Q. **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:

Table 1: Irregular CF(L)Co Production Profile

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:

Table 2: Irregular CF(L) Co Production Water Release

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:

Table 3: Gull Island Uncontrolled Inflows March

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)

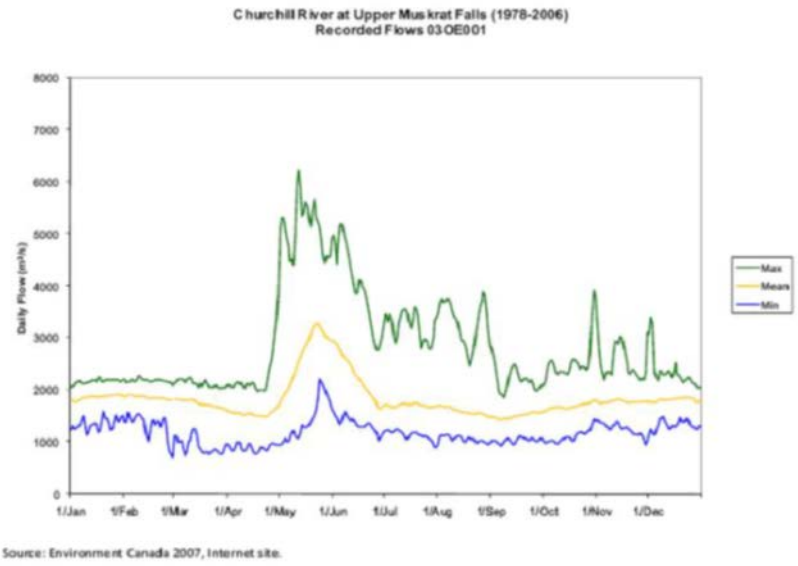
During the May timeframe, uncontrolled inflows into the Gull Island reservoir from snow melt and precipitation under average and wet year conditions are as follows:

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.



Source: Environment Canada 2007, Internet site.

Figure 4: Muskrat Falls (Monitoring Station 03OE001) Hydrograph

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.**

A. Hydro has provided its response in GRK-NLH-021 (Revision 1, Jan 14-15) and GRK-NLH-024 (Revision 1, Jan14-15) in relation to similar questions previously posed by the GRK.

In Board Order No. P.U. 5(2015) at Page 3, the Board specifically noted as follows:

> In Order No. P.U. 41(2014) the Board denied Hydro's challenge to GRK-NLH-21 and 24 to the extent that the responses address the availability of a reliable and adequate supply of power to the Island Interconnected system associated with the risks of scenarios outlined. The Board found that the consequences of an unfavourable ruling in relation to the Quebec litigation may be relevant to the issue of reliable and adequate power on the Island Interconnected system and that, to the extent that the information requested relates to the implications on the power available on the Island Interconnected system, some aspects may be relevant. The revised answers to GRK-NLH-21 and 24 provide a short explanation as to the impact of an unfavourable ruling in the Quebec litigation and the alternatives available for Hydro. The Board finds this explanation adequate for the purposes of this review and answers the issue which the Board found in Order No. P.U. 41(2014) should be addressed in the response. Therefore the Board does not accept the motion of Grand Riverkeeper Labrador, Inc. with respect to GRK-NLH-21 and 24.

As noted by the Board the responses provided by Hydro (which include a cross reference to response GRK-NLH-044 for options available to Hydro) are adequate for the purposes of this review.

With respect to requests for hypothetical information see also Hydro's response to GRK-NLH-104.