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Implications of the Court of Appeal Decision for the Water Management Agreement

Report submitted to the
Commission of Inquiry Respecting
the Muskrat Falls Project

by

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1. INTRODUCTION

The Water Management Agreement (WMA) for the Churchill River, put in place by the NL PUB's Order P.U. 8(2010), establishes the terms under which the Churchill Falls (Labrador) Corporation (CFLCo) and Nalcor (or its subsidiary the Muskrat Falls Corporation) are to manage power production at their generating stations on that river — the Churchill Falls Generating Station (CFGS) and the Muskrat Falls Generating Station (MFGS), respectively. Among other things, it establishes a banking system whereby surplus generation at MFGS can be "banked" at Churchill Falls for use at a later time. In doing so, however, it specifies that it must be interpreted so as not to infringe the provisions of any existing power contract.

The MFGS was conceived of and planned to contribute to meeting the needs of the Island Interconnected System (IIS). The WMA has implications with respect to both the energy and capacity balances of that system.

In July 2013, HQ applied to the Quebec Superior Court for a declaratory judgment concerning the renewal provisions of its Power Contract with the CFLCo. That application was granted in a decision (the "Castonguay Decision") released on August 8, 2016, which found that, both before and after renewal, "HQ enjoys the exclusive right to purchase all available capacity and all energy produced at Churchill Falls" (para. 1150). In so doing, it made it impossible for the WMA to operate as intended, as explained in my 2016 paper prepared in the context of the PUB's Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System.[1] The same paper was presented to this Commission as P-01468.

Nalcor appealed the Castonguay Decision and, on June 20, 2019, the Quebec Court of Appeal released its decision (the "Chamberland Decision"). The Chamberland Decision reverses several important aspects of the Castonguay Decision, and clearly establishes certain rights flowing from the renewal provisions of the Power Contract between Hydro-Québec (HQ) and CFLCo. The

[1] Raphals, P. Muskrat Falls' Contribution to the Reliability of the Island Interconnected System, October 2013. The filing was ultimately rejected by the PUB as out of scope.

Chamberland Decision represents a compromise that gives each of the two parties some, but not all, of the rights they sought. However, in doing so, it affects other aspects of the operations of the CFGS — and, in turn, the Water Management Agreement that is essential to the operations of the MFGS — in ways that are less clear. The purpose of this paper is to look at the effects of the Chamberland Decision on the operations of the CFGS, and its implications for the Water Management Agreement.

It remains to be seen whether or not one party or the other will see fit to seek appeal of the Chamberland Decision to the Supreme Court of Canada. If they do not, if the Supreme Court declines to hear it or if the Chamberland Decision is confirmed on appeal, it will represent the definitive interpretation of the renewal provisions of the Power Contract. For reasons to be be explained below, I am of the view that, under that eventuality, it would likely be in the interest of both parties to seek a negotiated settlement to resolve some of the issues discussed below.

2. MUSKRAT FALLS AND THE WATER MANAGEMENT AGREEMENT

2.1. Power Production at Muskrat Falls

Planning documents of Newfoundland Labrador Hydro (NLH) indicate that MFGS will provide some 790 MW of firm capacity, presumably meaning that Hydro can rely on it whenever required.[2] For example, the recent Reliability and Resource Adequacy Study explains:

> The Muskrat Falls development has a nominal plant rating of 824 MW (i.e., four units, each rated to 206 MW), based on rated head conditions. During certain river operating conditions, the plant will be able to produce more or less power than 824 MW. These operating conditions affect the water elevation at the water intakes to the units and the water outlet, or the tailwater, elevation.
>
> When these estimated ice cover tailwater rating curves were applied to the plant production models, the maximum plant output during the winter was restricted to 790 MW.

[2] NLH, Reliability and Resource Adequacy Study, Nov. 16, 2018, Page 31, (62 pdf). Table 1 shows an Installed Capacity for the Muskrat Falls Plant of 824 MW, and a Gross Continuous Unit Rating of 790 MW.

> Data has been collected and analyzed to determine whether adjustments can be made to the projected tailwater rating curves. While the new data does show that for a given flow the tailwater levels are in the lower range of the predicted relationship there is not yet sufficient data to verify this will be a long-term trend warranting a change to the curves. It is therefore recommended, until further operating data is obtained with the dam and plant in place, that the winter maximum output of 790 MW derived from the predicted tailwater curves be used in planning studies. This operating restriction has been incorporated in the Reliability Model.[3]

This value of 790 MW apparently does not take into account transmission losses between Muskrat Falls and the IIS. More importantly, there is no recognition in this document — or any other NLH planning document that I have seen — that the capacity available to NLH from the MFGS during peak periods might be considerably less, because the flows in the Churchill River during peak hours are likely to be far lower than the 2660 m^3/s required for the MFGS to generate its full capacity.

My October 2016 report explained that power production by the Muskrat Falls Generating Station (MFGS) varies with the flows in the Churchill River, which in turn vary based on the operations of the Churchill Falls Generating Station (CFGS) upstream, and on the inflows from the tributaries that enter the river downstream of Churchill Falls, which vary seasonally.[4]

The Muskrat Falls facility will only have about 50 million m^3 of live storage capacity,[5] equivalent to just under 5 ½ hours at full output,[6] and drawing down the Muskrat Falls reservoir is undesirable, as it reduces the head and thus the efficiency with which the stored water can produce electricity. This limited amount of reservoir storage is not adequate to ensure that the MFGS will be able to provide its full installed capacity whenever needed to meet IIS demand during peak periods. Thus, while it is not mentioned in Hydro's planning documents, the

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[3] Ibid., s. 4.2.2.3, page 33 (pdf 64).

[4] Reservoir inflows reflect rainfall in the drainage basins feeding the Churchill Falls reservoirs, minus evaporation and other losses. (The unofficial translation of the Chamberland Decision uses the term "hydraulicity", reflecting the French term, *hydraulicité*.)In winter, inflows at Muskrat Falls depend almost exclusively on outflows from the CFGS whereas, in other months, flows from the tributaries between the two power stations would contribute significantly to them.

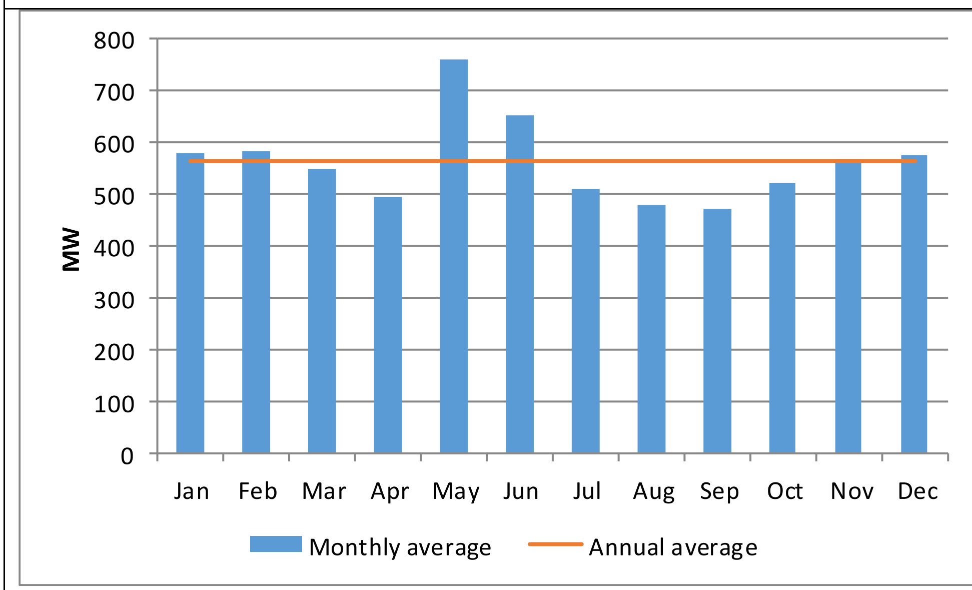
[5] Nalcor Energy, WMA Application, Pre-filed Evidence, p. 13.

[6] In comparison, Churchill Falls has 30 billion cubic metres of storage capacity. Nalcor Energy, Water Management Agreement Application – Prefiled Evidence, Appendix A, p. A-4.

intended operation of the Water Management Agreement (WMA) is essential for MFGS to be able to play its assigned role in meeting Hydro's capacity requirements.

Figure 2 of that paper, reproduced here, shows that, based on historical flows at Muskrat Flows, average generation at the MFGS for the years 1977-2014 would have been about around 580 MW during winter months.

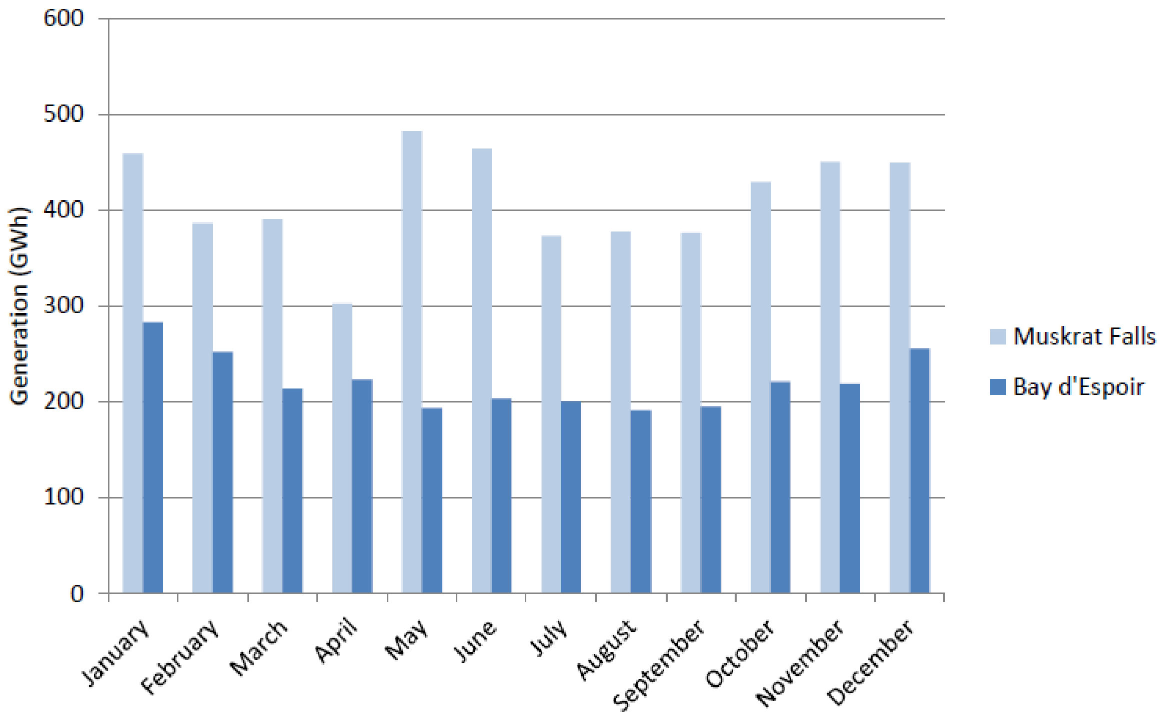
Figure 1. Average monthly generation (simulated) at Muskrat Falls (1977-2014)



Based on the historical hydrological record, I found that the daily average winter flows fell on one occasion to a level which would have produced just 418 MW — which, after line losses, would result in delivery of around 385 MW to Soldiers Pond. Furthermore, 167 MW (during on-peak hours, 16 hours per day) is committed to Emera for the Nova Scotia Block. leaving just 218 MW of firm capacity from the MFGS available to meet IIS capacity requirements during on-peak periods. As a result, I concluded that the capacity balances presented by Hydro substantially overstate available firm capacity from MFGS.

The Reliability and Resource Adequacy Study filed by Newfoundland and Labrador Hydro (NLH) in November 2018, also provides estimates of monthly power generation at Muskrat Falls, as shown in Fig. 2 (pale blue bars) [9]:

Figure 2. Expected monthly generation (NLH Reliability and Resource Adequacy Study)



The two generation profiles are similar, though the values are not identical. For example, January generation in Fig. 2, which appears to be about 460 GWh, is the equivalent of about 640 MW on average throughout the month, which is somewhat higher than the 580 MW shown in Fig. 1. Perhaps Hydro relied on a different hydrological data set in preparing this graph, or on different assumptions. That said, this graph confirms that, without the WMA, the MFGS cannot be expected to generate 790 MW of firm power throughout the winter.

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9 NLH, Reliability and Resource Adequacy Study, vol. III: Long-Term Resource Plan, page 15 (page 255 of the pdf).

Thus, the WMA would have to be able to provide the difference between 790 MW and the power actually produced by the flows at Muskrat Falls when that amount of power is required. As these flows vary constantly for reasons beyond the control of Nalcor or its subsidiaries[10], the unimpeded operation of the WMA is essential if the MFGS is to be able to play its assigned role in providing peak capacity to the Island Interconnected System (IIS).

2.2. The Water Management Agreement and the Castonguay Decision

Without a water management agreement, availability of power from the MFGS would be closely tied to real-time variations in flows at Muskrat Falls. The primary purpose of the WMA is precisely to break this link, by allowing Nalcor to receive more (or less) power than is actually being generated by the MFGS at a particular moment.

The operation of the WMA can be summarized as follows. If MFGS generates more power than Hydro requires at any given moment, the additional power is transmitted to Churchill Falls and used to contribute to providing the amount of power required at that moment by Hydro-Québec, allowing the amount of water stored in the CF reservoirs to be greater than it would have been otherwise. The energy resulting from this transfer is credited to Hydro's "banking account".

At a later time, if the amount of power scheduled by Hydro exceeds the actual power generation of MFGS, the CFGS is to increase its generation to make up the shortfall. The energy resulting from this transfer is then debited from Hydro's "banking account".

Let X represent the actual momentary generation at MFGS, and Y the requirements of Hydro at that moment Y. If X=Y, Hydro simply receives the full output of MFGS. If X>Y, Hydro receives Y from MFGS, and the remaining X-Y is transferred from MFGS to Churchill Falls. If X<Y (and if the balance in the banking account is greater than zero) then Hydro receives the full

[10] HQ's management of its deliveries from the CFGS, and hence of the storage in the Churchill Falls reservoirs, is determined by its own proprietary optimization protocols, which are not publicly disclosed and which can change at any time.

output of MFGS, and also receives Y-X from CFGS. At all times, Hydro's requirement of Y MW is met.

My 2016 paper demonstrated that, under the terms of the Castonguay Decision, the WMA would not be able to play such a role. While the WMA was not itself the subject of the litigation, the Castonguay Decision's implications regarding the rights of each party under the Renewal Contract of the Churchill Falls Power Contract made it impossible for the WMA to work as intended.

The Castonguay Decision found that:

> 1150 … HQ enjoys the exclusive right to purchase <u>all available capacity and all energy produced at Churchill Falls</u> … except for the power and energy associated with [the Twinco block and the Recall Block]. (underlining added)

In my 2016 report, I concluded (at page 23) that, in light of this interpretation of the Renewal Contract:

> Nalcor cannot claim deliveries of banked energy without adversely affecting a provision of the HQ Power Contract.
>
> This suggests that, insofar as the Quebec Superior Court decision stands, the WMA is like a bank account to which Nalcor can deposit, but from which it may not withdraw.

Thus, under the Castonguay Decision, Nalcor could not count on receiving Y – X MW from the CFGS when required. Indeed, it might never be able to recover the energy "banked" at Churchill Falls, since all of the plant's output was sold to HQ.

The Chamberland decision, however, comes to very different conclusions, described in the next section.

3. THE CHAMBERLAND DECISION

3.1. Energy and operational flexibility

3.1.1. Freezing AEB

The Chamberland Decision rejects the Castonguay Decision's conclusion quoted above that "HQ enjoys the exclusive right to purchase all available capacity and all energy produced at Churchill Falls". Rather, it states:

> [74] <u>It is not contested that HQ is required to purchase and pay for, and CFLCo is required to sell to HQ, a fixed and predetermined quantity of energy. And, in my opinion, nothing less, but nothing more either</u>. Section 2.1 (*Object*) of Schedule III and the concepts of *Annual Energy Base*/*Continuous Energy* are too clear to allow for another conclusion.
>
> [75] <u>Unlike the Initial Contract, Schedule III does not contain anything that would lead to the conclusion that HQ is entitled to all the energy produced by the Churchill Falls plant, over and above the quantities defined by the concepts of *Annual Energy Base*/*Continuous Energy*.</u> The first establishes the annual quantity of energy to which HQ is entitled, while the second, as the trial judge rightly noted, allocates this quantity from month to month, on a purely mathematical basis, essentially to ensure CFLCo has a regular and stable flow of revenue throughout the year. (underlining added)

Justice Chamberland explains that, in the past, *Annual Energy Base* was adjusted to take into account spillage and changes in reservoir levels.

> [84] Indeed, HQ argues that on September 1, 2016, the value of the *Annual Energy Base* was identical to the value of that in effect the previous day, August 31, 2016. It points out that <u>the adjustments to this value</u> throughout the period from September 1, 1976 to August 31, 2016 <u>took into account all energy deliveries to HQ, the equivalent kilowatthours of any spilled water and the equivalent number of kilowatthours represented by the change (up or down) in the reservoir level</u> as compared with the reservoir level on the date the plant was commissioned (section 9.2—*Basis for Adjustment*). In short, it reflected the entire proven energy potential of the hydroelectric complex. (underlining added)

While I find the term used in the last sentence of this paragraph — "the entire proven energy potential" — to be somewhat problematic, the general idea is correct: by taking into account total deliveries since commissioning as well as spills and changes in reservoir levels, the adjusted

Annual Energy Base ("AEB") represented, on average, the amount of energy that could have been produced each year, averaged over the entire period since commissioning.[11]

More specifically, the adjustment mechanism set out in s. 9.2 can be described as follows:

$$\Delta\ AEB = AEB_1 - (\text{deliveries} + \text{spills} + (\text{ReservoirLevel}_2 - \text{ReservoirLevel}_1))$$

$$AEB_2 = AEB_1 + \Delta\ AEB$$

$$AEB_2 = AEB_1 + (AEB_1 - \text{deliveries} - \text{spills} - (\text{ReservoirLevel}_2 - \text{ReservoirLevel}_1))$$

Let us assume, hypothetically, that AEB was being re-evaluated after one year of operation, that there had been no spills, and that reservoir levels remained unchanged from the same date the previous year. If deliveries were equal to the original AEB (AEB_1), then Δ AEB would be equal to zero, and AEB would remain unchanged (AEB_2 would equal AEB_1).

If, on the other hand, reservoir inflows had remained the same but HQ had instead taken 1 TWh less deliveries, then ReservoirLevel_2 would be 1 TWh greater than ReservoirLevel_1. So deliveries would be 1 TWh less, but the reservoir adjustment would be 1 TWh more, so Δ AEB would again be zero. Thus, HQ's operational decisions with respect to energy deliveries do not affect AEB.

If, on the other hand, inflows had increased by 1 TWh and deliveries had remained the same, then the reservoir levels would be higher, resulting in an increase in AEB. Thus, changes in inflows <u>do</u> affect AEB.

This implies, first, that adjusted AEB varied with inflows — wet years would result in higher values of adjusted AEB than would dry years. It also implies that adjusted AEB does <u>not</u> vary depending on how much energy was actually generated during the year. If Hydro-Québec had chosen to generate very little electricity during the year, leaving large quantities of water in the reservoir (either to rebuild reserves from an earlier year, or to store them for the future), this

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[11] According to s. 9.1 of the Power Contract, AEB can be adjusted every four years.

would have no effect on adjusted AEB. Similarly, if HQ had chosen to generate a great deal of electricity, drawing down the reservoir to a low level, this would not have any effect on the adjusted AEB either.

Adjusted AEB thus reflects the <u>average annual energy capability</u> of the CFGS. This is perhaps what is meant by the last sentence of para. 84.

The decision goes on to explain that:

> [87] Another fact must also be taken into account. Since September 1, 2016, the value of the *Annual Energy Base* is no longer subject to periodic adjustments. <u>It is frozen in time, until the end of the 25-year period</u>. During this period, knowledge of hydroelectricity will undoubtedly continue to grow, to increase the efficiency of the facilities and, inevitably, to drive the energy potential of the hydroelectric complex upwards, but without being reflected in the *Annual Energy Base*. (underlining added)

Again, the wording of the last sentence is somewhat problematic. If the energy potential of the hydroelectric complex increases in the coming decades, it might be due to climate change or to physical improvements to the turbines, but likely not to growth in "knowledge of hydroelectricity".[12]

But this does not undermine the main point of the paragraph, which clearly states that AEB is <u>frozen</u> for the duration of the renewal contract.

The decision elaborates on the significance of this freezing as follows:

> [112] Sections 4.2.1 and 6.5 of the Initial Contract gave HQ <u>full operational flexibility</u> allowing it, through its requests for the delivery of energy, to <u>control production and manage water levels in the reservoirs</u>. This allowed HQ to adapt its requests for energy and power based on the <u>seasonal</u> demand for energy in Quebec, reducing its requests in the summer (thereby allowing water to accumulate in the reservoirs) and increasing them in the winter, when demand was higher. Given that HQ had access to all the energy produced by the plant, <u>it also adapted its requests for energy on a multi-year basis</u>, by scheduling deliveries above

[12] In the original, this last sentence reads: « Pendant ce temps, les connaissances en matière d'hydroélectricité continueront assurément de progresser, d'accroître l'efficacité des installations et, inévitablement, de tirer vers le haut le potentiel énergétique du complexe hydroélectrique, sans pour autant se refléter dans l'*Annual Energy Base*. »

> the value of the *Annual Energy Base* during years of high hydraulicity and below that value during years of weaker hydraulicity.[13]
>
> …
>
> [116] In my view, one must try to reconcile the concept of operational flexibility with the notion that HQ has access to a limited, albeit considerable, quantity of energy. On this point, I agree with HQ. It would be surprising if the parties had intended a purely intra-monthly flexibility (i.e., solely within each month), as CFLCo proposes, despite the fact that HQ enjoyed full operational flexibility for 40 years and that, even after August 31, 2016, HQ still needs to efficiently coordinate the considerable energy contributed by the Churchill Falls plant with the energy from its own network of plants.
>
> [117] The wording of the operational flexibility clauses in Schedule III, which is identical to the wording of the clauses that defined the relationship between the parties during the first 40 years of their agreement, does not say this.
>
> [118] I see nothing in the terms and conditions applicable as of September 1, 2016 that would prevent HQ from doing as it has always done since the plant was commissioned, which is to adjust its requests for the delivery of energy (and power) based on the seasonal profile of demand for electrical energy in Québec (higher in winter than in summer) and in perfect harmony with its own network of plants. This, of course, is subject to an additional restriction which did not exist before September 1, 2016, that is, the annual limit on the energy to which HQ is entitled pursuant to Schedule III (*Annual Energy Base*).
>
> [119] Consequently, I see nothing in Schedule III that would prevent HQ from postponing (or accelerating) the delivery of energy it has paid for (or will pay for) pursuant to sections 2.1 and 7.1, but of which it has not yet taken delivery (or which it needs sooner), subject, however, to the annual cap represented by the *Annual Energy Base*. (underlining added)

The Chamberland Decision comments on the intra-annual (seasonal) flexibility which HQ has thus far enjoyed, and concludes that it remains intact during the renewal period. However, the Decision effectively eliminates inter-annual flexibility, which has also been an important aspect of HQ's use of the CF facility. Indeed, the only mention of inter-annual flexibility is in the last sentence of para. 112, which (incorrectly) assumes that HQ necessarily increases its deliveries in wet years and decreases them in dry years.[14].

So not only is AEB frozen, but it now constitutes an "annual cap" on HQ's energy entitlement. HQ no longer has the right to exceed AEB in one year and take less in another. This implies that

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[13] This last sentence is not entirely correct, as detailed below.

[14] As we shall see in Table 1below, the amount of electricity delivered to HQ from CF has in fact varied over the years, but not in lock-step with reservoir inflows.

HQ is no longer responsible for managing water levels in the Churchill Falls reservoirs, and that it no longer bears the hydraulic risk.

The Chamberland Decision declares that Schedule III provides HQ with operational flexibility "very similar to the operational flexibility it enjoyed" in the past:

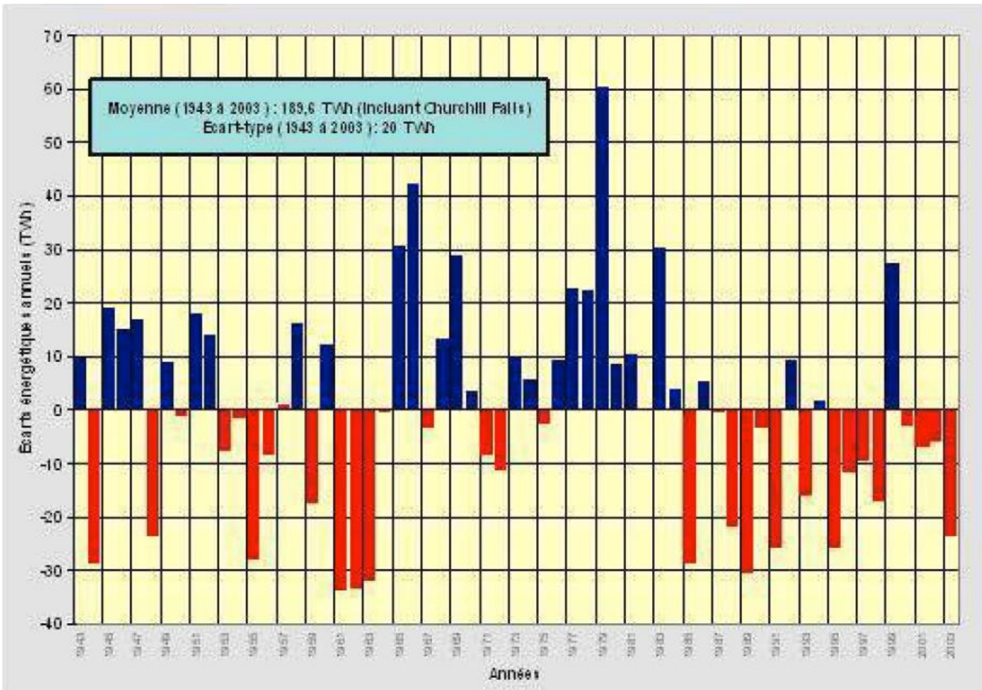
> 1151. DECLARES that the rights conferred on Hydro-Québec under sections 4.1.1 (Operational Flexibility) and 5.3 (Firm Capacity Schedules) of Schedule III to the May 12, 1969 contract <u>provide it with an operational flexibility very similar to the operational flexibility it enjoyed since the commissioning of the Upper Churchill plant</u>, including its right to schedule and plan its energy and power requirements and to postpone (or accelerate) the delivery of energy from one month to another …

Similar, perhaps, but not the same. HQ has maintained its intra-annual operational flexibility, but lost its inter-annual flexibility.

Freezing AEB and limiting HQ's annual deliveries to that amount mean, on the one hand, that Hydro-Québec's entitlement does not vary with inflows. In a dry year, CFLCo may find itself obligated to draw reservoirs down to lower levels in order to provide Hydro-Québec with the energy to which it is entitled. In the event of a multi-year series of low inflows, such drawdowns could be substantial. Similarly, any excess energy that can be produced due to higher than average runoff would accrue to CFLCo, not to Hydro-Québec.

I am not aware of public records describing inflows to the Churchill Falls system other than the 5-year series shown in Table 1 below, but Hydro-Quebec has from time to time published long-term records of inflows to its own system. Figure 3, which shows inflows to the HQ system (including Churchill Falls) from 1943 to 2003, shows that multi-year dry (and wet) series are not uncommon.

Figure 3. Energy value of variations in hydaulic inflows to the HQ system, 1943-2003 (normalized)[16]



Furthermore, the climate is changing, which means that, for hydroelectric systems, the historical record is not necessarily an accurate guide to the future. If average inflows in the future are more (or less) than in the period from commissioning to renewal, the resulting gain (or loss), under the Chamberland Decision, will accrue to CFLCo, not to HQ.

Limiting HQ's entitlement to AEB also means that, if Hydro-Québec were to take less electricity in any given year, its entitlement would not increase in the following year. Having lost the ability to defer generation from one year to the next, it would be surprising if HQ did not take its full entitlement each year, regardless of inflows or reservoir levels.

Thus, while under the Chamberland Decision Hydro-Québec retains intra-annual flexibility (compared to CFLCo's interpretation, which would have limited it to intra-monthly flexibility), it nevertheless loses the capacity for inter-annual flexibility, which it had prior to renewal.

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[16] Source : Hydro-Québec, responses to information requests from the Régie de l'énergie, R-, HQP-1, doc. 1, page 16, Feb. 18, 2004.

How significant is this difference? Because Hydro-Québec's generation activities are unregulated, there is very little detailed information publicly available about its operations. However, compendia of operations data released until the mid-1990s include the data shown in yellow in the following table (the remaining values are calculated)[17]:

Table 1. Historic operational values for the Churchill Falls Generating Station

	1987	1988	1989	1990	1991	1992	1993	1994	1995
Energy Reserves at Jan. 1 (TWh)	10.8	10.5	7.7	8.7	11.5	9.4	16.4	9.1	10.6
Inflows (TWh)					26.1	36	25.8	32.3	26.8
Generation (TWh)					28.2	29	33.1	30.8	
Energy Reserves at Dec. 31	10.5	7.7	8.7	11.5	9.4	16.4	9.1	10.6	7.2
Energy Reserves at Dec. 31 (% of 26 TWh capacity)	40%	30%	33%	44%	36%	63%	35%	41%	28%

Data regarding energy storage at CF, available from 1987 through 1995, show that storage levels varied greatly, from a low of 7.2 TWh (at Dec. 1) in 1995 to a high of 16.4 TWh in 1992, representing a minimum of 28% and a maximum of 63% of total storage capacity of 26 TWh.

Inflow data are only available from 1991 through 1995, and show variation from 36 TWh in 1992 to 25.8 TWh the year after (38% lower).

Finally, generation levels (which can only be calculated for years when storage and inflows are known) varied between 28.2 TWh (in 1991) and 33.1 TWh (in 1993).[18]

We can conclude from these data that inflows vary greatly from one year to another, as does HQ's use of the Churchill Falls system. HQ's delivery schedule is likely based on its efforts to optimize generation and costs not only at Churchill Falls, but also across its entire system.

The Chamberland Decision, which calls for freezing of HQ's energy entitlement, has several implications in this regard. First, as noted above, it means that HQ cannot choose to defer

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[17] Sources : Hydro-Québec, Historique financier et statistiques diverses, 1987-1991, page 176; Hydro-Québec, Historique financier et statistiques diverses, 1991-1995, pages P-13 and P-14. The types of data presented vary from year to year.

[18] These figures necessarily include energy delivered to Labrador as well as to HQ.

deliveries from one year to the next. As noted earlier, if it were to take less than AEB in a given year, it would not be able to increase deliveries by a corresponding amount in a later year.

Second, it means that the risk (and benefits) of changes in inflows are shifted from HQ to CFLCo. In wet years, when runoff is above average, the additional generation capability would accrue to CFLCo, which would in principle be able to make additional interruptible sales (discussed in the next section). However, in dry years (and especially during multi-year dry periods), CFLCo may have to draw the reservoirs down to low levels in order to maintain deliveries to HQ equal to the AEB. In the worst case, CFLCo could even have to purchase energy elsewhere in order to meet its obligations to HQ.

This is clearly a substantial difference from the situation prior to renewal. I do not see any evidence in the Chamberland Decision that the Court was fully aware of these implications. Nor am I convinced that this shifting of hydraulic risk to CFLCo is in the interest of either party, as — due to the much larger size of its system — HQ is probably in a better position to absorb this risk than is CFLCo. Should the Chamberland Decision stand, Nalcor might well be willing to modify these arrangements — for a price.

3.1.2. Interruptible sales

Having concluded that HQ's energy entitlement is limited to AEB, which is henceforth frozen at the value it had at the moment of renewal, the Chamberland Decision then concludes that CFLCo can sell any remaining energy as it sees fit, in the form of interruptible sales. The Decision is silent, however, with respect to how the "remaining amount of energy" will be calculated, either at year-end or in real time, and how the permissible levels of interruptible sales are to be determined.

The Court was convinced that there would inevitably be additional energy above AEB.

> [89] All things being equal, there is, and will continue to be, a certain quantity of energy over and above the value of the Annual Energy Base. As a matter of fact, why would this dispute have arisen if both parties did not believe in the existence of a certain quantity of energy over and above the value of the Annual Energy Base?

While that may likely be the case, I do not see how that position can be taken with certitude. Were the long-term climate trend in the Labrador region to result in decreasing inflows, there could turn out to be less energy available than AEB, not more.

That said, it is very likely that, in some years, the energy value of inflows will exceed AEB. If the amount of stored energy remained constant from one year to another, then the generation capability of the CF system would be equivalent to the year's inflows. One could then determine (post facto) the "remaining amount of energy" after HQ's AEB entitlement, which would be the amount that CFLCo would have been entitled to sell as interruptible energy during the year.

However, since storage levels are likely to vary from one year to the next, one cannot assume that the energy actually generated during the year was equal to inflows. Nowhere in the Decision is it stated that CFLCo must manage its interruptible sales such that storage levels remain constant year to year. Indeed, as we saw above in Table 1, storage levels have in the past varied greatly from one year to another. If CFLCo made substantial interruptible sales for several years and reservoir levels were to decline, it is not clear how one could determine which such sales were authorized under the Power Contract and which were not.

The second problem is that there is no indication as to how CFLCo is to determine the "remaining amount of energy", in order to be able to decide how much energy it is allowed to sell, in real time, in the current year, or at some point in the future. The Chamberland Decision provides no guidance as to how to determine whether or not this right is being respected.

The parameters governing CFLCo's right to sell interruptible electricity thus constitute another point that may need to be resolved in subsequent negotiations.

3.2. Power

As we saw earlier, the primary purpose of the WMA is to make it possible for Muskrat Falls to provide firm power (capacity) to the IIS, regardless of the changing flows in the Churchill River.

The Chamberland decision devotes just three paragraphs to Power, quoted here in full.

> [143] Schedule III, which applies to the period from September 1, 2016 to August 31, 2041, provides that HQ has a right to the *Firm Capacity* under the same conditions as in the Initial Contract, namely, 4,382,600 KW from October to May and 4,163,500 KW from June to September. This power is available "at all times" when HQ requests it (section 5.2). Pursuant to said section 5.2, it is also possible for HQ to obtain additional power if, "in the opinion of CFLCo", this additional power is available.
>
> [144] In addition to these sections, there is the GWAC, which has been in effect since November 1, 1998 and which I mentioned earlier (682 MW for the period from November 1 to March 31 of each year until 2041, a guarantee that is not subject to "the opinion of CFLCo" regarding the availability of this additional capacity).
>
> [145] In short, HQ is entitled, at all times, to the power defined by the expression *Firm Capacity*, and, upon request, to any additional power which, according to CFLCo ("in the opinion of CFLCo"), is available, as well as the additional power whose availability HQ has ensured under the GWAC, which has been in effect since November 1, 1998.

The decision is unequivocal. HQ is entitled to all power available — "the power defined by the expression *Firm Capacity*, and, upon request, to any additional power which … is available".

The meaning of "firm capacity" is summarized in para. 143, quoted above. Scheduling is described in s. 6.5, which reads in part (as quoted in para. 108):

> Each such seven-day schedule shall constitute Hydro-Quebec's request for availability of such capacity over the period scheduled to the various extents and at the various times indicated by the schedule, but subject to Hydro-Quebec's right to make further requests for changes in capacity during the period within the limits of Firm Capacity and Minimum Capacity. Any such request shall be considered as revising the schedule to the required extent and for the required time.

Thus, HQ could at any time increase its schedule, for a given hour or group of hours, to include the full generating capacity of the CFGS. This implies that CFLCo cannot make any commitment to provide any specific amount of power to any other party at any fixed time in the future.

As mentioned in para. 143 of the Chamberland Decision, Firm Capacity is defined in both the Power Contract and the renewal contract as a precise amount of power (4,382.6 MW from October through May, and 4,163.5 MW from June through September).[19] Does the actual

[19] According to page 4 of the Power Contract, Recapture Power (commonly referred to as Recall Power) is deducted ("withheld") from these amounts.

generating capacity of the CFGS provide for additional capacity, beyond these amounts defined as "Firm Capacity"?

According to Schedule II, the installed capacity of the 11 units is 5170 MW at the generator terminals (Col. 3), or 4841.5 MW at the Delivery Point (col. 4). This latter value takes into account losses and also local loads, including (according to Note 1) the Twin Falls (Twinco) load of 225 kW.

However, the monthly commitments from Churchill Falls, under the Power Contract and the GWAC, exceeds these levels in the winter months:

Table 2. Monthly capacity at the Churchill Falls Generating Station

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Firm Capacity	4382.6	4382.6	4382.6	4382.6	4382.6	4163.5	4163.5	4163.5	4163.5	4382.6	4382.6	4382.6
GWAC	682	682	682								682	682
Firm Capacity + GWAC	5064.6	5064.6	5064.6	4382.6	4382.6	4163.5	4163.5	4163.5	4163.5	4382.6	5064.6	5064.6
Installed capacity at delivery point (after Twinco)	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5	4841.5
Capacity surplus (shortfall)	-223.1	-223.1	-223.1	458.9	458.9	678	678	678	678	458.9	-223.1	-223.1

The explanation apparently lies in capacity upgrades undertaken in 1985, which brought the installed capacity to 5428 MW.[20] This is an increase of 258.5 MW compared to the installed capacity shown in col. 3 of Schedule II, from which losses must be subtracted (about 2%, or 5 MW). Adjusting the above table to include this upgraded installed capacity reduces the surplus capacity in winter to just 30.2 MW, as shown in the following table — a negligible amount given the size of the CFGS.

Table 3. Monthly capacity at the Churchill Falls Generating Station after upgrade

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Firm Capacity	4382.6	4382.6	4382.6	4382.6	4382.6	4163.5	4163.5	4163.5	4163.5	4382.6	4382.6	4382.6
GWAC	682	682	682								682	682
Firm Capacity + GWAC	5064.6	5064.6	5064.6	4382.6	4382.6	4163.5	4163.5	4163.5	4163.5	4382.6	5064.6	5064.6
Installed capacity at delivery point w upgrade	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8	5094.8
Capacity surplus (shortfall) after upgrade	30.2	30.2	30.2	712.2	712.2	931.3	931.3	931.3	931.3	712.2	30.2	30.2

[20] NL Hydro, Lower Churchill Generation Project, Project Registration Pursuant to the Newfoundland and Labrador *Environmental Protection Act* and Project Description Pursuant to the *Canadian Environmental Assessment Act,* November 30, 2006, page 3 (p. 10 pdf). The increased capacity is first mentioned in Hydro-Quebec's 1989 Annual Report.

Thus, it appears that the Firm Capacity amounts shown in the Power Contract do indeed represent the actual amounts of capacity available, in the winter months. Whether or not the summer capacity meets or exceeds the figures shown here will presumably depend on the actual maintenance schedules. But the language of para. 143 indicates that HQ can also claim this additional capacity if, "in the opinion of CFLCo", it is available.

The Chamberland Decision states clearly that CFLCo has no right to any of the CFGS' *Firm Capacity*, which, as we have just seen represents the full capacity of the facility:

> [163] As regards the power contemplated by the expression *Firm Capacity*, both in the May 12, 1969 contract and in Schedule III, as well as in the GWAC, I agree with the trial judge. <u>CFLCo has no right to this power</u>, which HQ has paid for and whose availability it has ensured in case of need. (underlining added)

It is thus hard to see how CFLCo could make additional capacity available to NLH, knowing that HQ could claim all available capacity at any time. Nevertheless, the Decision then immediately goes on to say:

> **The power associated with the excess energy**
>
> [164] With respect to this power, I see nothing that stands in the way of CFLCo disposing thereof as it sees fit, provided it satisfies its commitments in that regard towards HQ under Schedule III (*Firm Capacity*) as well as under the GWAC (682 MW) or under any other agreement relevant to this matter.

What exactly is "the power associated with the excess energy"? Reference is apparently made to the physical notion of "power" described in para. 39, which states:

> [39] First, the concepts of power and energy. "*Power*", as defined in the May 12, 1969 contract, is <u>the rate at which electrical energy is delivered</u> at any point, measured in kilowatts (KW, 1000 watts) or multiples thereof. Similarly, "*Energy*" is the result of power multiplied by the time during which the power is used, measured, in the case of electrical energy, in kilowatthours (KWh) or multiples thereof. Energy and power (or capacity) are therefore two different, albeit interconnected, concepts; the trial judge rightly explained that it is [TRANSLATION] "useful to point out, once again, that <u>power is used to deliver energy</u>".

The Decision seems to suggest that any delivery of energy implies a delivery of power. However, in the utility industry, the sale of "power" (capacity) implies a <u>commitment</u> to make that power available at a certain time and for a certain duration. In this sense, the sale of interruptible energy does <u>not</u> involve the sale of power.

If it were possible — and, as explained above, I do not think it is, without further negotiations — to determine in advance that, for example, CFLCo had the right to sell 1 TWh of interruptible energy in a given calendar year, it would nevertheless not have the right to guarantee the delivery of that energy at any particular time. To do so would infringe on HQ's right to all of the Firm Capacity of the plant, as the same kW of firm capacity (the right to use that kW of generating capacity whenever needed) cannot belong to two parties at once. There can be no double-counting of firm capacity, as it constitutes a guarantee that the resource will be available if needed.

This nuance is of great importance for the application of the WMA. The Chamberland Decision's recognition of CFLCo's right to sell interruptible power does indeed change the situation described in my 2016 paper where, under the Castonguay Decision, the WMA created a banking account into which one could deposit but not withdraw. The Chamberland Decision restores the right to withdraw from this account, and thus constitutes a very significant improvement from Nalcor's point of view.

It does not, however, provide Nalcor with the right to schedule delivery of that energy at a moment of its choosing – or to guarantee that it will be available when requested – since, at any time, HQ could invoke its right to the full capacity of the CFGS. As noted in the Chamberland Decision, HQ may amend its schedules at any time to call for any additional capacity that may be available. Thus, while the WMA is indeed operational as an energy savings account, it cannot be relied on to provide firm capacity to the Island Interconnected System (IIS).

The Castonguay Decision quotes CF(L)Co's written argumentation as follows:

> 396. Given Hydro-Quebec's priority call on power up to the Firm Capacity level, before the interruptible power is sold to NLH, CF(L)Co must first make it available to Hydro-Quebec. Hydro-Quebec must then decide whether or not to request it in accordance with the Power Contract. It is only then, when the power is not requested by Hydro-Quebec that it can be sold to a third party such as NLH. Again, because this power is sold on an interruptible basis. It remains available to Hydro-Quebec should it require it at a later point, the whole in accordance with the scheduling procedure set up in the Power Contract and the Interchange

> Manual, which CF(L)Co will continue to respect, whether or not it sells interruptible power to NLH.[21] (underlining by Judge Castonguay)

This argumentation was offered in support of CF(L)Co's ability to make non-firm sales to NLH without infringing HQ's right to all of the plant's firm capacity. However, it also acknowledges CFLCo's inability to make firm deliveries to NLH.

As noted above, NLH's planning documents rely on 790 MW of firm power from the MFGS, implying that, whenever needed, the IIS can call on whatever power is needed from Churchill Falls to bring the Muskrat Falls output up to 790 MW. As noted above (p. 5), at the lowest winter flows seen in the historical record, the MFGS would have produced just 418 MW. Thus, on the day when those low flows occurred, Nalcor would have needed 790 – 418 = 372 MW of additional capacity from Churchill Falls (ignoring losses), by virtue of the WMA. This reliance is not compatible with my reading of the Chamberland Decision, whereby the energy banked under the WMA can only be recovered on an interruptible basis.

In practice, it is very likely that, most of the time, NLH will indeed be able to recover the power it requires when it requires it, as HQ probably only uses the full generating capacity of the CFGS from time to time. However, under the rights granted to it under the Chamberland Decision, NLH cannot rely on that capacity. This means that NLH will require other resources, whether on the Island or in Labrador, in order to meet its peak capacity requirements on both a planning and an operational basis; i.e., to ensure that it will be able to meet demand on the IIS at all times.

HQ includes the capacity of the CFGS in its own capacity balance, in its reporting to NERC.[23] Indeed, HQ is most likely to require the full installed capacity of the CFGS during the coldest hours of the winter — precisely when NLH is likely to require that capacity as well.[24]

21 Castonguay Decision, para. 1136.

23 In the NERC 2018-2019 Winter Reliability Assessment (page 19), HQ reports « Existing – Certain Capacity » of 42,026 MW. Its 2018 Annual Report shows an installed capacity of 37,310 MW. The difference (4716 MW) presumably represents the available capacity (after losses) of the CFGS.

24 However, the geographical diversity between Quebec's load centers and NLH's may tend to reduce the simultaneity of those requirements.

That said, it is conceivable that HQ would be willing to cede the few hundred megawatts of capacity that Nalcor needs to make the WMA effective, for a price — or perhaps in exchange for the multi-annual storage rights it lost in the Chamberland Decision. This would relieve NLH of the need to maintain a separate capacity reserve for this amount, a significant benefit.

4. SUMMARY

We have identified several important outstanding issues that could form the basis for negotiations between the the parties, assuming that the Chamberland Decision remains the definitive interpretation of the renewal provisions of the Power Contract:

- Whether or not HQ's right to multi-annual storage (and to manage reservoir levels, taking hydraulic risk into account) should be restored;
- Whether or not Nalcor should have the right to any firm capacity from the CFGS; and
- How the parameters governing Nalcor's right to make interruptible sales should be determined.

There is a fourth issue, which results from the interaction between, on the one hand, the limitation of HQ's energy entitlement to AEB and, on the other hand, its unlimited entitlement to the plant's Firm Capacity. What would happen if, for example, by mid-December, HQ had used its full entitlement to AEB. Would it lose its right to the plant's Firm Capacity for the rest of the month, since any power delivered would necessarily imply the delivery of additional energy as well, to which it not entitled?

Given the Chamberland Decision's interpretation of Schedule III, as seen in para. 145 quoted above, HQ's right to the plant's Firm Capacity appears to be absolute. That said, it would certainly have to pay Nalcor for the additional energy delivered, since that energy is not included in the Power Contract. The price to be paid by HQ for any energy delivered over and above its entitlement under the Power Contract would be yet another question to be determined in negotiations between the two parties.