

IN THE MATTER OF the *Public Utilities Act*, RSN 1990, Chapter P-47 (the "Act"); and

IN THE MATTER OF a General Rate Application (the Application) by Newfoundland and Labrador Hydro for approvals of, under Section 70 of the Act, changes in the rates to be charged for the supply of power and energy to Newfoundland Power, Rural Customers and Industrial Customers; and under Section 71 of the Act, changes in the Rules and Regulations applicable to the supply of electricity to Rural Customers.

IN THE MATTER OF the *Electrical Power Control Act*, 1994, SNL 1994, Chapter E-5.1 (The "EPCA") And The Public Utilities Act, RSNL 1990, Chapter P-47 (The "Act"), As Amended; And

IN THE MATTER OF An Investigation And Hearing Into Supply Issues And Power Outages On The Island Interconnected System.

REQUESTS FOR INFORMATION

THE NEWFOUNDLAND AND LABRADOR PUBLIC UTILITIES BOARD

GRK-NLH-93 to GRK-NLH-133

GRAND RIVERKEEPER LABRADOR INC. (GRK)

Issued June 1, 2015

GRK-NLH-93

Re: GRK-NLH-021 (Rev. 1)

Citation 1 (GRK-NLH-021 (Rev. 1)):

If Nalcor's interpretation of the renewal of the Churchill Falls Contract is not upheld, then depending on the finding of the court and the response by Hydro Quebec to such finding, the manner in which water will flow down the Churchill River from the Churchill Falls plant and thus the timing of when energy is produced at Muskrat Falls could be impacted. It could therefore impact the degree which Hydro can influence the timing of delivery of energy to the Island Interconnected System to maximize the efficient use of the water resources it has control over. This would not impact system reliability but could impact how Hydro utilizes the resources available to it at any given time to meet system requirements. Hydro would evaluate the circumstances arising at the relevant time and run its system accordingly. Please refer to Hydro's response to GRK-NLH-044 for options available to Hydro. (underlining added)

Citation 2 (Water Management Agreement, s. 6.3 (a)(i):

6.3 Limitation on Powers

(a) The parties acknowledge and agree that the following shall exceed the powers and duties of the Independent Coordinator:

(i) Scheduling CF(L)Co production for Nalcor, to the extent that such production conflicts with CF(L)Co's obligations under Prior Power Contracts; and ...

Please explain in what way "the manner in which water will flow down the Churchill River from the Churchill Falls plant ... could be impacted" if Nalcor's interpretation of the renewal of the Churchill Falls Contract is not upheld, and describe in detail the ways in which this could affect "the timing of when energy is produced at Muskrat Falls".

In your response, please indicate whether or not NLH has carried out or received copy of any specific analysis of to the extent to which the Hydro-Quebec's interpretation of the Churchill Falls Power Contract, as set out in its filings before the Quebec Superior Court, would limit the Independent Coordinator's ability to respect NLH's Delivery Requirements with respect to s. 6.3(a) of the WMA (Citation 2).

If so, please provide a copy of said analysis. If not, please explain on what basis NLH has been able to conclude that "this would not impact system reliability".

GRK-NLH-94

Re: GRK-NLH-021 (Rev. 1)

Citation (GRK-NLH-021 (Rev. 1)):

If Nalcor's interpretation of the renewal of the Churchill Falls Contract is not upheld, then depending on the finding of the court and the response by Hydro Quebec to such finding, the

manner in which water will flow down the Churchill River from the Churchill Falls plant and thus the timing of when energy is produced at Muskrat Falls could be impacted. It could therefore impact the degree which Hydro can influence the timing of delivery of energy to the Island Interconnected System to maximize the efficient use of the water resources it has control over. This would not impact system reliability but could impact how Hydro utilizes the resources available to it at any given time to meet system requirements. Hydro would evaluate the circumstances arising at the relevant time and run its system accordingly. Please refer to Hydro's response to GRK-NLH-044 for options available to Hydro. (underlining added)

Citation 2 (Order P.U. 3 (2014), Schedule A (Investigation and Hearing Issues), page 2

II. FINAL REPORT

...

2. Evaluation of Island interconnected system adequacy and reliability up to and after the interconnection with the Muskrat Falls generating facility

...

- **Back-up generation and/or alternative supply requirements after interconnection**
- **Other system planning, capital and operational issues which may impact system adequacy and reliability before and after interconnection**

Preamble:

The underlined passage in Citation 1 appears to suggest that Hydro sees no need to determine in advance the degree to which an adverse court ruling might affect its ability to have its production schedules met.

Please confirm or correct the statement in the Preamble, taking into account the issues to be addressed in this proceeding as indicated in Citation 2.

GRK-NLH-95

Re: GRK-NLH-044

Citation:

In the (very) unlikely event of a dam breach at Muskrat Falls, several options are available to Hydro. As stated in Hydro's response to GRK-NLH-004: "Upon the completion of the Labrador-Island Link and the Maritime Link, the Island of Newfoundland will, for the first time, have access to electricity from neighbouring utilities. ... These transmission interconnections will, if necessary, enable the Energy Control Centre operators to utilize emergency support from neighbouring utilities and to obtain power through electricity market arrangements either through the Quebec or Maritime Link interconnections." (underlining added)

Please list and describe agreements currently in place or under discussion to provide “emergency support” from neighbouring utilities via the LITL and the Maritime Link, indicating for each:

- any limitations on capacity and energy available,
- any limitations in terms of the duration for which “emergency support” can be counted upon, and
- the costs or other financial implications related to relying on “emergency support”.

GRK-NLH-96

Re: GRK-NLH-044

Citation:

In the (very) unlikely event of a dam breach at Muskrat Falls, several options are available to Hydro. As stated in Hydro's response to GRK-NLH-004: "Upon the completion of the Labrador-Island Link and the Maritime Link, the Island of Newfoundland will, for the first time, have access to electricity from neighbouring utilities. ... These transmission interconnections will, if necessary, enable the Energy Control Centre operators to utilize emergency support from neighbouring utilities and to obtain power through electricity market arrangements either through the Quebec or Maritime Link interconnections."

In addition, with a continued 60 MW interruptible arrangement, Hydro will have sufficient installed capacity to supply full load until at least 2025. Beyond the 1650 MW load level, there are options available to supplement capacity that Hydro will explore including:

- Additional industrial and commercial interruptible load arrangements;
- Customer demand side management initiatives;
- Additional imports via the Maritime Link when existing constraints in the Maritime/New England systems are mitigated; and
- Potential on-Island capacity additions. (underlining added)

Please provide detailed worksheets demonstrating that, “with a continued 60 MW interruptible arrangement, Hydro will have sufficient installed capacity to supply full load until at least 2025”. Is this based on a P50 or P90 estimate of future loads?

GRK-NLH-97, rev. 1

Re: GRK-NLH-044

Citation:

In the (very) unlikely event of a dam breach at Muskrat Falls, several options are available to Hydro. As stated in Hydro's response to GRK-NLH-004: "Upon the completion of the Labrador-Island Link and the Maritime Link, the Island of Newfoundland will, for the first time, have access to electricity from neighbouring utilities. ... These transmission interconnections will, if necessary, enable the Energy Control Centre operators to utilize emergency support from

neighbouring utilities and to obtain power through electricity market arrangements either through the Quebec or Maritime Link interconnections."

In addition, with a continued 60 MW interruptible arrangement, Hydro will have sufficient installed capacity to supply full load until at least 2025. Beyond the 1650 MW load level, there are options available to supplement capacity that Hydro will explore including:

- Additional industrial and commercial interruptible load arrangements;
- Customer demand side management initiatives;
- Additional imports via the Maritime Link when existing constraints in the Maritime/New England systems are mitigated; and
- Potential on-Island capacity additions.

(underlining added)

Preamble:

The measures described here, in relation to a dam breach at Muskrat Falls, are also referred to in GRK-NLH-021 (Rev.1) as available in the event that Nalcor's interpretation of the renewal of the Churchill Falls Contract is not upheld.

Please elaborate on the likely availability, cost and lead times of each of the options described. In particular, please elaborate on:

- **The degree and extent to which additional industrial and commercial interruptible load arrangements can be relied upon, taking into account experiences of other utilities in this regard;**
- **The expected limits of customer demand side management initiatives, given NLH's and NP's experience to date in this field;**
- **Any constraints of all types limiting access to imports over the Maritime Link;**
- **Any constraints limiting of all types access to imports over the LITL; and**
- **The types, locations lead times and costs of the potential on-Island capacity additions to which reference is made.**

GRK-NLH-98

Re: NLH Reply to GRK Motion to Order more Complete Responses (Jan. 14), p. 5

Citation:

Regarding the 2nd bullet, in its response Hydro referred, as noted by the GRK in its Supplemental Motion, to Order P.U. 41's statement that it would not be relevant or useful in this proceeding to require the production of detailed technical information in relation to physical risks associated with the Muskrat Falls development and then cross referenced to Hydro's response to GRK-NLH-044. As noted above, Hydro's response to GRK-NLH-044 specifically describes in detail the options available to Hydro in the very unlikely event of a dam breach at Muskrat Falls. Other than to consider a potential dam breach at Muskrat Falls to be very unlikely, Hydro has not assigned a forced outage probability to "events concerning the

integrity of the MF reservoir". Hydro likewise does not assign a forced outage probability to catastrophic events concerning the integrity of any of its dams. Hydro notes that the Muskrat Falls dam is being designed similar to all other Hydro dam facilities so that the probability of risk of failure is negligible.

Preamble:

The last sentence is ambiguous. It could be interpreted to mean either:

- a) Hydro notes that the Muskrat Falls dam is being designed similar to all other Hydro dam facilities ~~so that~~ and therefore the probability of risk of failure is negligible; or
- b) Hydro notes that the Muskrat Falls dam is being designed, like similar to all other Hydro dam facilities, such so that the probability of risk of failure is negligible.

Please indicate which of the two possible meanings of the last sentence of the Citation is correct. If neither is correct, please clarify the meaning of this sentence.

Please confirm that Hydro does not assign a forced outage probability of zero to catastrophic events concerning the integrity of its dams.

GRK-NLH-99

Re: NLH Reply to GRK Motion to Order more Complete Responses (Jan. 14), p. 5

Citation:

Regarding the 2nd bullet, in its response Hydro referred, as noted by the GRK in its Supplemental Motion, to Order P.U. 41's statement that it would not be relevant or useful in this proceeding to require the production of detailed technical information in relation to physical risks associated with the Muskrat Falls development and then cross referenced to Hydro's response to GRK-NLH-044. As noted above, Hydro's response to GRK-NLH-044 specifically describes in detail the options available to Hydro in the very unlikely event of a dam breach at Muskrat Falls. Other than to consider a potential dam breach at Muskrat Falls to be very unlikely, Hydro has not assigned a forced outage probability to "events concerning the integrity of the MF reservoir". Hydro likewise does not assign a forced outage probability to catastrophic events concerning the integrity of any of its dams. Hydro notes that the Muskrat Falls dam is being designed similar to all other Hydro dam facilities so that the probability of risk of failure is negligible. (underlining added)

On what basis was it determined that "a potential dam breach at Muskrat Falls [is] very unlikely"? Please provide all supporting documentation leading to this conclusion.

GRK-NLH-100

Re: NLH Reply to GRK Motion to Order more Complete Responses (Jan. 14), p. 5

Citation:

Regarding the 2nd bullet, in its response Hydro referred, as noted by the GRK in its Supplemental Motion, to Order P.U. 41's statement that it would not be relevant or useful in this proceeding to require the production of detailed technical information in relation to physical risks associated with the Muskrat Falls development and then cross referenced to Hydro's response to GRK-NLH-044. As noted above, Hydro's response to GRK-NLH-044 specifically describes in detail the options available to Hydro in the very unlikely event of a dam breach at Muskrat Falls. Other than to consider a potential dam breach at Muskrat Falls to be very unlikely, Hydro has not assigned a forced outage probability to "events concerning the integrity of the MF reservoir". Hydro likewise does not assign a forced outage probability to catastrophic events concerning the integrity of any of its dams. Hydro notes that the Muskrat Falls dam is being designed similar to all other Hydro dam facilities so that the probability of risk of failure is negligible. (underlining added)

On what basis was it determined that “the probability of risk of failure is negligible”? Please provide all supporting documentation leading to this conclusion.

GRK-NLH-101

Re: GRK-NLH-044

Citation:

Q. Has any dam break study specifically addressed the possible failure of the North Spur? If so, please provide a copy. If not, why not?

A. ... It should be noted that a dam breach study does not assess the probability (one component of risk) of a failure of the Muskrat Falls dam, but rather the consequences of such an event if it were to happen. Similarly, a dam breach study does not inform the duration of an outage arising from a breach. ...

Please confirm that no study has been carried out that specifically assesses the probability of failure of the Muskrat Falls dam, or of the North Spur component.

If such a study has been prepared, please provide a copy.

GRK-NLH-102

Re: GRK-NLH-022

Citation:

The overall power available from Muskrat Falls is unaffected by a different interpretation of the power contract renewal in 2016.

Please specify the meaning of the term “overall power” in the citation.

Is it meant to mean available capacity (MW) at all hours, average annual energy (GWh), or something else?

GRK-NLH-103

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

Citation 1 (GRK-NLH-021 rev. 1):

If Nalcor’s interpretation of the renewal of the Churchill Falls Contract is not upheld, then depending on the finding of the court and the response by Hydro Quebec to such finding, the manner in which water will flow down the Churchill River from the Churchill Falls plant and thus the timing of when energy is produced at Muskrat Falls could be impacted. It could therefore impact the degree which Hydro can influence the timing of delivery of energy to the Island Interconnected System ...

Citation 2 (GRK-NLH-022):

The overall power available from Muskrat Falls is unaffected by a different interpretation of the power contract renewal in 2016.

Citation 3 (Nalcor Water Management Application, p. 12)

A water management agreement is required to provide the mechanisms of coordinated production. The operation of the agreement will ensure the efficient use of water on the river system by ensuring that water is available to meet all producers’ requirements, while maximizing the energy produced from the water resource.

Uncoordinated production among the Churchill River facilities could result in either excessive or insufficient water at the lower Churchill facilities. Excessive water will result in spill. Insufficient water to meet delivery schedules will result in excessive drawdown.
Either case represents inefficient use of the available water.

Please reconcile Citations 1 and 2 with the underlined passage in Citation 3.

More specifically, could a change that affects “the timing when energy is produced at Muskrat Falls” result in spills?

If so, please explain how a change in “the timing when energy is produced at Muskrat Falls” that results in spills would not affect “the overall power available from Muskrat Falls”.

GRK-NLH-104

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

Citation 1 (GRK-NLH-021 rev. 1):

If Nalcor’s interpretation of the renewal of the Churchill Falls Contract is not upheld, then depending on the finding of the court and the response by Hydro Quebec to

such finding, the manner in which water will flow down the Churchill River from the Churchill Falls plant and thus the timing of when energy is produced at Muskrat Falls could be impacted. It could therefore impact the degree which Hydro can influence the timing of delivery of energy to the Island Interconnected System ...

Citation 2 (GRK-NLH-022):

The overall power available from Muskrat Falls is unaffected by a different interpretation of the power contract renewal in 2016.

Citation 3 (CF(L)CO'S DEFENCE TO HYDRO-QUEBEC'S INTRODUCTORY MOTION FOR DECLARATORY JUDGMENT, pp. 12 and 13):

1- INTRODUCTION

A. The essence of the dispute between the parties

131. What are the respective rights and obligations of the owner and operator of a power plant and its customer under a power purchase agreement negotiated more than 45 years ago, which will come into force on September 1, 2016 ?

132. As holder of the hydraulic rights, and owner and operator of the Churchill Falls power plant, CF(L)Co asserts that the amount of power and energy to which its customer Hydro-Quebec is entitled and the conditions for delivery of that power and energy are strictly those defined by the terms and conditions of that contract, which will fully replace and supersede the present agreement between the parties, which expires on August 31, 2016.

...

139. Simply put, Hydro-Quebec is only entitled to the rights that have been clearly delineated and circumscribed by the terms and conditions of the Renewal Contract, nothing more, nothing less.

140. Conversely, as holder of the hydraulic rights and owner of the power plant responsible for operating the plant, CF(L)Co enjoys the universality of rights that have not been limited by way of agreements with its customers and is free to dispose of such rights as it sees fit, provided it respects the terms and provisions of the contracts that have been entered into with its customers, including Hydro-Quebec.

141. It is CF(L)Co, not Hydro-Quebec, which is entitled to the entire actual and potential capacity and energy of the Churchill Falls power plant, except for those specific amounts of capacity and energy that are requested by and made available to Hydro-Quebec pursuant to the terms and conditions of the Renewal Contract. (underlining added)

Citation 4 (Nalcor Water Management Application, p. 5-6)

2.2.1 HQ Power Contract

CF(L)Co sells approximately 85% of the energy produced at Churchill Falls to HQ pursuant to an agreement dated May 12, 1969 (the HQ Power Contract) (Exhibit 3). The HQ Power Contract has an initial term that runs to August 31, 2016. Thereafter, the HQ Power Contract is renewed for a further term of 25 years from September 1, 2016 to August 31, 2041 in accordance with Schedule III to the contract. The contract provides for 4,083 MW of firm capacity in winter and 3,864 MW in summer, after accounting for power and energy recalled for sale to Hydro. Energy entitlements are derived from a periodic assessment of historic sales, spillage and reservoir elevation readings. The value derived from this assessment, called the Annual Energy Base (AEB) will be fixed for the renewal period of the contract. Schedule III to the HQ Power Contract alters the manner in which the AEB will be supplied to HQ by CF(L)Co. Upon renewal, HQ will become entitled to receive Continuous Energy, defined in Schedule III, Article 1.1 (II) as follows:

“*Continuous Energy*” means, in respect of any month, the number of kilowatt-hours obtainable, calculated to the nearest 1/100 of a billion kilowatt-hours, when the Annual Energy Base is multiplied by the number which corresponds to the number of days in the month concerned and the result is then divided by the number which corresponds to the number of days in the year concerned.

Annual Energy Base is also defined in Schedule III, Article 1.1 (II) as follows:

“*Annual Energy Base*” means the number of kilowatt-hours per year represented by the Annual Energy Base in effect at the time of expiry of the Power Contract which is hereby renewed.

As a result, HQ will be entitled to essentially equal amounts of energy during each month after renewal. However, HQ will remain entitled to schedule the hourly deliveries of its monthly entitlement of Continuous Energy at any time during the month. (underlining added)

Citation 5 (Nalcor Water Management Application, p. 27, lines 10-14)

Energy produced by Nalcor in its facilities to meet CF(L)Co’s delivery requirements is proposed to be credited to Nalcor in the CF(L)Co reservoir system. When the production schedule calls for CF(L)Co to produce power to meet Nalcor’s delivery requirements, the accumulated volume banked by Nalcor in CF(L)Co’s reservoirs will be reduced. The converse is also true at lower Churchill.

Preamble:

Citation 3 describes, in Nalcor’s terms, the essence of the dispute between it and Hydro-Quebec. In paragraph 141, it explains that it, and not Hydro-Quebec, is entitled to the entire actual and potential capacity and energy of the Churchill Falls power plant, except for the specific amounts of power and energy requested by and made available to HQ under the Renewal Contract. Citation 4 describes Nalcor’s understanding of Hydro-Quebec’s rights under the Renewal Contract. Citation 5 indicates that, under the WMA, CF(L)Co may be called upon to produce power to meet Nalcor’s delivery requirements.

Please confirm that the effects on the operation of the WMA, should Hydro-Quebec's interpretation of the Renewal Contract be endorsed by the Courts, could include the following:

- a) That HQ would not be limited to "essentially equal amounts of energy during each month after renewal" (Citation 3), but would continue to be able to schedule its power deliveries from Churchill Falls as it sees fit;
- b) That HQ, and not CF(L)Co, would be "entitled to the entire actual and potential capacity and energy of the Churchill Falls power plant, except for those specific amounts of capacity and energy that are specifically attributed to CF(L)Co under the various contracts in force; and
- c) That, consequently, requests from Nalcor "to produce power to meet Nalcor's delivery requirements" (Citation 5) could come into conflict with CF(L)Co's contractual obligation to Hydro-Quebec.

Please elaborate on the implications for the reliability of MFC's deliveries to NLH in the event of each of these eventualities.

GRK-NLH-105

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

Please consider a hypothetical scenario in which, for a particular hour, a) Hydro-Quebec has scheduled the maximum capacity of the Churchill Falls generating station and b) MFC has scheduled the return of 400 MW of banked energy.

In this hypothetical scenario, please explain how power from the Churchill Falls generating station will be apportioned between Hydro-Quebec and MFC for the hour in question a) if Hydro-Quebec's interpretation of the Renewal Contract is endorsed by the Courts, and b) if Nalcor's interpretation of the Renewal Contract is endorsed by the Courts.

GRK-NLH-106

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

Preamble:

In managing a hydropower generating station with limited annual inflows and significant storage, decisions must be made on an ongoing basis to decide how much water should be turbined at each moment, taking into account likely future inflows and power needs.

Please explain how this reservoir management function is currently divided between Hydro-Quebec and CF(L)Co, and how these roles will change, if at all, with the advent of a) the Renewal Contact and b) the Water Management Agreement.

GRK-NLH-107

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

Please consider a hypothetical scenario in which reservoir levels are low and both Hydro-Quebec and MFC have indicated the need for high levels of power over the coming months.

In this hypothetical scenario, please explain how energy available in the Churchill Falls reservoirs will be apportioned between Hydro-Quebec and MFC a) if Hydro-Quebec's interpretation of the Renewal Contract is endorsed by the Courts, and b) if Nalcor's interpretation of the Renewal Contract is endorsed by the Courts.

GRK-NLH-108

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

Citation 1 (GRK-NLH-021 rev. 1):

If Nalcor's interpretation of the renewal of the Churchill Falls Contract is not upheld, then depending on the finding of the court and the response by Hydro Quebec to such finding, the manner in which water will flow down the Churchill River from the Churchill Falls plant and thus the timing of when energy is produced at Muskrat Falls could be impacted. It could therefore impact the degree which Hydro can influence the timing of delivery of energy to the Island Interconnected System ...

Citation 2 (GRK-NLH-022):

The overall power available from Muskrat Falls is unaffected by a different interpretation of the power contract renewal in 2016.

Citation 3 (Nalcor Water Management Application, p. 13-17)

Water management through coordination of flows and storage mitigates the effects of irregular delivery requirements and production at Churchill Falls. For example, in any month, CF(L)Co deliveries could be requested in a manner that calls for Continuous Energy to be produced at an increased rate for part of the month with the remainder of the Continuous Energy to be produced at a reduced rate later in the month.

Irregular production at Churchill Falls will have different effects on the lower Churchill facilities depending upon the uncontrolled natural inflows at various times of the year. In many months, the lower Churchill facilities would have insufficient water for production requirements during periods of reduced production at Churchill Falls. However, during the spring runoff, there would be excess water, resulting in spillage, during periods of increased production at Churchill Falls. These problems would be compounded if full CF(L)Co delivery of Continuous Energy was scheduled early in one month followed by full production late in the following month.

These effects can be illustrated with two examples showing maximum production early in the month and minimum production later in the month. The first example reflects March

conditions, while the second example reflects the spring freshet in May. In each case, Churchill Falls production would be as follows:

Continuous Energy – First 20 days of month	4,765 MW
Recall and Twinco	495 MW
Total – First 20 days of month	5,260 MW
Continuous Energy – Last 11 days of month	900 MW
Recall and Twinco	495 MW
Total – Last 11 days of month	1,395 MW

The resulting releases into the lower Churchill reservoirs would be as follows for the above production values:

Daily Churchill Falls Water Release – First 20 days of month	160 million m ³
Daily Churchill Falls Water Release – Last 11 days of month	42 million m ³

During the March timeframe, uncontrolled inflows into the Gull Island reservoir will be minimal and under average and dry year conditions are as follows:

Daily Uncontrolled Natural Inflows – Average Year	6 million m ³
Daily Uncontrolled Natural Inflows – Dry Year	0.7 million m ³

Under average conditions, the resulting production at Gull Island would be 1,519 MW for the first 20 days and 443 MW during the last 11 days of March. During a dry period, this scenario would require production levels of 1,471 MW during the first 20 days of March, and 395 MW during the last 11 days. Consequently, without a water management agreement, Nalcor would be limited to approximately 400 MW of continuous delivery in a long-term power purchase agreement for Gull Island. Such an arbitrary constraint on lower Churchill delivery schedules is unnecessary and is incompatible with the concept of the efficient use of the resource. (underlining added)

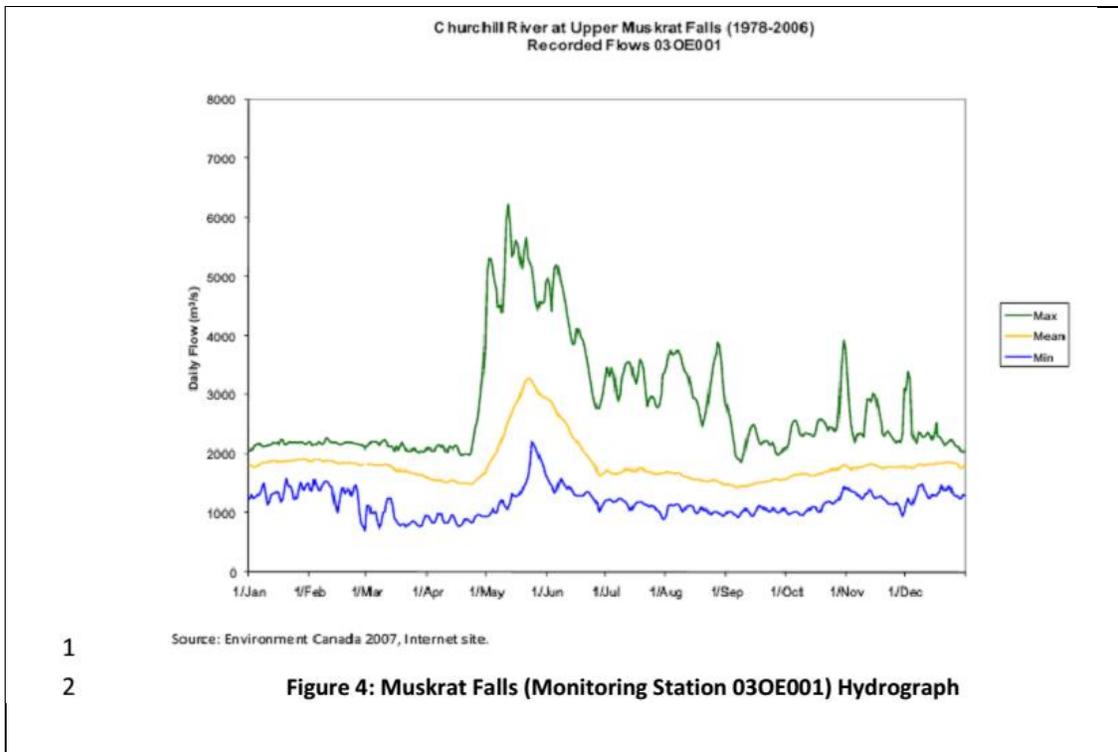
During the May timeframe, uncontrolled inflows into the Gull Island reservoir from snow melt and precipitation under average and wet year conditions are as follows:

Table 4: Gull Island Uncontrolled Inflows May

Daily Uncontrolled Natural Inflows - Average Year	94 million m ³
Daily Uncontrolled Natural Inflows - Wet Year	154 million m ³

Under average conditions, the resulting production at Gull Island would be 2,330 MW for the first 20 days and 1,253 MW during the last 11 days of May. During a wet period, this scenario would require production levels of 2,879 MW during the first 20 days of May, and 1,803 MW during the last 11 days. Since the optimized capacity of Gull Island is 2,250 MW, the surplus inflows would be spilled.

The preceding analysis uses historic monthly averages and daily flow averages instead of peak daily flows. The use of average values understates the extent of the spillage that will result during periods of peak flow. The chart below illustrates the recorded minimum, mean and maximum flows, month over month and within each month, and how monthly average values offer a conservative view.



In the absence of a water management agreement, Nalcor would not even have advance knowledge of expected flows from the Churchill Falls facility to enable it to take steps to mitigate spillage through advance drawdown of the lower Churchill reservoirs.

These outcomes are not consistent with maximizing the long-term energy generating potential of the Churchill River, as contemplated in Subsection 3(1) of the Regulations.

In the absence of a water management agreement, Nalcor would be required to utilize the water as it became available. Given the limited storage capacity in the Gull Island reservoir (approximately three to four days of maximum flow from the upper Churchill facilities), Nalcor would have to turbine the water and produce energy at the time that it was available; it would be required to “chase the flows” from the upper Churchill. Spills would be likely during the period of the spring runoff, resulting in wasted energy.

A water management agreement addresses these issues by enabling Nalcor to produce energy for CF(L)Co during those periods when CF(L)Co has increased deliveries and during the spring runoff. Water held back and stored for Nalcor can then be utilized for Nalcor at a later period when CF(L)Co deliveries are reduced. This minimizes spillage and enables Nalcor to optimize its long-term energy producing capability, in accordance with the provisions of the EPCA. (underlining added)

Preamble:

The description of the need for and the operation of the Water Management Agreement set out in Citation 3 is based on Nalcor’s understanding of Hydro-Quebec’s rights after renewal, which are contested by Hydro-Quebec.

Please explain in detail how the Water Management Agreement would operate in the event that the courts decide in favour of Hydro-Quebec’s interpretation of the Hydro-Quebec Contract and its Renewal.

In support of this response, please provide:

- 1) Detailed records, in Excel format, for hourly flows of the Churchill River at Muskrat Falls, for each year from 2000 through 2014;**
- 2) Indications of the amount of power that would have been produced by the Muskrat Falls Generating Station for each of these hours, had it been in service during this period;**
- 3) Indications of the extent to which the storage capacity of the Muskrat Falls reservoir could influence the amounts provided in response to #2; and**
- 4) a hypothetical hourly schedule of NLH’s power requirements from MF for a typical year.**

GRK-NLH-109

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

For the hypothetical hourly schedule of NLH’s power requirements provided in response to GRK-NLH-108, and for hourly flows at Upper Muskrat Falls corresponding to each of the three lines in Figure 4 of Citation 3 of that RFI, please provide:

- a) hourly production at Muskrat Falls,**
- b) hourly deliveries to NLH,**
- c) hourly deliveries to Emera,**
- d) hourly market sales,**

- e) hourly deliveries from MFC to CF(L)Co and from CF(L)Co to MFC, under the Water Management Agreement,
- f) hourly balance of the CF(L)Co Banked Energy account.

GRK-NLH-110

Re: GRK-NLH-021 rev. 1, GRK-NLH-022

For the hypothetical hourly schedule of NLH's power requirements provided in response to GRK-NLH-108, and the two hourly flow scenarios described below, please provide the same information requested in GRK-NLH-109.

Scenario 1: Hourly flows corresponding each month to an "Irregular CF(L)Co Production Profile" similar to those illustrated in Tables 1 and 2 of Citation 3 of GRK-NLH-108, assuming that Nalcor's understanding of the Renewal Contract is retained by the Courts;

Scenario 2: Hourly flows assuming that Hydro-Quebec's understanding of the Renewal Contract is retained by the Courts, and that, throughout the winter season, Hydro-Quebec schedules and CF(L)Co delivers the maximum possible power during all hours, and minimum power levels during all hours in the other seasons, taking into account CF(L)Co's other contractual obligations, safe operation of the reservoir and legally required minimum flows.

GRK-NLH-111

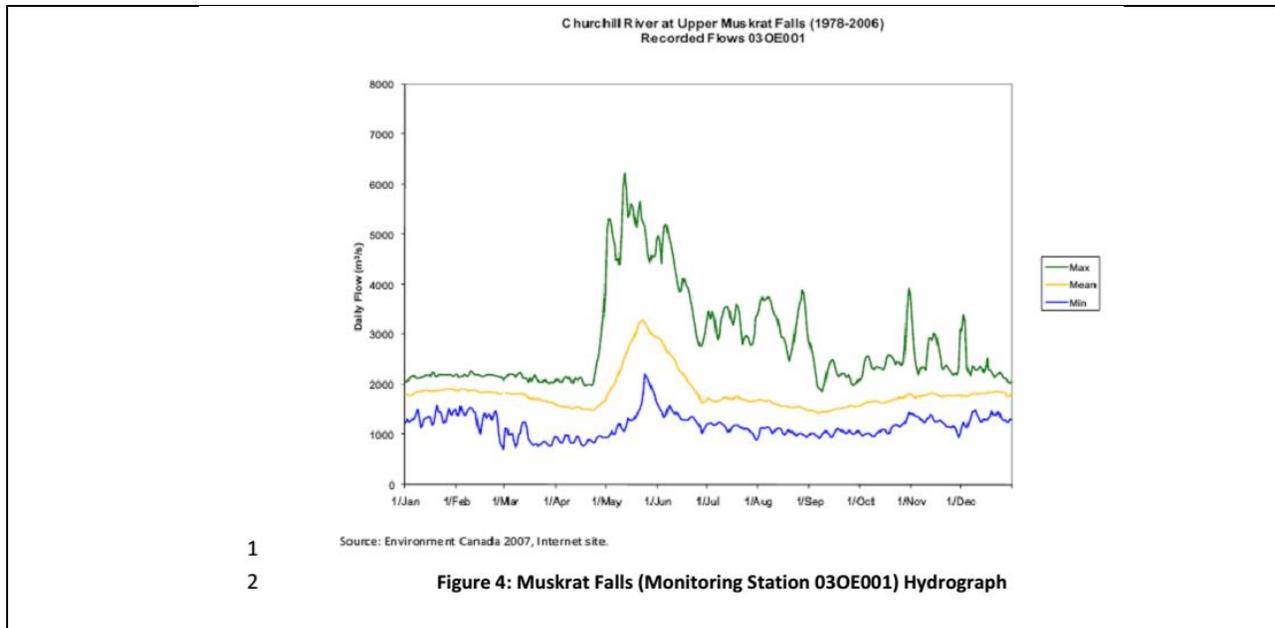
Re: GRK-NLH-21, rev. 1

Citation 1 (WMA Application, Appendix A, p. 4-11):

4.2.2.2 Powerhouse

The Muskrat Falls powerhouse will be a surface-type, concrete structure with a steel superstructure, 188 m long by 69 m wide. Four turbines each with a capacity of 206 MW will provide a total installed capacity of 824 MW. In turn, total discharge from the powerhouse will be 2,660 m³/s. The net head will be 35 m.

Citation 2 (WMA Application, Figure 4, page 16):



1
2

Preamble:

Figure 4 in Citation 2 shows that, in some years, flows on the Churchill River at Upper Muskrat Falls exceed 2,660 m³/s throughout the summer.

Please indicate the amount of spillage from Muskrat Falls in a year in which flows on the Churchill River at Upper Muskrat Falls equal those shown in the upper line of Figure 4.

GRK-NLH-112

Re: GRK-NLH-21, rev. 1

For the precipitation year corresponding to the “Max” line in Figure 4 of Citation 2 to GRK-NLH-10X, please indicate, in Excel format:

- a) the hourly flows recorded at the Muskrat Falls monitoring station,
- b) the hourly flows that would have been recorded at the Muskrat Falls monitoring station, had the Renewal Contract, as understood by Nalcor, been in effect.

GRK-NLH-113

Re: GRK-NLH-21, rev. 1

Preamble:

Figure 4 on page 16 of the WMA Prefiled Evidence shows that, in some years, flows on the Churchill River at Upper Muskrat Falls remained under 1,400 m³/s for much of the year.

Please indicate the hourly power production at Muskrat Falls in a year in which flows on the Churchill River at Upper Muskrat Falls equal those shown in the a) middle and b) lower line of Figure 4.

GRK-NLH-114

Re: GRK-NLH-043

Citation (p. 2, lines 5-7):

Similarly, no hazards associated with the operation of the dam exist prior to impoundment, so the Emergency Preparedness Plan is not required until impoundment takes place.

Please confirm that, to date, no Emergency Preparedness Plan for the Muskrat Falls Generating Station has been prepared. If it has, please provide a copy.

GRK-NLH-115

Re: GRK-NLH-045 Rev. 1

Citation from the RFI:

Q. Have any studies been performed including progressive failure analysis in the North Spur? If so, please provide the complete analysis. If not, why not?

Preamble:

The list of studies and analyses mentioned on page 2, lines 7-16 does not include mention of a progressive failure analysis.

Recent research has demonstrated that Limit Equilibrium analysis has no relevance in assessing the stability hazard in very sensitive clay formations, and that progressive failure analysis is required.

Please confirm that no progressive failure analysis has been carried out in relation to the North Spur.

If it has, please provide a copy.

GRK-NLH-116

Re: GRK-NLH-046 Rev. 1

Citation from the RFI:

Q. Has NLH or its parent company evaluated the risk of retrogressive spreads, downhill progressive landslides or “bottleneck slides” at the North Spur site? If so, please provide a summary of its conclusions, and copies of any studies referred to.

Preamble:

The list of studies and analyses mentioned on page 2, lines 7-16 of GRK-NLH-045 Rev. 1 does not include mention of an evaluation of the risk of retrogressive spreads, downhill progressive landslides or “bottleneck slides” at the North Spur site.

Please confirm that no evaluation of the risk of retrogressive spreads, downhill progressive landslides or “bottleneck slides” at the North Spur site has been carried out in relation to the North Spur.

If it has, please provide a copy.

GRK-NLH-117

Re: PUB-NLH-210

Citation :

The key risks for the project what have already been successfully mitigated include the following: ...

Preamble:

There is no mention in the document of risks to the physical integrity of the Muskrat Falls dam related to the risk of retrogressive spreads, downhill progressive landslides or “bottleneck slides” at the North Spur.

Please confirm that no risk analyses have been completed that specifically consider risks to the physical integrity of the Muskrat Falls dam related to the risk of retrogressive spreads, downhill progressive landslides or “bottleneck slides” at the North Spur.

If such studies exist, please produce them.

GRK-NLH-118

Re: PUB-NLH-210, Att. 1

Citations:

Two members of MWH, as part of the IE’s team, attended a project briefing and participated in a site visit to the Muskrat Falls project during September 24-26, 2013. The project briefing was carried out by project designers and supervisory staff in the SNC-Lavalin (SNC-L)/Nalcor project offices in St. John’s on September 24, 2013.(p. 7)

The stabilization works have been designed in accordance with currently accepted geotechnical design practices and will effectively stabilize the north spur when the reservoir is impounded. (p. 9)

The IE has reviewed various aspects of the geotechnical designs and planned works. Detailed and rigorous investigations and laboratory testing of samples have provides accurate geotechnical and hydrogeological data. Limit Equilibrium stability analyses have been carried out for the final slopes. (p. 9)

Was the MWH team provided with detailed specific soil properties for the Upper Clays 1 and 2 in the North Spur?

If so, please provide the data that was provided to the MWH team.

GRK-NLH-119

Re: PUB-NLH-210, Att. 1

Was the MWH team provided with detailed specific analyses of the residual shear resistance of undrained and undisturbed clay samples from the North Spur?

If so, please provide the analyses that were provided to the MWH team.

GRK-NLH-120

Re: PUB-NLH-210, Att. 1

Was the MWH team provided with any detailed analyses of the large forward progressive landslides that have occurred in the Churchill River valley in the past?

If so, please provide the analyses that were provided to the MWH team.

GRK-NLH-121

Re: PUB-NLH-210, Att. 1

Aside from reviewing the materials provided them during the project briefing, did MWH reviewers undertake any independent study of the North Spur geotechnical conditions?

If so, please provide any materials they submitted in this regard, other than the report filed as PUB-NLH-201, Att. 1.

GRK-NLH-122

Re: PUB-NLH-210, Att. 1

Citations:

Geotechnical design work continues at the time of writing and the final design report has not yet been issued. The recently issued “Cold Eye Review of Design and Technical Specifications, North Spur Stabilization Works” by Hatch has indicated that, among other things, additional investigations and analyses are recommended to further enhance the design parameters for the sensitive clays and the overall seepage analysis assessment of the spur. The recommended work includes further investigations of the properties of the sensitive clays with respect to cyclic softening, more detailed stability analyses to assess the impact of earthquake ground motions and further seepage analyses. The IE was advised that Nalcor is following the recommendations provided by the Cold Eye reviewers. The IE has not yet been advised of details of the planned work. (p. 9)

The IE agrees with the Cold Eye recommendations and understands that work is proceeding on them. This supplementary work will further enhance confidence in the current design and should not result in any significant modifications to the planned work. (p. 10)

How could the IE know in advance whether or not the supplementary work would result in significant modifications to the planned work?

GRK-NLH-123

Re: GRK-NLH-058

Citation:

However, in summary with respect to capacity, Hydro is entitled to the full capacity of the Muskrat Falls plant, except for the portion required to deliver the Nova Scotia Block.

Does the expression “the full capacity of the Muskrat Falls plant” in the citation refer to a) the full installed capacity of the Muskrat Falls plant (824 MW), at all times, or b) the full amount of whatever capacity is available from the Muskrat Falls plant at any given time?

If the latter, does the MFPPA provide any commitments to NLH with respect to the amount of capacity that will be available to it at any given time?

GRK-NLH-124

Re: GRK-NLH-060, rev. 1

Please state the combined forced outage rate for the Muskrat Falls Generating Station in combination with the Labrador-Island Link as a whole.

Please confirm that this combined rate does not include any provision for outages related either to a) the integrity of the MF reservoir (e.g. a North Spur slide) or b) outages related to application of the Water Management Agreement.

GRK-NLH-125

Re: PUB-NLH-217

Citation 1 (p. 8):

A full loss of the LIL, referred to as a permanent bipole failure, will result in immediate curtailment of the export of the Nova Scotia capacity and loss of a maximum of 673 MW of capacity on the Island Interconnected System. The loss of 673 MW to the Island Interconnected System will require load shedding of up to 673 MW in order to rebalance on Island generation with load and return system frequency to normal. This load shedding scheme is under study to determine appropriate trigger levels and allocation across the Island.

Citation 2 (p. 9):

Once the Island Interconnected reaches 1 a stable mode following loss of the LIL, standby Island generation, if not already on line, would be brought on line to restore load curtailed during the event. The standby generation would include:

- NLH standby combustion turbines and diesel 234.7 MW (including the new 120 MW Holyrood CT); and
- Newfoundland Power standby thermal generation 41.5 MW.

A total of 276.2 MW of standby generation, if not already on line, would be available in ten to 20 minutes.

Please confirm that, in the event of a full loss of the LIL under the circumstances described:

- **immediate load shedding of 673 MW would be required;**
- **within 20 minutes, this amount could be reduced to 396.8 MW (673 - 276.2), due to the availability of standby generation.**

GRK-NLH-126

Re: PUB-NLH-217

Citation:

In the event of a complete LIL outage, capacity available to supply Island load would include approximately:

- 1013 to 1043 MW of on Island hydro-electric (variation due to reservoir levels);
- 276 MW of on Island thermal generation;

- Up to 300 MW of import via the Maritime Link; and
- Potential interruptible customer loads of 60 MW or more.

Please confirm that the 276 MW of on Island thermal generation mentioned here includes the 234.7 MW of NLH standby combustion turbines and diesel and the 41.5 MW of NP standby thermal generation mentioned in the preceding paragraph.

GRK-NLH-127

Re: GRK-NLH-069 Rev. 1, GRK-NLH-066 Rev. 1

Citation 1 (GRK-NLH-069 Rev. 1,):

As noted in Hydro's response to PUB-NLH-212, Hydro has set the maximum LIL bipole outage duration at two weeks for loss of the overhead line. The worst case two-week outage window with respect to capacity to supply the load would occur during the winter peak load period.

Citation 2 (GRK-NLH-066 Rev. 1, p. 1, lines 18-21):

For the reasons discussed in detail in Hydro's response to PUB-NLH-299, Hydro concluded “the two-week repair duration objective was selected as reasonable for the development of restoration plans”. Hydro confirms that it does not have a worst-case planning estimate in excess of two weeks for the situation in question.

Please confirm:

- a) that the two-week outage scenario mentioned in Citation 1 is not a “worst case planning estimate,” but rather the “repair duration objective [that] was selected as reasonable for the development of restoration plans”;**
- b) that this repair duration objective was selected “for loss of the overhead line” and cannot necessarily be applied to outages due either to problems in the submarine portion of the line, or to the integrity of the Muskrat Falls reservoir.**

GRK-NLH-128

Citation 1 (GRK-NLH-069 Rev. 1):

The worst case two-week outage window with respect to capacity to supply the load would occur during the winter peak load period.

Preamble:

While loads may be at their highest levels during the winter peak, reservoir levels are presumably at lower levels in the end of the winter period.

Please evaluate the duration at which the Island hydro system could be operated at 1000 MW or more in the event that the outage occurs in early March in a low-water year.

GRK-NLH-129

Re: PUB-NLH-280

Please indicate whether agreements have been finalized with NSPI and NBP with respect to emergency assistance and reserve sharing.

If so, please provide copies of the agreements.

If not, please describe the negotiations to date, and describe any points of disagreement.

GRK-NLH-130

Re: GRK-NLH-074

Preamble:

An analysis is provided to demonstrate that, for the period 2018-2025, sufficient energy resources are available on the Island to supply full load throughout the year, even without the LIL.

Please confirm that this analysis does not rely on any capacity or energy from the Holyrood thermal units.

Does this mean that, through 2025, the Island power system could be operated safely and reliably without either LIL or Holyrood? If so, please explain why a) why the Holyrood thermal units are currently used, and b) why Muskrat Falls commissioning was not deferred to a later date.

GRK-NLH-131

Re: GRK-NLH-074

Preamble:

An analysis is provided to demonstrate that, for the period 2018-2025, sufficient energy resources are available on the Island to supply full load throughout the year, even with the LIL.

Please provide a similar analysis for the period 2025-2040.

GRK-NLH-132

Re: GRK-NLH-079

Citation:

The table does not include any new savings (forecast) beyond 2014.

Preamble:

The table shows cumulative energy savings declining from 33,711 MWh in 2014 to 22,490 MWh in 2019.

Please provide a similar table that includes all planned additional savings in future years.

GRK-NLH-133

Re: GRK-NLH-081

Citation:

... Hydro and Newfoundland Power will conduct a study of the current potential for conservation and demand management potential. This study is presently underway and is expected to be completed by mid-2015.

Has the “study of the current potential for conservation and demand management potential” been completed? If so, please provide a copy. If not, please indicate the date when the study is expected to be finalized, and provide a copy at that time.

DATED at Montreal, in the Province of Quebec, this 1st day of June, 2015.

Charles O’Brien

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Inc.

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