Lower Churchill Hydroelectric Generation Project
Nalcor Energy Responses to
JRP Information Requests 146 through 164
Innu Nation Comments
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IR # 146 – NEED, PURPOSE AND RATIONALE

References

EIS Guidelines, Section 4.3.1 (Need, Purpose and Rationale of the Project)

JRP.5, JRP.25S/26S

Rationale

On July 23, 2010, Innu Nation wrote to the Panel[1] in relation to issues of Aboriginal rights and indicated, among other things that:

> *On the basis of the Project now being assessed, and subject to exclusions for certain types of potential adverse effects specified in the initialed IBA, Innu Nation is satisfied that the financial compensation and other benefits provided in the initialed IBA represent full and final compensation of Innu Nation, the First Nations and the Innu of Labrador by Nalcor for the adverse effects of the Project, and resolve the issues associated with financial compensation and benefits payable by Nalcor to the Innu for the adverse effects as identified in the submission of Innu Nation to the Joint Review Panel on the conformity of the Environmental Impact Statement for the Lower Churchill Hydroelectric Generation Project.*

As a result of the above letter, our review of the information provided in response to JRP.146 focuses on the financial viability of the Project as this is relevant to the potential of the Project to pay for planned and unplanned mitigation and monitoring.

In addition, Innu Nation is concerned that decisions of the Regie de l'energie, new policies in the potential markets, and evolution of the marketplace since the date of filing of the Project Description in 2006 have changed the development context to such an extent that, if approved, the Project will not be developed in the manner described in the EIS. This likely change involves a change to the development sequence such that Muskrat Falls is constructed before Gull Island. This Project inversion has further implications that are discussed in our response to JRP.147.

Panel Information Request

EIS Guidelines 4.3.1:

(e) Export market opportunities, forecasts and expected evolution;

(g) Risks to the Project, in-stream flow variability, market prices and schedule delays, interest rates and other risk factors relevant to the decision to proceed with the Project;

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[1] Innu Nation. 2010. Letter to Panel re: Innu of Labrador Aboriginal Rights considerations in the area of the Project. www.ceaa-acee.gc.ca/050/document-eng.cfm?document=44818

(h) Projected financial benefits for the Project (including their distribution) as measured by standard financial indicators

In JRP.146, the Panel clarifies the above and provides a request for "order of magnitude estimates, financial analysis, risk assessments, and sensitivities normally or generally available at the feasibility stage of a Project of this nature." The Panel notes that this information is "required in order to assess Nalcor Energy's statements of need in energy and economic terms and to assess environmental effects and benefits."

Prior Relevant Innu Nation Comments

Innu Nation has made prior comments related to export markets and Project financial benefits, specifically in relation to the following:

- IN.4 – Electricity Demand in Other Markets
- IN.5 – Electricity Prices in Other Markets
- IN.6 – Project Economic Benefits
- IN.9 – Alternative Means – Economic Feasibility
- JRP.5 – Need, Purpose and Rationale
- JRP.25/25S – Need, Purpose and Rationale
- JRP.26 – Alternatives to the Project and Alternative Means

IN Comments re: Nalcor Response

Nalcor provides additional information in relation to the need for the Project in economic and energy terms in the "Supplemental Report on the Need, Purpose, and Rationale". This Supplemental Report was reviewed with the intent of encouraging the provision of important information that would allow a more thorough understanding of the Project as it is most likely to be developed, and clarifying the information required to determine whether the Project can afford to implement mitigation and monitoring measures necessary to minimizing the potential for significant adverse environmental effects.

3.0 Market Demand and Project Justification in Energy Terms

3.1 Competitive Position in Power Sector

The competitiveness of the Project is compared in this section of the Supplemental Report to that of other electricity projects across Canada. There are several issues of concern with this comparison.

Specifically, the NEB Report utilizes only generation costs and appears to ignore geography. Transmission costs will form a substantial part of the costs necessary for the Project to access markets. Transmission costs are a smaller proportion of overall costs for each of the other projects in Table 1, with the possible exception of Conawapa. The table also compares projects in entirely different markets, providing little useful information on whether the Project will be able to compete against other

generation sources in the target markets. The date of the NEB Report (i.e. 1992) is also relevant since most of the markets in which the Project would compete now have competitive wholesale markets where future opportunities favour projects with lower capital costs. We note, for example, the thousands of megawatts of natural gas capacity commissioned in Canada since 1992 that do not even appear on the list in Table 1 as potential projects. A recent example is the 900 MW Oakville Generating Station, a natural gas plant in Ontario that was proposed, designed, sited, assessed and approved all in the time since the Lower Churchill Hydroelectric Generation Project was registered for environmental assessment.[2]

Section 3.2 Market Opportunities

The Proponent identifies four export market opportunities, three of which relate to supply replacements and one to the potential for electricity demand increases.

With respect to opportunities to replace aging infrastructure, the Proponent suggests that "almost 14,000 MW of installed capacity in Newfoundland and Labrador, Nova Scotia, New Brunswick and Ontario will reach the end of normal service life, is expected to retire, or is scheduled for shutdown by 2030." However, the vast majority (>11,000 MW) of this infrastructure is in Ontario. As indicated previously, the Ontario Integrated Power System Plan (IPSP) shows no intention of pursuing the option of importing power from Labrador:

> *"Unlike the many other supply and conservation options which are discussed in detail in the IPSP, discussion in the IPSP of future hydroelectric imports into Ontario from Labrador is limited only to a preliminary corridor identification report for a potential transmission line expansion in eastern Ontario.*[3]

The fact that Ontario is currently planning or has committed to develop over 15,000 MW of new Ontario-based capacity scheduled to come on-line prior to 2030 provides further evidence against the potential for the Project to replace generation in Ontario. The issue of exporting power from the Project to Ontario is further complicated by the recent decision of the Regie de l'energie concerning complaints filed by Nalcor under Section 86 of the Act respecting the Regie de l'energie.[4]

Lastly, there is the issue of the new Feed-in Tariff (FIT), recently implemented in Ontario. In just twelve months, the program has seen over 3,000 applications (2,136 MW of executed contracts) under the FIT (projects > 10 kW), and nearly 20,000 applications (98 MW of conditional offers) under the Micro-FIT (projects < 10 kW).[5]

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[2] www.transcanada.com/oakville

[3] Ontario Power Authority. Integrated Power System Plan. Exhibit E, Tab 3, Schedule 6, Attachment 1.

[4] Regie de l'energie. 2010. Decision D-2010-053 rendered on May 13, 2010 in the files P-110-1565, P-110-1597 and P-110-1678.

[5] Ontario Power Authority. 2010. Bi-weekly FIT and MicroFIT Report. September 13, 2010.

For the above reasons and for additional reasons discussed below in response to Section 5.3, Innu Nation is concerned that inclusion of Ontario in the market opportunities and analysis is not justified by the current realities. While it is possible that the situation could change in the long-term, the inclusion of Ontario as a realistic market for the Project is not adequately justified by the current facts.

For this reason, it is important that the evaluation of need focus on other jurisdictions in Canada. As indicated in Table 2, there is a total of 2354 MW of potentially retired generation in Newfoundland and Labrador (600 MW), Nova Scotia (1432 MW) and New Brunswick (322 MW) between now and 2030. As such, the Atlantic Provinces appear to offer significant market potential for the Project. Previously, the Proponent indicated that there "will be a portfolio of sales of lower Churchill River power comprising a balance of long, medium and short term sales arrangements"[6] and is now clarifying that it is "not relying on achieving long-term power purchase agreements (PPAs) in the New England and New York markets". This seems reasonable, since access through Quebec appears to be in doubt following the decision of the Regie de l'energie regarding transmission access through Quebec, and the Proponent has not yet provided any information as to how it would access New England through the Maritimes.

As the Panel is aware, the Project consists of two generating stations of 2250 MW and 824 MW, respectively. Considering that the Labrador-Island Transmission Link, which would send power to the Island of Newfoundland, has a maximum capacity of 1800 MW as determined by the cables crossing the Strait of Belle Isle,[7] it appears that only one of the generating stations would be developed until or unless transmission access could be obtained through Quebec. Presuming that the full 800 MW identified for transmission to the Island is actually transmitted, then this leaves a maximum of 1000 MW to be sold into the Nova Scotia and New Brunswick markets, with potential for some short-term sales into New England, assuming transmission access.

In other words, the Project appears to now be relying on the negotiation of long-term contracts with Nova Scotia and potentially New Brunswick, along with the displacement of load on the Island of Newfoundland. With this in mind, what would be beneficial to the assessment of need and to a more meaningful discussion at the panel hearings is a more detailed analysis and description of the markets in Nova Scotia and New Brunswick, including expected electricity prices, competing wholesale generation facilities, competing embedded generation, demand-side initiatives and important policy initiatives (e.g. Nov Scotia's Renewable Electricity Plan).

3.3 Market Analysis and Forecasted Evolution

Nalcor notes that it is relying on "growth in demand over the long term [to] support the need for new energy supplies in the market place." As shown in Table 5, the projected

[6] Nalcor Energy. 2009. Lower Churchill Hydroelectric Generation Project. Environmental Impact Statement. Volume 1 Part A – Project Planning and Description. Section 2.4.4.4. Sales Portfolio.

[7] Nalcor Energy. 2009. Labrador-Island Transmission Link. Environmental Assessment Registration / Project Description, at p.21.

increases in demand in the potential markets are modest and in some cases negative. To put these growth rates in perspective, the projected 0.5% growth in Ontario capacity amounts to 125 MW per year. Also, none of the projections appear to be net of embedded energy. Embedded energy is energy produced within the distribution system (e.g. ground source heating, solar, wind, biomass, etc.) that meets energy demand included in Table 5, but that decreases requirements for electricity from the transmission system, and thus reduces actual demand for electricity from interconnected generation, including the Project.

For instance, in the upcoming 18-month period in Ontario, the embedded generation capacity is expected to grow by 150 MW, which is actually larger than the expected 100 MW growth in the impact of conservation in the same period.[8] In lieu of considering embedded energy potential, Nalcor's consultant makes a non-conservative assumption that capacity growth in Ontario will continue at 0.5% per year (~125 MW) indefinitely. Applying 100 MW of annual growth in embedded capacity in Ontario to the current peak capacity of 24000 MW results in an annual growth of 0.1% or 25 MW, which is negligible as far as the Project is concerned. Along with the implementation of time-of-use pricing in Ontario, the growth in embedded generation could explain why the IESO predicted in December 2009 that long-term annual energy and peak demand in Ontario will remain essentially flat to slightly negative for the next decade[9] and not increase at 0.5% as predicted by Nalcor's consultant.

The potential for embedded energy is also not included in any of the references for other jurisdictions used in Table 5. This appears somewhat problematic since Nova Scotia has also mandated a community feed-in tariff in its recently released Renewable Electricity Plan,[10] and Vermont implemented similar legislation in 2009.[11] While the effects of these new policies cannot yet be fully determined, the initial experience in Ontario suggests that even modest development of embedded energy significantly curtails demand growth going forward.

3.4 Justification in Energy Terms - Conclusion

The Proponent notes that the "overall identified market potential is almost eight times the size of the annual output of the projects in 2020." This comment does not appear to take into account the current development context for the Project, which includes:

- no confirmed transmission access through Quebec into Ontario;
- only short-term sales through the Maritimes into New England and New York, pending confirmation of available transmission capacity;

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[8] Independent Electricity System Operator. 2010. 18-Month Outlook Update. From September 2010 to February 2012. www.ieso.ca/imoweb/monthsYears/monthsAhead.asp

[9] Independent Electricity System Operator. 2009. Ontario Reliability Outlook. December 2009, at p. 10.

[10] Nova Scotia has mandated a Community Feed-in Tariff in its Renewable Electricity Plan. www.gov.ns.ca/energy/renewables/renewable-electricity-plan/

[11] www.vermontspeed.com

- the need for long-term power purchase agreements with Nova Scotia and, potentially New Brunswick, for the Project to be economically viable; and
- limits of 1800 MW on the capacity of the Labrador Island Transmission Link.

A more conservative conclusion would be that there is a potential for up to 1000 MW of long-term contracts to displace existing generation in Nova Scotia and New Brunswick, with potential short term sales into New England and New York, pending transmission access and availability. The economic justification needs to consider the current development context and not the expected development context at the time that the Project was registered for environmental assessment in 2006.

5.0 Project Justification in Economic Terms

5.3 Revenues

Electricity price is a critical consideration in determining the economics of the Project, and whether the Project has sufficient ability to pay for planned and unplanned mitigation and monitoring. Table 22 summarizes the market energy and capacity forecasts for New York Zone M,[12] New England and Ontario from 2015 onwards. What are not shown in the Table are the current electricity prices. For example, the electricity prices in Ontario since the opening of the Ontario market are shown in Table 1.

Ignoring the exceptions of 2005 and 2009, prices show a gradual decrease of about 2% per year between 2002 and 2008 (3.5% per year[13] adjusting for inflation). Table 22 presents an average annual price of $75/MWh[14] in Ontario in 2016. This implies that the market price in Ontario would need to increase 14% per year for the next 7 years. Even assuming that prices in 2009 are artificially low due to the recession, an increase from $49/MWh to $75/MWh amounts to a year over year increase of 6.4%. In comparison, New England market prices in 2009 were approximately $44[15] and are projected to be $78 in 2016 in Table 22, which amounts to an annual increase of about 9% per year. However, prices in 2007 and 2008 were $69/MWh and $84/MWh, respectively, which suggests that Nalcor anticipates a return to pre-recession prices in New England by 2016. This is not an unreasonable assumption, but will depend on increases in the price of natural gas, since this is the price-determining fuel in New England.[16]

[12] Note that "Zone M" is not an actual zone in the New York market but a term used to refer to the transmission interconnection between New York and Quebec.

[13] Calculation not shown.

[14] Converted from $US at $C=0.9604$US

[15] ISO New England Inc. 2009. 2008 Annual Markets Report, at p. 1.

[16] Ibid., at p. 7.

Table 1. Ontario – Mean Annual Hourly Ontario Electricity Price[17] [18]

Year	Price ($/MWh)	Cumulative Annual Price Change (%)	Inflation-adjusted[19] Price ($/MWh)
2002	56	0	56
2003	51	-8.9	50
2004	53	-2.6	51
2005	72	+8.7	67
2006	49	-3.0	45
2007	48	-2.7	43
2008	49	-2.0	43
2009	30	-5.6	26

Innu Nation has not obtained independent price forecasts, however it appears that some justification is required for a forecast that envisions a sudden and substantial reversal in the established trend in wholesale electricity prices in Ontario.

5.5 Transmission Access

In order to properly determine the socio-economic effects of the Project, the portion of transmission costs shifted to ratepayers and the impact on rates needs to be discussed.

5.7 Sensitivity Analysis

The sensitivity of the Project to variations in electricity prices supports the need for clarification from Nalcor regarding the estimates of future increases in electricity prices, particularly in the Ontario market. Specifically, the analysis has not addressed the sensitivity of the findings to initial prices (i.e. in 2016). For example, if Ontario electricity prices increase at 3% per year from 2009 to 2016, as opposed to the 14% per year implied in Nalcor's analysis, the price of electricity in Ontario in 2016 will be $37/MWh, or 50% below Nalcor's projected market price of $75/MWh. In reality, in

[17] Independent Electricity System Operator. Year in Review. [2002 through 2006]

[18] Independent Electricity System Operator. Monthly Market Report. [2007 through 2009]

[19] www40.statcan.ca/l01/cst01/econ09g-eng.htm

order for Ontario prices to be within 15% of Nalcor's projected market price in 2016, they would need to increase to $65/MWh by 2016, an increase of nearly 12% per year for seven years. In other words, the predictions of financial benefits are very sensitive to the predicted rate of increase in electricity prices over the next seven years. Nalcor does not acknowledge this reality in its analysis.

Outstanding Issues

Innu Nation is concerned that while the analysis provided by Nalcor in its response to JRP.146 provides some new information, it relies on a development context that does not reflect conditions as they are currently but at they were at the time of submission of the Project Description in 2006.

Project Need, Purpose and Alternatives was proposed by the Panel in its letter of May 5 as one of the primary topics for discussion during the Panel Hearings. Innu Nation replied on June 3 in support of inclusion of this topic. If that Hearing is to be meaningful, then participants should have access to sufficient information pertaining to the likely development scenarios, considering that the preferred scenario for development of the Project appears much less likely to occur.

Innu Nation is requesting that the Proponent revisit the justification of the Project in energy terms by:

- excluding the Ontario market from the analysis;
- providing a more detailed analysis and description of the markets in Nova Scotia and New Brunswick, including expected electricity prices, competing wholesale generation facilities, competing embedded generation, demand-side initiatives and important policy initiatives (e.g. Nova Scotia's Renewable Electricity Plan) in these jurisdictions.

With respect to the justification of the Project in economic terms, Innu Nation is requesting the Proponent to provide:

- justification (if the Ontario market is to continue to be considered in the analysis) for the price forecast that envisions a sudden and substantial reversal in the established trend in electricity market prices in Ontario.

Finally, as has been previously requested by Innu Nation and in order to properly determine the socio-economic effects of the Project, the Proponent is requested to provide the portion of market transmission costs shifted to Newfoundland and Labrador ratepayers and the estimated impact on rates.

IR # JRP.147 – ALTERNATIVES TO THE PROJECT

References

JRP.26, 26S, 146

EIS Volume 1-A, Table 3-2

Rationale

Innu Nation is concerned that decisions of the Regie de l'energie, new policies in the potential markets, and evolution of the marketplace since the date of filing of the Project Description in 2006 have changed the development context to such an extent that, if approved, the Project will not be developed in the manner described in the EIS.

Panel Information Request

> *The Proponent is asked to revisit its response to JRP.26 (e) and provide the evaluation and quantification requested by the Panel and required by Section 4.3.2.1 of the EIS Guidelines.*

IN comments re: Nalcor Response

Our review of the response to this JRP focuses on issues related to the potential and implications of developing Muskrat Falls prior to Gull Island.

Considerations Respecting the Timing of Phases and Components of the Project

Nalcor identifies three important considerations respecting the timing of Phases of the Project: market access, sales, and financing.

With respect to market access, Nalcor indicates that "Greater available transmission capacity will favour Gull Island first, and lesser available capacity will favour Muskrat Falls first." Based on our earlier analysis in relation to JRP.146, it appears that transmission through Quebec, if it is possible at all, will be delayed for some time. This tends to suggest development of Muskrat Falls first.

Regarding sales, the current low prices in the markets suggests slower as opposed to stronger sales, again supporting the development of Muskrat Falls first.

Lastly, considering that financial markets continue to remain tight, this also tends to support development of the smaller Muskrat Falls development first.

Further to our comments above in response to JRP.146, it appears that there is an 1800 MW limit to the capacity that can be developed and transmitted to potential markets at this time. This quantity (even presuming sales contracts of 1800 MW) appears to be too low to permit the development of the Gull Island project, which also suggests that Muskrat Falls would more likely be developed first.

As noted by the Proponent, if Muskrat Falls is developed first, "the cash flows from Muskrat Falls then could be used to help finance the more costly Gull Island phase of the Project." This is theoretically true, but in practice it seems unlikely that sufficient cash flow could be obtained in the first several years of the production phase for the following reasons:

- the capital cost of Gull Island includes the costs of the 230/735 kV switchyard (est. $130M), communications infrastructure (est. $70M) and other costs associated with construction of the first of the two projects – these costs would need to be borne by Muskrat Falls if it is constructed first;
- cost savings, such as reuse of the construction bridge and construction camps, and staged mobilization from Gull Island will no longer be available to Muskrat Falls and must be added to its capital cost (est. $50M total);
- construction costs at Muskrat Falls could potentially increase for other reasons as a result of Gull Island not being in place during construction, including costs for larger diversion facilities and cofferdams (est. to be determined);
- based on the information in Table 23 of the Supplemental Report, the capital cost of Muskrat Falls is $2682/kW compared to $1902/kW for Gull Island meaning that it has a lower rate of return and will generate less cash flow; adding an estimated $250M to the capital cost of Muskrat Falls results in an estimated capital cost of $2985/kW.

Innu Nation suggests that the lower cash flow resulting from initial development of Muskrat Falls as opposed to Gull Island would contribute to:

- a consecutive development sequence (as opposed to a staged overlap) where Gull Island is not developed for several years following completion of construction at Muskrat Falls;
- temporarily or permanently raising the crest elevation of the Muskrat Falls dam to create a larger reservoir and more head and/or operating the reservoir to take advantage of higher market prices during peak periods;
- the potential for tailrace improvements at Muskrat Falls in an attempt to create greater head; and
- the potential to avoid or delay implementing required mitigation measures and monitoring programs in order to reduce costs.

The assessment of Alternative Means contained in Section 3.7.12 of Volume 1-A of the EIS did consider the potential for initial development of Muskrat Falls. This assessment is summarized in Table 3-2 below.

In addition to the information in this table, Section 3.7.12 notes the following:

- If Muskrat Falls were constructed first, its energy output would be affected by the filling of the Gull Island Reservoir;
- All three alternatives to sequencing are economically feasible but the rate of return differs;

- Consecutive construction is not preferred due to the potential for a socio-economic peak and valley effect;
- From a socio-economic standpoint, duration of employment is an important consideration for economic stability; and
- Consecutive construction does not minimize mobilization costs or allow best use of temporary infrastructure such as accommodations complexes.

EIS Volume 1-A Table 3-2 Summary of Analysis of Alternative Means of Carrying Out the Project

Major Components of Analysis	Alternative Means of Carrying Out the Project that were Considered	Technically Feasibility	Economic Feasibility	Environmental Effects	Preferred Alternative
Sequence and pace of construction	Sequence of construction - Gull Island or Muskrat Falls constructed first	Both are technically feasible	Construction of Gull Island first has the best opportunity to create revenue stream for the support of the construction of Muskrat Falls	The environmental effects of Gull Island first are more positive with the greater amount of energy and revenue realized earlier, and the earlier opportunity to offset GHG from other sources	The preferred alternative is Gull Island first
	Pace of construction - consecutively, concurrently with the same finish date, or staged overlap	All are technically feasible although concurrently may have workforce issues	All are economically feasible with varying rates of return	The duration of biophysical effects is greatest with sequential, socioeconomic effects best optimized with staged overlap	Preferred alternative is staged overlap reducing boom and bust and maximizing Project economics

Outstanding Issues

The Proponent notes that "the sequencing of sites would not result in changes to the predicted environmental effects associated with each phase of the Project."

Innu Nation does not agree with this conclusion based on the information provided to date by the Proponent in the EIS and the supplementary responses. Innu Nation requests the Proponent to revisit the Alternative Means assessment in Section 3.7.12 of the EIS by addressing the following:

- the socio-economic implications of consecutive development of Muskrat Falls first followed by consecutive construction at Gull Island following completion of construction at Muskrat Falls;
- the environmental implications of temporarily or permanently raising the crest elevation of the Muskrat Falls dam to create a larger reservoir and more head and/or operating the reservoir to take advantage of higher market prices during peak periods, if these actions are being considered;
- the environmental implications of tailrace improvements at Muskrat Falls, if this is being considered;
- the environmental, socio-economic or financial implications of any other changes to the Muskrat Falls project that would come about as a result of this project being constructed in advance of development at Gull Island; and
- the capital and operating costs related to mitigation measures and monitoring programs anticipated to be required, including the level of confidence in these estimates.

IR # JRP.148 – RESERVOIR PREPARATION

References

IR # JRP.6, JRP.33

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to provide the following:

a. A cost-benefit analysis of partial versus full clearing of the reservoir area;

b. Additional information on the preferred options for storage and eventual disposition of merchantable timber and identification of the preferred option for disposal of slash and implications on methyl mercury, along with a discussion of the advantages and disadvantages of this approach;

c. A copy of the referenced report and material being prepared for the Department of Natural Resources on the preferred disposal methods and the environmental effects of burying wood waste as opposed to removing it from the site;

d. Copies of the GIS maps showing proposed infrastructures for reservoir clearing;

e. A more detailed description of the effects of impoundment on fish and fish habitat by individual month. If the Proponent is committing not to carry out impoundment during certain months, these may be omitted;

f. A rationale as to why pre-upper Churchill flow levels were used as the baseline for calculating minimum flows during impoundment; and

g. Additional information on the potential for increased sedimentation of the reservoirs during impoundment and what mitigation is proposed.

Relevant Prior Innu Nation Comments

IR#IN.12

The EIS indicates that "full clearing would be a substantially greater cost and would extend the construction schedule, resulting in unacceptable levels of interest during construction, and is therefore not economically feasible. The partial clearing strategy affords the best opportunity to maximize fibre removal, reduce debris and slash for operation and reduce the emissions of GHG."

However, it is likely that partial clearing would produce fewer jobs for Innu than full clearing, and would result in less-than-optimal utilization of commercially valuable forest resources in Labrador.

The analysis leading to the above conclusion is inadequate for the reasons described in Information Request JRP.6 Reservoir Preparation, dated May 1, 2009. Innu Nation supports the information request made by the Joint Review Panel.

In addition to the concerns raised by the Panel, no explanation can be located in the EIS as to why clearing in the Gull Island Reservoir does not commence until Year 2. The Proponent is requested to demonstrate why the apparent delay is necessary, as well as data or modelling to show the effects on the economics and schedule for full reservoir clearing.

JRP.6 and JRP.33

Innu Nation requested the Proponent to:

- consider how its reservoir clearing alternatives would be integrated with a Labrador-based lumber mill and pellet production facility, similar to that proposed by AFI, and how the development of these facilities in advance of or in conjunction with the Project would alter its conclusions regarding the preferred reservoir clearing alternative;
- make available a report on wood disposal methods being prepared for the Department of Natural Resources; and
- provide clarification on what is meant by: "Once cleared, merchantable timber will be placed above the flood zone and made available"? Does that mean it will be piled on the side of the TLH and made available to a third party at no cost?

JRP.28

The Proponent is asked to provide, for each proposed reservoir filling and management strategy, and for each alternative means, detailed information on the following, including the potential impacts on fish and fish habitats and the rationale for any recommended options:

- *the scheduling/timing of reservoir impoundment; associated interruption of downstream flows.*

The Proponent response does provide alternative reservoir filling and management strategies as requested by the Panel. Two options for reservoir filling are presented: one without compensation flows and the second with compensation flows of 30% mean annual flow. Seasonal models were run to model filling during each of the four seasons for each of the two options. The fixed flow scenario would reduce fish stranding after the onset of downstream flows following initial impoundment however mortality resulting from fish stranding can still be expected (especially during initial flooding when downstream flows are not provided).

The Proponent will require a Fisheries Act authorization to allow such Project-related fish mortalities, and allowable mortality would be the subject of determinations made by DFO in consultation with the Proponent.

A concern with respect to fish mortality caused by reservoir filling remains with either option.

IN Comments re: Nalcor Response

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Clearing Costs

The Proponent indicates a minimum top diameter of 9.1 cm, when the permit conditions for commercial operations typically state that all trees must be utilized to 8 cm. This error may not be significant to clearing costs, but should be corrected.

A buffer zone of 15-meters is proposed to limit the potential for silting during pre-impoundment runoff events. It is Innu Nation's understanding that the required buffer in Newfoundland and Labrador is 20 metres. This buffer would likely be several hundred kilometres in length, considering that it is on both sides of the main stem and tributaries in areas that would be inundated. It is unclear whether merchantable timber, which could readily be removed from these areas, has been included in the calculations of timber volumes in Table 1.

Table 1 summarizes the volumes of wood for both full and partial clearing. Compared to partial clearing, full clearing would result in 397,000 m^3 more harvested merchantable timber for the Gull Island reservoir and 131,000 m^3 more for the Muskrat Falls reservoir. That represents nearly 4 years of the total Allowable Annual Cut for District 19.

Schedule Premium

The Proponent indicates that increased crew and fleet sizes would be required for full clearing and that this would dramatically increase the unit costs of the clearing operations, but acknowledges that the amount of this premium is not known. The Proponent has also yet to respond to Innu Nation's prior request for clarification as to why clearing is delayed to Year 2, making it difficult to judge whether the schedule is as tight as the Proponent claims.

The other concern, pursuant to our comments in response to JRP.147, is that the order of reservoir clearing (i.e. Gull before Muskrat) is decreasingly likely to occur as proposed in the EIS and in the Proponent's response. Specifically, it appears increasingly likely that if the Project is to proceed at all, it will proceed with development at Muskrat Falls first followed by consecutive construction (as opposed to staged overlap) at Gull Island. If this is the case, then the intervening period between development at the two projects would provide for additional time for greater harvesting within the proposed Gull Island reservoir. Moreover, the Proponent has yet to confirm any electricity sales from the Project, and the development of the Project, even under a Gull Island first scenario, may be delayed for some time while electricity sales and market access are established. With this in mind, it may be beneficial to harvest within the future reservoirs in advance of Project sanction as part of the Annual Allowable Cut for District 19.

Recovery of Merchantable Timber

The Proponent has based its analysis on estimates from other jurisdictions "in the absence of firm proposals to develop secondary processing for timber" in Labrador. This is a significant assumption. Without information on prices that would be paid by a Labrador-based secondary processor, it is difficult to gauge the accuracy of the Proponent's conclusions. It is important to note that the current state of the forest industry in eastern Canada and the dramatic decrease in exports to the United States is placing downward pressure on prices. The estimated net price of $\$33/m^3$ used by the Proponent is very likely lower than what would be paid at the time of clearing.

Non-Quantifiable Benefits

The Proponent notes that "implementing the partial clearing option would not preclude clearing of additional material within the flood zone by a secondary wood processor, prior to impoundment, provided safety and Project schedule are not compromised." This suggestion may have merit and should be further evaluated by the Proponent working in collaboration with Labrador-based harvesters in the event that the Proponent proceeds with the partial clearing option.

Cost-Benefit Summary

With respect to the "adverse effects" of full clearing presented in Table 5, the analysis and presentation provided by the Proponent appear to be inconsistent with other

analyses and presentations of environmental effects conducted throughout the EIS. Below are relevant example summary statements from the EIS (our underlining):

Section 3.10.2 of Volume 2-A of the EIS:

> *The magnitude of the changes to Air Quality will be moderate during construction within the Assessment Area, in association with the transportation and road maintenance. The environmental effects are medium term, occurring occasionally, are reversible and occur in an ecologically undisturbed location. The contribution of air pollutants to the Assessment Area from the Project (with mitigation) are not expected to frequently result in ambient concentrations greater than the provincial ambient air quality standards or cause concerns about deposition. Therefore, the environmental effects of air pollutant emissions from the Project are predicted to be* ***not significant*** *(Table 3-13).*

Section 5.14.3.1 of Volume 2-B of the EIS:

> *The population of Moose in Labrador has expanded dramatically over the past several decades, and is likely to be sufficiently robust to withstand increases in predation and hunting pressure. Some of the loss of foraging habitat will be offset by foraging opportunities created by the successional vegetation stimulated by the reservoir preparation and clearing for the transmission line and access roads. While anthropogenic and natural perturbations encourage primary succession vegetation and are therefore attractive to Moose, most of the watershed is considered undisturbed during this phase of the Project. Considering the severity of winters in Labrador, the loss of primary wintering habitat will have a moderate adverse environmental effect on Moose in the Assessment Area. However, because a much lower proportion of primary spring and summer habitat will be affected, and Moose has already shown considerable adaptation to the Labrador winters during its recent population expansion, the population is expected to remain sustainable. Therefore, the residual environmental effect during construction is considered* ***not significant*** *(Table 5-31).*

In both of these instances, and throughout its environmental assessment, the Proponent always provides the Panel with a summary statement of the significance of the adverse effects. The statement "**not significant**" is absent from Table 5 of the Proponent's response and, based on the Proponent's own approach to this assessment, needs to appear beside each of the assessments of "adverse effects" in Table 5.

With respect to the purported $200 million increase in costs associated with full clearing, a detailed breakdown for these costs is not provided by the Proponent, other than that $150 million is attributable to full clearing at Gull Island and $50 million to Muskrat Falls.

Innu Nation is concerned that this increase in costs appears to be at odds with the Proponent's own cost estimates submitted in previous responses. Table 3 of the Proponent's response to JRP.6 is provided below.

Table 3 Comparison of Reservoir Clearing Parameters for Full and Partial Clearing

Parameter	Full Clearing	Partial Clearing
Estimated volume of commercial timber salvaged	1,600,000 m^3	1,000,000 m^3
Estimated harvesting costs	$215,000,000	$165,000,000
Value of timber salvaged and possible markets	$33,000,000 (Pulpwood)	$22,000,000 (Pulpwood)
Employment and other local business benefits (clearing only)[1]	Direct Employment – 230,000 person days Indirect Employment – 150,000 person days Material and Supplies – $86,000,000	Direct Employment – 190,000 person days Indirect Employment – 125,000 person days Material and Supplies – $64,000,000

1. Based on the current District 19A Forest Management Plan, forestry activities in the region will be re-directed to the reservoir area in the event that the project proceeds. Consequently these employment and business benefits represent the displacement of other activities and not new business.

From the information provided by the Proponent, we are unable to determine why the volumes of merchantable timber are now much smaller for both clearing options (though the ratio remains similar). More importantly, how has a $50 million difference between options now become a $200 million difference?

A change of this magnitude in an important cost estimate raises more general concerns about the estimating methodologies being employed by the Proponent, and calls into question other cost estimates presented in the filings of the Proponent to date.

148 b) and 148 c)

The following are comments on the Reservoir Preparation Plan 2009

7.0 Reservoir Preparation Methodology

7.1 Clearing of Merchantable Timber

The Proponent proposes to use only mechanical harvesters, but notes that "there may be localized areas where manual harvesting could be applied." Under sloped conditions, using a manual system or a combination of manual cutting and mechanical removal (cable, etc.) may mean the ability to clear more merchantable timber and provide more

employment. Another option is to purchase specialized harvesting equipment, which may be of long-term interest to local operators allowing them to access stands that are currently not accessible due to equipment restraints.

In the District 19 Forest Management Plan, steep slopes are defined as being >30%. This constraint is mostly due to the limited abilities of the equipment owned by local operators. In other parts of the country, it is common for steep slopes to be defined as >45%, due to the use of specially-designed machines and manual and cable logging. In the event that slopes steeper than 30% are logged, specific environmental protection measures will need to be developed and implemented. Cutting on steeper slopes could also permit the harvesting of more merchantable timber although, as noted by Nalcor, construction of roads steeper than 30% is not possible.

7.2 Removal of Merchantable Timber to Above the Flood Zone

The Proponent has proposed to place laydown areas for the storage of wood above the full supply level. Innu Nation recognizes the additional costs for the Proponent to transport the wood to the TLH or elsewhere, however the overall costs to the Proponent and the wood processor may be reduced by creation of laydown areas along the TLH or by direct hauling to a processing facility. This is a cost-sharing issue, and final determination should be based on reducing overall costs at the time of contracting as it is likely that the harvester contracted to the Proponent will be the same harvester contracted to the wood processor.

7.3 Alternatives for Dealing with Slash

Innu Nation supports the revised method of mulching as opposed to burying slash. The Proponent suggests that "Mulching will be done with a large disc type hammering device, purpose built, to break up the material so that it will lay flat on the forest floor and tend to become water logged and break down fairly quickly."

This approach appears to require special equipment, which may be costly. Slash could be mulched using standard equipment and then, similar to the merchantable timber, hauled directly to the wood processing facility. Direct transfer of the mulch to trucks (i.e. at the time of mulching) would also avoid issues related to excessive wind on the forest floor. Whether this alternative procedure is cost-effective would need to be determined.

7.4 Alternatives for Access

It is unclear whether the locations for roads have been harmonized, where possible, with the forest access roads for District 19.

148 d)

There appear to be isolated areas where harvesting is planned, but road access is not shown. Clarification is required as to how these areas will be accessed.

In the Reservoir Preparation Map Muskrat Fall River Chainage 79-82 (and potentially elsewhere) there is an unusual mix of areas to be harvested interspersed with flood zones that are identified in the map as areas not to be harvested. However, this pattern on the map seems to be the result of a GIS exercise (to exclude constraint areas such as slope). It may make more sense to simply harvest the entire area. Also, if it has not already been done, an "isolation" analysis should be conducted on the map set. This would involve evaluating the isolated polygons created by the GIS to determine if they are consistent with actual conditions or whether isolating such a small area makes technical and economic sense.

148 e)

The Proponent's response does not provide a detailed description of the effects of impoundment of fish and fish habitat by individual month, as requested by the Panel. While the Proponent does not provide a commitment not to carry out impoundment during certain months, the response describes only effects on fish and fish habitat of an optimal timing of impoundment beginning in August.

The Proponent indicates in its response that "a compensation flow of 30% Mean Annual Flow (MAF) will be provided to maintain downstream fish habitat during impoundment for fish to spawn and eggs to develop". This commitment mitigates the previous concern that downstream flows would not be provided during initial flooding.

Concern remains with respect to fish mortality during reservoir filling period. Proponent response that mitigations "such as fish relocation activities will be initiated to collect and relocate stranded fish to suitable locations, to the extent possible" may only partially alleviate issues related to fish and fish habitat stranding and desiccation.

148 g)

The Proponent response does provide additional information on the potential for increased sedimentation of the reservoirs during impoundment and what mitigation is proposed.

Innu Nation is concerned by the comment from the Proponent that "Given the short periods for reservoir impoundment, no mitigation measures are proposed to avoid sedimentation during impoundment". Issues related to sedimentation as a result of reservoir impoundment may continue for extended periods of time after reservoirs are filled. Rapidly filling the reservoirs does not remove the possible need for mitigation of sedimentation effects on fish and fish habitat.

Outstanding Issues

Innu Nation is requesting the Proponent to:

- provide an explanation as to why clearing in the Gull Island Reservoir does not commence until Year 2;

- clarify whether merchantable timber from the buffer zones can be harvested and whether it is included in the calculations of timber volumes in Table 1;
- clearly indicate the significance of the adverse effects in Table 5;
- provide an explanation, including a detailed cost item table, for the cost difference between full and partial clearing and why the cost difference has changed from $50 million to $200 million;
- clarify whether access roads have been harmonized with planned forest roads for District 19;
- clarify how isolated areas identified for harvesting will be accessed;
- conduct an isolation analysis on the Reservoir Preparation maps, if not already completed;
- provide a detailed description of the effects of impoundment on fish and fish habitat by individual month, as requested by the Panel, or provide a commitment not to carry out impoundment during certain months, and indicate how that commitment would be enforced;

Concern also remains with respect to fish mortality during the reservoir filling period. The Proponent response that mitigations "such as fish relocation activities will be initiated to collect and relocate stranded fish to suitable locations, to the extent possible" may only partially alleviate issues related to fish and fish habitat stranding and desiccation.

Lastly, issues related to sedimentation as a result of reservoir impoundment may continue for extended periods of time after the reservoirs are filled. Rapidly filling the reservoirs does not remove the possible need for mitigation of sedimentation effects on fish and fish habitat.

IR # JRP.149 – PROJECT OPERATING REGIME

References

JRP.28, JRP.119

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to provide the following:

- *An assessment of the role of the pending Water Management Agreement with respect to risks to Project viability and environmental implications;*
- *An assessment of how demand fluctuations, seasonal operating conditions and transitional operating conditions (i.e. for the four year period between the time that Gull Island begins to produce electricity and Muskrat Falls*

comes online) are to be managed in terms of water flow, and how these fluctuations will impact the river system,

- *A more detailed description of the impacts of proposed annual reservoir drawdown and related mitigation measures on fish and fish habitat.*

Relevant Prior Innu Nation Comments

JRP.28 – Reservoir Filling and Management Strategies

The Proponent is asked to provide, for each proposed reservoir filling and management strategy, and for each alternative means, detailed information on the following, including the potential impacts on fish and fish habitats and the rationale for any recommended options:

- *the scheduling/timing of reservoir impoundment;*
- *associated interruption of downstream flows.*

The Proponent response does provide alternative reservoir filling and management strategies as requested by the Panel. Two options for reservoir filling are presented: one without compensation flows and the second with compensation flows of 30% mean annual flow. Seasonal models were run to model filling during each of the four seasons for each of the two options. The fixed flow scenario would reduce fish stranding after the onset of downstream flows following initial impoundment, however mortality resulting from fish stranding can still be expected (especially during initial flooding when downstream flows are not provided).

The Proponent will require a Fisheries Act authorization to allow such Project-related fish mortalities, and allowable mortality would be the subject of determinations made by DFO in consultation with the Proponent.

A concern with respect to fish mortality caused by reservoir filling remains with either option.

JRP.46 – Changes in Regional Climate

c. The Proponent is asked to provide a discussion of any elevation and/or microclimate restrictions that would prohibit the reestablishment or continued survival of specific ecotypes after inundation.

It is reasonable to assume that microclimate and elevation will not be determining factors in the establishment or survival of any ecotypes around the reservoirs. However, Innu Nation has concerns about the prediction that all ecotypes will re-establish similar to existing patterns following inundation.

The discussion of the conditions that contribute to the formation of fluvial ecotypes, riparian marshes, thickets and riparian forests leaves out the influence of hydrological patterns in a large river system. This is generally considered to be the single most important factor in the establishment of the diversity in fluvial morphology and

vegetation communities. It is certain that, lacking spring floods, the total area of the riparian zone and these ecotypes will be much smaller than under current conditions. Sediment transport and deposition will change in response to inundation and control of water levels throughout the year. Except for slumping, which may increase in many areas, processes such as bar formation will decrease and therefore also the creation of areas for the formation of early successional ecotypes.

The deltas of large tributaries will continue to have a significant fluvial influence, which should contribute to the reestablishment of fluvial ecotypes in these areas. However, if the gradients are steeper and the main river channel does not recede during the growing season to the extent that it does now following spring floods, then the future area of these ecotypes will still be reduced compared to current conditions.

The extent to which periodic extreme floods may influence the botanical diversity of the riparian forests in the river valley is not presented in the EIS.

JRP.119 – Spring Flood

The Proponent is asked to:

> *a. Discuss the existing knowledge concerning the importance of spring floods for river sedimentation, aquatic and shoreline vegetation, habitat complexity, biodiversity, nutrient supply, water quality and productivity;*
>
> *b. Describe the implications of conversion of shallow, fast-flowing river habitats to deeper, slow flow reservoir habitats in the region due to river regulation;*

The response begins by stating that seasonal spring floods will be the same as under current conditions and elaborates on this, but this is referring to areas outside of the proposed reservoirs. They then briefly mention that the areas inside the reservoirs will experience a "modest spring flood".

Earlier, the response to the question in JRP 89d) argued in favour of more stable water levels, stating that: "Both reservoirs of the Lower Churchill development will be operated as close as possible to full supply level (125 m for Gull Island and 39 m for Muskrat Falls above sea level [asl]). However, due to operational demands, reservoir drawdown may be required (up to 3 m in Gull Island Reservoir and 0.5 m in Muskrat Reservoir). Drawdown within the Gull Island Reservoir to a minimum elevation of 122 m asl would occur during April in anticipation of the spring freshet (Figure 1). The reservoir would then be refilled to the full supply level once the spring freshet commences, with the reservoir reaching full supply by early June (Figure 1). Throughout the rest of the year, Gull Island Reservoir will be maintained as near as possible to full supply level with minimal fluctuation."

This described pattern is not a spring flood, not even a "modest" one. A spring flood raises the water levels well beyond the winter lows bringing sediments and moisture to a zone that is then gradually exposed throughout the growing season as water levels recede. It is not re-flooded during the growing season.

IN Comments re: Nalcor Response

JRP.149 a)

The Proponent indicates the following in its response:

> *The WMA will allow the maintenance of existing flow conditions downstream of Muskrat Falls. Figure 2 provides an overview of the mean, minimum and maximum daily flows at Muskrat Falls since the operation of the Churchill Falls facility. Future flow conditions downstream of Muskrat Falls will continue to occur between these limits.*
>
> *Consequently, the WMA increases the predictability of the operating regime, which in turn reduces in-stream flow variability, and therefore reduces the environmental implications of the Project.*

These comments from the Proponent suggest a continued misunderstanding of the fundamental importance of flow variability to river ecology. The issue is not only whether the future flows are within the extremes but also whether important variations in flow (e.g. spring flood) are maintained. As shown in Figure 1, the water management agreement will further lower the spring flood downstream of Muskrat Falls. As has been noted previously by Innu Nation, lacking spring floods, the total area of the riparian marshes and similar ecotypes downstream of Muskrat Falls will be smaller than under current conditions.

JRP.149 b)

Nalcor contends that "minimum flow downstream of either Gull Island or Muskrat Falls will not be materially different than the minimum flow that has occurred since 1974" and that "while flows downstream of a generating facility will vary on an hourly basis, they are expected to continue to vary within the limits of fluctuation that currently exist on the river". The response fails to recognize that the expected changes in flow regime due to demand fluctuations, seasonal operating conditions and transitional operating conditions may include such effects as changes in frequency of water level changes (not just amplitude), hour-to-hour, day-to-day variability in water levels, changes in speed of change, etc., all of which may have an impact on the river system. The response does not expressly indicate how fluctuations will impact the river system other than to imply that there will be no impact on the river system as a consequence of demand fluctuations, seasonal operating conditions and transitional operating conditions – largely because "operation within the operating envelopes will ensure that the minimum flows historically seen on the river are maintained".

Outstanding Issues

Concerns remain that the implementation of the Water Management Agreement will further lower the spring flood downstream of Muskrat Falls, contributing to reductions in the area of riparian ecotypes and ultimately reducing biodiversity.

The Proponent also fails to recognize in its response that the expected changes in flow regime due to the Project may include such effects as changes in frequency of water level changes (not just amplitude), hour-to-hour, day-to-day variability in water levels, changes in speed of change, etc., all of which may have an impact on the river system.

IR # JRP.151 – ABORIGINAL CONSULTATION AND TRADITIONAL LAND AND RESOURCE USE

References

JRP.1, JRP.3, JRP.16

Rationale

Innu Nation understands that the Proponent intends to submit "a comprehensive Consultation Assessment Report" to the Panel no later than September 30, 2010. The Panel has indicated that there will be a consultation period with Aboriginal groups concerning that document following its receipt by the Panel. Innu Nation will provide any comments on that document and any related comments concerning Aboriginal Consultation and Traditional Land and Resources Use during that consultation period.

Outstanding Issues

Submission of the Consultation Assessment Report by the Proponent.

IR # JRP.152 – DOWNSTREAM EFFECTS BELOW MUSKRAT FALLS

References

JRP.43

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to discuss the potential effects of the Project (including cumulative effects over time) on secondary production, fish productivity and the impacts of possible foodweb shifts in the areas below Muskrat Falls.

To help substantiate its predictions, the Proponent is asked to provide a literature review on the potential for dams to cause long-term and cumulative effects on the productivity of downstream ecosystems, including marine ecosystems. The Proponent should also discuss effects noted in the literature in

relation to changes observed by Inuit in the Lake Melville area following the Churchill Falls project.

Relevant Prior Innu Nation Comments

JRP.43 – Expansion of study area to include Goose Bay estuary/Lake Melville and enhanced impact analysis below Muskrat Falls

The proponent is asked to provide a more thorough analysis of potential impacts of the main stem and tributaries below Muskrat Falls, the Goose Bay Estuary and Lake Melville including:

a. possible changes in flow patterns, nutrient/water quality parameters, temperature and related potential effects on fish productivity;

The Proponent is requested to extend the Study Area included in the EIS into Goose Bay and Lake Melville as the assessment indicates that physical/chemical effects of the Project extend into this area.

Furthermore, baseline studies should include sampling at sites upstream and downstream of the Project's zone of influence to provide:

- an upstream reference site to define conditions prior to influence by the Project; and
- a minimum of one sampling site downstream of the furthest downstream extent of the predicted Project effects to facilitate monitoring to demonstrate/confirm the impact predictions (i.e., that effects are limited to the area defined in the EIS).

JRP.56 – Coastal geomorphology - Churchill River delta at Goose Bay

c. The Proponent is asked to provide information on anticipated effects on the benthic community and aquatic habitats at or in the vicinity of the delta.

The Proponent responded that it concludes that there are no anticipated effects on the benthic community and aquatic habitats at or in the vicinity of the delta. This is a somewhat surprising conclusion. The component study indicates that: "No invertebrate macrofauna were identified at any of the sampling sites within Goose Bay or Lake Melville."[20] These sampling sites were located in the intertidal zone of Goose Bay and Lake Melville.

The Proponent justifies this by noting that: "Runoff from the Churchill River continually deposits and shifts large volumes of sand and fine grained particles around the estuary, creating an environment unsuitable for most benthic species. Furthermore, macroinvertebrates are typically absent from large freshwater lake environments with homogeneous sandy substrates."

[20] Nalcor Energy. 1999. Biological Study of the Goose Bay Estuary. Component Studies Aquatic Environment: Fish Habitat.

Innu Nation does not disagree, but the finding of not a single macro invertebrate in the sampling area raised concerns at the time and no subsequent sampling was ever undertaken. Also, microinvertebrates were not targeted by the sampling effort and would have gone undetected.

Though the work conducted to date in the estuary has contributed to our understanding of general patterns of presence/absence and relative abundance of macroinvertebrates, the environment of the Goose Bay estuary and Lake Melville is highly complex and dynamic (with likely significant seasonal and year-to-year variation). Considerably more baseline work (and more recent) would be required in order to fully describe the baseline condition for purposes of effects prediction and possible follow-up monitoring.

IN Comments re: Nalcor Response

The Proponent concludes that since "flows downstream of Muskrat Falls will remain at current levels" and given the "limited nature and extent of effects downstream of Muskrat Falls (i.e., no adverse effects predicted below Muskrat Falls) the potential effects of the Project (including cumulative effects over time) on secondary production, fish productivity and the impacts of possible food web shifts in the areas below Muskrat Falls, particularly beyond the mouth of the river in to Goose Bay and Lake Melville, are predicted to be negligible and not significant".

The meaning of the Proponent's statement that "flows downstream of Muskrat Falls will remain at current levels" appears to be only that minimum flows historically seen on the river will be maintained. Elsewhere in its response to JRP.149, the Proponent acknowledges that there will be some changes in the flow regime downstream of Muskrat Falls, e.g.:

- "with the commissioning of generating facilities on the Lower Churchill River, the river will be further regulated, and while flows downstream of a generating station will vary on an hourly basis, they are expected to continue to vary within the limits of fluctuation that currently exist on the river".
- "the operation of the Water Management Agreement will serve to reduce water flows when flows are higher than required for sales requirements and increase them when flows are low. This will act to moderate fluctuations in flow".

Outstanding Issues

The Proponent does discuss the potential effects of the Project on secondary production, fish productivity and the impacts of possible foodweb shifts in the areas below Muskrat Falls, as requested by the Panel. However, we are unable to locate additional data in support of the Proponent's conclusion that such effects are predicted to be negligible and not significant because the Churchill River is regulated by the Churchill Falls facility and the flows downstream of Muskrat Falls "will remain at current levels".

There appears to be little baseline data available against which the Proponent will be able to monitor effects and confirm the prediction of negligible effects (as part of an overall adaptive management monitoring strategy for the Project) on secondary production, fish productivity and the impacts of possible foodweb shifts in the areas below Muskrat Falls.

The Proponent response does not appear to recognize that changes in flow regime due to the Project may include changes in frequency of water level changes (not just amplitude), hour-to-hour, day-day variability in water levels, changes in speed of change, changes in sediment deposition, etc., all of which may have potential impact on the river system downstream of Muskrat Falls, including the Churchill River delta.

As requested by the Panel, the Proponent does provide a literature review on the potential for dams to cause long-term and cumulative effects on the productivity of downstream ecosystems, including marine ecosystems. However the Proponent concludes that the majority of the literature on this subject is not relevant to the lower Churchill River since "no change in the flow regime is predicted due to the Project". The basis for this conclusion may be erroneous given that there will be some changes to the flow regime downstream of Muskrat Falls.

IR # JRP.153 – FISH HABITAT COMPENSATION STRATEGY

References

JRP.19, JRP.23, JRP.49, JRP.54, JRP.107

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to provide a final Fish Compensation Strategy prior to scheduling of the public hearings, or in the event that a final strategy is not agree upon, provide an update on the key components of the Strategy and on the areas of outstanding discussion(s).

Prior Relevant Innu Nation Comments

JRP 19 – Application of Precautionary Principle and validation of assumptions, limitations and uncertainty

For each environmental impact prediction made in the EIS, the Proponent is asked to either provide the following information or to reference where it can be found in the EIS or components studies:

a. the limitations, uncertainties and assumptions underlying the prediction.

The Proponent has provided an extensive list of references to the existing documentation. A cursory review of the principal references indicates that these do provide the requested discussion, as well as discussion about the application of a precautionary approach, at least in describing the existing environment.

In its response, the Proponent also presents a summary table of uncertainty, limitations and assumptions for effects predictions (Table 1). For the Fish and Fish Habitat component at least, the text provided appears to discuss these aspects for the description of the existing environment and quantification of existing habitat, rather than for the predictions made. Although there may be considerable certainty about their description of the existing environment, their claim that there are no residual uncertainties or limitations seems unsubstantiated (for example, see comments to **IR# JRP.23 - Habitat Assessment Method**).

With regard to the general statement that *"the level of certainty with respect to the environmental effects prediction is high, based on the extensive base of knowledge regarding existing fish and fish habitat conditions…"*, this is valid for some habitat components but not all (for example, see comments to **IR# JRP.53 – Sampling Deficiencies in Baseline Studies [Winokapau Lake]**). Similarly, the Proponent also notes that tributary deltas were not identified as distinct habitat types (i.e., were not specifically assessed), although they were included in the application of fish habitat compensation since they were identified as such by the Innu Traditional Knowledge Committee.

To summarize, although a precautionary approach was generally applied to the description of the existing aquatic environment it is not clear that this was done in making effects predictions.

b. whether and how it is possible to monitor the accuracy of the predictions made in a timely fashion.

In its response, the Proponent provides a list of ongoing monitoring studies "successfully" implemented for other hydroelectric projects in the region. Although these studies may have relevance, there is no discussion provided regarding their actual success (i.e., how successful were they at meeting their objectives and verifying EIS predictions; what use was made of monitoring results and did they facilitate adaptive management). If the Proponent wishes to cite the Hines Lake, Upper Salmon and Cat Arm developments as examples of "successfully implemented environmental effects monitoring", then it should follow through with a discussion on whether initial predictions of environmental impact were accurate - and if not, whether the adaptive monitoring program in each case resulted in changes to the project being implemented.

The Proponent points out that monitoring the accuracy of predictions is a focus of the Fish Habitat Compensation Plan. Since discussions between the Proponent and DFO are ongoing and very minimal specific information is currently available regarding the Fish

Habitat Compensation Plan, Innu Nation and other interveners are not in a position to comment at this time with respect to this component of the monitoring strategy.

> *c. whether and how the Project could be adapted if the prediction is found to be incorrect.*

This response is similar to the previous 19b, but refers specifically to how the Project could be adapted if a prediction is found to be incorrect. The Proponent provides a discussion of adaptive management and a commitment to apply its principles (and the Precautionary Principal) diligently. Presumably, details are still in development. Since discussions between the Proponent and DFO are ongoing and an Adaptive Management Program has not yet been completed, and since minimal specific information is currently available, little comment can be made at this time.

IR# JRP.23 – Habitat Assessment Method

> *The Proponent is asked to provide a copy of the 2007 Smokorowski and Derbowka document and explain how the Proponent selected and implemented this method to quantify fish and fish habitats and if and how the precautionary principle was applied given that these methods have not been applied elsewhere previously.*

Innu Nation has provided extensive comments over the years concerning the approach to habitat quantification and assessment, and these were summarized in IR#IN.93. Notwithstanding those prior issues and the caveats related to the DFO workshop discussed in the Proponent's response, as a general comment, the method used to quantify and qualify existing habitat appears valid and robust. While the methodology is reasonable, it does not address connectivity among habitats or impacts to the estuary.

One of the principal issues that remain is how the predicted habitats are described and quantified. Whereas the starting (pre-Project) habitat definitions are based on velocity, depth and substrate, only flow velocity appears to be considered when classifying habitats in the modeled post-Project environment. The same habitat types are therefore not necessarily comparable in the pre- and post-Project environment, and the accounting used to determine compensation requirements may not be valid. Future habitats should be re-quantified with pre-Project habitat criteria preserved. Additional habitat types should be identified, particularly for the main stem, to account for the wider ranges in depth after flooding and changes to other habitat parameters that would influence habitat suitability and productive capacity.

The connectivity among the habitats could be handled by taking a process approach to habitat (i.e., physical fish habitat is the result of hydrology and geomorphology). There are no standards for the definition of where a river stops and a lake begins for reservoirs created by dams. If the habitats were quantified in terms of the specific hydraulic processes such as erosion, transport, and deposition, then a more transferable comparison of pre- and post-Project conditions would result. For example, it is reasonable to assume that deposition occurs at flows below 0.20 m/s and this would define a flow boundary for 'standing' water (in both lacustrine and riverine

habitats). In doing so, reservoirs that have significant flows need only account for the added variable of depth (nearshore/offshore or littoral/profundal) and have a biologically relevant suite of habitat classifications for pre-post and river-lake comparisons. A small adjustment to the definitions of certain reservoir categories would align the comparisons under the common theme of 'habitat as a consequence of hydrology and geomorphology' and allow a more intuitive use of the biological data. There seems to be a sufficient amount of hydraulic modeling done to assess the net changes in pre-post habitat.

Data from both Winokapau Lake and Gull Lake could be used to develop a prediction of the future reservoir fish assemblages and trophic linkages. Direct scientific validation of predictions on the other hand would have to be accomplished through a post-Project monitoring process.

IR# JRP.49 – Alteration, Disruption or Destruction of Fish Habitat

> *a. The Proponent is asked to provide a comprehensive discussion of the alteration, disruption, or destruction of fish habitat and its relation to productive capacity and relevant legislation.*

Innu Nation notes that discussions and negotiations between the Proponent and the DFO regarding the application of HADD to the Project have continued subsequent to the development of the EIS. As such, we have no specific comment on these discussions.

The Panel points out that, in the EIS, the Proponent does not acknowledge the potential for harmful alteration, disruption or destruction (HADD) of fish habitat and resultant loss in productive capacity, and does not adequately discuss HADD in relation to legislation and regulatory requirements. Instead, the EIS focuses on the predicted increase in total wetted area and concludes that there will be a 'net gain' in productive capacity (also see comments under **IR# JRP.23 – Habitat Assessment Method**). DFO did not agree with this assessment and subsequently provided the Proponent with and itemized and quantified HADD determination.

The Proponent has since acknowledged the HADD determination provided by DFO, but considered it excessively conservative as it did not recognize any future habitat utilization potential in the reservoir. Innu Nation assumes that discussions between the Proponent and DFO have continued and that a final determination and habitat compensation requirements are yet to be determined (discussions began in September 2008, according to the *Habitat Compensation Strategy Framework*).

The Proponent refers the Panel to the *Habitat Compensation Strategy Framework* document appended to IR# JRP.107 for further clarification regarding the HADD determination and the *Fisheries Act*. Such discussion is included in that document (see also further comments under **IR# JRP.107 – Fish Habitat Compensation**).

> *b. The Proponent is asked to provide a detailed analysis of the existing and predicted post-impoundment habitat and its utilization by all fish species and their different life stages, to the extent possible the Proponent should include*

Aboriginal Traditional Knowledge from the Innu Nation to complete this analysis and indicate where this has been done;

i. description and explanation of potential habitat use by resident species after reservoir creation, including the type of fish community structures anticipated (i.e., species composition and abundance) needs to be more fully addressed and explained;

ii. Explanation of the impacts of this increased habitat availability for large predators on the dynamics of their respective populations and on those of other species; and

iii. Determination of the anticipated changes in species diversity, abundance and relative importance for all phases from pre-impoundment through reservoir stabilization.

The Panel has asked for a detailed analysis of the existing and predicted post-impoundment habitat and its utilization by all fish species and their different life stages, including Aboriginal Traditional Knowledge (ATK) from the Innu Nation to the extent possible. In its response, Nalcor directs the Panel to the previously submitted analysis in the Habitat Quantification report but provides no substantive new information. Since discussions between the Proponent and DFO are ongoing and the Fish Habitat Compensation Strategy is only a framework, little comment can be made at this point.

In its response, the Proponent does not address the Panel's request for ATK inclusion in its assessment of existing and predicted post-impoundment habitat utilization by fish. Although the *Habitat Compensation Strategy Framework* does discuss the intended public consultation process, including aboriginal and community consultations, it does not specifically indicate that ATK will be solicited, or if/how the process will allow for incorporation of traditional knowledge into the design of the Habitat Compensation Strategy (see also further comments under **IR# JRP.107d – Fish Habitat Compensation**)

IR# JRP.54 – Fluvial Geomorphology – Change in Habitat Quantity

The Proponent is asked to provide either:

a. justification for the "slow velocity" classifications of the above mentioned sections of the reservoir; or

b. revisions to the text in 4.12.2, Figures 4-8 to 4-11 and, Tables 4-10 and 4-13, to better portray the resulting distribution of slow and lacustrine habitats along the river resulting from the proposed Project.

The Proponent's response provides an adequate justification for the slow velocity classification of the reservoir.

The Proponent's position that future reservoir habitats will be riverine, not lacustrine, is predicated on the assumption that in this case lacustrine habitat is distinguished from riverine habitat by the tendency to stratify thermally (with supporting references from

the scientific literature). Thermal stratification aside, however, there are other parameters that will be fundamentally different between the reservoirs and the existing riverine sections of the river; primarily depth and velocity. Although the future reservoirs may not stratify, excessive depth alone may cause future reservoir habitats to be functionally (i.e., ecologically speaking) more similar to existing lacustrine habitats than riverine habitats. In reality, much of the future reservoir habitat will likely represent a distinct type that does not have an analogue in the existing environment, at least not one that has been described or quantified (see also comments under **IR# JRP.23 – Habitat Assessment Method**).

IR# JRP.107 – Fish Habitat Compensation

> *With regards to the Fish Habitat Compensation Strategy, the Proponent is asked to identify and describe:*
>
> *a. additional compensation options that are adequate to address fish habitat loss and alteration associated with the construction and operation of the Project.*

The Panel requests that the Proponent provide and describe additional compensation options (i.e., additional to what was provided in the EIS) that are adequate to address fish habitat loss and alteration associated with the construction and operation of the Project. This request is not directly addressed in the Proponent's response, rather they direct the Panel to the *Habitat Compensation Strategy Framework* where some (3) additional options are provided. The Framework document, however, provides minimal description of these options and the response as a whole does not address the question of adequacy. Since discussions between the Proponent and DFO are ongoing and very minimal information is currently available, little comment can be made at this time.

> *b. the monitoring of compensatory fish habitat, which should include fish species assemblages and diversity, reservoir productivity (primary and fish), sediment transport/loading, etc. how an adaptive management approach will be utilized in assessing the future reservoirs;*
>
> *c. how an adaptive management approach will be utilized in assessing the future reservoirs.*

The Proponent is asked to identify and describe the monitoring of compensatory fish habitat, including fish species assemblages, reservoir productivity, sediment transport/loading, etc. Since a monitoring plan has not yet been completed, the Proponent refers the Panel to the attached *Habitat Compensation Strategy Framework,* which outlines the elements that the final Plan will include. The response to the Panel's request to describe how an adaptive management plan will be used in assessing the future reservoirs similarly directs the Panel to an overview discussion in the Framework document. Since discussions between the Proponent and DFO are ongoing and an Adaptive Management Program has not yet been completed, and since minimal specific information is currently available, little comment can be made at this time.

IN Comments re: Nalcor Response

Innu Nation has not undertaken a detailed technical review of the Fish Habitat Compensation Strategy. Based on our preliminary review, the Strategy provides specific compensation works, areas where these works are to be carried out, and a basic timeline for monitoring on the immediate (annual) and long-term (bi-annual) scales. However, many of the key elements of the Strategy remain vague and undeveloped, and key concerns raised previously by Innu Nation and others are not addressed in this Strategy.

With respect to further Innu Nation review of this Strategy and the subsequent Plan, we understand that it is the responsibility of the Department of Fisheries and Oceans (DFO) to initiate consultation with Innu Nation. To date, no meetings between DFO and Innu Nation have been held concerning the Strategy.

On March 23, 2010, the Proponent gave a presentation to Innu Nation and other organizations within Labrador concerning the general contents of the Strategy. Several questions were raised during this meeting, including the following:

- Will Nalcor be drawing on successful examples of compensation from other similar projects, e.g. the Romaine River Hydroelectric Project or other Hydro Quebec projects?
- What evidence will Nalcor provide to show that the type and scale of proposed compensation being contemplated have been tried elsewhere and have been successful?
- What if the monitoring indicates that the fish habitat compensation has not been effective?

In response to the first question, the Proponent indicated that it had been in contact with Hydro Quebec concerning this issue, but that Hydro Quebec had not provided Nalcor with any fish habitat compensation strategies or any information related to fish habitat compensation for any of its recent hydro projects. The Strategy does not contain any references to compensation successes or failures at other large-scale hydroelectric projects, of which there are many in Canada and almost all of which appear to have fish habitat compensation programs.

The Proponent did not provide an answer to the second question. No examples of successful habitat compensation on a similar scale are provided in the Strategy.

In response to the third question, the Proponent indicated that it "will have a variety of mitigation options in the event that the fish compensation as designed is not effective." Upon review of the Strategy, no mitigation options or contingency plans are identified. As is clear from Table 3.10 in the Strategy, all of the Methods are monitoring methods, and none involve mitigation measures or contingency actions in the event that compensation fails. In fact, the Proponent acknowledges as much in Section 3.3.2 (our underlining):

Results that indicate a failure to meet predetermined cautionary-critical levels will trigger timely investigations into possible mitigations.

The fish habitat alteration, disruption and destruction in relation to this Project is extensive, and all the more important due to the significant fish habitat losses associated with the Churchill Falls project, and the uniqueness of the Churchill River within the Labrador landscape. The Proponent acknowledges that locations and quantity of compensatory habitat have not been determined, but that it could include up to 175 kilometres of shoreline habitat, and several thousand hectares of shoal and delta creation or enhancement.

Outstanding Issues

The Fish Habitat Compensation Strategy requires considerable development in relation to the following:

1. Values Identification. The Proponent has begun the process of values identification in the Strategy, but more work is required to properly define values of the various parties, including DFO, Nalcor, Innu Nation, and other affected parties.

2. Fisheries Objectives. Explicitly defined fisheries objectives are required to ensure that values are protected and to provide overall guidance to development of the Plan.

3. Compensation Works. Compensation works need to be targeted based on the values and objectives, and their design and location need to be developed in consultation with DFO, Innu Nation and other potentially affected groups.

4. Monitoring. Monitoring parameters need to be identified prior to conclusion of baseline data collection to ensure that appropriate information is available on preferred parameters for the monitoring program.

5. Baseline. Additional baseline data needs to be identified and collected prior to implementation of the compensation plan and construction of compensation works.

6. Contingency Actions. Further monitoring in response to the results of monitoring is not adaptive management. The Compensation Plan needs to identify realistic, affordable and proven contingency actions in the event that compensation works do not function as planned.

In summary, Innu Nation remains concerned about several issues related to fish habitat compensation planning, including:

- the lack of Proponent experience in the development and implementation of fisheries compensation on the scale required;
- the lack of presented examples in similar environments demonstrating success or failure with the type and scale of compensation being contemplated;

- no identification of proven contingency actions in the event that monitoring reveals that compensation does not meet pre-determined cautionary-critical levels; and
- the financial robustness of the Project affecting the ability of the Proponent to commit the resources necessary to investigate, develop and implement the compensation works, adaptive monitoring programs and contingency actions.

IR # JRP.154 – ASHKUI

References

JRP.48

Rationale

Innu Nation is concerned that there remains a difference of views about what constitutes an ashkui, and whether these features will form following inundation.

Panel Information Request

The Proponent is asked to:

a. Examine the additional information concerning ashkui as listed by Innu Nation in their submission and incorporate this information into the description and analysis of ashkui where appropriate;

b. Provide a statement as to whether this new information supports or contradicts the descriptions given and predictions made to date by the Proponent concerning ashkui;

c. Describe the range of effective mitigation and/or adaptive management measures that could be implemented if monitoring and/or follow-up programs show that new ashkui areas do not form as expected or do not have the same characteristics;

d. Describe the circumstances under which the Proponent would implement the proposed mitigation and/or adaptive management measures; and

e. Describe examples from other projects where ashkui conditions were restored after reservoir formation and compare and/or contract these examples with pre- and post-Project conditions.

Prior Relevant Innu Nation Comments

JRP.48 – Ashkui

Given that in the post-Project case tributaries will still have higher velocities and higher temperatures than the receiving reservoir, there is

> *confidence in the EIS prediction that ashkui will develop at these new confluences.*

Innu Nation disagrees with this conclusion. The formation of ashkui depends on more than just velocity and temperature. If this were the case, then there would be an ashkui at every intersection of a tributary with the main stem of the river. And there is not.

> *Existing ashkui on the lower Churchill River include areas at the confluence of the main stem and tributaries, where deltas are present; hence Hatch (2007) noted that these geologic conditions were 'probably influential' in ashkui formation.*

As pointed out in Hatch (2007) geologic conditions also play a role in ashkui formation. This poses an issue, in our view, for the significance of the Project for ashkui formation since delta formation can take many decades or longer, suggesting that ashkui may not properly form for some time if ever.

> *Additionally, other areas of open water during spring are available in the lower Churchill River watershed and were considered during the completion of the EIS (refer to Figure 5-3 in Volume IIB).*

The Proponent appears to be confusing any area of open water with ashkui.

> *Nalcor has committed to conducting a follow-up program to confirm the extent and location of ashkui formation.*

A follow-up program is not a substitute for not gathering the proper information and conducting adequate research to make accurate predictions of the effects of the Project on ashkui.

IN Comments re: Nalcor Response

Innu Nation has reviewed the materials provided by the Proponent and further discussed the nature of Ashkui with Innu and researchers, including an author of some of the papers reviewed by Nalcor.

In general, Ashkui are not any areas of water that remain open during the winter or that open in the ice in the early spring. Innu make a distinction between any open area in the ice and ashkui. Defining features include that ashkui are places where people are able to go and do go to harvest resources, and where there is an abundance of resources. Not all ashkui are riverine and they can and do occur in lakes throughout Nitassinan.

In light of the above characteristics of an ashkui, three key questions arise:

- will the ice remain open or open early during the winter?
- will the area be rich in wildlife?
- will Innu go there to harvest?

Innu Nation has already suggested that whether the ice opens at certain locations (e.g. tributary confluences with the main stem) depends on several factors, including velocity, temperature and water depth (though it can be argued that depth and velocity are related). Presuming the ice opens, monitoring would need to be undertaken to determine whether wildlife and fish are present in abundance. This is a function of the underwater and surrounding conditions at the open water site. Fast flowing, warm water is not a guarantee of an abundance of fish and wildlife.

Presuming that there is open water and there is an abundance of resources is this an ashkui? Not necessarily. The third condition must be met: people must be able and willing to harvest there. This is not a trivial issue. Discussions with Innu indicate that people generally do not trust travelling on man-made waterbodies (e.g. reservoirs) because of uncertainties about fluctuations in water levels and ice stability. If Innu must travel on a reservoir, the preferred approach is to stay near the shore and get off of the reservoir as soon as possible. In many instances, the shoreline of a reservoir may also be quite inaccessible due to fluctuations in the water levels leading to excessive shoreline ice formation.

In summary, the Proponent has proposed to conduct a follow-up program to confirm the extent and location of ashkui. Innu Nation supports such a program. However, an effective program must monitor not only biophysical changes, but also cultural changes. In other words, it must ask three types of questions: What is the extent and location of open ice areas? What is the abundance and diversity of species? And, are people harvesting at these locations?

Outstanding Issues

Innu Nation is seeking clarity from the Proponent that it is willing to implement a follow-up program for ashkui that includes both biophysical and Innu land use components.

IR # JRP.155 – WETLANDS

References

JRP.67, JRP.119

Rationale

There are many inconsistencies, errors and gaps in the response provided by the Proponent, and the responses to the information request are not adequate.

Panel Information Request

The Proponent is asked to provide:

a. A reference map showing the location of all wetlands that would be impacted by the Project;

b. A summary table of information about these wetlands, including wetland identifier, wetland area, wetland type/class, and specific wetland ecological functions; and

c. A discussion on the proportions of each wetland type loss or impacted by the Project, and on the ecological and social significance of the loss of these wetlands.

Prior Relevant Innu Nation Comments

JRP.119 – Spring Flood

The Proponent is asked to:

a. Discuss the existing knowledge concerning the importance of spring floods for river sedimentation, aquatic and shoreline vegetation, habitat complexity, biodiversity, nutrient supply, water quality and productivity;

b. Describe the implications of conversion of shallow, fast-flowing river habitats to deeper, slow flow reservoir habitats in the region due to river regulation; and

The response begins by stating that seasonal spring floods will be the same as under current conditions and elaborates on this, but this is referring to areas outside of the proposed reservoirs. They then briefly mention that the areas inside the reservoirs will experience a "modest spring flood".

Earlier, the response to the question in JRP 89d) argued in favour of more stable water levels, stating that: "Both reservoirs of the Lower Churchill development will be operated as close as possible to full supply level (125 m for Gull Island and 39 m for Muskrat Falls above sea level [asl]). However, due to operational demands reservoir drawdown may be required (up to 3 m in Gull Island Reservoir and 0.5 m in Muskrat Reservoir). Drawdown within the Gull Island Reservoir to a minimum elevation of 122 m asl would occur during April in anticipation of the spring freshet (Figure 1). The reservoir would then be refilled to the full supply level once the spring freshet commences with the reservoir reaching full supply by early June (Figure 1). Throughout the rest of the year, Gull Island Reservoir will be maintained as near as possible to full supply level with minimal fluctuation."

This described pattern is not a spring flood, not even a "modest" one. A spring flood raises the water levels well beyond the winter lows bringing sediments and moisture to a zone that is then gradually exposed throughout the growing season as water levels recede. It is not re-flooded during the growing season.

IN Comments re: Nalcor Response

Validity

The information presented by Nalcor regarding impacts to wetlands contains many inconsistencies, raising questions about the validity of any conclusions drawn from the information. A few of the inconsistencies are as follows:

- The information on the map does not match the data discussed in the text and there are inaccuracies in the data presented:
  - The reference maps provided are missing three of the 103 sampled wetland sites.
  - The report states that there are "53 wetlands located in area of future inundation" (p. 3), yet there are many more than 53 sites indicated on the map.
  - WL 1049 appears on the map to be in the area of inundation but is not identified as such. The original survey data in Appendix E (Minaskuat 2008)[21] put this site 10 m from the main river channel just upstream of the Gull Island dam.
- The information in the new data table does not match the data discussed in the text:
  - "Eleven of 14 shallow water wetlands identified within the study area…" (p.11) and yet there are 19 on the list.
  - "Of the sampled wetlands, 23 were classified as marsh (comprising 231.5 ha)…" (p.11). Approximately 185.4 ha of the 337.2 ha (55 percent) of riparian marsh habitat identified within the study area will be inundated (based on 103 sampled wetlands)."
- None of the "Habitat Suitability" numbers discussed in the text coincide with data in the table except for the Human Use category:
  - "Thirty of the sampled wetlands were identified as providing habitat suitable for herpetiles..." (p. 13). The table lists 43.
  - "Twenty-four of the sampled wetlands were identified as having high habitat suitability for mammals…" (p. 13). The table lists 43.
  - "Of the 28 sampled wetlands identified as having high overall suitability for birds…" (p. 13). The table notes 53. This does not appear to be due to differences in data reporting or rating schemes.
  - There are many other examples that can be listed for the Panel if requested.

[21] Minaskuat Ltd. 2008. *Wetland Assessment and Evaluation*. Prepared for Newfoundland and Labrador Hydro for the Lower Churchill Hydroelectric Generation Project.

- The information in the new table[22] JRP.155.1 is inconsistent with the survey data reported in the Minaskuat (2008). There are many discrepancies with the data presented in Appendix E – Field Observations of that Report:
    - Site WL 1017 and WL 2011 have exactly the same documented ratings for Diver habitat suitability, but one is listed as suitable in the new JRP.155.1 table and the other is not;
    - Site WL 1028 scored a total of 8 for Herpetile suitability in the original survey data, but is not listed as having high suitability in the new table, whereas WL 1038 scored a 1 and is listed as having high habitat suitability for herpetiles. Higher scores correspond to higher habitat suitability ratings.
    - Site 1014, recorded as "extensively grazed", with one of the highest ratings for Canada Goose habitat in the survey data, is not listed as having high suitability in the new table.
    - Another example calls into question data reporting and methodology. Site WL 1017 is listed as having "high habitat suitability" for other birds, based on a score of 21, while WL 2011 is not listed as having high suitability based on a score of 19. Such slight differences in ratings based on general observations, and relatively small sample sizes cannot reasonably be used to calculate proportions of quality habitat to be affected and to conduct analyses of overall significance of the loss of these habitats.
    - There are two columns for "Flow Moderation".
- There are several additional issues with the data that should be addressed in order to properly assess the conclusions:
    - The response states that the Table IR# JRP.155b "replaces" Appendix E of Minaskuat (2008). This new table is a supplement to Appendix E. Most of the detailed survey data is not included in the new table. In addition, as noted above, there are many inconsistencies between the two tables.
    - The data table would be much easier to interpret if the sites were grouped according to wetland types, and whether they are inside or outside the future zone of inundation. Since the numbered sample site identifiers are not sequential in location, it serves no purpose to order them this way.

The Proponent must be required address these data problems prior to completing this information request and any analysis based on these data.

Methodology

There are several problematic issues related to methodology and analysis.

Sampling and documenting of individual sites:

[22] Innu Nation is concerned that since there are so many discrepancies, that perhaps the data rows and columns in the tables became mixed up.

The EIS Guidelines ask the Proponent to provide information on the abundance of wetlands in the study area. The component study (Minaskuat 2008, p. 7-1) explains why "the number of sites reported is subjective" due to the methods for choosing, sampling and documenting individual sites. For example, in large bogs more than one site was given a site number. It is therefore erroneous for the analysis in the Proponent's response to use these numbers to calculate proportions of the total wetlands affected. i.e. "Of the 651 wetlands identified in the study area, 53 are expected to be affected by the project (598 will remain unaffected)." (p. 9 JRP.155)

Underestimation of wetland habitats:

The mapping used in the ELC is not at an adequate resolution to capture linear riparian wetland habitat features. These features, especially riparian shrub thickets, are present along the entire length of the river on almost all shores and are not represented in the data.[23]

Overly optimistic results for mitigation measures:

The mitigation measures proposed suggest cutting trees to create shrub habitat close to shore, 3 m above the high water level and 3 m below the low water level. Since the drawdown zone is narrow, this would create only a narrow band of shrubby vegetation in many locations. This most closely approximates the type of habitat that is also most poorly mapped along the current river in Proponent's analysis. The Proponent does not propose any hydrological mitigation measures that would also deliver plant propagules and nutrient-filled sediments to the new riparian zone, which will lack flood pulses. Experience with similar reservoirs, such as La Grande 1 in Québec, shows that such mitigation measures are only feasibly applied to a small proportion of the affected area. Furthermore, they do not recreate the former biodiversity that existed in the linear shrub thickets along a large river.[24]

The Proponent has provided no evidence that its mitigation measure will produce the stated results. If the Proponent clearly acknowledged that this mitigation measure can account for only a partial habitat replacement, not of the same quality of biodiversity, and that the potential results are currently unknown, then the document would more accurately portray the impacts of this Project.

Findings

The analysis of wetlands that "Support Biodiversity" (p.13) appears flawed. Only 5 sampled wetlands within the area of future inundation are reported as having high

[23] Luttermann, A.M., 2007. Historical Changes in the Riparian Habitats of Labrador's Churchill River Due to Flow Regulation: The Imperative of Cumulative Effects Assessment. Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, Dalhousie University, Halifax.

[24] Bouchard, D., J. Ouzilleau, R. Denis and S. Besner. 2001. Complexe La Grande. Suivi environnemental de la végétation riveraine et aquatique. Rapport synthèse pour la période 1979-1999. Report for Unité Hydraulique et Environnement, Hydro-Québec Production. FORAMEC inc., Québec. 133 p. http://www.ceaa.gc.ca/010/0001/0001/0017/001/1220/Synthese_Vege_LaGrande_f.pdf

species richness. The survey work found <25 species at site WL 1028, for example. In a survey conducted in the same location, using a different methodology, 86 species were identified.[25]

In the discussion of Water Quality Treatment as a wetland function (p. 5) there is no mention of the Churchill Falls facilities and town site in the discussion of potential sources of water quality degradation. There has been at least one documented spill of PCB-laden oil from a transformer incident into the river from Churchill Falls. Even with preventive measures in place, this large facility presents a risk of water contamination. Other factors such as sediment runoff from the TLH could also affect water quality in the river. Fuel spills and other contamination are also possible from the construction and engineering work associated with Project planning. For example, a barge was lost in the river downstream from the Gull Island site just a couple of years ago.

Overall Approach

In general, the approach used in this wetland analysis:

- places little value on the seasonally inundated riparian zone that forms a strip along the entire length of the river, that forms a large area of habitat, and is of high quality over time due to characteristics such as diversity and connectivity;
- does not acknowledge that riparian features, including wetlands, are formed and reformed over time by fluvial processes, which maintain a mosaic of habitats;
- does not acknowledge or discuss the fact that in rivers with natural flow patterns, these processes are highly variable and that variability contributes to the characteristics of wetlands;
- does not examine in what ways a reservoir environment of the type proposed differs from the current conditions when proposing mitigation measures and taking these into account in a determination of significance;
- does not address in adequate detail the fact that hydrological conditions are the main determinants of wetland habitat types; and
- does not consider observations from other reservoirs with similar operating regimes to determine the likely characteristics that new riparian zones will develop.

Outstanding Issues

Innu Nation is concerned that the conclusions presented on the overall effect of the Project on wetlands and the significance to the study area are misleading due to poor methodology and disorganized use and presentation of data.

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[25] Luttermann, A.M., 2007. Historical Changes in the Riparian Habitats of Labrador's Churchill River Due to Flow Regulation: The Imperative of Cumulative Effects Assessment. Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, Dalhousie University, Halifax.

Innu Nation is requesting that the Proponent resubmit its response to this information request for additional review by the Panel, including:

- correcting the many inconsistencies, errors and gaps in the maps and data table;
- accurately describing the potential effectiveness of proposed mitigation measures;
- including in the analysis riparian habitats not captured by the scale of the ELC;
- correcting errors in the analysis, including those related to wetland functions;
- addressing the concerns regarding the overall approach to the wetland analysis identified in these comments; and
- demonstrating a more careful consideration of the data, the limitations of the data and survey methodology, and a better understanding of the contribution of fluvial processes of large rivers to riparian habitat types.

IR # JRP.157 – RED WINE MOUNTAIN CARIBOU

References

JRP.93, JRP.163

Rationale

Some of the information requests remain incompletely addressed by the Proponent. Our comments should be read in conjunction with comments regarding impacts on migration pattern in JRP.163.

Panel Information Request

The Proponent is asked to provide the following technical information with respect to the model:

a. The least cost pathway analysis, including an assessment of the use of subjective values rather than likelihood estimates from the Resource Selection Function (RSF);

b. Details regarding how lichen estimates were collected or derived and how this information was incorporated with Forestry Inventory stand types;

c. A statement as to whether biomass of lichen was measured and if so, how;

d. A contingency table summarizing kappa coefficients between validation stations (ELC data) and FI stand types, if these were used to validate FI data and modify habitat categories.

e. Definitions of qualifying terms used to describe the quality of caribou habitat;

f. An explanation as to why only areas that have burned in the last 30 years are included in the habitat model and the impact this has on predicting available habitat;

g. A table that summarizes all of the variables that were initially input into the model (e.g. distance to water bodies and elevation) and provide the thresholds used for collinearity;

h. Additional information with respect to the stability of the model;

i. Mean relocation interval (and its variation) and range of associated buffer sizes used;

j. Revised statements pertaining to the scope of the model inference in order to accurately reflect the limitations of the model;

k. The thresholds and their metric (e.g. are the maps probability of occupancy, or do they correspond to each of the three separate validation models?) used to define 'primary' 'secondary' and 'tertiary' habitat suitability; and

l. A discussion on the observed suitability of secondary and tertiary habitats based on telemetry data.

The Proponent is also asked to discuss the following:

m. How the precautionary principle has been applied to the data gaps resulting from the use of a model that does not cover the entire RWM range or the entire assessment area;

n. The availability of primary habitat within the RWM range after inundation;

o. The broader implications of habitat disturbance, particularly predator-prey interactions, with respect to RWM caribou;

p. Whether and how the significance determination took into consideration effects of the Project on RWM caribou that may extend beyond the amount of Caribou Habitat within Disturbance Zones of Influence in the Forest Inventory Area (JRP.93, Table 6); and

q. Further rationale for the "not significant" Project effects determination for RWM Caribou in light of the information requested above.

Prior Relevant Innu Nation Comments

Innu Nation has submitted previous comments regarding component studies, the EIS and subsequent responses. We have emphasized the following concerns and requests for follow-up information regarding the effects of the Project on caribou, many of which were echoed by the Wildlife Division of the Newfoundland & Labrador Department of Environmental Conservation. We note for each issue whether the Panel followed up with a request for information from Nalcor:

- Modeling approach and classifications of caribou habitat suitability (distinction between primary, secondary and tertiary habitat); *Panel requested additional information on how these habitat classes were distinguished (e and k)*
- Limitations of the least-cost path analysis (LCP) approach for defining patterns of movement across the Churchill River for any of the caribou herds, and abandoning the plan to identify movement corridors within the Project area used by the George River Herd; *Panel requested additional information on LCP analysis (a), but did not follow up on the issue of other caribou (e.g., George River) movements.*
- Application of modeling results and other information to assessment of impacts as insignificant to the RW population. *Panel requested discussion of significance determination (o-q).*
- Information requests regarding the uncertainties inherent in drawing conclusions about impact from this modeling approach; *Panel requested additional information on the limitations of the modeling approach (j), but did not request a discussion of how general matters of uncertainty affect the significance determination.*
- Request for discussion of increased disturbance in addition to that of habitat loss (airplane traffic, construction, etc.), as well as analysis of cumulative effects that are likely to be stimulated by this project in an otherwise intact area and implications thereof for caribou. *Panel did not request additional information or discussion on this issue.*
- Discussion of the additive impact of the project on the already well-known poor status of the Red Wine population. *While Panel alluded to this in their overall Rationale (p. 1), there was no specific request for additional information or discussion on this issue.*
- Discussion of the importance of the George River Herd winter range for the Innu. *Panel did not request additional information or discussion on this issue.*
- Discussion of the application of the precautionary approach as a means to account for uncertainty and risk; *Panel requested additional discussion on the application of the precautionary principle (m).*

IN Comments re: Nalcor Response

The Red Wine caribou herd has already has been subjected to substantial non-habitat-related threats and, as noted by reviewers, was deemed "not self-sustaining" in the federal Boreal Caribou Critical Habitat Science Review Report (Environment Canada 2008). While the focus of the environmental assessment will traditionally be on the entity that is regarded as a species at risk (e.g. Red Wine herd), the "boundaries" between these sedentary Red Wine herd and migratory George River herd are fluid, and overlap commonly occurs during winter months in particular. Members of sedentary boreal populations in particular do not travel or otherwise group together, such that it is not generally possible to distinguish the "herd identity" of individuals, except by association with area. There are some physical differences between sedentary and

migratory caribou, but these are not generally obvious to most observers. Impacts to caribou may, however, vary with respect to season and/or ecotype. As Innu Nation has previously noted, this strongly suggests that even while adverse effects of the Project may differ (by ecotype and/or season), it is inappropriate to focus attention to avoidance/mitigation of impacts on only a subset of the caribou in the Project area. This is substantiated by recent survey results (analysis in progress) that suggest the George River herd is in a decline phase, underscoring the need to consider all caribou in the Project area in this environmental assessment.

The principal areas of concern regarding adverse effects of the Project on caribou are:

- permanent loss of habitat due to flooding (Schmelzer et al. 2004);
- transformation of the Lower Churchill River posing barriers to movement during migration (Schmelzer et al. 2004)
- disturbance from infrastructure associated with the Project resulting in temporary or permanent displacement (Murphy and Curtalo 1987; Dyer et al. 2001; Vistnes and Nelleman 2001; Schaefer and Mahoney 2002; Cameron et al. 2005);
- cumulative effects arising from piecemeal development that is initiated by this Project leading to more permanent displacement (Nelleman and Cameron 1987; Vistnes et al. 2001); and
- increased wolf or bear predation either through declines in moose or increased road densities promoting ease of access to all predators, including human hunters (Curtalo and Murphy 1986; Dyer et al. 2002; Schmelzer et al. 2004).

Of the 17 additional information requests by the Panel pertaining to the Red Wine Caribou herd, 12 related to technical aspects of habitat modeling approaches (most of which were raised by the N&L Wildlife Division), and while five were requests for additional discussion of the implications of the modeling results and other information related to impact assessment on RW caribou. Most of the questions that arose from Innu Nation's past reviews have related to issues concerning broader impact, but were not carried through by the Panel (see above). Some important issues were raised by the Panel on the first page of the document under "Rationale," (e.g., "Reviewers continue to raise concerns that an expanded industrial footprint and associated impact within the RWM range may further compromise the population and continue to question the actual risks to this population posed by the Project" p. 1), but the specific questions that follow appear to be much narrower in their scope and do not for the most part overtly press Nalcor to defend the conclusions they derived from the analyses. This appears to have resulted in some narrow responses by Nalcor to a number of the information requests.

Most of the technical questions posed by the Panel did not emanate from Innu reviews, with the exception of details on LCP analyses and habitat classifications. The discussion questions, by contrast were more relevant to our previously-raised concerns regarding impact of the project on caribou.

- *LCP analysis and evaluation of caribou river crossings* (a and q). The response to the question posed by the Panel is adequate. The Proponent has confirmed our original concern for this analysis as not being particularly useful due to the fact that caribou do not always use travel routes in a predictable fashion. This has, however, led to the confident conclusion by Nalcor that caribou will be able to adjust to the flooding and disturbance and should be able to cross anywhere. As a result, Nalcor's discussion of the implications for mitigation of impacts to caribou are unnecessarily dismissive (caribou can cross everywhere therefore as long as there are undisturbed sections of the river, there will be no impact). There are many additional factors regarding river crossings that we have raised previously, e.g., the consequences of changes in river levels and unstable ice or currents will change relative risk of one crossing point from another from the perspective of caribou. It would be impossible to predict this from either the LCP analysis or scrutiny of radio-telemetry points. The flooded area will displace many moose, which are heavily concentrated in the river valleys (as are bears), thereby potentially causing shifts to predation risk. Most germane to the discussion of impact is the cumulative nature of the disturbance and the stimulation of increased disturbance from the Project and the probable impact of this on caribou, which remains unaddressed. Finally, the Proponent did not explore radio-telemetry data for movement information of George River caribou, who are also known to cross the river and for which impacts should be assessed.
- *Habitat classifications* (e and k). Nalcor provides an adequate response to the question of how habitat quality was classified, while at the same time confirming that the distinction between these relative quality measures was somewhat arbitrary (evenly divided between relative probabilities of occupancy). While the model validation results indicate that one can have confidence that caribou selected "primary habitat classes" more than "tertiary," there is no indication of how much the species relies on relative habitat classes and how limiting these are for caribou. Therefore, while the map of relative habitat selection by caribou of the Project area has validity, it is still a leap of faith to relate this to future impact from the Project (see below).
- *Applying results of the habitat model to significance determination* (h and j): Because the proponent has not linked habitat modeling to population condition, determinations of environmental effects are restricted to caribou-specific habitat-based considerations. The assessment of impact is derived from precise calculations of habitat loss based on the proportion of the caribou range within the project area covered by the disturbance (e.g., reservoir). This artificially separates the threats of predation/hunting from habitat, by ignoring how habitat changes mediate or exacerbate other threats. The approach is unable to deal adequately with disturbance during the construction phase. It also ignores the cumulative disturbance that will likely result from this Project. As the recent Critical Habitat science review from Environment Canada (2008) has

stressed, the amount of disturbance on the range is a more important driver of caribou population condition than the amount of available habitat. Most importantly, the already precarious state of the Red Wine population is not considered in the conclusions. The conclusions of no significant adverse effect remain, as a result, unsubstantiated.

- *Precautionary principle (m).* The focus of the Proponent's response to this question has been in terms of mitigation, given the determination of non-significant effects of the project to caribou. There is no discussion of whether or not the determination of non-significant impact itself is precautionary. Given the poor condition of the Red Wine population at the outset, combined with the probable cumulative effects the initial disturbance will engender (particularly through road access), not to mention the considerable uncertainty surrounding the application of the habitat model results to determine probable impact (see above), Innu Nation maintains its previous assessment that the significance conclusion as it pertains to caribou is unsubstantiated, subjective, and lacks precaution.
- *Discussion of impact to caribou (n-q).* The responses to these four discussion points are narrowly focused and by and large inadequate. The Proponent does not address the concern that "an expanded industrial footprint and associated impact within the RWM range may further compromise the population." The responses express a degree of confidence in the assessment of non-significant impacts to caribou from this Project that is not merited by experience or understanding of caribou ecology and behaviour. The already precarious status of the Red Wine herd, in particular, is not taken into account. Finally, possible impacts to George River caribou, for which the Project area has great seasonal importance, are ignored.

Outstanding Issues

It remains in our view that the Project will have an additive effect on the prospects of caribou within the Project Area. Innu Nation does not share the Proponent's view that the effects of the Project on caribou are not significant. Furthermore, there is little doubt that this Project will facilitate the development of other industrial activities in Labrador that will place further pressure on caribou populations.

IR # JRP.158 – RARE PLANTS

References

JRP.8, JRP.42

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to:

a. Establish a list of native rare plants that have been found within the flood zone, species that have a current "S1" ranking in Labrador, and species that are considered newly discovered for Labrador in the Proponent's research;

b. Identify which of these species, when compared with the Wildlife Division's database and Atlantic Canada Conservation Data Centre rankings, are currently considered at extreme risk of extirpation, and identify their underlying ecotypes;

c. Provide details as to any additional surveys the Proponent plans to undertake to determine whether the identified native "extreme rare" plants are found in other river systems in Labrador (details should include, but not be limited to, timelines and identification of specific river systems to be surveyed and how these results will be incorporated into the analysis of predicted environmental effects);

d. Provide an analysis of the predicted environmental effects of the Project on plant species identified as "extreme rare", indicating the rationale for such predictions, where data gaps exist, how they affect the certainty of predicted environmental effects, and how the precautionary principle was applied in making predictions.

Prior Relevant Innu Nation Comments

JRP.8 – Aquatic Vegetation

In order for the Panel to assess the effects of the Project on rare or potentially rare aquatic plants, the Proponent should confirm the presence and status of rare or potentially rare aquatic plants species identified by AMEC (2008) in the Lower Churchill, and provide an evaluation of the effects of the Project on the status and integrity of these species.

The response to the question of rare plants and the possible reduction of biodiversity in the region suggests that any plants that are uncommon outside of the area to be disturbed can simply be "dealt with" and that this will entirely mitigate the adverse effect. In reality, there is not enough evidence to show that uncommon species can be successfully reestablished elsewhere in the river basin.

In addition, since our collective knowledge of the botany of the lower Churchill River is still quite limited, there remains the possibility that species could be affected that we are not aware of at this time. The area to be affected is extensive with many regionally uncommon riparian habitats.

With regards to the subject of rare species in general, it is unlikely at the outset that there would be any endemic species in central Labrador due to its recent glacial history.

The concern then is with regional biodiversity and whether the Project will degrade this. Some species are most common along the major river courses in various types of aquatic environments and riparian wetlands. Each major river that is regulated (and several more are being considered for development) will experience habitat conversion that places certain groups of species at a disadvantage and reduces their regional abundance. This is a more realistic way to view the effect on uncommon plants in a boreal ecosystem, than searching only for highly endangered, endemic species.

The Proponent is requested to present a simple but straightforward acknowledgement of possible residual effects on uncommon aquatic plant species, some explanation of mitigation methods, and the likelihood of success in attempts to re-establish populations of uncommon aquatic plants.

JRP.42 – Rare Plants as Key Indicators

a. Determine the proportion of the known populations of rare plants (including the Atlantic Canada Conservation Data Centre potentially rare plant list) that occur within the proposed flood zone of the Lower Churchill Project;

b. Provide the number of populations known both inside and outside of the flood zone;

The focus on plants designated as rare under geographically wider-ranging legislation is not problematic in itself except for what it leaves out. In terms of the biodiversity of the region, if the Project contributes to extensive habitat conversion, and degradation of habitats associated with large scale river processes, this should be more clearly reflected in the EIS.

The additional information provided in table form assists in understanding several species of vascular plants that are found within the zone to be flooded. This is useful.

An obvious question for the environmental assessment, for example, is whether the Project could cause any relatively common species to become regionally rare. For example, the common wetland species, *Iris versicolor*, was recorded in the Proponent's studies 81 times within the flood zone and only 8 times outside. This raises the question of whether *Iris versicolor* persists on reservoir shorelines. Survey work in the upper Churchill River watershed would help to provide information on the presence of species in pristine areas compared to areas affected by the existing hydroelectric developments. Though strict comparisons cannot be made with the upper watershed due to such factors as higher elevation and shorter growing season, nonetheless observations from the upper watershed could inform predictions of future reservoir conditions and potential species composition. The east forebay reservoir is most comparable to the reservoirs proposed for the lower Churchill River.

An additional source of recent survey data from the upper and lower watersheds is:

- Luttermann, A.M., 2007. Historical Changes in the Riparian Habitats of Labrador's Churchill River Due to Flow Regulation: The Imperative of Cumulative Effects Assessment. Submitted in partial fulfillment of the

requirements for the degree of Doctor of Philosophy, Dalhousie University, Halifax.

c. Determine all of the ecotypes within the study area containing potentially rare plant species (including the Atlantic Canada Conservation Data Centre potentially rare plant list) and then proceed to survey a number of other river systems and tributaries for the same or similar ecotypes;

In their response to this information request, Nalcor states that the results of their study on vascular plant occurrences show that the Churchill River and the Goose River basins are "not particularly distinct". The report on the rare plant survey (Minaskuat 2008) states that: "The results of the cluster analysis are broadly similar to those of the ordination, with a large number of sites representing continua of community composition, and a much smaller number of diverse groups." (p. 2 of Appendix C). The conclusions emphasize the similarity of the two basins rather than trying to understand the differences that may be more significant to the study of rare plants. Compare this statement to that in the ELC report using a different database: "The results of the cluster analysis are broadly similar to those of the ordination, with a larger number of forested sites representing continua of community composition, and a smaller number of wetlands." (p. 5-4 of ELC Report). This suggests that wetland sites are more diverse, as may be expected. This diversity of riverine wetland sites is perhaps the most important factor in considering the presence of rare plants in habitats most affected by the Project.

In other regions, research shows that larger river basins are also shown to host many more plant species than smaller ones, and the Churchill River is orders of magnitude larger than the Goose River and every other river in the region.

d. Complete an environmental effects analysis for rare plants as a Key Indicator in the terrestrial environment, indicating where data gaps exist, how they affect the certainty of predicted environmental effects, and how the precautionary principle will be applied;

The Proponent does not answer the question but simply states that no plants listed under the legislation were found.

e. Provide appropriate mitigation measures for rare plants;

It would be useful to provide some information about transplanting and propagating rare plants in boreal environments and more general information regarding mitigating the loss of rare plant populations by attempting to reestablish them in new locations.

How successful are such efforts likely to be in reestablishing populations? Is there experience to draw on that would be relevant to this area? To what extent can the proposed mitigation address the cultural and historical loss of these populations?

f. Include rare plants as a Key Indicator in the cumulative effects assessment.

The Proponent ignores the question of including rare plants (using a broader definition) as a key indicator in the cumulative effects assessment, stating again that no *listed* rare plants were found in the Project assessment area.

IN Comments re: Nalcor Response

The main issue of concern in regards to the EIS, including the additional information provided in JRP.158, is that the Proponent is overly optimistic that regional biodiversity will not be affected by this Project. This level of certainty should be more clearly qualified in the material presented. The following should be noted:

- Transplant of rare plants to establish new populations is not always successful.
- The area to be affected is very large, and the habitats substantially changed. New species have been recorded in the area quite recently. The potential for other unrecorded rare plants to exist in an area of this magnitude is relatively high. The survey work conducted to date has considerably reduced uncertainty. However, the fact that there is some level of risk should be acknowledged. This risk, of course, cannot be quantified but is not nil.

As mentioned in previous submissions to the Panel, Innu Nation does not accept the premise that transplanting rare plants to establish new populations elsewhere will completely mitigate the loss of the original populations. There is history and tradition associated with the ecological knowledge of the landscape. Of course, the landscape is constantly changing due to natural causes, but flooding an entire river valley is a radical change within the timeframe of cultural evolution. This represents a major change across the traditional landscape supporting common plants and animals.

This negative effect should be acknowledged in the EIS, even if transplant efforts are successful. The loss of populations of rare plants in known locations, especially plants used for food or medicinal purposes, is significant for many Innu.

With respect to the discussion of the significance of effects of this Project, the fact that it will convert a major portion of the remaining main stem of the river – including its diverse and extensive riparian habitats – to reservoirs with less diverse shoreline habitat is a cumulative effect. The upstream reaches are already dramatically altered. Species could become less common as a result of this selective habitat conversion across the landscape. This should be discussed in relation to the precautionary principle for development planning.

Following completion of the 2010 survey work, additional analysis will need to be conducted to predict environmental effects as requested in JRP.158d. Further investigation into habitat requirements and transplant experience needs to be completed for any species not located elsewhere in the region. It may then be possible to better predict the likelihood of success in establishing new populations.

The locations for all regionally rare species outside the inundation zone need to be assessed for potential or known threats to habitat.

Outstanding Issues

In order to evaluate the adequacy of the Rare Plants Study and analysis for the EIS, it will be necessary to see the results of the additional survey work described in the response to JRP.158c. The level of effort that would be put into the "confirmation" surveys in the surrounding region was unclear from the response given by the Proponent.

Included below is an abstract from an article that critically examines experiences with transplanting for conservation. It suggests that the mitigation measures proposed by Nalcor for the loss of habitat supporting populations of rare plants in the Churchill River Valley may be unlikely to succeed.

Therefore, Innu Nation requests that the Proponent:

- Acknowledge in the EIS the potential complexity of successfully transplanting rare species.
- Acknowledge in the EIS that there is a possibility of failure to preserve genetic variation and regional biodiversity if the habitat of populations of rare species is inundated.

Fahselt, D., 2007, Is transplanting an effective means of preserving vegetation? Canadian Journal of Botany, Volume 85, Number 10, 1 October 2007 , pp. 1007-1017(11)

> Abstract. Transplantation to new locations is used widely to propagate horticultural and agricultural species but is also promoted as a means of relocating whole communities that stand in the way of development. It may be used as well to move vegetation from the field for experimentation under controlled conditions. Transplantation has not in the past been considered a reliable means of conserving threatened species or reproducing functional characteristics of natural communities, and has been regarded by many as highly ineffective. However, its potential must now be re-examined because of the many recent transplant attempts as well as advances in related fields. Recent trials illustrate that individual endangered species are still particularly difficult to transplant and displaced multi-species sods are almost always changed in the process. Exact reconstruction of communities from individual components is next to impossible because the full complement of species, including critical microbial components, is almost never known. Owing to a limited understanding of phenology, reproduction, functional roles, and interrelationships among constituent microbes, cryptogams, vascular plants, and fauna, transplants may be placed into sites with both biological and physical insufficiencies. Genetic diversity may be lost or, if genotypes from diverse sources are mixed, outbreeding depression may result. Recent advances in soil science, microbial ecology, and population genetics have in some cases improved the effectiveness of transplantation, but new insights mainly permit a fuller appreciation of the causes of failure. Home-site advantage has been demonstrated, and habitat

protection appears to be the best and perhaps only reliable way of preserving intact natural communities and rare species. Furthermore, experimentation with vegetational mats under controlled conditions may have little relevance to natural ecosystems.

IR # JRP.161 – ECONOMY, EMPLOYMENT AND BUSINESS

References

JRP.11, JRP.39,

Rationale

Additional comments.

Panel Information Request

The Proponent is asked to:

a. Identify and describe the anticipated or preferred work schedule/rotation during construction and reservoir clearing and provide a table showing the relative advantages and disadvantages of different schedules;

b. Clarify the large increase in person-years of employment as a result of increased Project costs and, if that information is accurate, assess its significance on the socio-economic effects of the Project;

Prior Relevant Innu Nation Comments

JRP.11 – Socio-economic Modeling

While, as stated in the EIS, revised Project costs may cause proportional changes to either adverse or positive socio-economic effects without modifying significance determinations, the Proponent is asked to re-run its economic modeling based on its most current estimates of Project costs and update the following tables and figures found in the EIS (Volume III):

- *Table 3-6 (Project Employment Effects – Construction Phase)*
- *Table 3-7 (Labrador Employment Effects – Construction Phase)*
- *Table 3-10 (Project Construction Expenditures)*

The updated (2009) employment figures in Tables 3-6 and 3-7 provided by the Proponent indicate that the number of direct person-years of employment has increased by about 70% over the 2006 estimate, while revised Table 3-10 indicates labour costs have increased by 48% (see comparison table below). Innu Nation notes that this increase in labour costs should not greatly influence the reported number of person-

years of employment, unless the increase in costs reflects a change in the Project description, which does not appear to be the case. Thus, it appears Nalcor's updated employment estimates provided in response to JRP.11 are in error.

JRP.39 – Workers Schedule

The Proponent is asked to:

a. describe the anticipated working schedule (number and length of shifts, rotation times, etc.) during construction and reservoir clearing;

As noted in Innu Nation's comments on the Proponent's response to JRP.29b, the rotation schedule(s) that are ultimately decided upon may influence the impact of the Project on the Goose Bay airport passenger capacity. The same applies to vehicle traffic counts between HVGB and the various Project sites. As noted in our comments to JRP.142, there appear to be rotation schedules that are more favourable to maintaining/enhancing Aboriginal opportunities to engage in traditional activities. Given that the majority of employees will not be Innu, the rotation schedules that are negotiated will likely reflect the needs/wishes of non-Innu employees and their representative labour organizations.

b. clarify whether the construction sites and reservoir clearing areas will be operated strictly as 'remote sites' and whether workers who live in adjacent communities will be required to stay at the camp during their entire shift rotations;

The Proponent states; "Workers from immediately adjacent communities may find it convenient to commute back and forth to the construction site, and transportation between the Gull Island and Muskrat Falls sites and a pick-up point in Happy Valley-Goose Bay will be provided for workers who wish to commute." It appears that the Proponent has no plans to provide a pick-up point in Sheshatshiu for Innu workers.

The Proponent is asked to describe what shift rotation assumptions they have used to develop estimates of airport passenger numbers and vehicle traffic counts.

The Proponent is asked to indicate whether or not it will provide for transportation of Innu workers between Sheshatshiu and the Project work site(s), whether transportation is required at the beginning/end of a shift and/or daily during the shift.

The Proponent is asked to explain how the needs of Labrador Innu with respect to employment rotation schedules that optimize opportunities for engagement in traditional land use activities will be addressed in negotiations with labour organizations.

Innu Nation Comments re: Nalcor Response

JRP.161a

Nalcor has identified a 20 days on/8 days off rotation schedule as the primary schedule utilized for their Project cost estimates and construction schedule. The rationale for this rotation schedule is that this is the primary schedule used by companies who operate in

Alberta's oil sands and that Newfoundland and Labrador-based workers employed at the oil sands are familiar with this schedule. This rotation schedule also appears to be favoured because it minimizes Nalcor's costs associated with worker travel expenses, though this is not stated by Nalcor.

Nalcor has indicated that the majority of construction phase workers will be residents of Labrador. Given the close proximity between the job site and their residence, Labrador residents may prefer a shorter employment rotation (e.g. 2 weeks on/2 weeks off or 1 week off), which allows them to spend time with their family on a more frequent basis.

The description of advantages and disadvantages of various employment rotation scenarios addresses implications on airport passenger and traffic volumes, Project travel costs, total numbers of employees, employee productivity, and schedule acceptability.

The Proponent has not included advantages/disadvantages from the perspective of the Innu of Labrador in its response. The literature reviewed by both Nalcor and Innu Nation on the subject of rotation schedules and effects on Aboriginal traditional use activities indicates that shorter rotations (e.g. 2 weeks/2 weeks off) are the least disruptive to traditional activities as well as general family life. The two weeks off provide the opportunity for the worker to rest and address family obligations and duties in the first week and attend to traditional pursuits in the second week.

Nalcor has reiterated that work rotation schedules will be negotiated with labour organizations and, in the case of Labrador Innu specific contracts, schedules would be negotiated under specific agreements. The preferred rotation identified by Nalcor is essentially 3 weeks on/1 week off. This rotation presents less opportunity for Innu to continue to engage in traditional activities and meet their family needs and responsibilities. Innu may have the opportunity to negotiate preferred rotation arrangements for contracts that are directly between Nalcor and Innu businesses.

JRP.161b

Nalcor has provided a reasonable explanation for the increase in person-years of employment. The highest increase in person-years is in Labrador-based workers and if in fact the predicted number of workers is realized, this should not substantially increase airport passenger counts and/or air traffic volumes. However, if Nalcor is unable to meet its Labrador-based employment projections, labour costs will increase (i.e. more travel costs incurred) as will airport traffic counts, air traffic volumes, etc.

Outstanding Issues

None.

IR # JRP.162 – DAM BREAK

References

JRP.96, 145

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to provide the following:

a. A copy of the Upper Churchill dam failure study, when it becomes available, and updated dam break model with inundation mapping for cascading dam failure scenarios involving the Upper Churchill, Gull Island and Muskrat Falls;

b. An outline of integrated emergency planning for these scenarios;

c. A dam breach analysis for construction phase cofferdams; and

d. Estimates of economic losses from dam failure (i.e. not just residential dwellings).

Prior Relevant Innu Nation Comments

JRP.96 – Inundation and Flood Mapping

d. a map of the area(s) to be flooded following a possible dam failure, as detailed in the dam breach study;

e. a copy of the Dam Breach Study;

f. an evaluation and description of the risks and impacts associated with a potential cascade failure involving the Churchill Falls installation/dams. This should include considerations of the potential effects on the communities of Happy Valley-Goose Bay and Mud lake and associated infrastructure and a map of the area that would be flooded;

g. the mitigation measures proposed to reduce the effects or consequences of a possible dam break on the communities of Happy Valley-Goose Bay and Mud lake and associated infrastructure;

JRP.145 Accidents and Malfunctions

a. Consider the communities of Northwest River and Sheshatshiu when responding to JRP.96, which asks the Proponent to evaluate and describe the risks and impacts of a dam failure.

Nalcor, in its response to JRP.145a states that the information requested is contained in their response to JRP.96f. The question asked in JRP.96f pertains to an evaluation and description of risks and impacts associated with a potential cascade failure involving the Churchill Falls installation/dams and any consequent potential effects on the communities of Happy Valley-Goose Bay and Mud Lake only. Nalcor has indicated in its response that an analysis of complete dam failure, which will consider dam failure impacts on Northwest River and Sheshatshiu, has be commissioned but the results of this study are not expected until early 2010.

None of the information provided by Nalcor in response to JRP.145 or JRP.96 (d-g) addresses the potential risk of any of the dam failure scenarios on Sheshatshiu. This is a long-standing request from Innu Nation that was first tabled in our review of the draft dam break study in June 2008:

- The inundation maps only extend to Sandy Point, but suggest flooding at this location meaning that low-lying areas in Sheshatshiu and Northwest River would likely be flooded. Mapping for these locations should be included in the 1:50,000 maps.
- The inundation maps should also include areas in the Terrington Basin, Sheshatshiu and Northwest River to fully assess the extent of the potential damage and the associated costs in these areas.

Until Innu Nation has an opportunity to review the information that Nalcor indicates should be available in early 2010, the information requested by JRP.145 (and JRP.96) remains outstanding.

Innu Nation Comments re: Nalcor Response

Since June 2009, Innu Nation has been requesting Nalcor to provide information, including maps, about the potential consequences of various dam break and climate change related sea level increase scenarios on Labrador Innu infrastructure and human safety.

Nalcor has included its response to JRP 145a in its response to JRP.162 (Dam Break Study by Hatch, Appendix F). Nalcor has provided inundation mapping at Sheshatshiu for cofferdam failure scenarios. No flooding is projected to occur at Sheshatshiu as a consequence of cofferdam failure during the Project construction phase.

Nalcor has provided mapping of inundation in the vicinity of Sheshatshiu associated with a cascade dam failure event involving both the Gull Island and Muskrat Falls North Dam (see Figure 4.1 in Appendix F). Figure 4.1 is a very generalized map indicating that peak water levels near Sheshatshiu would increase between 0.8 to 0.9 meters and the incremental increase over peak flood stage would be in the order of 0.4 to 0.5 meters. Nalcor's report does not provide a detailed map showing the extent of peak flood inundation and cascading dam peak levels at Sheshatshiu. Therefore the extent of damage to Sheshatshiu infrastructure (houses, roads, docks, public buildings and other infrastructure) has not been identified.

Nalcor also indicates that an assessment of the impact of a cascading dam failure involving Churchill Falls, Gull Island and Muskrat Falls dams has not been completed.

Outstanding Issues

Innu Nation is requesting that the Proponent provide:

- Detailed flood mapping at Sheshatshiu resulting from cascade dam failure of Gull Island and Muskrat Falls showing infrastructure that would be impacted, if any.
- Detailed flood mapping at Sheshatshiu resulting from cascade dam failure of Churchill Falls, Gull Island and Muskrat Falls showing infrastructure that would be impacted, if any.

IR # JRP.163 – CUMULATIVE EFFECTS

References

JRP42, JRP.44, JRP.57, JRP.70, JRP.93, JRP.97

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to describe how past projects, activities and events have affected current ecological and socio-economic conditions. In particular, the Proponent is asked to discuss the environmental conditions that prevailed in the Assessment area prior to hydroelectric developments on the Churchill River.

To the extent that information is available to the Proponent, the Proponent is asked to justify whether or not the projects or activities suggested by reviewers should be included in the CEA and, if so, whether or not it may influence CEA conclusions. Specifically, the Proponent should consider uranium mining in the CEA. For hypothetical projects, the Proponent should discuss how they may contribute to and influence future environmental planning in the region, to the extent that their impacts may overlap with those of the Project.

The Proponent is also asked to explain and provide rationale for the methodology used in the CEA to assess the impacts to migration patterns as a result of the Project in combination with other projects, activities, or events, given the limited spatial boundaries of the CEA area. The Proponent should be specific with respect to the migration patterns of the Lac Joseph, George River and Red Wine Mountain caribou herds, as well as any other migratory KI that would benefit from such a discussion.

Prior Relevant Innu Nation Comments

Innu Nation has made prior comments related to cumulative effects, specifically in relation to JRP.42f, JRP.44c, JRP.57, JRP.70, JRP.93, and JRP.97.

Innu Nation Comments re: Nalcor Response

General Comments

The Proponent does not agree with the Panel that any additional information is necessary to meet the requirements of the Guidelines with respect to the assessment of cumulative effects. Nevertheless, some limited additional information is provided, along with very limited additional analysis. The Proponent has a more narrow interpretation of the spatial and temporal scope that consideration of cumulative effects should encompass. There appears to be inadequate understanding of the significance of cumulative effects to the environment and local people in the context of making decisions about this Project. The response from the Proponent confirms Innu Nation's views expressed previously to the Panel that cumulative effects should be a topic of a specific panel hearing.

The Proponent does not agree that a better understanding of the effects of previous developments, including river regulation will have any influence on the conclusions in the EIS. Even in the absence of robust quantitative data, it is clear that certain types of habitats, such as riparian wetlands and shallow, lotic (swift-flowing) aquatic environments, have been reduced extensively in the watershed, and will be reduced further by the proposed Project. An analysis of cumulative effects must attempt to take this into consideration.

It is also clear that a hydroelectric project that creates extensive infrastructure and landscape alteration (e.g. reservoir development and operation) in a region immediately adjacent to another large ongoing hydroelectric development constitutes a significant cumulative effect on Innu traditional territory. This is still not well reflected in the EIS.

Past Projects, Activities and Events

The Proponent states that "The Churchill River is a regulated river, and the effects of this regime on the lower section of the Churchill River have been monitored and are understood". (p.3) This is a misleading statement. Some elements of the effects have been monitored to some extent (i.e. methyl mercury levels in fish and hydrological conditions), but the ecological effects are not well understood. Understanding baseline conditions, especially for habitat potential into the future, requires greater appreciation of ecological processes over time. The Proponent must acknowledge the limitations to our level of understanding of effects, especially for the general reader.

Much more use still could have been made of research from other regions to gain some understanding of the effects of the current regime on the lower and upper river.

The summary of findings from other reports (e.g. Luttermann 2007, Collier et al. 1996) is incomplete in many cases and poorly communicated. For example, issues such as increased winter ice scour and the extent of downstream erosion effects are not well described.

With regards to fish habitat, the response to IR# JRP. 44 stated that "reduced variability in water level fluctuation would have also enhanced river bank stability" (p.20). River bank stability has quite probably been reduced throughout the length of the lower river due to increased winter flows accompanied by increased daily fluctuations.[26] The observations made by local people, in addition to historical ground and aerial photos demonstrate dramatic bank erosion in many areas of the lower river. This is described in detail in Luttermann 2007. While there is limited longer term data on this issue, the data that are available suggest an interpretation contrary to that of the Proponent.

On page 5 of its response, the Proponent states, "Interviewed residents mentioned more exposed shorelines in some areas due to a perceived reduction in water level (Luttermann 2007; Sikumiut 2009). Based on information obtained from the interviews it is unclear where these effects were located. If the observations were on the lower Churchill River, the phenomenon may have been a result of increased deposition of sediment in downstream reaches due to accelerating beach creation (Collier et al. 1996)". This could be better explained. Are the Proponents disputing the hypothesis that bank erosion has increased in many specific areas in the lower river? If it has increased in certain areas and affected populations of rare species such as *Oxalis acetosella* subsp. *montana ,* for example, this is an effect of note. The future reservoirs would of course completely change and override current conditions and effects of the regulated hydrological regime, but additional riparian habitat loss would constitute a cumulative effect within the footprint of the Project.

There is an implication in the EIS in general and in the JRP.163 on "consistency" as being ecologically positive. This is not always the case, especially in disturbance dependent systems. In describing the lower magnitude of the spring freshet in the lower river the Proponent states, "Fish populations, therefore, experience a lower range of velocities and a more consistent area of habitat as compared to conditions that existed prior to the development of the Churchill Falls Power Station." (p.4) First, this interpretation does not consider the increased <u>daily</u> fluctuations in flow. These are different from natural conditions in this river. Such daily fluctuations in summer are perhaps similar to glacial fed streams, which are typically less biologically rich. Second, a less variable aquatic environment is more favourable for some fish species, but less favourable for others. If the lower river is converted to reservoirs, the aquatic

[26] Luttermann, A.M., 2007. Historical Changes in the Riparian Habitats of Labrador's Churchill River Due to Flow Regulation: The Imperative of Cumulative Effects Assessment. Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, Dalhousie University, Halifax, p.163.

environment will be that much more "consistent". Again, this has ecological consequences that need to be understood in the EIS.

The Proponent provides additional hydrological information (p.7) about how the Twin Falls facility affected the lower river flow. The graph compares mean daily flow data pre-Twin Falls with several years of daily flow data post-Twin Falls. This data presentation appears to miss the point about the influence of changes in daily fluctuations of water levels that were in fact noticeable as far as Muskrat Falls (Luttermann 2007).

Daily fluctuations of water levels in the reservoirs will have an important influence on the development of riparian vegetation in the future. Review of data from similar reservoirs is important to understanding the cumulative effects of this type of reservoir development for the river system as a whole.

Some additional information is provided to consider the wetted perimeter of the river bed (pp.9-11). Such information could be useful for understanding the extent of the floodplain if analyzed for the whole river using a digital elevation model. However, there is no analysis of the ecological relevance of changes in the wetted perimeter for the past, present and future environment. There is no application of the data to the complexity of the actual shoreline. The decrease in the flood plain may have already reduced the fluvial wetland habitat that currently exists, by reducing the periodic flooding of raised basins and back channels for example. Future permanent flooding in addition to a further decrease in the wetted perimeter would constitute a cumulative loss of wetlands.

In general, flow patterns need to be considered in terms of ecological processes, such as flushing sediments and nutrients through a system; dispersal of plant propagules along the length of a river system, and along the floodplain; and creation and maintenance of wetlands in the floodplain.

The Proponent provides some examples of the changes that have occurred in the terrestrial environment in relation to changes in species diversity, abundance and distribution. It could be noted more clearly that the cumulative effects of multiple hydroelectric developments in the region include incremental loss of caribou and waterfowl habitat, even though this is difficult to quantify.

Potential Future Projects

The Proponent does provide some information and analysis of several other projects and activities in the assessment area as requested by the Panel. It would not be too onerous to make this information more robust. For example, there is considerable information available on the potential environmental effects of aluminum smelters. This could be summarized briefly. Of course it does have to be made clear in the EIS that such a project is hypothetical at this stage. However, realistically, it has been actively pursued and is a potential induced project. It probably cannot happen without the Lower Churchill Project.

Cumulative Effect on Innu

This response demonstrates little understanding of Innu concerns and perspectives Innu regarding cumulative effects.

Throughout the EIS and in recent responses to questions from the proponent there is a refusal to acknowledge that cumulative effects assessment should include the additive effects of adjacent projects. To Innu considering industrial development in Nitassinan as a whole, the loss and conversion of habitats is spreading, as is the alienation of lands previously available to generations for hunting, fishing, harvesting, travelling, and otherwise living.

Though the existing data are limited, a general understanding of the incremental loss of territory experienced by Innu should be better presented. For example, p. 14 of the response to question JRP.163a. indicates that settlers were beginning to use the lower Churchill River more heavily as trapping grounds. Innu use declined then partially as a result of competition and the cultural need for less populated territory. Additional, major alienation of territory for land and resource use occurred as a result of the Churchill Falls project, especially in the Michikamau region (now the Smallwood Reservoir, 5.7×10^3 km^2 in size - the largest impoundment in Canada). Future projects on the Churchill River will directly affect the remaining uses of the river, and the sites where Project infrastructure will be located, but also prevent opportunities for future uses that benefit from knowledge of the Innu history and culture in the landscape.

Although this has not been specifically studied in this region, there have certainly been negative cumulative effects on Innu culture from multiple hydroelectric developments related to the knowledge of mercury contamination of fish, and concerns for the health and safety of other wildlife. These can be considered to be cumulative impacts with increased industrialization of the landscape.

Mitigation efforts could partially address fears and past cultural erosion, but such effects should be recognized on at least a qualitative level.

"Standard Environmental Assessment Practice"

The Proponent consistently states in the EIS and in additional responses to Information Requests, simply that "In accordance with standard environmental assessment practice, the Lower Churchill Hydroelectric Generation Project's environmental effects were assessed using the existing environment as the baseline (pre-project conditions), which captured the environmental and socio-economic effects of previous developments and activities".

Unfortunately, "standard environmental assessment practice" has been frequently and soundly criticized for being inadequate, especially in its treatment of cumulative effects.

The baseline description cannot "capture" the effects of past projects if these effects are not specifically analyzed in any detail. It provides no historical reference points for environmental, social, economic, cultural or health change, effects or adaptation; or

causal explanation for current conditions needed to understand cumulative degradation, or potential improvements.

The following is an excerpt from Duinker and Greig (2006, 157)[27]:

> *Predicted impacts (i.e., impacts expected in future, not those that may already have occurred) are correctly calculated as differences between alternative future outcomes. Thus, a project's impacts are, at a minimum, the differences in VEC responses (or outcomes or behaviors) between a future without the project and a future with the project. Both these futures, to be realistic, must be firmly anchored in the present, which, if correctly characterized, will depict VEC conditions as they have evolved with past and present projects in place.*

If we want to correctly characterize present conditions for a valued ecosystem component such as fluvial wetland habitats within a watershed, or region, then we can use basic data to describe the region. This region has several large storage reservoirs with various operating regimes that provide certain types of wetland habitats. These are different from what they were four decades ago. They are directly upstream of the proposed Project and have affected the main stem of the river as well as numerous tributary rivers, streams and lakes.

When a new project is proposed that will create similar changes on most of the remaining main stem river habitat, the future extent of the fluvial wetland habitats can be understood to be remnant for this river. Given that the Churchill is the largest river in Labrador, and larger rivers are known to support higher biodiversity per unit area than smaller rivers, this should be considered in the decision making for more river regulation.

The discussion in the EIS and additional responses to information requests do not include even a summary of the conversion of lake, river and terrestrial habitats to reservoirs in the upper watershed. It presents very limited information on the extent of dewatered rivers and spray zones.

New habitats also take time to develop following major landscape manipulation. The operation of the Churchill Falls project has the potential to influence the evolution of new habitats in the upper and lower portions of the watershed. To gain some understanding of future alternative outcomes, there should be a more detailed discussion included in the EIS of a future without the lower Churchill projects. This requires a better understanding at minimum of the existing reservoir systems upstream.

Impacts on Migration Patterns

The Proponent takes a fairly narrow view of disruption of movements, especially given that this question is related to cumulative effects.

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[27] Duinker, P. and Grieg, L. 2006. *The Impotence of Cumulative Effects Assessment in Canada: Ailments and Ideas for Redeployment*, Environmental Management Vol. 37, No. 2, pp. 153-161.

Caribou will not move to a particular location once levels of disturbance have become enough to change community dynamics in the region (i.e. alter wolf and moose distributions) and/or preclude options for caribou to migrate elsewhere. Nalcor contends that:

> *There is conflicting opinion in the literature (Volume IIB, Section 5.7.1.2) as to whether the existing projects and activities considered under the context of the CEA (e.g., transmission line rights-of-way, roads, forest clearings or military training) may be disrupting movement of caribou.*

However, this is not so much a conflict as a realization that different members of the population are affected differently (e.g., calving success can be more easily impacted).

The Proponent argues that "Inclusion of the full range of the George River Caribou Herd would have encompassed a much larger area and resulted in a broad, generalized and unfocussed assessment." However, is not a broad assessment needed to truly understand the effects of an activity (i.e. the Project) at the population level? The fact is that the effects are broad and need to be evaluated as such. This is exactly why most environmental assessment failures to understand the true cumulative effects of our activities. Understanding the potential effects of the Project on the George River herd would require more analysis and consideration of the available data, and not only habitat modeling and attempts to classify relative habitat quality as was undertaken for the Red Wine hard.

The Proponent concludes that "the influence of this Project and others considered within the CEA, will likely be more prominent on seasonal migration movements of species that are resident year-round, compared to those which only breed within the CEA Area."

Innu Nation does not support this generalization, which is unsupported by the evidence presented to date by the Proponent. It must be acknowledged that seasonal ranges can figure prominently in the life cycle of caribou, and it may be the case that the George River herd has other options for overwintering than the Project area.

Outstanding Issues

The responses presented here and in previous Proponent responses improve the information available to the public through the EIS, but still offer a weak understanding of cumulative effects.

To date, the Proponent has largely dismissed the potential for the Project to affect the George River herd, and yet the Proponent presents very limited information to indicate sufficient understanding of the movements of this herd. The reality is that this Project is being developed at a time when the George River population is in decline. Regardless of the causes of this decline, there is considerable evidence that adverse effects on reproductive success of caribou when populations are low have a magnified effect on the ability of the herd to recover.

IR # JRP.164 – MONITORING AND FOLLOW-UP

References

JRP.112/112S

Rationale

Some of the information requests remain incompletely addressed by the Proponent.

Panel Information Request

The Proponent is asked to provide the information required by the EIS Guidelines regarding effects monitoring, follow-up and adaptive management programs needed for management of project-related impacts on the socio-economic environment, including land and resource use. This is to include lines of responsibility, accountability and proposed approaches for each program that is needed and proposed involvement of affected parties. Where the Proponent suggests that a government department or agency would carry out the monitoring or follow-up, the Proponent is asked to report on the willingness and capacity of the department to take on this role.

…the Proponent is also asked to provide a table of the proposed monitoring programs for these permits, including, to the extent that information is available, the regulating agency, frequency, duration and geographic extent, reporting, and the Proponent's role for these different monitoring programs.

Prior Relevant Innu Nation Comments

Preface to December 18, 2009 Innu Nation Comments

Mitigation of Community Impacts

Nalcor's responses to various JRP information requests concerning mitigation of community impacts (e.g. shortage of child care services, increased demand for social/health services, etc.) indicate that they continue to hold the position that it is the responsibility of government to address any Project-induced impacts (see for example response to JRP.108). Innu Nation and the Proponent have both reported that social and health services delivery capacities within Sheshatshiu are already exceeded. This suggests that government has not been able to respond to existing needs and therefore Innu Nation is concerned that the Proponent proposes that any additional socio-economic impacts associated with their Project will be addressed by Government. Of great concern, Nalcor suggests that Labrador Innu use IBA monies to mitigate adverse impacts on the community. For example, in their response to JRP.137 Nalcor suggests that Sheshatshiu can address Project-related demand for child care by using their IBA benefits to build a new child care facility.

Socio-Economic and Health Monitoring and Follow-Up

Nalcor's responses to various JRP information requests concerning socio-economic monitoring (JRP.108, 112S, 113) indicates that they expect government will primarily be responsible for socio-economic (including land and resource use) data collection. Further, Nalcor suggests that the information presented in the environmental assessment process represents an adequate baseline, and that routine data collected by government will be sufficient for monitoring any Project impacts and/or assessing the effectiveness of mitigation measures.

One of the main concerns raised by Innu Nation before and during this environmental assessment is the lack of baseline information concerning various socio-economic and traditional land use indicators for Innu. For example, current information (less than 20 years old) on traditional use activities (locations, numbers of people, harvest and consumption levels) is lacking and thus no contemporary baseline exists to enable monitoring during either the construction or operational phases of the Project. Moreover, Innu Nation has no resources to assemble current baseline information or implement a monitoring program, and neither the federal or provincial governments or the Proponent appear to have plans to design and implement relevant monitoring programs. With respect to other socio-economic indicators (e.g. employment data, incidence of substance abuse, domestic violence, etc.), there are "problems" with the data routinely collected by government (e.g. census, health records) and these data are not specifically relevant to understanding Project-related impacts. Without resources to implement monitoring programs specifically designed to assemble relevant baseline and on-going information, Innu Nation's will have no ability to document Project-related socio-economic and land use impacts.

With respect to socio-economic related follow-up programs, Nalcor states that it is too early to comment on what follow-up programs may be recommended by the Panel. In its response to JRP.112S, Nalcor notes that its "responsibility for monitoring and follow-up of Project effects on social services and infrastructure is discussed in response to IR# JRP.108." JRP.108 however deals specifically with mitigation and compensation, not monitoring or follow-up.

Table 3 in Nalcor's response to JRP.112S provides the only indication of what the Proponent considers to be its responsibilities for follow-up with respect to socio-economic issues. It appears that Nalcor considers a follow-up program will involve: reporting on project expenditures and employment; conducting employee exit interviews; and providing information to government and communities so they can plan to deal with Project-related influences. Since the purpose of a follow-up program is to verify the accuracy of assessment predictions and the effectiveness of mitigation measures, the aforementioned will not deliver data/information on whether the potential impacts of critical concern to Innu Nation (e.g. increased demand for social, health and other community services) have occurred.

In the case of traditional land use, harvesting and country food consumption, the follow-up programs suggested by Nalcor in its response to JRP.112S (Table 3) are

equally inadequate. For example, Nalcor indicates their follow-up program to determine if fish consumption will decline as a consequence of mercury-related restrictions will involve monitoring mercury levels in fish. This approach will not document changes in fish consumption. Similarly, Nalcor's approach to evaluating impact predictions on land use patterns is to provide information to government and community agencies so they can plan for land and resource use. Again, this approach will not facilitate assessment of impact predictions concerning impacts on land and resource use.

It is of grave concern to Innu Nation that the Proponent does not appear to understand that existing Government data collection efforts are not adequate for proper monitoring and that to be effective, monitoring programs must be carefully designed and implemented with the full participation and support of Labrador Innu, and properly funded over the long term. Innu Nation is also very concerned that with respect to follow-up, the Proponent does not appear to be taking a pro-active approach, but rather is waiting to see what the Panel may prescribe.

JRP.112

The Proponent is asked to provide table(s) that summarize all proposed monitoring and follow-up programs and include general schedules over the course of construction and operation.

In addition, for each proposed monitoring and follow-up program, the Proponent is asked to provide to the extent possible:

a. monitoring objectives;

b. proposed thresholds at which to initiate monitoring;

c. proposed frequency, duration and geographic extent of monitoring,

d. sampling design, including methodology, frequency, duration and geographic extent of monitoring and justification for the extent;

e. the role the Proponent sees itself playing in the monitoring program;

f. reporting mechanisms;

g. procedures to assess the effectiveness of monitoring and follow-up programs; mitigation measures and recovery programs;

h. procedures to assess the effectiveness of monitoring and follow-up programs, mitigation measures and recovery programs for areas disturbed by the Project;

i. adaptability of the Project and application of adaptive management to refine or modify the design and implementation of management plans, mitigation measures and Project operations where necessary;

j. criteria the Proponent would apply to determine that adaptive management measures are necessary given follow-up and monitoring results;

k. examples of adaptive management measures that could be applied for VECs / KIs in order to refine and optimize monitoring and mitigation measures;

l. approaches and methods for monitoring the cumulative effects of the Project with existing and future developments in the Project area; and

m. experience gained from previous and existing monitoring programs.

The response does not address each program but is more generic in nature. In some instances, the generic response is appropriate where it is more or less the same for each program. However, specific information is also requested for each program. No information has been provided that is specific to each program.

Without specific information, it is not possible to be confident that adequate programs will be put in place or that the Proponent understands the magnitude of the monitoring task and appreciates the significant costs involved.

The Proponent is requested to provide information specific to each monitoring or follow-up program to the extent that it is available.

JRP.112S

In addition to the information requested in IR # JRP.112, the Proponent is asked to indicate:

a. How it plans to establish suitable baseline information relating to physical/social/health infrastructure and services for Aboriginal communities affected by the Project against which to compare Project-related changes;

b. What adaptive management measures would be implemented should there be significant increase in Project-related demand for community infrastructure and services (Aboriginal and non-Aboriginal communities affected by the Project);

c. The role it envisions for Aboriginal and non-Aboriginal communities to ensure that they are involved in monitoring/follow-up/mitigation/adaptive management programs;

d. Ways in which holders of Aboriginal traditional and community knowledge, including elders, women and youth, will be involved in each proposed monitoring and follow-up program; and

e. The proposed source of funding for such programs.

The Proponent explicitly states that responsibility for monitoring and follow-up of Project effects and mitigation on physical, social and health infrastructure and services will fall to agencies and organizations who currently deliver such services **(see Proponent response to JRP.108**). It is further suggested that the type of data that would be collected would be the same data that is already being collected. There are several problems with this approach:

- the types of data routinely collected are not necessarily relevant to monitoring adverse and positive Project effects;
- the types of data routinely collected are not necessarily relevant specifically to Innu conditions and the methods of data collection are often culturally inappropriate;
- relevant baseline data for indicators important to monitoring effects are lacking;
- agencies do not have dedicated resources to acquire necessary baseline conditions or to engage in enhanced or new monitoring efforts.

In the absence of a commitment by the Proponent to support comprehensive monitoring and follow-up initiatives, including the establishment of relevant baseline indicators, existing data collection efforts by Government will not enable the Proponent or Labrador Innu to effectively determine the accuracy of predicted impacts and benefits, the effectiveness of mitigation measures, or implement adaptive management measures. This means that the Proponent's predictions that the Project will not have a significant effect on Labrador Innu health and social services, individual and family health and wellness, traditional culture, land use and knowledge, increased access and competition by non-Innu harvesters and recreationists, to name a few, will not be monitored to verify the accuracy of the prediction and there will be no credible basis upon which to determine the effectiveness of mitigation measures or to apply adaptive management.

The Proponent is requested to provide clear evidence that Government is willing to fund the design of and implementation of monitoring and follow-up programs, in collaboration with Innu.

The Proponent is requested to provide a rationale for why it should not directly fund monitoring and follow-up programs.

The Proponent is requested to consider the socio-economic and/or health monitoring strategies employed elsewhere in the country, including those offered/prescribed in the Victor Diamond Project, Mackenzie Valley Pipeline project, Ruby Creek Molybdenum Mine Project[28], and Eastmain I-A and Rupert Diversion.

Innu Nation Comments re: Nalcor Response

Socio-economic Monitoring

Nalcor maintains that provincial and federal governments will receive financial benefits from the Project and further states that it is inappropriate for Nalcor to assume responsibility for issues that are within the mandate of these government agencies.

[28] http://a100.gov.bc.ca/appsdata/epic/documents/p258/1189525032588_f206d5a25ace40db9fd3919e367a4a50.pdf

Nalcor further states they do not intend to fund agencies who receive funds from either provincial or federal governments to conduct socio-economic monitoring and/or follow-up programs.

Monitoring Programs

The Proponent indicates that: "the proposed monitoring programs for the permits…are provided in Table 3", and later that: "The details regarding frequency, duration, geographic extent, and reporting will be defined (if required) when the permit is issued and, therefore, detailed information is not available at this time."

None of the information provided by the Proponent constitutes an example of a monitoring program. We don't disagree that the permits and the follow-up program will ultimately define the monitoring that is to be carried out. The fact that the Proponent continues to be unwilling or unable to provide this information further raises our concern that the Proponent does not understand the magnitude of the monitoring task and has not made preliminary estimates of the significant costs of these programs.

Outstanding Issues

Nalcor has not provided the socio-economic monitoring information requested by the Panel. The concerns identified in the preface of Innu Nation's December 2009 submission have not been addressed.

The Proponent is requested to provide the capital and operating costs related to mitigation measures and monitoring programs anticipated to be required, including the level of confidence in these estimates.