently throughout the January 2-8, 2014 period.

[58] Sectionalizing or offloading feeders and adjusting relays may require the dispatch of engineers, technologists or line crews to the field. When this is required, it will tend to extend the duration of customer outages.

[59] Newfoundland Power experienced no damage to primary distribution conductor resulting from increased loads associated with cold load pickup. Less than 30 distribution transformers were damaged during the period January 2-8, 2014 due to increased load associated with cold load pickup. Newfoundland Power has approximately 60,000 distribution transformers on its electrical system.

[60] As a result of these breaker and recloser failures, Newfoundland Power inspected every breaker and recloser on the Avalon Peninsula on January 6-7, 2014 to reduce the risk of further failures compromising customer service.

[61] There were 447 distribution feeder rotations completed in the period January 2-8, 2014. (9/(447 x 2) = 0.01).

generation.[62] Using this protocol there was practically no margin between the amount of generation available and the customer load on the system.

As an alternative approach to rotating power outages Newfoundland Power could have attempted to provide all customers affected with advance notice of the timing and location of rotating power outages. Providing customers with advance notice would necessarily have involved planning to remove blocks of customer load based upon the *forecast* peak load and generation for the planned rotation period. Under this approach, the timing and magnitude of the supply shortfall would need to be forecast hours in advance. Using this forecast, a schedule would be developed to address the anticipated shortfall. The schedule would identify groups of distribution feeders with sufficient load to rotate such that demand would not exceed supply, with an appropriate allowance for forecast error.[63]

For the period January 2-8, 2014, Newfoundland Power is not in a position to estimate the number of additional customers that would have been off the system had customers been given advance notice of outages. This is largely due to the significant destabilizing events which occurred on the Island Interconnected System through this period and would have effectively prevented the giving of advance notice.[64] But, conceptually, it seems clear that scheduling rotating power outages so prior notice to customers is given will result in a greater number of customers being affected by the outages.[65]

---

[62] The determination of which distribution feeders were rotated off and on the electrical system was guided by real-time monitoring of system frequency and voltage levels. System frequency for the Island Interconnected System provides an indication of the balance of electrical demand and supply on a system wide basis. Voltage levels measured at delivery points will provide an indication of the balance of electrical demand and supply on a local geographical basis. Together, system frequency and voltage levels provide an indication, in engineering terms, of how many and which distribution feeders can be rotated off and on the electrical system at any point in time.

[63] The identified groups of distribution feeders would have to (i) include sufficient load to accommodate forecast error in the system peak, (ii) include the individual distribution feeder loads identified for rotation, and (iii) accommodate the dynamic and uncertain system circumstances which exist in an environment where there is insufficient supply.

[64] See **B.1: Chronology of Electrical System Events,** page 10 for a description of the series of major system disruptions which occurred during the January 2-8, 2014 period. Events of this magnitude create a level of instability on the Island Interconnected System that effectively precludes any realistic capability of scheduling rotating customer outages with advance notice.

[65] The conceptual basis for this conclusion is more fully described in the response to Request for Information PUB-NP-048.

B.3 Customer Communication & Response

B.3.1 Background

B.3.1.1 General

Utility customer communication and response is most critical in situations of electrical system distress. For Newfoundland Power, these situations typically occur as a result of severe weather damage to transmission and distribution systems.[66] In each year, Newfoundland Power usually experiences 1 or 2 major electrical system outages. These major electrical system outages serve as real-time tests of Newfoundland Power's customer service capabilities.

Newfoundland Power communicates with its customers by a variety of means. They include telephonic, digital and mass media based communications. The Company's operational processes aim to ensure that information provided to customers is responsive, accurate and timely, regardless of the customer's choice of communication channel.

Following major electrical system outages it is usual for Newfoundland Power to review its communication and customer service response to identify areas of potential improvement. The Company's customer communications performance in the period January 2-8, 2014 was improved as a result of changes made during 2013 to the Company's operational processes largely as a response to the electrical system events caused by equipment problems at Hydro's Holyrood plant on January 11th, 2013.[67]

B.3.1.2 The 2013 Customer Service Improvements

Newfoundland Power reassessed some key aspects of its customer service response in major electrical system outages following the electrical system events of January 11-13, 2013. This reassessment resulted in changes to customer communication technology, overall outage response processes, and human resource deployment.

---

[66] These severe weather events typically include ice storms, blizzards, hurricanes and tropical storms. Ice storms and blizzards occur in the winter; hurricanes and tropical storms occur in autumn. Newfoundland Power's operational protocol for response to severe weather events is described in the response to Request for Information PUB-NP-028.

[67] On January 11-12, 2013, Hydro's Holyrood Thermal Generation Station was unavailable for 21 hours. The reinstatement of electrical service to Newfoundland Power's customers following this outage was not concluded until January 13th, 2013. The events of January 11-13, 2013 are described more fully in **B.1: Chronology of Electrical System Events**, page 6.

Following the January 2013 outage, Newfoundland Power's Customer Contact Centre phone capacity was increased by over 25%.[68] Enhancements were made to facilitate more advanced telephone message handling.[69] In addition, improvements were made to permit quicker mobile phone access to outage information.[70] During this time, Newfoundland Power also deployed upgrades to its website to permit improved customer access to outage related information.[71]

To improve the timeliness, accuracy and consistency of customer communications during major electrical system events, Newfoundland Power established a team referred to as the *communications hub*. The communications hub is comprised of a mixture of operations, customer relations, communications and information services employees. The communications hub is responsible for the assembly, update and dissemination to key employees of information relating to outage status and restoration.[72]

To increase the pool of employees available to communicate with customers through a major electrical system event, the Company identified additional employees for service in the Customer Contact Centre.[73] The employees identified included employees in human resources, finance, conservation, regulatory, information services and audit functions.

[68] This contributed to a reduction of unanswered calls during the January 2-8, 2014 period by approximately ¾ compared to those experienced by customers during the January 11-13, 2013 period.

[69] One enhancement was establishment of an overflow menu to eliminate the "busy tone". When all trunks to the Contact Centre are busy, instead of receiving a busy tone, the overflow menu provides customers with the ability to indicate if their call is a public hazard. If so, the customer is routed to an agent through capacity reserved for public hazard calls. If the call is not a public hazard, the customer is asked to refer to the website for the most recent outage information or to try calling again.

[70] Prior to these improvements, unrecognized phone numbers (primarily cellular phone numbers) accessed St. John's area outage information by default. A new menu system was developed that prompts these particular callers for their calling area so that they receive outage information for their area.

[71] This included an interactive outage map, list of known customer outages and informational messages, such as outage status. The upgrades also permitted the Company to modify its website during response to major system events so that specific customer messaging for outages (i.e., the safe use of generators) could be exclusively run. Finally, enhancements included an application to permit customers to report outages online. Development of the interactive outage map was commenced prior to January 2013.

[72] This includes information from company sources, such as the Customer Contact Centre, SCC and Field Operations. It also includes information gathered from a diverse array of external sources, including customers, Hydro, fire and emergency services, department of transportation, municipalities, critical suppliers (i.e., fuel and food suppliers), school districts and seniors' homes.

[73] During major electrical system events and restoration, Newfoundland Power's Customer Contact Centre operates on an around-the-clock basis. During the January 11-13, 2013 electrical system event, Newfoundland Power encountered shortages of qualified employees available to answer customer inquiries.

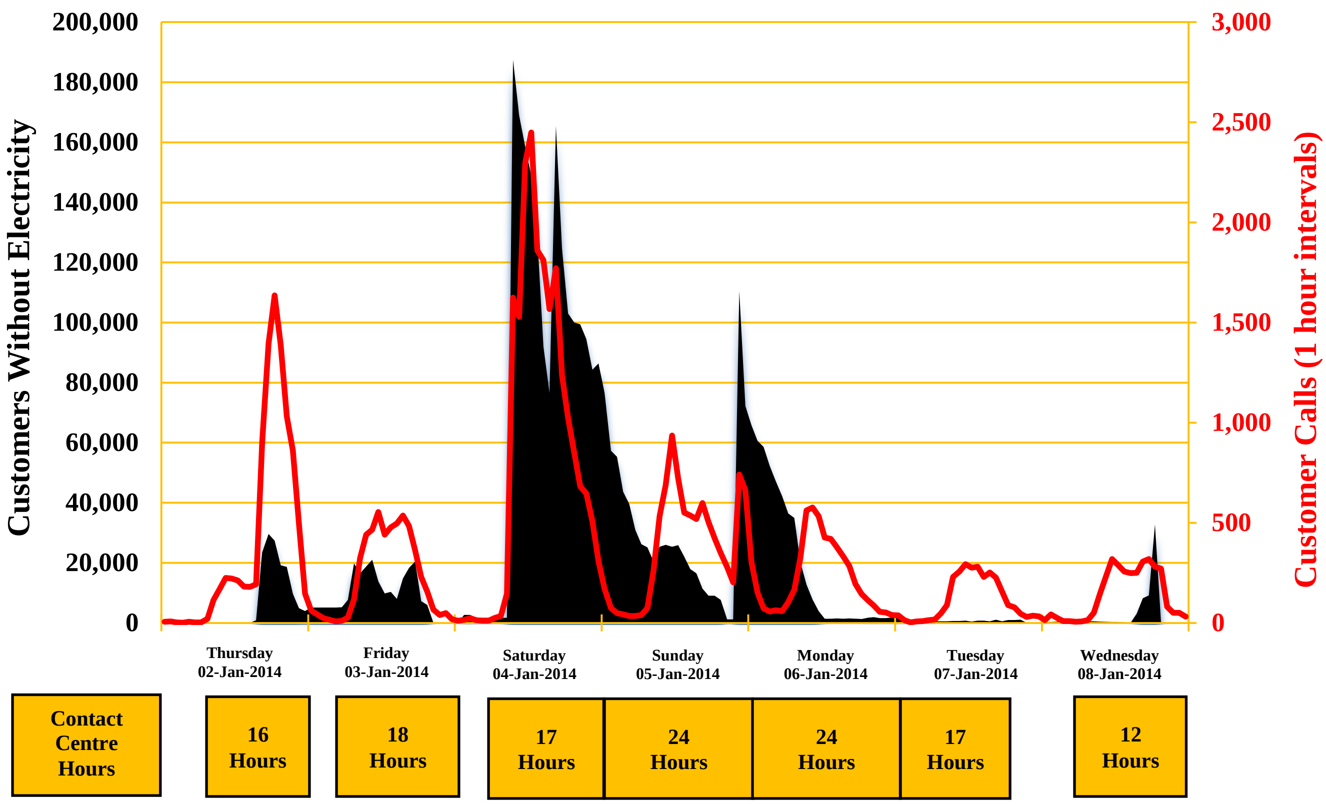
In August 2013, prior to the 2013/2014 hurricane season, the Company conducted a storm scenario test day in order to evaluate the improvements made in the aftermath of the January 2013 outage.

B.3.2 Customer Inquiry and Response

B.3.2.1 Overview

Figure 3 shows (i) Newfoundland Power customer outages, (ii) the number of customer calls received (in 1 hour intervals) and (iii) the hours of operation of the Company's Customer Contact Centre during the period of January 2-8, 2014.

Figure 3
Customer Outages & Customer Calls
January 2-8, 2014



The Customer Contact Centre received typical volumes of customer calls (i) prior to the commencement of rotating power outages at 4:13 pm on January 2nd, 2014; (ii) on January 7th, 2014; and (iii) prior to the recommencement of rotating power outages at 3:23 pm on January 8th,

2014. Customer calls to Newfoundland Power were highest on the evening of January 2nd, 2014, when rotating power outages were commenced by the Company, and immediately after the major electrical system disruptions of January 4th and 5th.[74]

Newfoundland Power's Customer Contact Centre was in operation until midnight on each of January 2nd and 3rd, 2014. The extended hours were necessary to respond to customer inquiries related to the rotating power outages during the peak evening periods in each of those days. From 7:00 am on January 4th until 5:00 pm on January 7th, the Customer Contact Centre was operating on a continuous basis. This was required to respond to customer inquiries following the major electrical system disruptions and the subsequent electrical system restoration periods.[75] The Customer Contact Centre also operated from 6:00 am to midnight on January 8th, 2014.

B.3.2.2 Customer Response

Table 4 shows a summary of customer contacts received by Newfoundland Power via telephone, email and website from January 2-8, 2014.

Table 4
Customer Contacts
January 2-8, 2014

Source	Number
Customer calls	139,335[76]
Emails	240
Website visits	947,215[77]

[74] Shortly after the commencement of rotating power outages at approximately 4:15 pm on January 2nd, 2014, Hydro's Granite Canal hydroelectric plant went out of service. This materially increased the number of customers affected by rotating power outages.

[75] On January 3rd and 4th, 2014, blizzard conditions were experienced across Newfoundland Power's service territory. The Company arranged safe transportation for staff as necessary to ensure the commencement of Customer Contact Centre operations by 6:00 am on January 4th, 2014.

[76] Newfoundland Power did not record how many customer calls to the Customer Contact Centre were related specifically to *rotating power outages*. Instead, the Company simply coded calls related to all aspects of the electrical system events as *outage calls*.

[77] The peak periods of web site visits occurred on January 4th, 2014 (approximately 219,000 visits) and January 5th, 2014 (approximately 200,000 visits).

During this period, Newfoundland Power's website was visited 947,215 times or approximately 87% of total contacts via these media. By comparison, Newfoundland Power received approximately 1 million visits to the Company's web site during the full year in 2013. During the January 2013 supply outage event, there were approximately 156,500 visits to the Company's website.[78]

Customer telephone calls to Newfoundland Power's Customer Contact Centre accounted for approximately 13% of contacts via these media. The 139,335 telephone calls received compares to the 194,564 telephone calls received during the January 2013 outage event.

Table 5 shows a summary of Newfoundland Power's response to telephone inquiries received from January 2-8, 2014.

Table 5
Telephone Response
January 2-8, 2014

Source	**Number**
Contact Centre Agent	25,792
IVR[79]	80,475
Unanswered Calls	33,068
Total	**139,335**

A total of 33,068 customer telephone calls received by Newfoundland Power during the period January 2-8, 2014 were unanswered. This represented approximately 24% of the total calls

[78] Increased customer website visits is consistent with recent patterns of customer contact with Newfoundland Power (see, for example, Newfoundland Power's 2013/2014 General Rate Application, Company Evidence, pages 2.6 to 2.8). Increased website contact, particularly via mobile device, is also reflective of the fact that mobile devices become the most convenient way for many customers to contact the Company when their electrical service has been disrupted. Finally, improvements to website outage content and mobile device accessibility undertaken in 2013 likely contributed to increased website traffic during January 2-8, 2014.

[79] IVR, or Interactive Voice Response, is an automated response which enables customers to access information regarding service by choosing from a menu via their telephone keypad.

received by the Customer Contact Centre during this period. This compares to over 50% of telephone calls unanswered during the January 2013 supply outage event.[80]

Table 6 shows a summary of the customer response to Newfoundland Power's social media efforts from January 2-8, 2014.

Table 6
Social Media
January 2-8, 2014

Source	**Number**
New Twitter followers	6,561
Facebook page likes	4,119

During the January 2-8, 2014 period, Newfoundland Power acquired approximately 6,600 new Twitter followers.[81] In addition, the Company's Facebook page was *liked* by just over 4,100 people. During the January 2013 supply outage event, Newfoundland Power acquired approximately 400 new Twitter followers.[82] Newfoundland Power did not have a Facebook presence in January 2013.

[Purposefully Left Blank]

[80] See Table 7, 101,171/194,564 = 0.5200, or 52%. The reduced unanswered call rate over January 2-8, 2014 is likely attributable to a combination of customer service improvements undertaken in 2013, particularly, increased Customer Contact Centre phone capacity, enhancements to facilitate more advanced message handling (i.e., a message directing customers to the company website instead of a standard telephone busy tone) and improvements to website outage content and mobile device accessibility.

[81] Newfoundland Power now has over 17,000 Twitter followers.

[82] This is an estimate. Newfoundland Power was experimenting with expanded use of social media during the January 2013 system event and did not keep reliable records of its experience.

Table 7 shows a comparative summary of key customer response data for the January 2013 and January 2014 supply outage events.

Table 7
Comparative Customer Service Statistics
Supply Outage Events
January 2013 & January 2014

	2013	**2014**
Customer Calls	194,564	139,335
Answered by Agent	9,610	25,792
Answered by IVR	83,783	80,475
Unanswered	101,171	33,068
Website Visits	156,506	947,215

The customer response data indicates that for the period January 2-8, 2014, Newfoundland Power answered a greater proportion of customer calls than during the January 2013 supply outage event. In addition, the Company website played a substantially more significant role in customer response for the period January 2-8, 2014 than it did during the January 2013 supply outage event.

B.3.2.3 Communications

Hydro took the lead on the issuing of public advisories related to the status of the Island Interconnected System throughout the January 2-8, 2014 period.[83] Hydro indicated to Newfoundland Power on January 2nd, 2014 that Newfoundland Power should not speak to the status of Hydro's generation and requested all media calls received by Newfoundland Power should be forwarded to Hydro. Newfoundland Power did not have access to real-time or forecast information relating to the status of most of Hydro's generation.[84]

At approximately 2:00 pm on January 2nd, 2014, a public advisory was made by Hydro to customers served by the Island Interconnected System "…to avoid unnecessary electricity usage and reduce their consumption as much as possible from 4:00 p.m. to 8:00 p.m. on Thursday,

[83] Newfoundland Power typically had no influence over the content of Hydro's media advisories throughout the January 2-8, 2014 period. Newfoundland Power received a copy of the 2:00 pm media advisory on January 2nd, 2014 by retrieving it from Hydro's website.

[84] See ***C.1.2: Current Transparency of System Operations***, page 50, line 22, *et. seq*.

January 2, 2014 and from 7:00 a.m. to 10:00 a.m. on Friday, January 3, 2014."[85] At approximately 9:00 pm on January 2nd, 2014, a further public advisory was made by Hydro indicating, in part, that "Temperatures and winds for tomorrow morning are forecast to result in colder weather than this evening, so rotating outages are highly likely for the peak period from 7:00 a.m. to 10:00 a.m. and possibly later."[86]

Newfoundland Power used mass and digital media to send broader messages to its customers concerning the status of events during January 2-8, 2014.

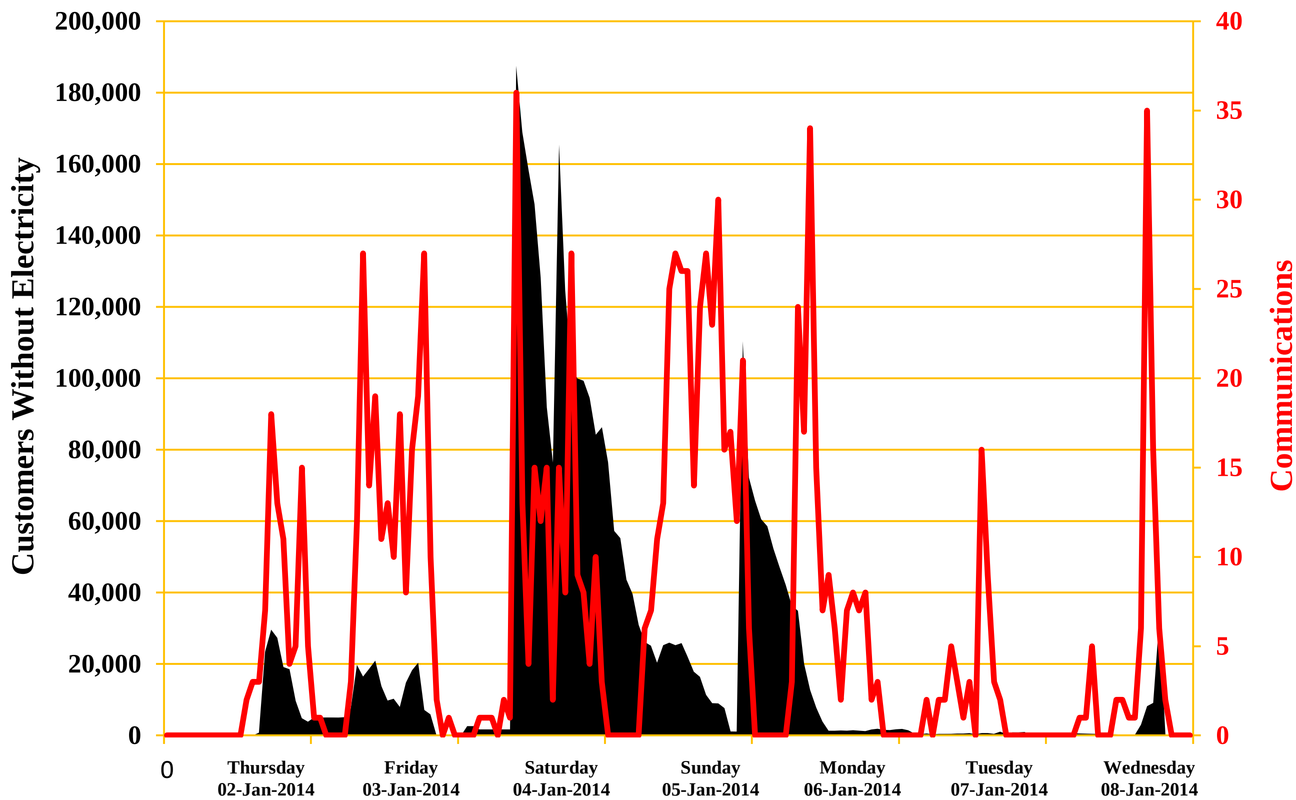
[Purposefully Left Blank]

[85] The public advisory is Attachment 1 to Hydro's response to Request for Information PUB-NLH-020.

[86] Hydro's public advisories tended to refer to high electricity loads. Only 1 of the 5 Hydro public advisories issued over the January 2-8, 2014 period actually referred to the reduced generation availability on the Island Interconnected System.

1 Figure 4 shows (i) Newfoundland Power customer outages and (ii) outbound Company
2 communications during the period January 2-8, 2014.[87]

Figure 4
Customer Outages & Communications
January 2-8, 2014



3 Over 100 media interviews on radio, television and in newspapers were completed by
4 Newfoundland Power as part of its mass media efforts to keep customers informed of the status
5 of electrical system events, including rotating power outages. Digital media included 598
6 website postings and 302 original social media posts. Of these digital media messages, just over
7 50% related to the rotating power outages undertaken by Newfoundland Power.[88]

[87] The communications depicted in Figure 4 include Newfoundland Power public advisories, media interviews, website postings and social media posts.
[88] While electrical system outage status was the primary theme of Newfoundland Power's communications, electricity conservation and safety, particularly customer generator safety, were also prominent themes.

In addition to its media efforts, Newfoundland Power conducted outreach to key stakeholders through the January 2-8, 2014 period. This included daily updates with mayors of larger affected municipalities on the coordination of conservation and safety measures. It also included arrangements for adding distribution feeders serving municipal *warming centres* to Newfoundland Power's critical feeder list for the purpose of rotating power outages. Daily updates with executive and senior management of the school system on issues ranging from conservation measures to school scheduling were also undertaken. Increased commercial customer conservation was encouraged through direct contact with commercial customers and outreach to business organizations such as the St. John's Board of Trade.

Newfoundland Power participated in the Government Power Outage Response Committee.[89] This committee developed a joint mass media (radio and newspaper) campaign focused on customer electricity conservation during peak periods on the Island Interconnected System. The campaign commenced on January 6th, 2014 and concluded on January 11th, 2014.

Finally, Newfoundland Power participated in 6 joint press conferences during the January 2-8, 2014 period. These joint press conferences were undertaken with representatives of Hydro, Fire and Emergency services and the Premier of the province.[90]

B.3.2.4 Customer Communications Feedback

In February 2014, Newfoundland Power conducted a survey of its customers to obtain feedback on the effectiveness of the Company's communications during the January 2-8, 2014 period.[91]

---

[89] The Government Power Outage Response Committee also included a representative for Hydro and 2 representatives for the Government of Newfoundland and Labrador. The committee was formed on January 5th, 2014 during a meeting with the Premier, other government officials and Hydro.

[90] One of the joint press conferences (2:30 pm, January 3rd, 2014) included representatives from Newfoundland Power, Hydro, and Fire and Emergency Services. Two of the joint press conferences (2:00 pm and 6:00 pm, January 4th, 2014) included representatives from Newfoundland Power and Hydro. Two of the joint press conferences (12:30 pm, January 5th and 1:00 pm, January 7th, 2014) included the Presidents of Newfoundland Power and Nalcor/Hydro and the Premier of the Province. One of the joint press conferences (12:30 pm, January 6th, 2014) included the President of Newfoundland Power and the Premier of the Province.

[91] The survey was a random telephone survey of 400 Newfoundland Power customers resident in the eastern Newfoundland areas most affected by the system events of January 2-8, 2014 (the Avalon, Bonavista and Burin Peninsulas). Customer data was collected during February 6-10, 2014 and survey results have a margin of error of ± 5% at a 95% confidence interval (19 times out of 20).

The survey results will be used to improve Newfoundland Power's communication efforts during future major electrical system events.

Based upon this communications feedback, it appears that radio is a favored media source for customer information in periods of electrical system distress. This indicates that the Company should further pursue partnerships with local radio stations to provide regular outage updates with customers.[92]

Newfoundland Power's website was the digital communications source preferred by customers. It was also more popular than television or print media. This indicates that the Company should pursue website improvements to provide more customer friendly information related to system outages. Social media tended to be preferred by younger customers and is growing in popularity. This indicates that Newfoundland Power should increase its efforts in social media communications in future situations of electrical system distress.[93]

The survey results indicated that many Newfoundland Power customers conserved electricity during the January system interruptions. Over 70% of the Company's customers indicated that they turned off lights, however, less than half turned off electric heat or made the conscious decision to wash clothes or dishes in off peak hours. This indicates that increased communications emphasis on customer conservation in situations of electrical system distress is warranted.

The results of Newfoundland Power's survey of its customers will be incorporated in future communications in situations of electrical system distress.

[92] Newfoundland Power already has such partnerships; however, the degree of customer reliance on radio as a source of information indicates further development of such partnerships is warranted.

[93] Media outlets also access Newfoundland Power's social media as a source of information for reporting purposes. This reinforces a continued Company focus on social media during major outages or system interruptions.

B.4 Inter-Utility Coordination

B.4.1 Routine Operational Coordination

Hydro's ECC operates an energy management system that monitors and controls Hydro's generation and bulk transmission systems. The ECC's primary functions are the economic dispatch of generation and ensuring the balance of electrical system supply and demand for the Island Interconnected System.[94] Newfoundland Power's SCC, operates a supervisory control and data acquisition system that monitors and controls Newfoundland Power's generation, transmission and distribution systems. Both Newfoundland Power's SCC and Hydro's ECC are staffed 24 hours a day, every day of the year.

The energy management system in Hydro's ECC is linked to the supervisory control and data acquisition system in Newfoundland Power's SCC.[95] This link provides each utility with near real-time information concerning the other's electrical operations on the Island Interconnected System.[96] Communication and coordination between Newfoundland Power's SCC and Hydro's ECC is continuous and is the central feature of daily operational coordination on the Island Interconnected System. Newfoundland Power's SCC and Hydro's ECC ensure that routine daily electrical system operations such as generation dispatch and line and equipment switching are performed on a safe and reliable basis.

Newfoundland Power and Hydro coordinate scheduling of work on their respective systems for 2 basic reasons. One is to ensure that one utility's actions will not unnecessarily affect the other utility's provision of service to its customers.[97] The other is to ensure that the *joint* actions of the

94 Newfoundland Power is responsible for the availability of its generation resources which includes approximately 97.5 MW of hydroelectric generation and approximately 41.5 MW of thermal generation; however, this represents less than 10% of the available generation resources on the Island Interconnected System. Each morning, Newfoundland Power's SCC informs Hydro's ECC of the availability of Newfoundland Power's generation.

95 This link meets the *Inter-Control Centre Communications Protocol* of International Electrotechnical Commission IEC 60870-6.

96 The operational information available between utilities via this link is not comprehensive. It does include status of some critical equipment and some generation. (See **C.1: Public Policy Context**, page 47).

97 For example, Hydro routinely schedules maintenance of its 66/138kV radial transmission system from Bottom Brook to Port aux Basques when customer load in the Port aux Basques area is low, and Newfoundland Power's local and mobile generation is available. This coordination ensures service continuity to Newfoundland Power's customers on the southwestern portion of its service territory during Hydro's maintenance activities, which typically take 3-5 days to complete.

two utilities are undertaken in a way which is least disruptive to the reliable delivery of electricity to customers.[98]

Coordination of planned outages on the Island Interconnected System requires a high degree of communication and cooperation which is coordinated by Newfoundland Power's SCC and Hydro's ECC. General oversight of the communication and cooperation between utilities is provided by the Committee.

Newfoundland Power's SCC and Hydro's ECC are central to the utilities' response to major electrical system events. Such events include damage caused by severe weather events, failure of major system components, and loss of supply. When responding to major electrical system events, Newfoundland Power's SCC and Hydro's ECC work together to re-establish normal operations on the electrical system in a controlled and orderly fashion. Hydro's ECC operators typically take a lead role in informing Newfoundland Power's response to major electrical system events via the SCC.[99]

Newfoundland Power's SCC relies upon Hydro's ECC to keep it updated on system demand on the Island Interconnected System.[100] Similarly, Newfoundland Power's SCC relies upon

---

[98] For example, in 2012 Newfoundland Power relocated its mobile generation to enable scheduled maintenance of its 138kV radial transmission system serving the Baie Verte Peninsula with minimal disruption of service to customers. Hydro has a 138kV radial transmission system in the area which is supplied by the Newfoundland Power 138kV radial transmission system. Hydro coordinated its maintenance of its system in the same area for the same time. The coordination ensured that the overall disruption of electrical service to both utilities' customers was minimized.

[99] Examples of the type of information provided by Hydro's ECC which would inform Newfoundland Power's response to a major electrical system event would include (i) the amount of Hydro generation capacity available on the Island Interconnected System, (ii) the status of the bulk transmission system, and (iii) the operating condition of major electrical system components such as power transformers and breakers. The availability and quality of this information is critical to effective system restoration efforts. For some major weather events where damage is more localized and is not system wide, the information provided by Hydro's ECC will be less critical to Newfoundland Power's response efforts on an ongoing basis.

[100] Newfoundland Power's SCC monitors electrical demand on *Newfoundland Power's* electrical system on a real-time basis. Newfoundland Power does not have information on the Island Interconnected System electrical demand on a real-time basis; however, Newfoundland Power's electrical system accounts for approximately 85% of demand on the Island Interconnected System.

Hydro's ECC for information concerning the availability of system generation resources on a timely basis.[101]

Newfoundland Power's electrical system is programmed so that, whenever system demand or availability of generation requires, customer load will be shed to protect the integrity of the Island Interconnected System.[102] Following such an event, Hydro's ECC cooperates with Newfoundland Power's SCC to ensure that customers disconnected from the system are reconnected to the system quickly while maintaining system integrity.

When forced outages have occurred with Hydro's generation and Newfoundland Power's customers lose service, the Company's SCC and Hydro's ECC cooperate to take the available steps to restore service.[103]

B.4.2 Forecasting and Supply Planning

Newfoundland Power's and Hydro's respective forecasting personnel communicate on an ongoing basis. These discussions typically focus on the comparability of Newfoundland Power's energy and demand forecasts and Hydro's long range island load forecasts. Periodically, changes to Newfoundland Power's forecasts are made, either to update forecast methodology or to ensure the information provided is responsive to Hydro's requirements. In all cases, these changes are agreed between the two utilities.[104]

At least once each year, usually in the spring, Newfoundland Power provides Hydro with a 5-year forecast of its overall annual and monthly energy and peak load requirements (the "Energy

---

[101] The link between Hydro's ECC and Newfoundland Power's SCC provides Newfoundland Power with information on total Hydro supply online (with detail on thermal generation (Holyrood and gas turbines)). The link does not provide any information on Hydro's generation which is available but not serving demand. Newfoundland Power does not have real-time access to information concerning the reserve margins available on the Island Interconnected System.

[102] This is the most common response to an imbalance of supply and demand on the Island Interconnected System. For a description of how Newfoundland Power's underfrequency load shedding system operates to restore the balance between electricity supply and demand, see the response to Request for Information PUB-NP-022.

[103] Following a forced customer outage due to sudden loss of Hydro generation, Hydro will typically inform Newfoundland Power of the generation availability on a real-time basis to assist in restoration of service. See ***B.4.3: January 2-8, 2014***, page 41 for a description of coordination during the January 2-8, 2014 period.

[104] See the response to Request for Information PUB-NP-012 for information on changes to Newfoundland Power's load forecasting methodology.

and Demand Forecast”). The Energy and Demand Forecast is used by Hydro in developing its own forecast of energy and winter peak demand for the Island Interconnected System.[105]

Each year Newfoundland Power also provides Hydro with a forecast of winter peak demand and annual energy requirements for each of the interconnections where Newfoundland Power takes supply from Hydro.[106] This forecast is used to assess the capacity of system equipment at each of the points of supply.

Newfoundland Power does not actively participate in the assessment of either (i) the adequacy of existing generation resources to meet forecast loads on the Island Interconnected System or (ii) future generation alternatives for the Island Interconnected System.[107]

B.4.3 January 2-8, 2014

During the period January 2-8, 2014, there was ongoing coordination and frequent communication between Newfoundland Power’s SCC and Hydro’s ECC.

Following the morning peak on January 2nd, 2014, Newfoundland Power informed Hydro that its evening peak load could reach or exceed 1,375 MW. Hydro advised Newfoundland Power that, in light of this information, there was likelihood that there would be insufficient generation available to meet the evening peak. This was the first time that Newfoundland Power and Hydro had to coordinate the response to a forecast generation shortfall on the Island Interconnected System.[108]

On January 3rd, 2014, the second day of rotating power outages, an opportunity was recognized to improve the coordination process between Newfoundland Power and Hydro that shortened

105 For greater detail on this forecast please see the response to Request for Information PUB-NP-006.
106 Newfoundland Power takes power supply from Hydro at 24 metering points. These 24 metering points are at 21 locations.
107 Supply planning for the Island Interconnected System is described in **C.1: Public Policy Context**, page 47.
108 The level of interaction between Newfoundland Power’s SCC and Hydro’s ECC from this point was consistent with previous responses to major electrical system events as described at page 39, lines 9 to 15.

customer outages. This also reduced the impact of cold load pickup and ensured more customers were served by the available generation capacity.[109]

Throughout the January 4-8, 2014 period, a number of major system disruptions occurred on the Island Interconnected System. After these disruptions, Newfoundland Power implemented its normal electrical system restoration procedures, which included communication and coordination with Hydro as generation was brought back online and was available for distribution. During the period, Hydro indicated the amount of load Newfoundland Power could add to the Island Interconnected System. The amount of load varied from 5 MW to 100 MW but was typically made available in 20 MW increments.[110]

Throughout the January 2-8, 2014 period, Hydro called upon Newfoundland Power to dispatch its hydroelectric and thermal generating units.[111] During the period, Newfoundland Power's hydroelectric generation availability averaged approximately 88 MW each day and its thermal generation availability averaged approximately 27 MW each day.[112]

B.5 Assessment

The chronology of system events associated with the supply issues and power outages of December 2013 – January 2014 on the Island Interconnected System indicates that:

1) The generation supply issues experienced during January 2014 had certain similarities to the generation supply issues experienced during January 11-13, 2013. In both cases, equipment problems at Holyrood resulted in large numbers of Newfoundland Power customers being without service in winter conditions. Following the January 2013

---

[109] See the response to Request for Information PUB-NP-020.

[110] A typical distribution feeder winter load is approximately 10 MW. 20 MW increments were practical because they would provide enough capacity for Newfoundland Power to reconnect a typical distribution feeder during rotating power outages. See ***B.2.3: Field Operations***, page 23.

[111] A request to Newfoundland Power to maximize (i) hydro production and (ii) thermal production are steps 2 and 8, respectively, on Hydro's 14 step system operating instruction T-001 *Generation Loading Sequence and Generation Shortages*. (See Attachment 1 to Hydro's response to Request for Information PUB-NLH-033).

[112] Newfoundland Power's average thermal generation availability was substantially reduced due to the 20 MW Greenhill Gas Turbine being unavailable for 39.5 hours on January 3-5, 2014 because of the inability to arrange fuel delivery during blizzard conditions.

outage, available generation on the Island Interconnected System was reduced for the balance of the winter season.

2) The impacts on Newfoundland Power's customers resulting from the generation supply issues and power outages experienced during January 2014 were primarily the result of a combination of (i) insufficient available generation on the Island Interconnected System during the period January 2-8, 2014; (ii) a blizzard from January 3-4, 2014; and (iii) a series of major system disruptions from January 4-8, 2014. The series of major system disruptions had the most severe customer impacts. The blizzard had the least severe customer impacts.

3) Newfoundland Power's electrical system was robust and performed reasonably well during the period. The resilience of the Company's transmission and distribution systems resulted in minimal blizzard damage to the electrical system. Newfoundland Power's electrical system performed well in both the recovery from the series of major system disruptions and the implementation of rotating power outages during the period. The Company's generation resources provided reasonable support to the Island Interconnected System throughout the December 2013 – January 2014 period.

A review of rotating power outages undertaken by Newfoundland Power in response to the supply issues and power outages of December 2013 – January 2014 on the Island Interconnected System indicates that:

1) The average duration of rotating power outages experienced by affected Newfoundland Power customers on January 2nd, 2014 was 88 minutes and the average duration during January 3-8, 2014 ranged from 25 to 54 minutes. The reduced average duration of customer outages reflected improvements in implementation made following the initial experience on January 2nd, 2014.

2) Newfoundland Power did not provide its customers any specific advance notice of rotating power outages that would affect them. The provision of specific notice would

require more customers to be without service than otherwise would be the case. During much of the January 2-8, 2014 period major system disturbances destabilized the Island Interconnected System to such a degree that the provision of specific notice would have been practically impossible for much of the period.

A review of customer communications and response to the supply issues and power outages of December 2013 – January 2014 on the Island Interconnected System indicates that:

1) Newfoundland Power's customers did not receive timely or complete information relating to the insufficiency of available generation on the Island Interconnected System commencing January 2nd, 2014. Two hours before the commencement of rotating power outages on January 2nd, 2014, Newfoundland Power's customers were simply advised of the need to conserve electricity. Customers were not informed of the vulnerability of the Island Interconnected System or the likelihood of power outages later in the day.

2) Customer service improvements implemented by the Company in 2013 as a result of the generation supply issues experienced in January 2013 provided improved levels of customer service response during January 2-8, 2014. Newfoundland Power's Customer Contact Centre was operational for virtually all of the period.

3) Further improvements in customer service are achievable.

Increased availability to Newfoundland Power of real-time and forecast data on the Island Interconnected System will enable the Company to improve the extent of meaningful information it can provide to its customers relating to the forecast adequacy of generation supply to meet demand.

Improving information conveyed through mass media, particularly radio, and postings to the Company website should improve overall customer communication regarding outages.

An assessment of further possible improvements in the Company's telephonic response capabilities during outages may also yield tangible customer service benefits. Newfoundland Power is considering the potential of rerouting Customer Contact Centre telephone overflow to third party call centres in emergency situations.

A review of operational coordination between Newfoundland Power and Hydro, including that during the supply issues and power outages of December 2013 – January 2014 on the Island Interconnected System, indicates that:

1) Routine operational coordination between Newfoundland Power and Hydro is reasonable. The events of December 2013 to January 2014 on the Island Interconnected System were not routine.

2) January 2nd, 2014 was the first time that Newfoundland Power and Hydro had to coordinate the response to a forecast generation shortfall on the Island Interconnected System. Operational coordination between the utilities permitted rotating power outages to be carried out when overall system stability permitted. Newfoundland Power implemented rotating power outages to respond to generation shortfalls on 5 of the 7 days in the January 2-8, 2014 period.

On a broader basis, the supply issues and power outages of December 2013 – January 2014 clearly raise issues concerning current supply planning and bulk system operations on the Island Interconnected System. The assessment of these issues on reliability of supply for Newfoundland Power and its customers requires consideration over both near-term and longer-term time horizons.

Over the near-term, the reliability of Hydro's thermal generation resources, particularly Holyrood, is critical. In both January 2013 and January 2014, Holyrood reliability was a prominent vulnerability for the Island Interconnected System. Whether and how that vulnerability might be minimized in the future is a key near-term consideration.

Further, the series of major system disruptions which occurred on the Island Interconnected System in January 2014 raise potential questions concerning the adequacy of protection and control at the bulk system level. Protection and control systems are intended to operate in a way that isolates defective or malfunctioning electrical equipment and prevents widespread system impacts. The series of major system disruptions during January 2-8, 2014 suggest that protection and control systems may not have operated as they should.

Over the longer-term, different considerations will apply. The proposed decommissioning of Holyrood generation is a central consideration. Holyrood is the key generating station on the eastern part of the Island Interconnected System. The eastern part of the system is also the location of the largest and fastest growing loads. Following the commissioning of the Labrador in-feed and the Maritime link virtually all of the key generating resources serving the Island Interconnected System are proposed to be located outside the eastern part of the system. It is not clear how long-term reliability and security of power supply will be maintained at that time.

Greater backup generating capacity on the eastern part of the Island Interconnected System would have likely reduced the electrical system and customer distress experienced in January 2014. Whether increasing backup generating capacity on the eastern part of the Island Interconnected System will be necessary to ensure long-term reliability and security of power supply is also a key consideration.

C. ENSURING SYSTEM RELIABILITY THROUGH 2017

C.1 Public Policy Context

C.1.1 Supply Planning for the Island Interconnected System

Hydro has historically held the exclusive right to develop hydro-electric generation on the Island of Newfoundland.[113] In addition, to enable it to plan generation requirements Hydro has had the ability to require customers to provide load forecasts for periods up to 20 years.[114] Hydro was granted the exclusive right to supply power on the island of Newfoundland in 2012.[115]

Responsibility for supply planning for the Island Interconnected System under the existing regulatory framework also rests with Hydro.[116] The degree, if any, to which this responsibility may be practically shared with Hydro's affiliates such as Nalcor is not entirely clear to Newfoundland Power. But Nalcor planning decisions which could clearly impact reliability on the Island Interconnected System may need to be revisited.[117]

In the mid-1990s, the Board was given the statutory responsibility to ensure that adequate electrical system planning occurs for the Province. This responsibility includes oversight of supply planning for the Island Interconnected System.[118] In addition, the Board has broad powers to conduct enquires, set priorities, and, if necessary, re-allocate existing supply when a

[113] See for example, section 14 of the *Hydro Corporations Act,* R.S.N. 1990 which provides "…exclusive right and franchise…" to "…all power developed after January 1, 1975 from new hydro-electric sites.".

[114] See *Hydro Corporations Act,* R.S.N. 1990, s.13.

[115] See *An Act to Amend the Electrical Power Control Act, 1994,* the *Energy Corporation Act* and the *Hydro Corporation Act, 2007,* S.N.L. 2012, c. 47, s. 3. This exclusive right of supply does not apply to either Newfoundland Power's existing generation resources or generation resources used exclusively in emergency circumstances.

[116] This responsibility was affirmed in the Province's 2007 *Energy Plan* where it was indicated that Hydro would continue its lead role as the long-term planning entity for the electricity sector (see *Energy Plan*, page 47).

[117] See, for example, Hydro's *Technical Note, Labrador-Island HVdc Link and Island Interconnected System Reliability, October 30, 2011* filed as Exhibit 106 in the Board's Muskrat Falls Review. This technical note concluded "While the impact of these outage events could be further mitigated with the application of additional combustion turbines on the Island Interconnected System, given the low probability of the event and minimal impact of unsupplied energy, Nalcor, in the interest of minimizing overall cost to the customer, has opted to apply load rotation and other means to minimize the impact to customers should an event occur." The events of January 2-8, 2014 appear to provide sufficient justification to reassess the appropriate application of additional combustion turbines on the Island Interconnected System.

[118] See the *Electrical Power Control Act, 1994,* S.N.L. 1994, c. E-5.1, s.6, *et. seq.* This establishment of the Board's oversight of the supply planning in the *Electrical Power Control Act, 1994,* was part of a comprehensive change in the regulatory framework in the Province. One result of this change was that Hydro became a fully-regulated public utility within the meaning of the *Public Utilities Act.*

shortage in power supply exists or is anticipated.[119] The Board's responsibilities are subject to limitation in the form of Provincial Cabinet directives.[120] An appropriate process by which Hydro's responsibility for supply planning for the Island Interconnected System might be overseen has been the subject of Board consideration.[121]

There have been a series of Provincial Cabinet directives which have impacted supply planning on the Island Interconnected System. Since the mid-1990s, additions to Hydro's supply portfolio have typically been exempted from the Board's oversight by Provincial Cabinet directive. These exemptions have applied to new Hydro and Nalcor facilities, customer co-generation, and interruptible contracts.[122] One result of this is that the Board has not yet been required to approve a material addition to Hydro's supply portfolio for the Island Interconnected System. The Board has, however, recognized that such exemptions do not alter its responsibility to ensure that electricity supply for the Island Interconnected System is adequately planned and operated reliably.[123]

Since acquiring statutory oversight of supply planning, the Board has not yet fully considered a material addition to Hydro's transmission capacity for the Island Interconnected System. In 2011, Hydro proposed to add a 188 km, 230 kV transmission line from Bay d'Espoir to Western Avalon to satisfy "…an immediate need for enhancements to the transmission system east of Bay

[119] See the *Electrical Power Control Act, 1994*, S.N.L. 1994, c. E-5.1, s. 6 *et seq.*

[120] See, for example, the *Electrical Power Control Act, 1994*, S.N.L. 1994, c. E-5.1, ss. 5.1 and 5.2 and the references to these direct powers in Order No. P.U. 7 (2002-2003), page 25, Order No. P.U. 14 (2004), page 20, and Order No. P.U. 8 (2007), pages 5-6.

[121] See, for example, the commentary regarding integrated resource planning in Order No. P.U. 14 (2004), pages 147-149 and in Order No. P.U. 8 (2007), pages 58-60.

[122] See, for example, the *Granite Canal Hydroelectric Project Exemption Order*, which exempted Hydro's last commissioned hydroelectric facility on the Island Interconnected System. The *Newfoundland and Labrador Hydro-Corner Brook Pulp and Paper Limited Exemption Order*, (O.C. 2000-489/490) exempted a 15 MW cogeneration project of Corner Brook Pulp and Paper Limited. The *Newfoundland and Labrador Hydro-Abitibi Consolidated Inc. Stephenville Operations Exemption Order* (O.C. 2004-210) exempted an interruptible supply contract between Hydro and Abitibi-Consolidated's Stephenville facility.

[123] See *Reference to the Board Review of Two Generation Expansion Options, etc., Report to Government,* March 30, 2012 where the Board clearly recognized both the potential large societal costs related to outages and its responsibility to ensure the electricity supply for the Island Interconnected System is adequately planned and operated reliably at the lowest possible cost consistent with an acceptable level of reliability (at pages 99-100). The Board's review of the Muskrat Falls project was limited as the project was exempted from regulatory oversight by the *Muskrat Falls Exemption Order* (O.C. 2013-342).

d'Espoir."[124] Notwithstanding the indicated urgency, Hydro chose not to pursue this project citing the higher priority of the Muskrat Falls review.[125]

While material additions to Hydro's supply portfolio on the Island Interconnected System have typically not been subject to Board approval, the condition of Hydro's existing generating stations has. In particular, Hydro's thermal stations and the capital expenditures necessary to keep them reliable has been the subject of recurring Board review for well over a decade.[126]

All Newfoundland Power's capital additions are subject to prior approval by the Board.[127] While Newfoundland Power has made only modest additions to its generating capacity since the mid-1990s, they all required Board approval.[128] For planned replacement, refurbishment or construction of generation facilities, the Board has indicated that Newfoundland Power should consult with Hydro so as to avoid duplication of services.[129]

At Hydro's last 2 general rate applications, in 2003 and 2006 respectively, the issue of resource planning arose. In dealing with the 2003 general rate application, the Board observed:

> The Board has authority and responsibility to ensure that adequate planning occurs in the production, transmission and distribution of least cost reliable power in the Province. While the Board will make no order at this time with respect to Integrated Resource Planning, the utilities may be required by the Board, consistent with its mandate, to participate in a generic process to address issues and benefits associated with Integrated Resource Planning.[130]

[124] See Hydro's 2012 Capital Budget Application, *Upgrade Transmission Line Corridor- Bay d'Espoir to Western Avalon*, September 2011, page 16.

[125] See Hydro's letter to the Board of December 7, 2011.

[126] See, for example, *Prime Thermal Asset Remaining Life Assessment*, May 19, 1999 which assesses Hydro's 3 principal thermal generating plants, the 490 MW Holyrood facility, the 50 MW Hardwoods Gas Turbine and the 50 MW Stephenville Gas Turbine. Capital expenditures for each of these plants were considered, and approved, by the Board in 2013 (see **B.1: Chronology of Electrical System Events**, page 6).

[127] See s. 41 of the *Public Utilities Act.*

[128] For example, see Order No. P.U. 17 (1997-98) which approved the Rose Blanche Brook hydroelectric plant or Order No. P.U. 36 (2002-2003) which approved a 2.5 MW portable diesel generating plant.

[129] See Order No. P.U. 35 (2003), page 8.

[130] See Order No. P.U. 14 (2004), page 149.

After Hydro's 2006 general rate hearing, the Board chose to defer an Integrated Resource Planning exercise pending release of the Province's *Energy Plan* and completion of various rate design reviews and conservation and demand management studies, then underway.[131]

Hydro has primary responsibility for supply planning on the Island Interconnected System. Since the mid-1990s, the Provincial cabinet has routinely exempted material additions to Hydro's supply portfolio from regulatory oversight. Proceedings before the Board such as annual utility capital budget applications do consider aspects of the reliability of supply. However, to date, a comprehensive public review of the reliability of the Island Interconnected System has not been undertaken.

C.1.2 Current Transparency of System Operations

It is an essential requirement of electrical system operation that the generation available in all points in time is sufficient to meet the total customer demand.[132] Whenever there is insufficient generation available to serve total customer demand, some customers will not be served. In cases where transmission capacity is constrained, some customers may be at increased risk of not being served.[133] The ability of a utility to understand, in both real-time and forecast terms, available generation and customer demand is essential to understanding (i) when future customer outages might reasonably be expected to occur and (ii) when existing customer outages might reasonably be expected to end.

Newfoundland Power has limited access, in real-time terms, to information respecting available generation and customer demand on the Island Interconnected System. The link between Hydro's ECC and Newfoundland Power's SCC provides Newfoundland Power with information on total Hydro supply online (with detail on thermal generation (Holyrood and gas turbines)). The link does not provide any information on Hydro's generation which is available but not

[131] See Order No. P.U. 8 (2007), page 60.
[132] See the response to Request for Information PUB-NP-022, page 1, line 19 *et. seq.* for further information on this requirement and the consequences when it is not met.
[133] Transmission capacity constraints effectively limit the amount of generation that is available on a locational basis to serve customers. For this reason, transmission constraints can have similar customer impacts to system wide insufficiency of generation.

serving demand. Newfoundland Power does not have real-time access to forecast reserve margins available on the Island Interconnected System.

Historically, Newfoundland Power has not had access to Hydro's short-term supply and demand forecast for the Island Interconnected System. While communication between Hydro's ECC and Newfoundland Power's SCC has provided the Company with information for daily operational coordination, planned outage coordination and electrical system response, this information has not been provided as a matter of daily routine.[134] This information has become available since January 2014.[135]

In circumstances where there is sufficient generation available to serve total customer demand, the fact that Newfoundland Power does not have real-time and short-term forecast information on the Island Interconnected System is typically of little consequence.[136] This is the case for the vast majority of hours in any given year.

In circumstances where there is insufficient generation or transmission capacity available to serve total customer demand, the primary result of this lack of information is the restriction it places on Newfoundland Power's ability to confidently inform its customers of the status of their electricity supply. There are also operational restrictions associated with this lack of information

[134] See the response to Request for Information PUB-NP-002 for details of coordination between Newfoundland Power and Hydro.

[135] This information became available following the Board's commencement of its inquiry into the supply issues and power outages on the Island Interconnected System in December 2013 and January 2014.

[136] Currently, Newfoundland Power's under frequency load shedding system automatically responds to sudden losses of supply on the Island Interconnected System. When such a response occurs, Newfoundland Power will not be aware of the specific incident on the Island Interconnected System which gave rise to the loss of supply (i.e., which Hydro generator went offline). However, the disruption in customer service from such responses typically affects relatively few customers for a relatively short period of time. Newfoundland Power will typically learn the details of the specific incident from Hydro as part of the restoration of service after the automatic load shed. See the response to Request for Information PUB-NP-022, page 1, lines 27 to 33 for further information on under frequency load shedding.

including the provision of advance notice to customers of rotating power outages.[137]

C.2 Near-Term Actions

C.2.1 General

Hydro is the *de facto* system operator for the Island Interconnected System.[138] Hydro's system operating instruction *T-001 Generation Loading Sequence And Generation Shortages* outlines the sequence of steps that Hydro will undertake in the operation of the Island Interconnected System to minimize outages to customers in the event of a system generation shortage. This operating instruction does not indicate (i) what information regarding the adequacy of generation resources to meet forecast load should be made available to Newfoundland Power or its customers or (ii) when or how customers served by the Island Interconnected System are to be notified of the adequacy of forecast generation supply.

Section 4 of the *Electrical Power Control Act, 1994* requires the Board in exercising its regulatory powers to have due regard for sound public utility practice. For this reason, the Board in its Investigation should consider regulatory protocols in other jurisdictions to assess what, if anything, regulatory experience indicates might be appropriate for adoption in operations on the Island Interconnected System.

Information flow between utilities is critical to the reliable operation of electrical systems. Insufficient communication between utilities has been found in other assessments to have contributed to system failures. Similarly, limited real-time visibility of system operations on neighboring interconnected systems has been identified as a contributor to system failures.[139]

---

137 See the response to Request for Information PUB-NP-048 which indicates advance notice to customers of rotating power outages would practically require short-term forecasts of supply and demand. But such operational restrictions are varied. For example, diminished reserve margins provide an indication that active voltage management on the electrical system may be warranted or that curtailable customers should be taken offline. Lack of real-time or short-term forecast information makes Newfoundland Power completely dependent upon Hydro to inform the Company when management of voltage or curtailment of customers is likely to be required to support the Island Interconnected System.

138 A *system operator* is the person or entity that is responsible to monitor and control an electrical system.

139 See, for example, the Staff Report of the Federal Energy Regulatory Commission and the North American Electric Reliability Corporation into *Arizona-Southern California Outages on September 8, 2011*, April 2012. In that report, staff found that utilities' failure to share analysis and coordinate seasonal planning contributed to the blackout. Similarly, transmission operators' limited real-time visibility outside their systems resulted in inadequacy of situational awareness of external contingencies that also contributed to the blackout.

Communications and information flow improvements between participants on an integrated electrical system are not uncommon following major system disruptions.[140]

Newfoundland Power has undertaken a preliminary assessment of regulatory protocols in other jurisdictions relating to information availability and customer notice in situations of possible system generation shortage. This assessment indicates that provision of industry standard forward-looking information regarding supply and demand on the Island Interconnected System will contribute to improved transparency in situations of possible system generation shortage. This assessment also indicates that the establishment of clear regulatory guidelines governing when and how customers will be advised of the adequacy of forecast generation supply would be consistent with sound public utility practice in North America.

By improving the availability of information and establishing clear regulatory guidelines governing customer communication, the Board will not improve the adequacy of generation supply on the Island Interconnected System. These steps will, however, help ensure that customers served by the Island Interconnected System receive timely information concerning the reliability of that service. These steps, which are outlined in section ***C.2.2: System Wide Actions*** below, are capable of implementation before the 2014-2015 winter season.

The supply issues and power outages, which are the subject matter of the Investigation, are largely related to Hydro's generation supply planning and bulk transmission operations. Newfoundland Power has assessed the performance of its electrical system during January 2-8, 2014 and identified certain changes which would improve system performance. These changes, which are outlined in section ***C.2.3: Newfoundland Power Actions*** below, are also capable of implementation before the 2014-2015 winter season.

---

[140] For example, following a system event in December 1994 on the Island Interconnected System, Newfoundland Power and Hydro ensured that 4 separate means of communication existed between the Company's SCC and Hydro's ECC (see *Update To The Report Board of Commissioners Of Public Utilities On The Status Of Remedial Actions Arising Out Of The December 1994 Outage*, January 1996, jointly prepared by Hydro and Newfoundland Power). In the Staff Report of the Federal Energy Regulatory Commission and the North American Electric Reliability Corporation into *Outages and Curtailments during the Southwest Cold Weather Event of February 1-5, 2011*, August 2011, it was found that improved communications amongst grid participants during extreme cold weather events was indicated (see page 210).

C.2.2 System Wide Actions

C.2.2.1 Improving Information Flow

The 1996 Orders 888 and 889 of the U.S. Federal Energy Regulatory Commission ("FERC") materially changed the standards for electrical utility system information disclosure.[141] The FERC established the basic electrical system information that must be made available to market participants via an open access same-time information system ("OASIS"). Initially, OASIS requirements reflected the requirements of a wholesale electricity market including available and forecast transmission capacity and generation availability and prices. Today, compliance with FERC information requirements is often done through independent system operators.[142]

FERC information requirements have altered information management regarding electric utility systems in North America. Now, it is common practice for utilities to assemble real-time and forecast information relating to supply and demand on their electrical systems as a matter of routine.[143] Virtually all Canadian utilities meet the FERC requirements.[144] The details of information that is publicly available varies.[145]

---

[141] FERC Orders 888 and 889 essentially provided for the introduction of wholesale electricity market competition in the United States. Order 888 established the requirement that transmission facilities and services be available on an open market basis. Order 889 established the information standards for utilities to support the open wholesale electricity market.

[142] Utilities involved in the generation and transmission of electricity in the U.S. established OASIS *nodes* which were secure web-based interfaces to each transmission system's data. In recent years, the number of OASIS nodes has declined as many jurisdictions have opted to establish independent system operators, or ISOs, which provide the required data for ISO participants. So, for example, Alberta system data is reported by the Alberta Electric System Operator ("AESO"); Ontario system data is reported by Ontario's Independent Electric System Operator ("IESO"). However, the essential data requirements of FERC Order 889 continue to be followed by all participants, including Canadian utilities, that are connected to the North America electricity grid.

[143] For example, utilities in all Canadian provinces, except Newfoundland and Labrador, currently fulfill the data requirements of FERC Order 889 either through their own OASIS node, an ISO, or via a contractor such as Open Access Technology International, Inc. ("OATI").

[144] BC Hydro, NB Power and Nova Scotia Power Inc. all maintain their own OASIS nodes. Sask Power, Hydro Quebec and Maritime Electric report via OATI. Alberta, Manitoba and Ontario utility information is reported through their respective ISOs.

[145] For example, the AESO provides supply adequacy assessments by hour for a forecast 7 days and by week for a forecast 24 months. Nova Scotia Power provides current system supply and demand together with a 5-day load forecast and supply adequacy assessments by week for a fixed 18-month period (currently October 2013 to April 2015).

The North American Electric Reliability Corporation ("NERC") is the regulatory agency responsible for ensuring the reliability of the North American bulk power system.[146] NERC reliability standards provide guidance on the information required to maintain electrical system reliability which includes system reserves, capacity and energy adequacy, and planned outages.[147]

Since January 10th, 2014, the Board has required Hydro to file a 5-day forecast of its system supply and demand. The information provided by Hydro to the Board is also provided by Hydro directly to Newfoundland Power. On February 11th, 2014, Newfoundland Power requested real-time access at Newfoundland Power's SCC to an additional 454 data points that are monitored by Hydro's ECC.[148]

The benefits of improved information flow from the perspective of customer notice in situations of forecast or potential generation shortfall are obvious. On January 2nd, 2014, a public advisory for customers to conserve electricity was issued approximately 2 hours before a generation shortfall occurred on the Island Interconnected System. Hydro's March 2nd, 2014 5-day forecast of its system's supply and demand indicated that reserve margins on the Island Interconnected System would be approximately 5% commencing from the evening of March 4th. On the afternoon of March 3rd, more than 24 hours before the reduced 5% reserve margin was forecast to be experienced, Newfoundland Power issued a public advisory indicating that Hydro's forecast showed reduced generation availability that could result in power supply shortages.[149]

Improved information flow concerning the status of the Island Interconnected System would help ensure that more timely information regarding the reliability of service is available to Newfoundland Power. This, in turn, would enable Newfoundland Power to provide more timely

[146] NERC is subject to oversight by the U.S. Federal Energy Regulatory Commission and Canadian provincial electrical utility regulators. In Canada, NERC's reliability standards are typically approved and implemented by provincial regulators. (See, for example, NERC application to the Nova Scotia Utility and Review Board, *Fourth Quarter 2013 Application for Approval of Reliability Standards of the North American Electric Reliability Corporation*, February 28, 2014).

[147] See NERC *Standard IRO-005-3.1a – Reliability Coordination- Current Day Operations, Requirements R1*.

[148] Newfoundland Power is currently in discussions with Hydro concerning better access to additional information including Hydro's load forecast and assessment of generation availability for the Island Interconnected System.

[149] Hydro's March 2nd, 2014 5-day forecast indicated reserve margins of between 10%-15% prior to the evening of March 4th.

information to customers. At a minimum, this information would need to include the level of information that is currently provided in Hydro's 5-day forecast of system supply and demand together with real-time and forecast information on generation availability and demand for the Island Interconnected System. Such improved information flow would be consistent with current sound public utility practice.

C.2.2.2 Regulatory Protocols for System Shortages

NERC reliability standards are adhered to across the North American interconnected electrical system. The Island Interconnected System is not currently part of the North American interconnected electrical system.

NERC's reliability standards provide for 3 alerts in capacity and energy emergencies. The first alert indicates that all available resources are in use or are committed to meet firm load and reserve commitments. The second alert indicates that load management procedures are in effect. Such procedures include public appeals to reduce demand. The third alert indicates that firm load interruption is imminent or in progress.[150]

NERC's reliability standards do not specifically indicate when or how customers served by an electrical system should be notified of the adequacy of forecast generation supply.[151] Electrical systems which are subject to NERC reliability standards typically develop specific regulatory protocols for generation shortfalls that meet NERC's standards. Parts of these protocols will specify how and when customer communications are to be made when possible generation shortfalls are forecast.

Some regulatory protocols governing customer communications in possible generation shortfall situations provide for multiple separate communications.

[150] NERC *Standard EOP-002-2 – Capacity and Energy Emergencies, Attachment 1-EOP-002-0 Energy Emergency Alerts.*

[151] NERC's *Standard EOP-00-2 – Capacity and Energy Emergencies*, makes reference to procedures such as public appeals, voltage reductions, curtailing interruptible loads and firm loads, but provides no guidance on communications with customers.

The New England Independent System Operator ("NE-ISO") has adopted an 11 step operating procedure for generation capacity shortfalls.[152] This procedure provides for 3 separate customer notices. The first is a *power caution* posted to the NE-ISO website at the point that full electrical reserves can be no longer maintained using normal procedures. The second is a *power watch* posted to the NE-ISO website when further steps to manage capacity could affect the public. The third is a *power warning* which includes radio and television appeals for voluntary load curtailment prior to implementing load shedding.

Similarly, the Electric Reliability Council of Texas ("ERCOT") has adopted an operating procedure for generation capacity shortfalls which provides for 3 separate customer notices.[153] The first is a *power watch* at the point that operating reserves are less than 2,300 MW to notify customers that conservation is needed.[154] Customer notice channels include (i) a news release, if appropriate; (ii) the Emergency Alerts list; and, (iii) social media.[155] The second is a *power warning* at the point that operating reserves are less than 1,750 MW to notify customers that conservation is critical. Customer notice is provided by the same channels as a *power watch*. The third is a *power emergency* at the point that operating reserves continue to trend downward to notify customers of rotating power outages. Customer notice channels include (i) a news release; (ii) the Emergency Alerts list; and, (iii) social media.

The California Independent System Operator ("CISO") has adopted a notification process for load interruptions which provides for 3 primary stages in electrical emergencies due to loss of generating equipment, transmission facilities, or unexpected load changes.[156] At each stage, customers are notified. The first stage includes an *alert notice*, which encourages conservation efforts over a specified period. The second stage includes a *warning notice*, which advises

152 See *ISO New England Operating Procedure No. 4 – Action During A Capacity Deficiency.*
153 See *ERCOT Energy Emergency Alert Communications* which is contained in Attachment D to the response to Request for Information PUB-NP-050.
154 In normal operating conditions, operating reserves are greater than, or equal to, 3,000 MW.
155 The Emergency Alert list is accessible by subscription. Social media includes Twitter and Facebook.
156 See *California ISO Operating Procedure No. 4420 System Emergency* which is Attachment B to the response to Request for Information PUB-NP-050.

customers to conserve. The third stage includes a *1-hour notification* of *probable load interruption*.[157]

The Florida Public Service Commission has adopted a *Generating Capacity Shortage Plan* developed by the Florida Reliability Coordinating Council ("FRCC").[158] This plan provides for 3 customer advisories in response to generating capacity shortages which threaten to impact a significant number of customers. The first advisory is a *generating capacity advisory* which is precautionary and does not necessarily indicate an imminent threat or emergency. The second advisory is a *generating capacity alert* which is issued when the FRCC operating margin is such that the loss of the largest generating unit will require interruption of loss of firm load. This advisory is circulated through media, encourages conservation and warns of potential power interruptions. The third advisory is a *generating capacity emergency* which is an emergency declaration indicating a threat to overall reliability of the FRCC system. This advisory also specifies the time period of the emergency and firm load reductions.

Not all regulatory protocols governing customer communications in possible generation shortfall situations provide for multiple separate communications. A number of protocols provide only for a single public appeal for load reduction.

The AESO ensures the Alberta Interconnected Electric System is planned and operated in compliance with NERC and Western Electricity Coordinating Council ("WECC") standards.[159] AESO's reliability standards provide for 3 alerts in capacity and energy emergencies.[160] As part

[157] See *California ISO Operating Procedure No. 4420C System Emergency Notice Templates*.

[158] See *FRCC Generating Capacity Shortage Plan*, adopted by the Florida Public Service Commission, April 2008. The FRCC is a regional entity responsible for coordinating and providing bulk electric system reliability in Florida. The FRCC has delegated authority from NERC.

[159] WECC is the regional entity responsible for coordinating and promoting bulk electric system reliability on the Western Interconnected System. WECC has delegated authority from NERC.

[160] See *ISO Rules, Part 300 System Reliability and Operations, Division 305 Contingency and Emergency Section, 305.1 Energy Emergency Alerts.* Further to the 3 energy emergency alerts declared during the capacity and energy emergency, the ISO must, when a supply shortfall event ends, declare an Energy Emergency Alert 0 (a fourth alert), which is issued to terminate all previous energy alerts.

of *energy emergency alert 2*, reducing load through procedures such as public appeals is indicated.[161]

In Atlantic Canada, Nova Scotia and New Brunswick follow the Northeast Power Coordinating Council's ("NPCC") 12-step Emergency Operation Procedure in a developing or sudden capacity shortage.[162] The customer communication requirements of this procedure are similar to those in Alberta and Ontario.[163]

Establishing a regulatory protocol which indicates when and how customers are to be notified of possible generation shortfall situations would ensure a greater degree of certainty that customers would receive timely information regarding the reliability of the service they receive. Existing notification protocols for possible generation shortfalls appear to vary in the number of notifications required. However, establishment of such a protocol would be consistent with current sound public utility practice.

C.2.3 Newfoundland Power Actions

Newfoundland Power is already implementing changes as a result of the events of January 2-8, 2014. For example, changes to the Company's website to increase speed, capacity and redundancy have been implemented. Increased telephone capacity has been arranged.[164] Further changes to improve outage communications are underway and will be implemented prior to the 2014-2015 winter season.[165]

---

161 See *Alberta Reliability Standards, Emergency Preparedness and Operations, EOP-002-AB1-2 Capacity and Energy Emergencies, Effective January 1, 2014.* This model is substantially similar to that adopted by Ontario's IESO and the Midcontinent Independent System Operator ("MISO") which regulates electricity in all, or parts of, 15 U.S. states and the province of Manitoba. For Ontario, see *Market Manual 7: System Operations, Part 7.1: System Operating Procedure, Section 4.5.3 Customer Appeals.* For MISO, see *MISO Market Capacity Emergency Procedure RTO-EOP-002-r16.*

162 The NPCC is a regional entity responsible for coordination and promoting bulk electric system reliability in northeast North America which includes New York, New England, Ontario, Quebec and the Maritime provinces. The NPCC has delegated authority from NERC.

163 Step 11 of the procedure requires an appeal to the public for voluntary customer load reduction. See *NPCC 2013 Maritimes Area Comprehensive Review of Resource Adequacy, Approved by the RCC December 3, 2013*.

164 These types of changes are routine following major system events. See the responses to Requests for Information PUB-NP-036 and PUB-NP-053.

165 See *B.3.2.4: Customer Communications Feedback*, page 36, line 21, *et. seq.*

During the rotating power outages undertaken by Newfoundland Power in the January 2-8, 2014 period, system control limitations on transmission and distribution systems reduced the Company's flexibility. In addition, system control limitations on transmission and distribution systems limited the Company's ability to restore service quickly to customers following major system disruptions in cold weather conditions.

Cold load pickup on a number of distribution feeders served to extend outages to customers served by those feeders. A lack of automation on some distribution feeders limited the ability of Newfoundland Power to include them in the rotating power outages. Finally, the absence of transmission line breakers on certain systems required additional substations to be taken out of service which exposed customers to additional outages during a time of electrical system distress.

Newfoundland Power proposes to address some of these capacity and system control limitations prior to the 2014-2015 winter season. On its distribution systems, the Company proposes to install 14 downline reclosers and upgrade approximately 4.5 km of conductor. In its substations, the Company proposes to install an additional 7 reclosers and 2 transmission line breakers.[166]

These additions to Newfoundland Power's electrical system will improve the system's capability and flexibility to respond to both major disturbances and local system events on the Island Interconnected System. This includes improved flexibility in the implementation of rotating power outages to respond to forecast generation shortfalls.

Newfoundland Power will file a 2014 Capital Budget Supplemental Application describing these proposed electrical system additions and seeking the Board's approval of them in time to enable the additions to be completed prior to the 2014-2015 winter season. The additions are expected to have a cost of approximately $3 million.

[166] The 7 reclosers proposed to be installed in substations are fully automated and will replace existing reclosers or breakers that are not automated. The replaced equipment will be reconditioned and retained as spares as appropriate.