Initial Review of the Keeyask Generation Project Environmental Impact Statement

For Pimicikamak Okimawin

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Introduction

In preliminary discussions, Pimicikamak has raised a number of questions and concerns with regards to the proposed Keeyask development and how these are addressed in the EIS. After initial review, the general impression is that in many respects this EIS as a whole is well written and provides greater detail on several important issues than has been observed previously in similar assessments. However several outstanding questions and concerns remain.

This document outlines some preliminary comments and questions regarding the Keeyask EIS prepared by Manitoba Hydro and the Keeyask Partners. The responses to requests for additional information, Round 1 have also been reviewed.

Particular emphasis is on issues related to several of the questions previously raised by Pimicikamak.

These include but are not limited to:

1. **Concern about incremental environmental degradation on the long-term abundance and sustainability of all native species in the region as a whole, and in particular those harvested for subsistence and cultural purposes. Some species of particular concern include migratory waterfowl, moose and caribou, all fish species, especially sturgeon as it is already significantly depleted and at further risk.**
2. **Water quality throughout the river system**
3. **Erosion, shoreline losses**
4. **Changes in the cultural landscape**
5. **Cumulative Loss of archaeological sites**
6. **Cumulative alteration and degradation of the cultural landscape.**
7. **Concerns about the effort put into understanding cumulative effects hydroelectric development on the Nelson River and surrounding watershed on all of the above elements on the baseline historical or pre-hydroelectric ecosystem.**
8. **Dependence on the centralised industrial model of development. What choices are there? What is the justification for more large-scale hydroelectric development in this region?**

Keeyask EIS Executive Summary

Whereas regulatory authorities will be reviewing the EIS in its entirety, the Executive Summary is the one document most likely to be read by the majority of the public. It is important to Pimicikamak that this document provide as accurate a summary of the EIS as possible in a readable form, while acknowledging the complexity of arriving at conclusions in the assessment of a single large project. Ideally, an environmental assessment process will serve as a learning tool for all involved and for people into the future.

Comments, questions and suggestions are provided below related to the way certain ideas and conclusions are expressed in the Executive Summary based on a synthesis of information from the body of the EIS. In general, while important adverse effects are acknowledged in several sections of the EIS, many of these are minimised unrealistically or perhaps optimistically in the overall conclusions.

Executive Summary 1. Introduction

P.7 Provide a couple of lines of explanation for how the Project will directly displace coal or natural gas electricity production to result in a net global greenhouse gas reduction. Are there any specific plans for displacement or will the energy feed into a general market that may provide opportunities for displacement?

P. 7 The introduction suggests that the reservoir option chosen is one of the least damaging possible. The Executive Summary states: *"The Projects offers the lowest reservoir-level option among the technically and economically feasible options studied, resulting in the least amount of flooding and operating within a small, one-metre reservoir range."* (p.7)

Reducing the total area flooded and subjected to a regulated hydrological regime is certainly the better choice in initial design. However, this is still a large reservoir. If it is considered along with the area of all other existing and proposed reservoirs within the Nelson and Churchill River basins, the cumulative effects of this entire integrated hydroelectric generation system would be better appreciated.

For the benefit of all readers, it should be made clear in the EIS that a one-metre fluctuation in water levels throughout the year does not support the ecological processes that create the habitat diversity typical of a large northern boreal river system. It is not, in other words, necessarily a good thing from an ecological perspective. A small fluctuation in reservoir water levels is preferable for some values compared to a storage reservoir that has a large drawdown zone, with a reversed seasonality compared to an unregulated river. This creates large unproductive shorelines and dangerous ice conditions. This is the situation in the Southern Indian Lake reservoir. However, a reservoir with a one-metre water level range precludes the influence of a spring freshet on the shorelines and greatly reduces the extent and diversity of productive riparian habitats.

This is typical of a "control reservoir" as illustrated below. The continually fluctuating water levels over a relatively small range produce simplified riparian zones compared to a natural regime.

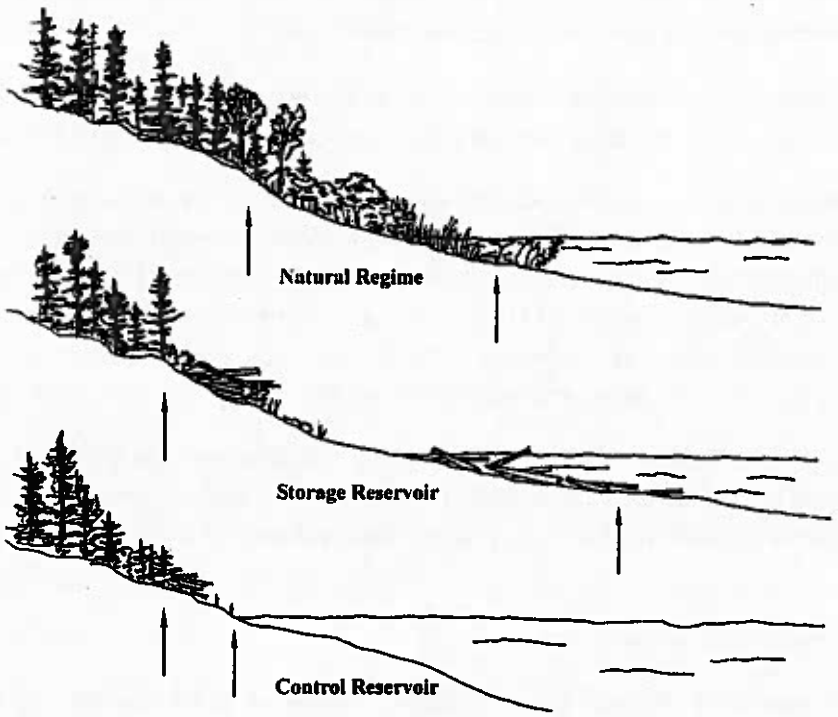

Figure 1 Conceptual drawing of the relative width of riparian zones and typical vegetation development in boreal rivers and reservoirs with various operating regimes. Illustration A. Luttermann

Spring flooding creates diverse morphology, delivers nutrient rich sediments and plant propagules to the riparian areas, and maintains early successional communities of shrubs, herbs, and forbs that provide good habitat for many species adjacent to a water body. A limited active riparian zone characteristic of reservoirs with narrow water level fluctuations is typically much more simplified and less species rich.

Recommendation: Explain that the expected benefits of a small range of water level fluctuations in a reservoir throughout the year are that the shorelines will suffer less from large draw downs in winter, and should have more stable ice conditions compared to a storage reservoir. However, one of the negative effects of this type of reservoir development is that these reaches of the river will no longer experience any of the long-term ecological benefits of spring freshets. These ecologically degrading effects are in addition to all of the other reservoirs in this river system. The Keeyask main stem reaches are affected by flow regulation upstream, but are still influenced to some extent by natural tributary flow patterns.

Executive Summary Section 3. The Keeyask Cree Nations Evaluation Processes

P. 15 The EIS Executive Summary states that: "*The Keeyask Cree Nations know that the effects of past projects cannot be undone. The way forward lies in enabling the river and land that has sustained the northern Cree for thousands of years to do so again.*" (p.15)

The statement may be referring to the increased erosion and water turbidity issues that will not likely change if the existing projects continue to operate as they have.

However, this statement is misleading in that it gives the impression that there is no further mitigation possible for the effects of past projects and that the proposed Project will improve ecological conditions.

It is possible for example, to allow river ecosystems to rejuvenate to a more diverse and species rich condition over time if natural hydrological processes were allowed to return, or if even periodic spring flooding were allowed to occur. So called "environmental flows" could be released to provide some level of spring flooding of shorelines which may help to increase riparian habitat diversity in the reaches that will be converted to a reservoir by the Keeyask project. This of course is not a favoured course of action as such measures would likely compromise the economics of existing projects to some extent.

Recommendation: Remove the first two sentences of the paragraph and change the next sentence to read something like: "After long deliberation, the Keeyask Cree Nations have chosen to support the project for the potential benefits that new economic opportunities will bring to present and future generations."

Baseline for cumulative effects assessment

One important aspect of the EA process that is raised, for example, in the Fox Lake Cree Nation Environment Evaluation Report is that the pre-hydroelectric development period should be the baseline for a cumulative effects assessment of the Keeyask Project and all other hydroelectric projects in the region. Aithough the other hydroelectric projects are acknowledged to have had widespread impacts on the environment and the people, there is very little effort in the EIS to explain and analyze what these changes have been except in a general way. There were certainly few systematic data collected prior to the previous developments; however information such as historical aerial photography can provide the basis for some quantitative analysis of landscape change.

Recommendation: Provide further explanation for why the baseline for cumulative effects assessment is not the pre-hydroelectric development environment.

Weight given to perspectives of Cree

In many instances, it is acknowledged in the sections of the EIS that the conclusions of the Keeyask Cree Nations differ from the technical analysis in the body of the EIS. For example, there are wide differences in the level of confidence that a sturgeon stocking program will be able to adequately mitigate for disturbance and additional losses of sturgeon habitat. It is also acknowledged that the approach taken to the cumulative effects assessment and the EIS in general focused on "valued ecosystem components" does not fully meet the concerns of the Cree.

Recommendation: These perspectives should be given more weight or attention in the conclusions presented in the EIS summary if an Aboriginal world view and traditional knowledge are truly being respected in this assessment.

Recommendation: Despite the official geographical designations, and given the context of attempting to understand the ecological effects of hydroelectric development, it would be useful in the EIS if references to bodies of water would accurately describe their relationship to river regulation. Thus, Stephens Lake should always be referred to as a reservoir as suggested by FLCN, as should all other reservoirs in the river basin.

Executive Summary Section 5. Environmental Effects Assessment

The Executive Summary states that "*...following mitigation, none of the residual adverse effects exceeded the regulatory test for significance*" (p.21). This statement is confusing for the general reader and does not provide an accurate depiction of the situation. There is much more uncertainty with regards to the potential success of several mitigation measures than is made clear here.

P. 25 With regards to sturgeon, the Executive Summary states: "*... in the long-term their numbers in the reservoir and Stephens Lake are expected to be comparable to that of today because habitat will be available to support all life stages.*" This will not necessarily be the case. The extent of the habitat currently used for reproduction and YOY will be reduced. The created habitat may or may not be utilised as hoped. in addition, the current numbers are very low, at least in part due to the effects of existing hydroeiectric developments.

P. 26 The Summary states: "*While boreal woodland caribou have been protected under the Species at Risk Act, their current range as designated by Environment Canada and Manitoba Conservation and Water Stewardship does not extend to the Keeyask area.*"

The Fox Lake Cree Nation Environmental Evaluation Report provides other information suggesting that certain populations of caribou that are present in the region year round could be considered to be boreal woodland caribou. The taxonomy and distribution of woodland caribou is not widely agreed upon, and the fact that animals will move between groups over time further blurs the distinctions.

Migratory caribou are less threatened, still range across reiatively intact territories and thus are not offered any additional nominal protection under SARA. However, most caribou populations across Canada are declining, and industrial development is occurring at an increasing rate. All caribou require large tracts of territory to thrive over the long-term. Each large-scale project such as Keeyask will create long-term fragmentation and additional disturbance.

Executive Summary Section 6. Cumulative Effects on Biophysical Environment

pp. 36-37 Overall, the Executive Summary presents a narrow interpretation of "cumulative effects". It acknowledges that a broad range of changes have occurred over the past 55 years in the Nelson River basin as a result of hydroelectric development, and that many of these are negative. it then concludes that:

"The Partnership has not identified cumulative effects on the biophysical environment requiring further mitigation. (emphasis added) *Accordingly, no residual adverse cumulative effects on the biophysical environment will exceed the regulatory test of significance." (p.36)*

This statement does not make it clear that many proposed mitigation measures are not yet well designed, and are in fact experimental. Although the EA processes that we have in place may not deal well with uncertainty, the fact remains that much uncertainty is inherent in these large projects. We should then focus on some of the certainties in the assessment and be realistic regarding uncertainties.

Recommendations:

In reporting on cumulative effects on sturgeon in the Executive Summary, based on the information in the EIS a more accurate representation would be along the lines of the following:

1. The Keeyask Project, in combination with other existing and future hydroelectric projects, will destroy and/or degrade additional large rapids habitat in a river system that has few such habitat types remaining. This is important for species such as sturgeon that are struggling with recovery from over fishing, as well as habitat destruction and degradation due to hydroelectric development.

Substantial mitigation measures have been proposed to address these cumulative effects. The mitigation measures proposed:

a) are experimental in nature;
b) have not been proven to be effective in other reaches of the river where similar habitats have already been destroyed; and
c) will require a very long-term and significant commitment of resources to achieve any success of replacing the ecosystem values disrupted by additional hydroelectric development.

Habitat creation programs will attempt to ensure that habitat for all life history stages will be present in future. However, there remains the potential for a net loss of functional habitat.

Stocking may prevent a further decline in numbers if it is more successful that has been the case to date in other reaches of the Nelson River. There is insufficient evidence to suggest that the genetic makeup of the remaining populations will not be substantially altered given the acknowledged challenges with collecting adequate breeding stock. It is unclear whether the existing populations will be capable of becoming self-sustaining in future under the further altered hydrological regime. Continual stocking and other measures may be necessary to maintain sturgeon populations in future in the reaches of the river affected by reservoir development.

Manitoba Hydro and the Cree Partners are committed to a long-term effort to reduce the magnitude of the serious cumulative effects of hydroelectric development on sturgeon in this river system to the extent possible at this time.

2. Additional riparian wetland habitats will be lost along tributaries and will be lost and/or further degraded along the Nelson River main stem. The Nelson River main stem habitats have already been substantially altered by existing upstream river regulation in ways that are not well-understood due to a lack of prior research.

The EIS argues essentially that the riparian wetlands along the reaches of the Nelson River that will be converted to reservoir are already so degraded from existing hydroelectric development that they have little ecological value now. The additional loss of higher quality "off-system" marshes is considered insignificant since they are "very small in extent, are not regionally significant, and can be replaced".

It is proposed that new wetland habitats will be created if deemed necessary after monitoring. Based on experience in other regions, these habitats are unlikely to host the same level of biodiversity present in riparian wetlands of the lower reaches of large river tributaries under natural hydrological regimes. This should be made clear in the conclusions rather than suggesting that creating new wetlands to "replace" those that are lost is a simple endeavour.

3. Acknowledge the complexity of the concept of cumulative effects and analysis in the Keeyask EIS.

The EIS provides a good example of the complexity of understanding scientifically probable cumulative effects on a species.

There are several hypotheses to explain the decline of the Olive-sided Flycatcher throughout its North American range. These include habitat loss in wintering grounds, changes in forest structure, urbanization, and loss of wetlands and associated edge habitats. The EIS states that "data to support these hypotheses are limited enough to make reasons for flycatcher declines inconclusive" (Chapter 6, p.6-115). This is certainly the case for most instances of cumulative effects. If we approach the analysis only with the idea of finding the 'straw that broke the camel's back', we will likely never be able to attribute the problem to any particular straw.

The Keeyask Project is unlikely to be the particular straw that causes the regional extirpation of any boreal species. Boreal species are almost all wide-ranging and resilient. However the Keeyask project along with many other developments that create landscape level disturbances can and will contribute to cumulative degradation of natural environments in the region.

The boreal woodland caribou are thought to be threatened by a combination of human settlement and land clearing, forest harvesting, landscape fragmentation, disease and predation. Industrial development in general is cited as one of the primary contributors the decline all caribou populations across Canada.[1] However, no one factor is thought to be entirely responsible for caribou population decline[2]. The fact is that we do not have sufficient data for all of these variables. Nor do we understand the effect of synergies between them.

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[1] Festa-Bianchet, M, Ray, J.C., Boutin, S., Côté, S.D and A. Gunn. 2011. Conservation of caribou (*Rangifer tarandus*) in Canada: an uncertain future. *Canadian Journal of Zoology*, 2011, 89:419-434. http://www.nrcresearchpress.com/doi/pdf/10.1139/z11-025

[2] International Boreal Conservation Science Panel. 2011. Keeping woodland caribou in the boreal forest: Big challenge, immense opportunity. http://www.borealcanada.ca/pr/documents/2011-07-11IBCSPCaribouScienceandPolicyBrief_FINAL.pdf

We cannot predict the effect of stochastic events. For example, a very small, remnant population of mountain caribou were recently extirpated in Banff National by a single avalanche. Disease or drought or large fire events can have widespread consequences for much larger populations. This is one reason why boreal species such as caribou require very large territories. There are many threats to these animals. Large, intact territories provide resilience in the face of predation and over grazing, and stochastic events.

Although it is virtually impossible to quantify, the addition of stressors increases the overall risk to declining populations. This additional risk can be lessoned with mitigation measures, but it cannot be eliminated in this case. This should be more clearly acknowledged in the summary of the cumulative effects analysis for the Keeyask EIS.

Executive Summary Section 9. Conclusion

It is understood that EIS documents are prepared to meet regulatory requirements and that the ultimate goal is to gain regulatory approval to proceed with the proposal. However, regulatory approval clearly does not depend upon a project being perfect in all ways. Given the considerable effort invested in preparing these EIS documents, they should reflect the objective science, economic and social complexities and sincere opinions of those who contributed to this effort. As mentioned, there is much well thought out material in the body of the EIS. The conclusions should present as realistic a portrait as possible of the challenges to be faced and the limitations of our collective knowledge, and not serve primarily as a public relations exercise.

The Summary states that:

> *The Project will cause numerous and widespread environmental and social effects, some of which would have had* [emphasis added] *the potential to be significant. However, using past experience, Aboriginal traditional knowledge and leading scientific and engineering techniques, the Partnership has mitigated, remediated and/or compensated for these effects, such that the Partnership is confident the Project should proceed.* (Executive Summary p.43).

This conclusion is not appropriate. It is overly confident as a whole, whereas there is much more uncertainty expressed in the body of the EIS. The proponents offer plans for mitigation, however several of these are not described in any detail, and are not guaranteed to be successful.

The work put into mitigation of adverse effects for this proposal will certainly reduce negative effects below that which were experienced in previous projects in which very limited environmental mitigation was attempted. However, to continue to characterize large-scale hydroelectric projects as "clean, renewable energy" continues to propagate the myth that such projects are generally speaking, environmentally benign.

The conclusions claim that the Project will produce "substantial environmental benefits". Even if it the Project does in fact reduce greenhouse gas emissions by offsetting coal and oil consumption, there are numerous negative, long-term effects on habitats and species that cannot be fully mitigated.

Chapter 6.2 Existing Environment

6.2.3.2.6 Surface Water and Ice Regimes

Additional Information Request

More information is needed in the Keeyask EIS about the Stephens Lake reservoir. This includes:

a. A seasonal hydrograph and yearly variations since reservoir development.

b. More detailed information about the quality of shoreline vegetation communities that have developed; including vegetation survey data such as species richness, and structure of vegetation communities in the riparian zones.

c. The Stephens Lake reservoir is used as a comparison with the proposed Keeyask reservoir in terms of factors such as the development of new riparian habitats in future. This reservoir fluctuates within a 3m range, whereas the Keeyask reservoir would fluctuate within a 1m range and according to a peaking operation pattern. Please explain the differences in these reservoirs and how these physical factors would be expected to influence future habitat development.

If it is too late in the process to ask for additional information, it can be safely predicted that due to the planned operating regime, any new riparian habitat development in future along the shorelines of the Keeyask reservoir would be less extensive and less diverse than what the Stephens Lake reservoir is capable of.

6.4 Effects and Mitigation Aquatic Environment

p. 6-238 Reservoir Comparisons

This section describes approaches used in the technical assessment. It mentions that magnitude and spatial and temporal extent of effects were determined through several methods, one of which is comparing data from other reservoirs. It mentions the "lower Churchill River reservoir in Newfoundland and Labrador".

There are no reservoirs on the lower Churchill River in Labrador. In the Churchill River system there are the Smallwood and Ossokmanuan reservoirs and two forebays associated with the Churchill Falls project in the upper reaches of the basin. These reservoirs all have widely differing characteristics. The lower Churchill projects are not yet developed. What data were used in this assessment?

6.4.2 Aboriginal Traditional Knowledge

The EIS lists a number of observations and predictions by the KCNs regarding the aquatic environment. It states that these conclusions differ in several aspects from the scientific conclusions, and that this will be dealt with through monitoring. Although information is scattered throughout the EIS document, more direct discussion on the points of difference would be useful in each section. There is little indication that KCN perspectives entered into the conclusions presented in the assessment.

6.4.6.2 Changes in Habitat – Sturgeon

"...given that in the existing environment lake sturgeon densities are highest in a few locations in Gull Lake despite the widespread presence of suitable habitat, not all the post-Project habitat will be highly preferred" (p.6-279). This observation should be included in the conclusions regarding the residual effects on lake sturgeon.

It is reported that the reasons for low population numbers in Stephens reservoir are not known but are attributed to the combined effects of emigration of adults at impoundment, habitat changes (reduction in YOY habitat) and prior over harvest (p.6-279).

Question: Has any experimental habitat enhancement been done in Stephens reservoir?

7.0 Cumulative Effects Assessment

Lake Sturgeon

Pimicikamak is extremely concerned about the long-term decline in Lake Sturgeon populations throughout the Nelson River and northern Manitoba. Although over harvesting is an important factor in historical declines, hydroelectric development has clearly had a significant adverse effect on sturgeon habitat and the potential for recovery and sustainability of native populations. More dams will only add to the incremental loss of natural sturgeon habitat.

Given the importance of this issue, it would seem reasonable for a cumulative effects assessment focused on sturgeon to clearly document in more detail what is known about the changes that have occurred throughout the river system, the current status of all populations, and the factors that limit population recovery.

The issue of fragmentation of the river system for fish populations is not given sufficient attention. The EIS states that FLCN members have observed that critical habitat was lost with each new dam construction and that fish were not able to move as freely in the river environment as they could prior to hydroelectric development. Fish passage described in the EIS consists of downstream access through turbines and the spillway which can be problematic for adult fish. Fish passage upstream consists of a trap/catch and transport program. This is not conducive to self-sustaining populations over the long-term. Along with stocking, Pimicikamak has serious concerns about the long-term financial, corporate and regulatory commitment to such artificial measures to sustain populations.

Lake Sturgeon Habitat Loss

With regards to the potential loss of sturgeon spawning habitat at Birthday Rapids, the EIS states that "... suitable habitat will be enhanced to make it attract spawning fish". For YOY sturgeon, if suitable habitat does not exist in the new reservoir, "suitable habitat will be created" (p.46 Executive Summary). The EIS concludes that: "During the operation period, no adverse long-term effects to lake sturgeon numbers in the area directly affected by the Project are expected due to mitigation measures that provide habitat for all life history stages both above and below the generating station, and an extensive stocking program" (p. 46 Executive Summary).

However in Supporting Volume, Appendix 1A, Section 1A.3.1.6, a mitigation recommendation with regards to Birthday Rapids states that: "if spawning no longer occurs there, or rates are significantly reduced, spawning habitat enhancement measures will be implemented to provide new spawning habitat if practicable and feasible." (p. 1A-11) This section refers to the stocking strategy as necessary to mitigate "the temporary reduction or elimination of spawning at Birthday Rapids." (p. 1A-11)

it is promised that these habitat enhancement and creation measures will be implemented within an adaptive management context and we must assume that best efforts will be made to realise the success of these measures. However the measures are experimental for these particular areas and success is not guaranteed. Therefore, it should not be asserted with such certainty in the EIS that habitat for all life history stages will be replaced and used in the future. There could still be a net loss of habitat. it is likely that there will be a net loss of healthy habitat. There is no acknowledgement of the risk of failure of mitigation even though many barriers to success are well known.

Lake Sturgeon Stocking Program

The conclusions of the EIS reveal very little about the uncertainties related to stocking to address the disruption of sturgeon spawning and possible loss of long-term habitat quality. One hopes that this program will be effective if this is the only way to recover populations in the Nelson River in the face of the certainty of further habitat loss and fragmentation with more dams. However much remains to be learned and there is no guarantee that this mitigation strategy will meet the desired objectives.

In the conclusions the EIS states: "*Lake Sturgeon are receiving special attention. A new program will stock fry, fingerlings and yearlings in the area directly affected by the Project, as well as in the broader region, while the project is being constructed and for an extended period after it goes into operation. Stocking is a proven method for increasing lake sturgeon numbers and has been an important feature of many recovery programs.*" (Executive Summary p. 25)

The draft Keeyask Lake Sturgeon Stocking Strategy (Aquatic Environmental Supporting Volume, Appendix 1A Part 2) clearly identifies a number of the issues to be addressed and steps that would need to be taken to develop an effective approach to stocking. The stated goal of the stocking strategy is to develop self-sustaining populations. This is a goal that would be supported by anyone. However the strategy is still in the early stages of development. Stocking for conservation purposes may be deemed necessary however there is the potential for negative effects on wild populations and it may not be as effective as hoped if future habitat conditions are not adequate (Smith 2009).

What the draft "Keeyask Sturgeon Stocking Strategy" document tells us is that there is very limited understanding of how successful any stocking program might be in the Keeyask region given the limited evidence of clear success in programs that have been implemented over the years in other areas including some in upper reaches of the Nelson River. The draft strategy explains the many difficulties of finding a suitable source population and collecting adequate spawn in this river system.

Recovery of self-sustaining populations of Lake Sturgeon in the Nelson River over the long-term may require many other measures such as alterations in flow regimes at existing dams and effective fish passage at existing dams. Additional loss of spawning habitat at Gull rapids and possibly Birthday rapids,

and degradation of YOY habitat are serious adverse effects. Creation of new habitat may be problematic due to such factors as high spawning site fidelity (DFO 2010).

Recommendation:

The risks and uncertaintles of stocking as mitigation for deliberate habitat loss and disruption of remnant Lake sturgeon populations in the Keeyask region should be communicated more clearly in the conclusions of the EIS. The potential effectiveness of stocking and habitat enhancement or recreation in this area is unknown must be considered experimental at this time.

Additional Information Request:

1. The draft Keeyask Lake Sturgeon Stocking Strategy suggests that a trial stocking program be implemented in spring of 2012 given the impending start of construction. Was this trial begun and if so is there any available information about it?

2. Can the Proponents provide more information about the success of the stocking programs in the upper Nelson River and the functioning of the Nelson River Sturgeon Co-Management Board?

Sustainable Development

Pimicikamak has concerns related to the claim in the Keeyask EIS that there will be a "net environmental benefit" from the Keeyask project. The EIS states that the project will result in a net environmental benefit due to the fact that hydroelectricity produces significantly less greenhouse gas emissions than coal or natural gas fired generation plants per unit energy produced. However in considering the environmental benefits of the project as a whole, some questions around this topic are:

1. is it not possible that the additional hydroelectricity produced will contribute at least in part to overall increased energy consumption in the region as opposed to directly displacing current and future coal and natural gas production and combustion equal to the energy production of Keeyask?

Specifically, what is the evidence that future generation facilities that burn fossil fuels in the US Midwest will in fact be avoided equal to the production of Keeyask? Although the hydroelectric option does result in fewer greenhouse gas emissions, there are many economic and political factors that influence energy markets.

2. While the GHG emissions per unit energy produced at a boreal facility like Keeyask are no doubt lower than fossil fuel powered generating stations there are some questions about the calculations used for comparison. In the life cycle analysis, was the planning phase factored into the total calculation including all travel and other energy consumption related to engineering, economic, environmental, social and cultural studies and planning? it appears that the analysis begins with construction? Has there been a thorough cost-accounting of all of the economic activity associated with the Keeyask project?

Final Guidelines Section 9.6 Effects of Potential Accidents and Malfunctions
EIS Section 4.7.8 Safety, Security and Emergency Response

This section of the EIS provides very little information about the types of accidents and malfunctions that may occur with this project. The section discusses a basic outline of measures to address protection of public safety, the general nature of an emergency response plan in the event of a dam failure that will be developed, and the basic approach to wastewater treatment. It does not give the reader any idea of the range of accidents, small and large, that may occur during the construction and operation of the facility, or their potential consequences or environmental effects.

Additional Information Request: More information is required to answer the questions posed in the Guidelines regarding accidents and malfunctions.

All large industrial projects carry with them an increased risk of adverse environmental effects due to potential accidents and malfunctions for the life of the project. Despite the implementation of best practices, accidental releases of fuel or other contaminants in the river or on land are real possibilities that could create adverse residual effects. This is an important issue to acknowledge in an environmental assessment.

Recommendation: The reality of possible accidents and malfunctions contributing to unforeseen residual effects should be clearly reflected in the Executive Summary. This is a fact of the future project scenario as opposed to a no project option and should be acknowledged in the EIS.

EIS Chapter 7 Cumulative Effects and Appendix 7A

Final Guidelines Section 9.8 Cumulative Effects

The scope of the cumulative effects study remains a concern. Pimicikamak would like to see a more thorough accounting of environmental impacts throughout the Nelson River watershed from the existing and future hydroelectric developments and how these affect the valued ecosystem components identified.

For example, it is recognised that riparian marshes and the quality of riparian wetlands in general have already been severely degraded in the reaches of the river that would be flooded by the Keeyask project. The vegetation communities in boreal riparian wetlands along larger rivers are known to typically host higher species richness than similar habitats of smaller rivers in the same region (Nilsson et al. 2005). How have riparian vegetation communities been altered in other reaches of the Nelson River due to hydroelectric development? What will be left? We do not achieve any understanding of these questions in the cumulative effects assessment.

Regional approaches to cumulative effects assessment are being developed for river systems in which series of dams and reservoirs have been constructed. As an example, a study was conducted for the Columbia River Basin in BC undertaken by the Columbia Basin Fish and Wildlife Compensation Program (FWCP) to initiate a process of developing ecological objectives for that watershed. The study was undertaken between 2005 and 2010 to update an understanding of the direct "footprint" impacts of hydroelectric infrastructure and to determine compensation options in support of on-going strategic planning. The first step is to investigate changes in ecosystem productivity that have already occurred due to industrial activity.

A draft of the Columbia Basin Plan and related action plans were released in June 2012 and are available here:
http://www.bchydro.com/about/sustainability/environmental_responsibility/compensation_programs/about_fwcp/columbia_region.html

Pimicikamak would like to see this process begin in the Nelson and Churchill River systems. However, the EIS for the Keeyask Generation project does not demonstrate a strong willingness to squarely address cumulative effects even on a more geographically restricted level.

Summary of Cumulative Effects of the Project with Past and Current Projects/Activities
EIS Section 7.5.2.2, P. 7-28

There is much information in the EIS that provides information about the likely range of effects of these developments on caribou. However, we have concerns with the way conclusions are reached. For example, the assessment splits up the discussion of cumulative effects of past and current projects and activities from future projects, and ultimately minimizes the overall long-term effects of the entire infrastructure in the discussion.

On p 7-28 it states that it is predicted that there will be "a slight reduction in total linear feature density (positive effect) due to existing cutlines being replaced by Project features". This may be the case, and total linear feature length may be one measure of intactness. However, the environmental effects depend on what these lengths of cutline are being replaced with. If a cutline is replaced by a transmission line, or a road, or a construction camp, even if the total length is reduced to some extent, the impact may be greater. Furthermore, the cumulative increase in total linear density of the Project in addition to all of the associated interdependent projects (access roads, transmission lines) certainly represents an overall reduction in the intactness of the terrestrial ecosystem.

Responses to Requests for Additional Information from TAC and Public Reviewers, Round 1

Reference: Volume: Response to EIS Guidelines; Section: 7.0
Cumulative Effects Assessment; p.7-30

Response to EIS Guidelines; Section: 7.0
Cumulative Effects Assessment
Re: CEAA-0004

A question from the CEAA about cumulative effects and linear feature development asks for clarification about apparent contradictory statements in the Keeyask Generation Project EIS.

The question is more generally addressing whether the density of linear human built features (known to have negative ecological effects) will increase due to the "Project" and how this is explained in the EIS. The "Project" in this case is the Keeyask Generation station, not the Keeyask Infrastructure Project, nor the Keeyask Transmission Project, nor the Bipole III Transmission Project. Clearly all of these projects are dependent upon one another.

The response clarified that linear feature density is expected to increase in the region, but that this is due to other projects including Bipole III and the Keeyask Transmission Project, not the "the Project" that is being assessed in this EIS. The Keeyask Generation Project will actually reduce linear feature density according to the EIS. This is given as a positive effect of the Project.

The effort put into sorting out these statements begins to be ridiculous. The fact is that this suite of interrelated developments will add again to what has been a dramatic increase over the course of a few decades in the density of linear built features in this region. This will most certainly have a cumulative negative effect on species such as caribou.

This is what regulators and people with concerns about caribou, for example, should be focusing on. Given our current level of knowledge of the ecological effects of linear features, it is next to impossible to determine the ecological significance that each incremental addition of linear infrastructure will have over the long-term. These projects are interdependent, physically and economically from the point of view of corporate decision making. Even if they are assessed separately, when discussing cumulative effects the overall conclusions should be stated plainly.

REFERENCE: Volume: Aquatic Environment Supporting Volume; Section: 6.3.1 Pre-1997 Conditions; p.6-8

DFO-0019

The EIS focuses more on historical over-harvesting as the cause of sturgeon decline and lack of recovery than on habitat change as an influence. Data do suggest that over harvesting was certainly a cause for concern. However, there is widespread concern about the long-term population health of species such as sturgeon in regulated and fragmented river systems.

DFO asked the proponent for a more fulsome discussion of aquatic ecosystem change in the lower Nelson River. It would be helpful to put the limited scientific data informing lake sturgeon population changes into the context of major river habitat changes related to past hydroelectric development in addition to over harvesting.

The response provided more detail about the studies that have been done post-Kelsey GS on populations and commented on historical harvesting information. It directs the reader to the EIS documents prepared by the Cree Nation Partners for a "more fulsome discussion of aquatic habitat change". In those documents, the Cree Nation Partners consistently point to dam development as a major cause of sturgeon decline. For example, the Fox Lake Cree Nation Environmental Evaluation Report states: "As each dam was built, essential habitats, such as spawning grounds located at rapids were destroyed and degraded, and fish could no longer move freely within their natural habitat." (p.39)

A gap remains between the conclusions of the EIS and the body of material presented within it. The experience of the Cree Nation Partners is not well integrated with the limited science. Habitat change due to all past hydroelectric development in the river basin could be described in much more depth, using mapping techniques and the general knowledge of the characteristics of the infrastructure, operations and river morphology.

Keeyask Transmission Project EA Report

The EIS for the Keeyask Transmission Project concludes that there are no individual or cumulative effects that have any regulatory significance. The Executive Summary does not reflect the material presented in the body of the EIS and associated reports such as the Tataskweyak Cree Nation Report. That report suggests that the effects of this new transmission line in addition to the other hydroelectric infrastructure and ongoing activity are highly significant to many of their community members.

Recognizing that the majority of people will likely be reading only summaries, it would be useful for the Executive Summary to provide a broader picture of how various people view this project. Manitoba Hydro has made much of the idea that they are partnering with the Cree, that they are incorporating Traditional Ecological Knowledge into the assessment, and that they are respecting the Cree world view.

This could be better reflected in the Keeyask Transmission Project executive summary by stating some of the concerns as outlined in the Cree assessments, whether or not it has regulatory significance.

References

Department of Fisheries and Oceans. Canada. 2010. Recovery Potential Assessment of Lake Sturgeon: Nelson River Populations (Designatable Unit 3). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/050.

Festa-Bianchet, M, Ray, J.C., Boutin, S., Côté, S.D and A. Gunn. 2011. Conservation of caribou (*Rangifer tarandus*) in Canada: an uncertain future. *Canadian Journal of Zoology*, 2011, 89:419-434. http://www.nrcresearchpress.com/doi/pdf/10.1139/z11-025

International Boreal Conservation Science Panel. 2011. Keeping woodland caribou in the boreal forest: Big challenge, immense opportunity. http://www.borealcanada.ca/pr/documents/2011-07-11IBCSPCaribouScienceandPolicyBrief_FINAL.pdf

Nilsson, C., C.A. Reidy, M.Dynesius and C. Revenga. 2005. Fragmentation and flow regulation of the world's large river systems. *Science* 308:405-408.

Smith A.L. 2009. Lake Sturgeon (*Acipenser fulvescens*) stocking in North America. Fish and Wildlife Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. 17 p + appendices.