

NEED FOR AND ALTERNATIVES TO (NFAT) REVIEW

NFAT review for Manitoba Hydro's proposed preferred development plan for the Keeyask and Conawapa Generating Stations, their associated domestic AC transmission facilities and a new Canada-USA transmission interconnection

EVALUATING MACRO ENVIRONMENTAL IMPACT

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Submitted to the Manitoba Public Utilities Board

On behalf of the Manitoba Métis Federation



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1 INTRODUCTION

1.1 BACKGROUND

The *Manitoba Hydro Act* requires approval from the Lieutenant-Governor in Council for the development of new electricity generating stations, interconnections, and contracts for power exports and imports. In January 2011, the Government of Manitoba notified Manitoba Hydro (Hydro) of its intention to carry out a Needs For and Alternatives To (NFAT) review of Hydro's Preferred Development Plan ("PDP", or "Plan"). In November 2012, the Minister of Innovation, Energy and Mines announced that the Government of Manitoba had requested the Manitoba Public Utilities Board ("PUB" or "Board") to conduct the NFAT.

On August 16, 2013, Manitoba Hydro filed its NFAT documentation with the PUB for approval of its PDP. This Plan includes:

- Development of the Keeyask Project, a 695-megawatt (MW) hydroelectric generation project on the Nelson River with a proposed in-service date (ISD) of 2019;
- Development of the Conawapa Project, a 1,485-MW hydroelectric generation project on the Nelson River with an earliest ISD of 2026;
- Development of the North-South Transmission Project, a proposed 185-MW transmission line with an in-service date coinciding with the Conawapa Project;
- Development of the Manitoba-Minnesota Transmission Upgrade Project, a proposed 750-MW transmission intertie between Manitoba, Minnesota and Wisconsin with an in-service date of 2020;
- Development of natural gas generation facilities later in the planning period; and
- Six long-term export commitments, with Minnesota Power (MP), Wisconsin Public Service (WPS) and Northern States Power (NSP).

Manitoba Hydro notes that while the PDP includes the Conawapa Project, decisions on whether or not to construct Conawapa and its specific timing are not required now. However, activities (and spending) would continue to protect an in-service date for Conawapa as early as 2026, but conditions will be continually monitored to determine if such continued investments are worthwhile and, ultimately, to determine if Conawapa should be constructed and for what ISD.

The PUB is to submit a report to the Minister responsible for the administration of *The Public Utilities Board Act* by June 20, 2014. The report is to include recommendations to the Government of Manitoba on the need for the PDP and whether the Plan is in the best long-term interest of the Province compared to other options and alternatives.

1.2 QUALIFICATIONS

Rick Hendriks is Director of Camerado Energy Consulting, an Ontario-based consulting firm providing management consulting, strategic planning, research, and negotiation services to Aboriginal communities, community energy cooperatives, municipalities and non-governmental organizations with respect to energy planning, assessment, development and conservation. Mr. Hendriks' work with Aboriginal communities has focused on the environmental assessment of proposed hydroelectric, transmission and mining developments on or adjacent to some of the largest rivers in Canada, including the Mishta-shipu (Churchill) River in Nitassinan (Labrador), the Attawapiskat River in Treaty 9 (northern Ontario), the Slave River in Treaty 8 (Alberta and the Northwest Territories), and the Peace River in Treaty 8 (BC) in the traditional territory of the Dane-zaa.

Mr. Hendriks works closely and collaboratively with community and organizational leadership to envision, implement and achieve strategic objectives. Trained in engineering, science and social science, he brings an analytical, structured and comprehensive approach to understanding and explaining the opportunities and risks of development proposals.

Rick has provided testimony in several proceedings evaluating the environmental and socio-economic risks and benefits of hydroelectric development in Alberta, British Columbia, and Newfoundland and Labrador. At the recent environmental assessment hearings for BC Hydro's proposed Site C Clean Energy Project on the Peace River, he prepared written submissions and provided oral testimony concerning: the socio-economic benefits of wind resources; effectiveness of mitigation measures related to fish, fish habitat and fishing; and the development of site alternatives to the proposed Site C Project as a means to provide for potential reconciliation of the rights of the Crown with the rights of the affected First Nations.

Prior to founding Camerado Energy in 2009, Rick worked for six years with Chignecto Consulting Group, supporting natural resource negotiations between Aboriginal groups, government and industry with respect to mining and hydroelectric developments across Canada. Previous to that, Rick worked for the Innu Nation in Labrador as their environmental and engineering analyst for the proposed Lower Churchill Project.

Mr. Hendriks is a founding member of the Hamilton Association for Renewable Energy, and a member of the Ontario Waterpower Association, the Ontario Sustainable Energy Association and the Ontario Association for Impact Assessment.

1.3 MANDATE

The Terms of Reference for the NFAT Review of Manitoba Hydro's PDP require "an assessment as to whether the Plan is justified as superior to potential alternatives that could fulfill the need."¹ This assessment requires consideration of "the macro environmental impact of the Plan compared to alternatives",² which involves "a critical analysis of the macro environmental impacts and benefits of Manitoba Hydro's Preferred Development Plan (PDP) and alternative Plans."³

I was requested by the Manitoba Métis Federation (MMF) to review the available evidence concerning the macro environmental impact of the PDP and the alternative Plans, paying particular attention to the requirements of the definition of macro environmental impact provided by the PUB. Secondly, I was asked to comment on the determination of the macro environmental impact of the hydroelectric resources used in the various development plans, and to identify additional relevant information that would assist the Board in fulfilling its mandate.

¹ Terms of Reference – Needs For and Alternatives To (NFAT) Review, at p.2.

² Ibid., at p.3.

³ Manitoba PUB, Order 92/13, at p. 13.

2 MACRO ENVIRONMENTAL IMPACT

2.1 REQUIREMENTS OF THE TERMS OF REFERENCE

The Terms of Reference for the NFAT Review detail the scope of the review to be undertaken by the PUB, and include:

An assessment as to whether the Plan is justified as superior to potential alternatives that could fulfill the need. The assessment will take the following factors into consideration:

- i. The macro environmental impact of the Plan compared to alternatives;⁴

2.2 SCOPING THE DEFINITION OF MACRO ENVIRONMENTAL IMPACT

Prior to providing clarification with respect to interpretation of “macro environmental”, the PUB, in Order 67-13, required Manitoba Hydro and any approved intervener intending to address this factor to submit a definition of this term. The PUB received several responses to its request, and I reviewed these responses in preparing this evidence in order to better understand the intentions and expectations of the Board when defining this factor, as well as the positions of other NFAT participants.

Manitoba Hydro

In its response to the PUB request, Manitoba Hydro provided a definition of macro environmental impact as follows:

Macro environmental: high level summary of environmental impacts and benefits sufficient to compare resources (not detailed evaluations such as in EIS)⁵

Hydro’s primary preoccupation in submitting this definition was to avoid any duplication of effort with the environmental assessment process being carried out by the Clean Environment Commission (CEC) in relation to the proposed Keeyask Project, one component of Hydro’s PDP. Hydro noted that the recommendations and the final report of the CEC process would be available to the PUB prior to the PUB issuing its recommendations regarding the NFAT.

In my view, that duplication can be avoided by timely provision to the PUB of the recommendations of the CEC with respect to the Keeyask Project, including any findings with

⁴ Terms of Reference – Needs For and Alternatives To (NFAT) Review, at pp.2-3.

⁵ Letter of Manitoba Hydro to Mr. H. Singh (PUB) of June 28, 2013 re: Manitoba Hydro NFAT Terms of Reference Meaning of “Macro Environmental” and “Socio-economic”, at p. 1.

respect to the significance of the environmental effects. The provision of this information, though necessary, is not sufficient for the PUB to make its determinations respecting the macro environmental impact of the Plan and the alternatives that include the proposed Keeyask Project, for reasons discussed further below.

In its response to the PUB request, Hydro also described the three-step process it used in its consideration of macro environmental impact:

1. Screening level analysis

- Sixteen available resource technologies were screened against over fifteen technical, economic, environmental and socio-economic criteria

The screening process undertaken by Hydro is described in Chapter 7 of the NFAT. Detailed information is summarized in Table 7.1, and further information concerning emerging energy technologies is provided in Appendix 7-1. The relevant findings in the NFAT concerning the macro environmental impact of hydroelectric resources are discussed below in section 3 of this submission.

2. Preferred and alternative development plans

- Specific resource plans were developed from the “screened in” technologies
- A qualitative analysis of the potential environmental and socio-economic impacts of the specific resources in the preferred and alternative plans was undertaken
- For the Keeyask, Conawapa and Manitoba-Minnesota Transmission Projects, Hydro drew on its existing understanding of these components of the PDP
- For natural gas turbine and wind projects, Hydro drew from past environmental impact statements and licenses (underlining added)

The proposal to use a qualitative approach to analyzing the environmental impacts is generally appropriate. However, where quantitative information is available (e.g. in the case of greenhouse gas emissions), it should be used to support the understanding of the significance of the effects and the comparison between alternative plans and the PDP. A decision not to provide quantitative information that could be reasonably prepared is not a valid reason for resorting to a qualitative approach.

As indicated above, there are limitations to relying solely on the Keeyask environmental impact statement and existing preliminary understandings of the other PDP components, which have yet to be constructed. In my view, it is also important to consider available information concerning the known effects of similar projects developed on the same river or on rivers in similar environments, and some examples of this kind of information are discussed and

analyzed further in section 4 below. The Keeyask and Conawapa projects are not the first hydroelectric facilities constructed on the Nelson River, the Nelson River is not the only river to be developed with multiple hydroelectric facilities, and northern Manitoba is not the only region to be extensively developed for hydroelectric purposes.

Manitoba Hydro's suggested use of previous environmental impact statements, licenses and other related existing information for other similar projects is important and necessary in the case of wind and natural gas resources as well hydro resources, since no detailed environmental assessments have yet been undertaken for specific wind and gas resources that would be developed as part of any alternative plans to the PDP.

3. Multiple Account Cost-Benefit Analysis (MA-CBA)

- The MA-CBA is a disaggregated form of cost-benefit analysis that integrates project specific environmental and socio-economic considerations along with other factors. It was used to assess the full range of economic, environmental and social advantages and disadvantages of the different plans to Manitobans
- The overall socio-economic benefit of the preferred and alternative plans was assessed by examining the advantages and disadvantages in terms of seven accounts of which "environment" is one
- The environment account "assesses the consequences of the different plans for the environment. It analyzes impacts on GHG emissions in Manitoba and elsewhere, criteria air contaminant (CAC) emissions in Manitoba, and natural resource and other bio-physical effects associated with the construction and operation of the projects in the different plans, and assesses the externality (net social cost) they represent. For GHGs this is done quantitatively; for other impacts it is done qualitatively."⁶

The MA-CBA compared the PDP to three plans as follows:

- Plan 1 – Gas Thermal with No New Interconnection (All Gas)
- Plan 2 – Keeyask with No New Interconnection (K22/Gas)
- Plan 4 – The Smaller Interconnection Alternative (K19/Gas24/250MW)

Specific limitations to the MA-CBA respecting the consideration of hydroelectric resources are discussed below in section 3. I note also that the MA-CBA did not compare the PDP to any of

⁶ Letter of Manitoba Hydro to Mr. H. Singh (PUB) of June 28, 2013, at p. 4.

the alternative plans containing wind resources. This issue is addressed more fully in my submission to the PUB pertaining to the macro environmental and socio-economic considerations of wind resources.

Consumers Association of Canada

In addition to Manitoba Hydro, the Consumers Association of Canada (CAC) also submitted its understanding of macro environmental impact to the PUB. The CAC made several observations that appear to have informed the PUB's determination of the definition of macro environmental impact, including a six-part definition of which the final three parts were as follows:

4. The macro level environmental effects findings presented to and discussed in the PUB process should be based on detailed existing analyses and the level of confidence about the conclusions ought to be clearly established. (p.2) (underlining added)

The request by the CAC for consideration of detailed existing analyses echoes the approach proposed by Hydro with respect to reliance on previous environmental impact statements and licenses.

5. The macro level environmental effects covered should include potential and likely effects, positive and adverse effects, individual and cumulative effects, and interactions among effects. (p.2-3) (underlining added)

This speaks to the need to address and consider a broad set of changes to environmental conditions.

6. The macro environmental effects discussion should consider not only the effects listed above but also the implications for the relative merits and the Plan components in light of the relative significance of the effects and the trade-offs involved in proceeding with the major Plan components and alternatives. (p.3) (underlining added)

The reference to "significance" is important given the task in front of the PUB. Not all changes are material for either the biophysical or socio-economic environments. Ecosystems have a degree of resiliency and human communities a degree of adaptability, and it is therefore important to focus on those effects that may threaten that resilience or capacity to adapt. Secondly, the "relative" significance is also material since the consequences of the changes to environmental conditions resulting from the PDP must be compared to the potential alternatives that could fulfill the need.

Manitoba Métis Federation

In its response to the PUB request, the MMF requested that I provide a definition of macro environmental impact, which was submitted to the PUB as follows:

macro environmental impact means: the collective adverse changes to the air, land, water, flora and fauna, including the potential significance of these changes, their equitable distribution within and between present and future generations, and their implications for ecological processes, biodiversity and life support systems of the environment.⁷

In preparing this definition, I relied on the requirement of the NFAT Terms of Reference to assess the “alignment of the Plan and alternatives to ... the Principles of Sustainable Development as outlined in the *Sustainable Development Act*”, which involve:

- management for equitable benefit within and between generations (Principle 2 – Stewardship, and Principle 3 – Shared Responsibility and Understanding);
- significant adverse environmental effects (Principle 4 – Prevention), where significance typically refers to effects that are not only large in “scale, scope or capability” but that are also, for example, of long duration or irreversible; and
- the need to maintain ecological processes, biodiversity and life support systems of the environment (Principle 5 – Conservation and Enhancement), which suggests the need for consideration of the impact of the plan and its alternatives in the context in which they would occur, suggesting the need for consideration of cumulative environmental changes.

Finally, I cautioned against the use of a “summary”, which implies a summation of the environmental changes. In general, this is not possible since the kinds of environmental changes will be different between the PDP and the alternatives and cannot simply be “summed” for the PDP and the alternatives and the end results readily compared. This was the basis for proposing the term “collective” in the definition, which was accepted by the PUB, and which implies a bringing together of the consequences of the environmental changes where their characteristics are maintained and distinguishable.

⁷ Letter of MMF to PUB Order 67/13, dated July 2, 2013, at p.1 of attached memo “Meaning of Macro Environmental Impact”.

2.3 APPLYING THE DEFINITION OF MACRO ENVIRONMENTAL IMPACT

In Order 92-13, the PUB provided the following definition of macro environmental impact for use by participants in the NFAT:

macro-environmental impact: the collective macro-environmental consequences of changes to air, land, water, flora and fauna, including the potential significance of these changes, their equitable distribution within and between present and future generations.⁸

Based on the contributions of Manitoba Hydro and the CAC, the explanations provided previously on behalf of the MMF, and the definition itself, I understand the definition to imply the following with respect to these key terms:

- Collective: a bringing together of the consequences resulting from all components of the PDP or of the alternative plans that maintains their defining features
- Consequences: includes potential and likely, positive and adverse, direct and indirect, individual and cumulative, secondary and synergistic, where likelihood is determined by:
 - Probability of occurrence
 - Scientific uncertainty⁹
- Significance: consideration of the following criteria in relation to the “consequences of the changes”:
 - Magnitude
 - Geographic extent
 - Duration and frequency
 - Degree to which the consequences of the changes are reversible or irreversible
 - Ecological context¹⁰

I am proposing use of the above understanding of significance provided by the Canadian Environmental Assessment Agency (formerly FEARO) since:

- It is in wide use across Canada, thereby supporting comparisons and use of findings across different jurisdictions; and

⁸ Manitoba PUB, Order 92/13, at p. 14.

⁹ Federal Environmental Assessment Review Office. November 1994. A Reference Guide for the Canadian Environmental Assessment Act: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects, at p. 193

¹⁰ Ibid., at p. 192.

- It has been in use for nearly two decades, allowing comparisons and use of findings over time.

Manitoba Hydro has indicated¹¹ that defining and determining “significance” is a task exclusively of the environmental reviews carried out by the CEC and to use the accepted understanding of this term leads to duplication. This is only the case to the extent that the PUB repeats the actions of the CEC. This is not what I am proposing, as the recommendations and conclusions of the CEC will serve as an input into the PUB process, not a replacement for that process.

The challenge facing the PUB is that it needs to be able to compare the macro environmental impact of the resources composing the PDP to those composing the alternative plans. Other than for Keeyask, we do not have access to environmental assessment findings for the resources being considered in the PDP and the alternative plans. Having multiple definitions and uses of the term “significance” does not allow for a consistent understanding, consideration and comparison of the “consequences of changes”. The use of the accepted definition of significance does not preclude the use of professional judgment, particularly in highlighting the uncertainties in the findings of significance from the environmental assessment conducted for the Keeyask Project, and also in evaluating information from comparative situations where resources similar to those proposed have undergone environmental assessment or similar reviews elsewhere.

¹¹ See MH/MMF I-053a, and MH/MMF II-041.

3 REVIEW OF NFAT INFORMATION

3.1 MANITOBA HYDRO

3.1.1 Environmental Effects

Chapter 2 of the NFAT describes the PDP facilities. With respect to the potential environmental effects, a “high-level summary” of information with respect to proposed mitigation measures, residual effects, and potential cumulative effects is presented for each of the four components of the PDP.

In response to CAC/MH I-231a, Manitoba Hydro provided a more detailed high-level summary of effects to air, land, water, flora and fauna in relation to each of the components of the PDP as well as for natural gas and wind resources.

The materials in the NFAT and the responses to information requests though helpful to obtaining a preliminary understanding of the “consequences of changes to air, land, water, flora and fauna” are not sufficient to allow for “an assessment as to whether the Plan is justified as superior to potential alternatives that could fulfill the need.” Other than a brief restatement of the conclusion to the Keeyask Project EIS given from the Proponent’s perspective, there is limited information concerning the potential significance of the environmental changes, or how these environmental changes are equitably distributed within and between present and future generations.

Hydro also presents and considers the effects individually for each of the components, and not collectively. Some insignificant effects may indeed be significant when considering multiple impacts, multiple project components, or multiple developments interacting cumulatively or synergistically.¹² For example, the CEA Agency noted in its recently released operational policy statement on cumulative effects that a “cumulative environmental effects assessment should consider those VCs [valued components] for which residual environmental effects are predicted

¹² Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling, and D. Stalker. 1999. Cumulative effects assessment practitioners guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency. Hull, Quebec, at p.30.

after consideration of mitigation measures, regardless of whether those residual environmental effects are predicted to be significant”.¹³

I anticipate that some of these shortcomings will be addressed with the submission of the report of the CEC in relation to the environmental assessment of the proposed Keeyask Project. However, the conclusions and recommendations to government provided by the CEC, though necessary to the NFAT, will apply only to a single component of the PDP and only to those plans in Table 9.3 of the NFAT that contain Keeyask as a plan component. The findings of the CEC will not apply at all to those alternative plans that do not contain Keeyask.

3.1.2 Multiple Account Analysis

The MA-CBA, discussed in Chapter 13 of the NFAT, presents the results of the PDP as compared to alternative plans with and without new U.S. interconnection capacity and new export sale commitments; and with and without new hydro generating capacity to meet domestic load growth. As noted by Hydro:

[MA-CBA] uses a set of evaluation accounts to move from a Manitoba Hydro to a broader Manitoba social perspective. The objective is to provide a systematic, comprehensive assessment of all of the benefits and costs to Manitobans in a manner that can assist the NFAT panel address the question of overall socio-economic benefit.¹⁴

The MA-BCA assesses the preferred and alternative plans in terms of a series of evaluation accounts, of which “environment” is one. In describing this environment account, Hydro notes that:

the focus of this account is not the impacts in themselves, but rather the externality they represent – the external net benefit or cost to Manitobans not reflected in the market valuation or other accounts.¹⁵

The challenge with this approach is that the impacts and their residual effects do matter. In fact, Manitoba Hydro acknowledges as much shortly thereafter:

¹³ CEAA (Canadian Environmental Assessment Agency). 2013. Operational Policy Statement, Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012. <http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=1DA9E048-1>

¹⁴ Manitoba Hydro. August 2013. Needs For and Alternatives To (“NFAT”), Chapter 13, at p.2

¹⁵ NFAT, Chapter 13, at p.12

With respect to biophysical effects, the issue is whether there are residual impacts despite the mitigation and compensation built into the projects' plans and costs.¹⁶

It matters whether or not these residual effects pose unacceptable economic or other risks, or that they pose threats to the environment or to human health, or that there are too many significant adverse effects or cumulative effects to justify imposing them on local communities, on future generations or on Manitobans more generally. The CEA Agency highlights one of the limitations to the approach used by Manitoba Hydro in the NFAT:

Although cost-benefit analysis could be used to justify proceeding with a project that is likely to cause significant adverse environmental effects, this justification can take place only after the likelihood of the significant adverse environmental effects has been determined.¹⁷ (underlining added).

In my opinion, this presents a problem for the PUB, as it suggests that the “consequences of the changes to air, land, water, flora and fauna, including the potential significance of these changes” of each component of the PDP and of the alternative plans would need to have undergone an environmental assessment prior to the completion of the NFAT.

That is not going to happen. Even once the CEC produces its report concerning the proposed Keeyask Project, we will only have information concerning the residual changes and their potential significance of, at most, this single component of the PDP, which is a component in only some of the alternative plans. As discussed below in section 4, other means to determine the likelihood of significant adverse environmental changes or effects as well as the “consequences of these changes” need to be used in the absence of information from additional environmental assessments of resources composing the PDP and the alternative plans.

3.2 MNP

As an independent expert consultant, MNP was retained to, among other things:

Perform a critical analysis of the macro environmental impacts and benefits of Manitoba Hydro's Preferred Development Plan and alternative Plans, specifically, the collective macro-economic consequences of changes to air, water, flora and fauna, including the potential significance of these changes,

¹⁶ NFAT, Chapter 13, at p.13

¹⁷ CEAA 2012. Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects. <https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=D213D286-1&offset=3&toc=show>

their equitable distribution within and between present and future generations.¹⁸

Much of MNP's report is dedicated to analysing the preferred and alternative development plans relative to the effects of climate change, GHGs and other air emissions. This information is necessary and the findings confirm the GHG benefits of the PDP versus many of the alternatives.

Sections 1.2 and 1.3 of the MNP report detail the approach taken to address water regime changes, and macro environmental impact, respectively. A small number of valued environmental components (i.e. water regime change, lake sturgeon, caribou and other at-risk fauna) were evaluated for representative purposes using a list of significance criteria as follows:

- Magnitude of the impact
- Risk of occurrence
- Importance of the predicted impact for further MPUB consideration in MNP's opinion.

Section 10 of the MNP report provides a useful summary of the "most significant impacts" of the preferred development plan in relation to the identified valued components. This summary partially addresses the concerns raised about the lack of information concerning the significance of the effects of other components of the PDP.

However, some issues are left outstanding.

First, the list of criteria used by MNP for its determination of significance does not include a criterion of particular relevance to assessing hydroelectric generation projects, namely reversibility. While some components of the PDP, such as the transmission lines, roads or quarries, may be readily decommissioned and the lands eventually returned to a more ecologically productive condition, other components, such as generating stations, dams and reservoirs and their associated effects are effectively permanent. This is evidenced by the fact that proponents typically do not file dam or reservoir decommissioning plans and do not consider decommissioning costs. This is not the case, for example, for wind or natural gas facilities, which can be readily decommissioned. This issue of reversibility also appears to be underappreciated in the analysis of the intergenerational equity of the macro environmental issues in section 9 of the MNP report. For example, once wildlife species habitat is lost to

¹⁸ Scope of Work for MNP NFAT Review Last Updated: September 20, 2013

reservoir inundation, it is lost indefinitely, and species populations will be indefinitely displaced and lowered. There will be fewer animals for predator species and for hunters and trappers. This is an effect that extends to future generations and should be considered effectively irreversible.

Secondly, other than the analysis of greenhouse gas emissions, there is no comparative analysis in the MNP report of the macro environmental impacts and benefits of the PDP and alternative plans with respect to other changes (i.e. land, water, flora and fauna). The analysis determined that the PDP “minimizes the effect of inequitable distribution of macro environmental impacts on future generations as this plan has the lowest overall GHG emissions and air pollutants.”¹⁹ Without knowledge of the macro environmental impacts of the alternative plans with respect to the consequences of other (i.e. non-GHG) changes to the environment, it is not possible to determine whether an alternative plan performs better overall than the PDP.

The primary finding of the evidence presented by MNP illustrates this problem:

the net environmental benefits of Manitoba Hydro’s (MH) preferred plan are found to outweigh its overall environmental costs in a regional and global context.²⁰

Regardless of ones views on whether the PDP has “net environmental benefits”, an additionally important question, and the one that matters most to the Board, is whether or not these net environmental benefits exceed those that could be obtained through pursuing an alternative plan.

3.3 SUMMARY

In summary, my review of the existing information concerning macro environmental impact indicates the following key concerns:

- The conclusions and recommendations to government provided by the CEC, though necessary to the NFAT, will apply only to a single component of the PDP and to those plans in Table 9.3 of the NFAT that contain Keeyask as a plan component. The findings of the CEC will not apply at all to those alternative plans that do not contain Keeyask.

¹⁹ MNP. January 2014. NFAT Review: A Review of Manitoba Hydro’s Macro Environmental Considerations, at p.75.

²⁰ *Ibid.*, at p.1.

- Other means to determine the likelihood of significant adverse environmental changes or effects as well as the “consequences of these changes” need to be used in the absence of information from additional environmental assessments of PDP and alternative plan resources.
- The consideration of the “consequences of changes to air, land, water, flora and fauna” must consider a criterion of particular relevance to assessing hydroelectric generation projects, namely reversibility.
- The “net environmental benefits” of the PDP, if there are net benefits, must be compared to the net environmental benefits of the alternative plans to determine whether these net environmental benefits exceed those that could be obtained through the development of any of the alternative plans.

4 INFORMATION TO ASSIST THE PUB

4.1 POTENTIALLY RELEVANT INFORMATION

In light of the summary of concerns identified above with respect to the existing information available to the Board to conduct “a critical analysis of the macro environmental impacts and benefits of Manitoba Hydro’s Preferred Development Plan (PDP) and alternative Plans”, I have considered additional relevant information for use by the Board.

1. Prior hydroelectric projects on the Nelson River.

The information provided during the environmental assessment of the Keeyask Project, in the NFAT, and in the analysis conducted by MNP is predictive information. That is, it is based on the collection of baseline data and information, analysis and professional judgment about potential changes in the future. Information respecting the actual environmental effects of the existing hydroelectric facilities on the Nelson River (i.e. Kelsey, Kettle, Limestone, Long Spruce and Wuskwatim) can also be very valuable to understanding the likely macro environmental effects of the PDP, which would be constructed in a similar landscape.

2. Similar hydroelectric complexes on other river systems.

The PDP is not the first example of a multi-facility hydroelectric complex on a boreal river system in Canada. Other jurisdictions have developed similar schemes and are also currently contemplating or recently contemplated the merits of additional hydroelectric facilities on these river systems. The considerations and findings in these other jurisdictions with respect to macro environmental issues are of potential value to the Board in its consideration of the macro environmental impact from the PDP and the alternative plans.

In addition to the above information pertaining to hydroelectric resources, I have identified potentially relevant information concerning the macro environmental impact of wind resources, as these resources have not been adequately considered by either Hydro or MNP in their respective comparative analyses. This information is discussed in my submission to the PUB pertaining to the macro environmental and socio-economic considerations of wind resources.

4.2 PRIOR HYDROELECTRIC PROJECTS ON THE NELSON RIVER SYSTEM

4.2.1 Historic Facilities

Probably the best place to begin to attempt to understand the “consequences of changes to the air, land, water, flora and fauna, including the potential significance of these changes” that would result from the PDP is with the existing hydroelectric facilities on the Nelson River, and the transmission infrastructure in the general region.

The relevance of these existing facilities stems from the fact that they are located in the same biophysical context as the proposed PDP. What has been learned about the existing facilities in terms of changes to environmental conditions is very relevant to trying to understand the macro environmental impact of the Keeyask and Conawapa facilities to be located directly upstream and downstream, respectively, of the existing facilities. (see Appendix A for a summary of these facilities and infrastructure).

4.2.2 Scope of Available Information

NFAT

In an attempt to identify information concerning the environmental changes of the existing hydroelectric facilities on the Nelson River, I searched for any information related to these facilities in the NFAT filings. While I was able to locate some information indicating that Manitoba Hydro is studying existing conditions within the reservoirs,²¹ there was no specific information respecting the likely effects of the prior developments that could assist in understanding the potential macro environmental impact of additional hydroelectric development as part of the PDP or the alternative plans.

Environmental Impact Statement

Recognizing that this NFAT process is not intended to duplicate the environmental assessment of the Keeyask Project, I reviewed only the aquatic portion of the environmental impact

²¹ E.g. in relation to lake sturgeon see NFAT, Appendix 2.1, at p.1.

statement²² and the historical overview portions of the Cree Nation environmental evaluation reports dealing with hydroelectric developments.^{23 24 25}

My review indicates that the EIS and environmental evaluations describe the adverse nature of the effects of the prior development in very general terms and provide overall perspectives on the implications of these effects for use of the affected lands and waters.

Past project effects have substantially altered the existing environment from that known historically, as such the current heritage resources environment along the river within the open water hydraulic zone of influence may not represent that which was present prior to hydroelectric development.²⁶

Some potential differences between the proposed Keeyask Project and the existing facilities in terms of environmental changes are also presented.²⁷ The behaviour of fish species within the existing reservoirs is also used to attempt to understand the behaviour of fish in the future Keeyask reservoir.²⁸ In other instances, the EIS acknowledges comparison to other components of the Nelson River system:

The magnitude and the spatial and temporal extent of effects were determined through several methods, including: use of Stephens Lake, a reservoir environment similar to the Keeyask reservoir, as a proxy; comparison to empirical data from other reservoirs (e.g. Limestone and Long Spruce reservoirs in Manitoba, the Robert-Bourassa reservoir in Québec, and the lower Churchill River reservoir in Newfoundland and Labrador); and, where applicable, empirical models developed on the basis of observed relationships in the study area and elsewhere.²⁹

While these types of information are useful to understanding the potential effects of the proposed Keeyask Project, they do not provide the kind of detail necessary to fully appreciating the nature and scope of the consequences of the changes that have resulted from the prior developments in a manner that would assist in characterizing the potential effects of potential future hydroelectric projects on the Nelson River.

²² Keeyask Generation Project: Response to EIS Guidelines. Section 6.4 Effects and Mitigation: Aquatic Environment.

²³ Cree Nation Partners. January 2012. Keeyask Environmental Evaluation, at p.12 and at Appendix 2, p.123.

²⁴ York Factory First Nation. June 2012. Kipekiskwaywinan: Our Voices, at p.62-63.

²⁵ Fox Lake Cree Nation. September 2012. Environmental Evaluation Report, at p.4-7.

²⁶ *Ibid.*, at p.182.

²⁷ *Ibid.*, at p.223.

²⁸ *Ibid.*, at p.269.

²⁹ *Ibid.*, at p.238.

Other Documents

It may be the case that Manitoba Hydro has characterized the residual effects of the prior developments in other documents. My review of materials on the company website confirmed the existence of some programs designed to monitor environmental quality in the existing reservoirs.³⁰ However, these programs do not seem to be designed with the overall intention of understanding the residual environmental effects of the existing facilities.

4.2.3 Summary

The apparent lack of comprehensive information concerning the residual environmental effects of the existing hydroelectric facilities is unfortunate. This kind of information would be very valuable in characterizing the potential consequences of changes to the environment resulting from future hydroelectric developments on the Nelson River, whether in relation to the PDP, to the alternative plans, or to some other future hydroelectric development in the Province.

Other utilities, including Hydro-Quebec³¹ and BC Hydro, have made and continue to make efforts to characterize the residual effects of previous developments. BC Hydro's fish and wildlife program for the Columbia River³² is particularly relevant as it considers cumulative environmental effects as an aggregate of multiple dam and reservoir footprints on the same river basin as an integrated ecological system.³³

In summary, there does not appear to be sufficient information pertaining to the residual effects of the existing hydroelectric facilities on the Nelson River to provide meaningful insight into the potential effects of the hydroelectric components of the PDP or the alternative plans. This situation may change in the future, particularly as a result of the recommendations

³⁰ http://www.hydro.mb.ca/environment/programs/events.shtml?WT.mc_id=2314

³¹ Hayeur, G. 2001. Summary of knowledge acquired in northern environments from 1970 to 2000. Hydro Québec, Montreal, September 2011.

³²

http://www.bchydro.com/content/BCHydro/en/toolbar/about/sustainability/environmental_responsibility/compensation_programs/columbia_region.html

³³ Moody, A., P. Slaney and J. Stockner. 2007. Footprint Impact of BC Hydro Dams on Aquatic and Wetland Primary Productivity in the Columbia Basin. AIM Ecological Consultants Ltd. in association with Eco-Logic Ltd. and P Slaney Aquatic Science Ltd. Prepared for Columbia Basin Fish & Wildlife Compensation Program.

provided by the CEC in relation to the environmental assessment of the Bipole III project, and that the Minister accepted,³⁴ in particularly recommendations 11.1 and 13.2:

11.1 Manitoba Hydro implement a cumulative effects assessment approach that goes beyond the minimal standard of the 1999 CEAA guidelines and is more in line with current “best practices.”³⁵

13.2 Manitoba Hydro, in cooperation with the Manitoba Government, conduct a Regional Cumulative Effects Assessment for all Manitoba Hydro projects and associated infrastructure in the Nelson River subwatershed; and that this be undertaken prior to the licensing of any additional projects in the Nelson River sub-watershed after the Bipole III Project.³⁶

The information that could come out of a regional cumulative effects assessment could greatly assist the Board in understanding the residual effects of the existing facilities and using that information to predict the macro environmental impact of the PDP. This information will not be available for the current process. However, in the event that the PDP does not proceed or is delayed for several years, I recommend that the Board make use of the findings of this cumulative effects assessment program.

³⁴ Letter from Minister Gord Mackintosh to Shannon Johnson (Manitoba Hydro), dated August 14, 2013 re: Environmental Act Licence No. 3055.

³⁵ Manitoba Clean Environment Commission. June 2013. Report on Public Hearing: Bipole III Transmission Project, at p.129.

³⁶ Ibid., at p.130.

4.3 SIMILAR HYDROELECTRIC COMPLEXES ON OTHER RIVER SYSTEMS

4.3.1 Identification of comparable situations

There are several large rivers in Canada that have been developed with multiple generation, transmission and river diversion projects. In order to identify comparable hydroelectric complexes to the proposed PDP, I began by considering the historical hydroelectric development context on the Nelson River, summarized in Appendix A. To focus the analysis, I defined several criteria that: reflect the existing developments on the Nelson River; acknowledge that the development context has substantial implications for Aboriginal peoples; and recognize that new developments are currently being considered. I then used these criteria to screen potential hydroelectric complexes on several rivers in boreal regions across Canada, as indicated in the following table.

Table 4-2: Hydroelectric Complexes in Canada

River Systems	Churchill River (Labrador)	Romaine River (Quebec)	Manicouagan River (Quebec)	La Grande River (Quebec)	Lower Mattagami River (Ontario)	Peace River (BC)	Columbia River (BC)
Evaluation Criteria							
Multiple large generation facilities and/or river diversions built over several decades	Y	N	Y	Y	Y	Y	Y
High voltage transmission facilities	Y	Y	Y	Y	Y	Y	Y
New generation, diversion and/or transmission facilities assessed in the past decade	Y	Y	N	Y	Y	Y	N
Existing or proposed generation facilities on the main stem of the river system	Y	Y	Y	Y	Y	Y	Y
Substantial implications for Aboriginal groups	Y	Y	Y	Y	Y	Y	Y
Located in boreal ecosystems	Y	Y	Y	Y	Y	Y	Y
Reviewed by an independent panel	Y	Y	?	Y	N	Y	?
Meets all Criteria	YES			YES		YES	

The inclusion of the final criterion – “reviewed by an independent panel” – reflects my desire to seek out the highest levels of informed advice provided to governments in Canada. As is the

case with the Nelson River developments, there is a considerable volume of information available concerning these similar hydroelectric complexes. Considering the available time and resources, I focused my review on the observations, conclusions and recommendations of these independent regulatory proceedings. My preoccupation was not so much with the particularities or idiosyncrasies of the specific cases since these may be different as a result of project design or environmental context, but on the findings that would have more general application to consideration of the macro environmental impact of these other proposed developments in the context of the available alternatives – the same task before the PUB.

4.3.1 La Grande River (Quebec)

Historic Facilities

Begun in the early 1970s, the hydroelectric generating stations on the La Grande River in northern Quebec, collectively referred to as the James Bay Project or La Grande Complex, constitute the largest such development in Canada. According to the Société d'énergie de la Baie James, the agency responsible for the development of the Project, it consists of the following:

- eight hydroelectric generating stations with a total installed capacity of 15,240 MW, producing 78.3 TWh of electricity annually
- six 735-kV AC transmission lines and one \pm 450-kV DC transmission line, for a total length of around 7,400 km
- partial diversion of the Caniapiscou and Eastmain Rivers into the La Grande River
- over three hundred retaining structures (dams and dykes)
- the development of thousands of kilometres of new roads, airports and other infrastructure^{37 38}

The implications of the La Grande Complex for the local Cree Nations were extensive, though the lack of a comprehensive environmental assessment at the time of the development of the Complex has prevented a full appreciation of the social effects for the Cree Nations.³⁹

³⁷ <http://www.hydroquebec.com/sebj/en/lagrande.html>

³⁸ <http://www.hydroquebec.com/hydroandfriends/publications/the-la-grande-hydroelectric-complex/index.html>

³⁹ See <http://www.gcc.ca/archive/article.php?id=38>

Nonetheless, the effects generally parallel many of those experienced by the Aboriginal groups in Manitoba in relation to the Nelson River hydroelectric developments.⁴⁰

The Eastmain-1 Powerhouse and Rupert Diversion

Project Description

In 2004, Hydro Quebec proposed additional hydroelectric facilities in Cree territory, as envisioned under the James Bay and Northern Quebec Agreement (JBNQA).⁴¹ These new facilities, known as the “Eastmain-1 Powerhouse and Rupert Diversion” entailed the construction of Eastmain-1-A powerhouse and Sarcelle powerhouse, as well as the partial diversion of the Rupert River into Eastmain-1 reservoir, which had previously been diverted into the La Grande Complex. The proposed Project is in many ways similar to the diversion of the Churchill River into the Nelson River in Manitoba, in that it was intended to increase the production of electricity at existing facilities on a neighbouring river.⁴² Hydro Quebec described the Project in the EIS as follows:

The water diverted from the Rupert River will be channelled through the Rupert forebay and tailbay into Eastmain 1 reservoir, where it will power the turbines at Eastmain-1 and Eastmain-1-A powerhouses. The flow will then continue on to Opinaca reservoir, at the outlet of which, as per the option exercised by the Crees, a powerhouse will be constructed on the right bank near the existing Sarcelle control structure. Downstream of Opinaca reservoir, the diverted waters will flow through Lake Boyd and Sakami Lake, and then into Robert-Bourassa reservoir, to be turbined at Robert-Bourassa and La Grande-2-A. The flow will then be channelled into La Grande 1 reservoir and turbined once more at the La Grande-1 facility before emptying into James Bay via the Grande Rivière. It should be noted that the Rupert diversion will go into operation at least one year before Eastmain-1-A powerhouse. This will enable Hydro-Québec Production to increase its average annual output by some 8.5 TWh: 2.3 TWh from Eastmain-1-A, 0.9 TWh from Sarcelle powerhouse and 5.3 TWh from the increase in overall output from Robert-Bourassa, La Grande-2-A and La Grande-1.⁴³

⁴⁰ <http://keeyask.com/wp/the-project/environmental-assessment-process/eis/keeyask-cree-nations-enviro-evaluation-reports>

⁴¹ For more information on the JBNQA see: <http://www.gcc.ca/pdf/LEG000000006.pdf>

⁴² https://www.hydro.mb.ca/corporate/water_regimes/churchill_river_diversion.shtml

⁴³ Eastmain-1-A Powerhouse and Rupert Diversion – Environmental Impact Statement Volume 1: Chapters 1 to 9 – December 2004, at p.1-6.

Aboriginal Groups

The Project was developed pursuant to the *Agreement Concerning a New Relationship Between le Gouvernement du Québec and the Crees of Québec* (NRA). The *Boumhounan Agreement*, a sub-agreement of the NRA that pertains specifically to the Project, was signed between the Crees of Québec, Hydro-Québec and Société d'énergie de la Baie James. The main provisions of the *Boumhounan Agreement* are as follows:

- The Crees consent to the construction, operation and maintenance of the project, subject to the provisions of the *Boumhounan Agreement*.
- The Project is subject to the environmental and social protection regime stipulated in Section 22 of the JBNQA.
- Hydro-Québec undertakes to carry out remedial and mitigation measures, implement the specific guarantees, assurances and undertakings, and provide the economic and community benefits stipulated in the *Boumhounan Agreement*.⁴⁴

Of note, once the Project was accepted by means of a special resolution of the Hydro-Québec Board of Directors and once the necessary permits and approvals were obtained, Hydro-Québec agreed that it would waive the possibility of building the Nottaway-Broadback-Rupert (NBR) project, which is provided for in the JBNQA. The following table from the EIS⁴⁵ compares the Project to the NBR.

Table 1-2: Comparison of project characteristics

Characteristics	Eastmain-1-A/Rupert	Nottaway-Broadback-Rupert^a
Reservoirs	Creation of two diversion bays along the course of the Rupert diversion	Four major reservoirs in addition to the forebays of the powerhouses
Total area flooded	346 km ²	6,497 km ²
Number of dams	4	Approximately 20
Number of dikes	74	Over 130
Source :Complexe Nottaway-Broadback-Rupert, <i>Rapport préliminaire d'impact sur l'environnement et le milieu social</i> , Volume 4, December 1982		

a. Diversion variant: Variant III
Reservoirs on the Rupert: R-10 and R-11
Powerhouses: on the Rupert (R-10 and R-11), on the Broadback (B1, B2, B3, B4, B5, B6, B8), and Quénonisca and Evans generating stations

⁴⁴ Ibid, at p. 1-10.

⁴⁵ Ibid, at p. 1-11.

As noted by Hydro-Quebec in the EIS:

Although the partial diversion of the Rupert will have impacts, the abandonment of the NBR project in favour of Eastmain-1-A/Rupert is a major plus for the Crees.⁴⁶

The decision by Hydro-Québec and the Cree Nations to move forward with the negotiation of the *Boumhounan Agreement* suggests the following:

- Historic agreements, like the JBNQA, can be renegotiated as circumstances change;
- The framework for dealings between the Crown and Aboriginal peoples is part of an ongoing relationship and can change over time; and
- It is not uncommon for large hydroelectric utilities to reconsider their initial plans in light of changing circumstances.

Environmental Assessment

A Joint Review Panel assessment of the Eastmain-1 Rupert Diversion was carried out over several years leading to submission of a Panel Report in November 2006. The environmental assessment was conducted pursuant to the *Agreement Concerning the Environmental Assessments of the Eastmain-1-A and Rupert Diversion Project*, put in place to prevent duplication and overlap and to coordinate and align the assessment and review processes of different jurisdictions.

The five-member Panel was mandated to conduct a review of the environmental effects of the Project, including in the context of the need and alternatives to the Project, and to report to the federal Minister of the Environment. The review included preparation of directives (terms of reference) for the assessment, review of the EIS, and hearings in several Cree communities, as well as in Chibougamau and Montréal. The key relevant findings of the Panel are discussed below.

Alternatives to the Project

The Panel concludes that, while wind power is a worthwhile complement to Quebec's core hydroelectric system, replacing viable hydroelectric projects with wind power cannot be justified under current conditions.⁴⁷ (underlining added)

⁴⁶ Ibid, at p. 1-10.

Those “current conditions” have changed considerably with respect to wind resources, as discussed in other submissions to the Board.⁴⁸ Interestingly, since the time of developing the Project, Hydro Quebec has constructed and contracted for nearly 3000 MW of wind resources.⁴⁹ As a result of developing both the Project, the Romaine Hydroelectric Complex and wind resources, coupled with the continued decline in load growth in domestic and export markets, Hydro Quebec will be running a large surplus for many years.⁵⁰

This situation illustrates for the PUB the importance of considering future trends in the costs of the alternatives to the PDP, both in terms of creating unnecessary and expensive surpluses but also in avoiding unnecessary and permanent imposition of adverse environmental effects on the receiving environment and communities.

Project Justification

The Panel concludes that, to date, there is no alternative or combination of alternatives that can guarantee the same operating and economic benefits as the proposed project. However, it considers that economic grounds alone are not sufficient to justify approval of the project since the project must also be considered environmentally and socially acceptable.⁵¹ (underlining added)

The Panel reached a somewhat similar conclusion to that reached by Manitoba Hydro in its NFAT submission:

Manitoba Hydro has compared the following development plan against alternative plans and has concluded that it is in the best long-term interests of Manitobans...⁵²

However, the two caveats included in the justification statement above indicate that the Eastmain-1 Panel established macro environmental requirements that the proposed Project had to satisfy regardless of its operational and economic benefits.

⁴⁷ Federal Review Panel for the Eastmain-1-A Diversion Project. 2006. Environmental Assessment of the Eastmain-1 and Rupert Diversion Project (“Eastmain-1 Panel Report”), at p.ii.

⁴⁸ La Capra Associates. January 24, 2014. Needs for and Alternatives to (NFAT) Review of Manitoba Hydro’s Proposal for the Keyask and Conawapa Generating Stations, Technical Appendix 2: Generation Alternatives, at p. 2-7.; Knight Piesold. January 23, 2014. Knight Piesold Independent Expert Consultant Report (Redacted), at p.47.

⁴⁹ http://www.hydroquebec.com/distribution/en/marchequebecois/parc_eoliens.html

⁵⁰ Hydro Quebec. 2009. Strategic Plan 2009-2013, at p.18.

⁵¹ Eastmain-1 Panel Report, at p.iii.

⁵² NFAT, Chapter 1, at p.2.

These macro environmental requirements speak to the “trade-off rules” noted by Dr. Gaudreau and Dr. Gibson in their Framework for Sustainability-based Assessment:

Explicit and principled consideration of trade-offs is also an important component of sustainability assessment. The essential rules for trade-off considerations centre on open deliberations, emphasis on avoidance, and preclusion of trade-offs that displace significant adverse effects to future generations. But as with generic sustainability requirements and criteria, trade-off rules need to be specified for the context.⁵³ (underlining added)

One of those “trade-off rules” is “Avoiding Trade-offs”:

- treat potential trade-offs as a regrettable last resort while seeking mutually reinforcing and lasting cumulative contributions for the most positive overall result and avoiding significant adverse effects⁵⁴

In assessing the PDP and the alternative plans with respect to macro environmental impact, it is my view that the experience of the Eastmain-1 Panel indicates that where significant environmental effects are anticipated, all reasonable steps must be taken to avoid trading off these environmental effects, including taking measures that could allow for the evolution of “an alternative or combination of alternatives” that would not require such trade-offs.

Cumulative Effects

In terms of the quality of life of the Cree, the negative impacts of the project, combined with the effects of previous hydro-electrical projects, could exacerbate problems relating to opening and developing the land and harvesting traditional foods. The Panel believes that although the impact of the project appears marginal when looking at the big picture, the communities will still suffer consequences.⁵⁵ (underlining added)

This observation speaks to the tendency to view additional impacts in the context of larger impacts that occurred historically and in the context of a prior and different cultural understanding with respect to what is acceptable to impose on people and places, rather than

⁵³ K. Gaudreau and R.B. Gibson. 2014. Framework for Sustainability-based Assessment for the Public Utilities Board’s Needs For and Alternatives To (NFAT) Assessment of Manitoba Hydro’s Preferred Development Plan and Alternatives, at p.6

⁵⁴ Ibid., at p.30.

⁵⁵ Eastmain-1 Panel Report, p.xxi

viewing these impacts in the current context or even attempting to project forward to what future generations may consider justifiable.

It feels that the cumulative impact is real, but difficult to quantify, making it impossible to specify the relative significance of the marginal cumulative impact and the causes of change attributable to the project. It therefore had to rely on its own judgment in this respect.⁵⁶

This observation of the Panel is consistent with observations of many independent reviews of hydroelectric facilities, namely that information respecting cumulative effects is not sufficient to draw defensible conclusions about macro environmental consequences, whether adverse or beneficial. In my opinion, the PUB may also be relying in this instance on “its own judgement” in respect of the potential cumulative effects of the proposed PDP. The NFAT has not provided information relevant to consideration of the “collective environmental consequences” that may result from the PDP, relying instead on the future submission of the materials from the CEC review of the Keeyask Project, a single component of the PDP.⁵⁷

The Panel is of the opinion that the cumulative impacts of the La Grande Complex, coupled with the effects of the increased flow of the Rupert River, should be evaluated for the Chisasibi, Eastmain and Wemindji communities.

...the Panel finds that the data that are currently available are insufficient to quantify the cumulative impacts on James Bay and Hudson’s Bay or separate them from the major factors affecting these ecosystems, including inter-annual variability and climate change.

... the Panel considers that a formal analysis of these impacts cannot be conducted without establishing a large-scale research and follow-up program, a measure which the Panel recommends.

... The Panel believes that it would be important to initiate discussions on a more systemic approach to the analysis of cumulative impacts or on the possibility of making greater use of strategic environmental assessment in the evaluation of governmental policies and programs.⁵⁸

⁵⁶ Eastmain-1 Panel Report, at p.xxi.

⁵⁷ See MMF/MH I-053a.

⁵⁸ Eastmain-1 Panel Report, p.xxi.

These recommendations are similar to those provided by the CEC in relation to the environmental assessment of the Bipole III project, and that the Minister accepted,⁵⁹ in particularly recommendations 11.1 and 13.2:

11.1 Manitoba Hydro implement a cumulative effects assessment approach that goes beyond the minimal standard of the 1999 CEAA guidelines and is more in line with current “best practices.”⁶⁰

13.2 Manitoba Hydro, in cooperation with the Manitoba Government, conduct a Regional Cumulative Effects Assessment for all Manitoba Hydro projects and associated infrastructure in the Nelson River subwatershed; and that this be undertaken prior to the licensing of any additional projects in the Nelson River sub-watershed after the Bipole III Project.⁶¹

The findings of the Eastmain-1 Panel support the concern that the cumulative environmental effects related to large-scale hydroelectric developments cannot be determined without a comprehensive research and follow-up program related to the existing facilities, which does not yet exist in relation to the Nelson River developments. In my opinion, without this knowledge of the existing conditions and the extent of change already imposed, the degree of certainty associated with the potential “collective consequences of changes” resulting from additional hydroelectric development on the Nelson River would be necessarily low.

Overall Finding

...the Panel believes that the anticipated environmental and social impacts will be numerous and widespread, but the impacts are definable and can be mitigated in a satisfactory manner if all of the necessary conditions are put into effect. For these reasons, and considering the project’s clear benefits, the Panel finds that the acceptance of these impacts is justifiable.⁶² (underlining added)

The underlined conditions suggest that the bar was high for approving the Eastmain-1 Project. The impacts can be mitigated only if all the necessary conditions are put into effect, and justifiable only if there are clear benefits, presumably compared to the adverse effects but also compared to the alternatives available.

⁵⁹ Letter from Minister Gord Mackintosh to Shannon Johnson (Manitoba Hydro), dated August 14, 2013 re: Environmental Act Licence No. 3055.

⁶⁰ Manitoba Clean Environment Commission. June 2013. Report on Public Hearing: Bipole III Transmission Project, at p.129.

⁶¹ Ibid., at p.130.

⁶² Eastmain-1 Panel Report, at p.xxiv.

Dissenting Opinion

A member of the Panel did not agree with the majority decision in the case of the Eastmain-1 Project. I have also considered this Panel member's observations, conclusions and recommendations of relevance to macro environmental issues.

- **Adaptive Management.** In order to limit the impact of the diversion of the Rupert River on fish habitats, an ecological instream flow regime is planned that would be synchronized around three periods of biological activity of the main fish species present in the river. The proponent has also agreed to respect the principle of adaptive management for this instream flow regime. The application of this principle would allow, if need be, for the revision of this regime if an impact is detected *a posteriori*, either during environmental monitoring by the proponent or as observed by users of the territory. However, such a measure does not allow one to determine, in advance of the project's approval, the potentially adverse effects if changes in the values of this regime aimed at protecting habitats or the sustainability of fish resources were to prove unrealistic in terms of the project's economic efficiency. ... The project's economic profitability must be assessed on the basis of environmental requirements before permits are obtained, otherwise the project would be funded on "environmental credit," in which case it would be unacceptable for the project to go ahead.⁶³ (underlining added)

This raises an important consideration for the Board in evaluating the PDP. The onus is on Manitoba Hydro to demonstrate that the macroenvironmental risks have been substantially addressed so as not to threaten either the economic viability of the PDP or threaten the economic advantage (if any) that the PDP may have over the alternative Plans (if any) that have lower macro environmental impacts.

- **Sum of effects of the project.** Given the magnitude of the follow-up and monitoring required, some of which will serve to confirm the hypotheses on which the very design of the project is based, it will be several years before we will be able to determine the accuracy of these hypotheses and the success of the mitigation and compensation measures. Only then will we be able to fully judge whether the project's advantages outweigh its disadvantages.⁶⁴ (underlining added)

The issue being raised here in this dissenting opinion speaks to the nature of hydroelectric resources, namely that once they are developed they cannot readily be undeveloped or substantially altered. In assessing the macro environmental impact of the PDP and the

⁶³ *Ibid.*, at p.381.

⁶⁴ *Ibid.*, at p.383.

alternative plans, I recommend that the Board pay particular attention to the degree of uncertainty assigned to the predicted effects of the Keeyask by the CEC, and that effects that are considered moderately or likely to occur be assumed to occur.

- **Loss of a natural and cultural heritage.** On a historical level, the Rupert River is part of one of the major arteries linking the St. Lawrence River and James Bay watersheds. It was one of the rivers most frequently travelled by explorers transporting commercial goods, including furs. The Crees have used it for centuries and it continues to play an essential role in their culture and way of life. Archaeological sites attest to its use as far back as the period of prehistoric human occupation. ... Despite the mitigation measures proposed by the proponent, therefore, the partial diversion of the Rupert River represents a major negative cumulative effect on Quebec's natural and cultural heritage and raises questions about whether limits should be imposed on hydroelectric development, particularly on Eeyou Istchee territory.⁶⁵ (underlining added)

The notion of limits in the case of further hydroelectric development within the La Grande Complex is consistent with the CEC recommendation for a cumulative effects assessment, discussed above, prior to the licensing of any additional projects in the Nelson River sub-watershed.

The context surrounding what happened after the approval of the Eastmain-1 Rupert Project is of particular relevance for the PUB. In this instance, the Panel acknowledged that the “anticipated environmental and social impacts will be numerous and widespread”, the Panel was aware that “under current conditions” alternatives could not yet be justified, but it proceeded to find these impacts justifiable without proposing a plan to avoid the trade-offs for a period of time to allow the situation to evolve.

As a result, those impacts are now imposed indefinitely without any lasting benefit to Quebeckers as a whole, since electricity from the Eastmain-1 Project is surplus to domestic requirements and sold on export markets at a cost considerably below production costs.

⁶⁵ *Ibid.*, at p.388.

4.3.2 Churchill River (Labrador)

Historic Facilities

Owned and operated by the Churchill Falls (Labrador) Corporation, the Churchill Falls Project is one of the largest hydroelectric generating stations in the world, having a capacity of 5,428 MW and producing approximately 34 TWh of electricity annually. Constructed in the late 1960s, the Project resulted in profound changes on the landscape and ecology within the reservoir, downstream of the powerhouse in the Churchill River, as well as downstream in the rivers that were diverted into the reservoir above the generating station and control structures. In a community review of the effects of this Project,⁶⁶ the Innu of Labrador made similar observations to those noted by similarly affected Aboriginal groups in Manitoba.⁶⁷

Commissioned in 1971, the Churchill Falls Project consists of the following components:

- A 5428 MW underground generating station
- A large reservoir totaling approximately 5750 km² in area
- Partial diversion of the Naskapi River
- Partial diversion of the Kanairiktok River
- Numerous dykes and controls structures
- Three 500 kV AC transmission lines from Churchill Falls generating station to Montreal
- The Town of Churchill Falls^{68 69}

The Lower Churchill Project

Project Description

In late 2006, Nalcor Energy registered the first of several components of Lower Churchill Project for environmental assessment. The Project consists of the following components:

- Lower Churchill Hydroelectric Generation Project

⁶⁶ The Innu Nation Community Consultation on the New Mishta-shipu Hydro Project. 2000. Power Struggle: An Innu Look at Hydro Developments in Nitassinan Final Report.

⁶⁷ See <http://keeyask.com/wp/the-project/environmental-assessment-process/eis/keeyask-cree-nations-enviro-evaluation-reports>

⁶⁸ <http://www.nalcorenergy.com/chuchill-falls-at-a-glance.asp>

⁶⁹ Hatch. 2010. Churchill Falls Dam Break Study, Volume 1 – Main Report

- Gull Island Generation Project, a 2250 MW facility on the Churchill River downstream of the existing Churchill Falls Project, generating 11.9 TWh/year
- Muskrat Falls Generation Project, a 824 MW facility on the Churchill River downstream of the proposed Gull Island Generation Project, generating 4.8 TWh/year
- A 735 kV AC transmission line between Gull Island and Churchill Falls (203 km)
- A 345 kV AC transmission line between Gull Island and Churchill Falls (203 km)
- Two 345 kV AC lines between Muskrat Falls and Gull Island (60 km)
- Labrador Island Transmission Link
 - An AC to DC converter station at Muskrat Falls
 - A ± 350 kV DC transmission line from Muskrat Falls to the Strait of Belle Isle (approximately 400 km)

The Labrador Island Transmission Link also continues onto the Island of Newfoundland, and electricity is eventually exported to Nova Scotia via the Maritime Link, which is also part of the Project. For the purposes of this review, I considered only those components within Labrador, and focused on the assessment of the Lower Churchill Hydroelectric Generation Project, since this was the only component considered by an independent review panel.

Aboriginal Groups

The Lower Churchill Hydroelectric Generation Project was developed pursuant to the Tshash Petapen (New Dawn) Agreement between the Province of Newfoundland and Labrador, the Province's Crown Corporation Nalcor Energy, and Innu Nation, the association representing the Innu of Labrador. The main components of the Tshash Petapen Agreement are as follows:

- A Land Claim Agreement in Principle
 - Land selection and rights of the Innu to quantities and categories of land
- Upper Churchill Redress Agreement
 - Payments to Innu Nation in relation to the Churchill Falls Project
 - A comprehensive release by Innu Nation for any and all past, present and future claims in relation to the Churchill Falls Project
- Lower Churchill Impacts and Benefits Agreement
 - Payments to Innu Nation in relation to the components of the Lower Churchill Project within Labrador
 - Other benefits to the Innu Nation (e.g. business opportunities)

- A comprehensive release by Innu Nation for any claims in relation to the Lower Churchill Project

Other Aboriginal Groups potentially affected by the Lower Churchill Project include the Labrador Inuit (Nunatsiavut Government), the southern Labrador Inuit (Nunatukavut) and Innu resident in Quebec who use lands in Labrador.

Environmental Assessment

A Joint Review Panel assessment of the Lower Churchill Project commenced in late 2007 and concluded in August 2011 with submission of the Panel Report to the Provincial and Federal Ministers of Environment. The environmental assessment was conducted pursuant to a harmonization agreement between the two levels of government.

The five-member Panel was mandated to conduct a review of the environmental impact statement in accordance with EIS Guidelines issued by the Ministers, determine the sufficiency of the EIS and hold public hearings. A total of 30 days of public hearings were held in Goose Bay and surrounding communities, in the Innu community of Sheshatshiu, in several Inuit communities, in Sept-Îles, Québec, as well as in St. John's. The key relevant findings of the Panel Report are discussed below.

Need, Purpose and Rationale

the Panel concluded that Nalcor had not demonstrated the justification of the Project as a whole in energy and economic terms, and that there are outstanding questions related to both Muskrat Falls and Gull Island regarding their ability to deliver the projected longterm financial benefits to the Province, even if other sanctioning requirements were met. The Panel therefore recommended that the Government of Newfoundland and Labrador carry out separate formal financial reviews before sanctioning either Muskrat Falls or Gull Island to confirm whether the component being considered for sanction would in fact deliver the projected long-term financial benefits.⁷⁰

These observations recognize the inherent challenges in determining the long-term financial benefits of hydroelectric projects as a result of long lead times and long financing periods, among other factors. They also demonstrate that during the reviews of hydroelectric projects,

⁷⁰ Report of the Joint Review Panel. August 2011. Lower Churchill Hydroelectric Generation Project, Nalcor Energy, Newfoundland and Labrador (Lower Churchill Panel Report), at p.xiii.

which are necessarily lengthy as a result of the complexity of issues involved, circumstances can change materially.

In the case of the Lower Churchill Project, during the review process, the initial preferred option to develop the larger Gull Island facility followed by the much smaller (and much more expensive in terms of unit energy cost) Muskrat Falls Project was reversed. Because the preferred option had been put forward as one of several possible options, the Panel proceeded to assess these variants since it was obligated to assess the Project “as proposed” by the Proponent.

In the current instance, such a reversal of the Keeyask and Conawapa generating stations is not contemplated as part of the PDP. However, some changes to the PDP as initially proposed have already occurred in relation to the Wisconsin Public Service (WPS) export and transmission investment. Further changes may yet occur prior to the conclusion of the process.

In the event the PUB recommends the proceeding with the PDP, I recommend that the PUB clearly indicate its understanding of the description of the PDP that is being recommended and, as appropriate, indicate any changes to the PDP that would be inconsistent with the findings of the PUB with respect to the associated macro environmental impact (e.g. changes that would make the PDP acceptable or unacceptable, based on macro environmental impact).

Alternatives to the Project

...the Panel concluded that Nalcor’s analysis, showing Muskrat Falls to be the best and least-cost way to meet domestic demand requirements, was inadequate and recommended a new, independent analysis based on economic, energy and environmental considerations. ... The Panel also recommended consideration of Integrated Resource Planning as a better planning approach compared to the traditional approach of forecasting loads and then finding the lowest cost solution for meeting them.⁷¹

The “new, independent analysis” recommended by the Lower Churchill Panel is similar in some ways to the NFAT process currently underway in relation to the PDP. However, a submission⁷² during the current NFAT proceeding has also noted that the review of the PDP also suffers from similar shortcomings to the approach used in the case of the Lower Churchill Project.

⁷¹ Lower Churchill Panel Report, at p.xiii.

⁷² Elenchus Research Associates Inc. January 2014. A Review of Manitoba Hydro’s Demand Side Management Plan, at p.1.

The use of a proper integrated resource planning (IRP) process is not only material to ensuring that DSM is properly considered as a resource option, but it is also material to ensuring that the macro environmental impact of DSM is properly evaluated. The environmental effects of DSM are substantially lower than all of the supply side resources contemplated in the PDP and the various alternative plans. As such, the decision not to include DSM as a resource option is to implicitly accept greater macro environmental impact from the outset and greater macro environmental impact than is necessary. In my opinion, that is unacceptable. Not developing DSM resource options and evaluating them through an IRP process is a fundamental shortcoming of the NFAT process.

Greenhouse Gases

The Panel notes that greenhouse gas emissions from the Project would be significant if considered in isolation. There is considerable uncertainty over the extent of displacement of higher greenhouse gas emitting sources of energy; however, there is every reason to expect that Project emissions would be more than offset through displacement of higher greenhouse gas sources of energy.⁷³

The Panel concludes that the opportunity to displace greenhouse gas intensive power is one of the great potential benefits of the proposed Project. How much of this potential is realized depends on the markets the power is sold into, whether it explicitly replaces coal-based power production, and whether the potential of utilizing the power from this Project to back up wind generation and other intermittent renewable power production is maximized.⁷⁴ (underlining added)

Two of the potential environmental benefits of large-scale hydroelectric development are described above: the potential to offset greenhouse gas emissions from other sources and the potential to integrate intermittent renewables into the electricity system. I recommend that the Board indicate in its report its conclusions respecting the long-term net greenhouse gas emissions of the PDP and alternative plans, noting any further emission reductions that could be realized for each of the plans through a more integrated approach to consideration of DSM or other demand-side measures.

⁷³ Lower Churchill Panel Report, at p.56.

⁷⁴ *Ibid.*, at p.59.

Aquatic Environment

The Panel concludes that ... the Project would result in a potentially irreversible, significant adverse environmental effect to fish habitat and the final fish assemblage in both reservoirs.⁷⁵

The Panel concluded that effective monitoring would be challenging because of the need for good baseline data, enough resources to support the needed level of effort over many years, and setting appropriate thresholds to trigger further action.⁷⁶

the Panel questioned Nalcor's certainty that riparian and wetland habitat would re-establish and concluded that the residual adverse effect of the Project on these habitats, even with the proposed compensation strategy, would be significant.⁷⁷ (underlining added)

It is important to acknowledge that the reservoirs for the Lower Churchill Project are much larger in size, namely ~200 km² for Gull Island and ~100 km² for Muskrat Falls. However, the concerns raised about the irreversibility of effects on the aquatic environment, the challenges to effective monitoring, and the implications for riparian ecosystems resulting from inundation and changes to the flow regime apply to varying degrees to all hydroelectric reservoirs.

Terrestrial Environment

The Joint Review Panel for the Lower Churchill Project reached the following conclusions with respect to the terrestrial environment:

- the overall loss of terrestrial habitat is significant
- the lack of recovery strategies and identification of critical habitat for some of these listed species make a final significance determination premature
- the Project would cause a significant adverse environmental effect on the Red Wine Mountain caribou herd
- the Panel is not in a position to make a cumulative significance determination because a proper cumulative effects assessment for the George River herd was not carried out
- no final determination was possible with respect to listed bird species

⁷⁵ *Ibid.*, p. 83.

⁷⁶ *Ibid.*, p.xviii.

⁷⁷ *Ibid.*, p.xix.

While many of the conclusions of the CEC regarding the Keeyask Project may differ as a result of the smaller reservoir size, the findings of the Joint Review Panel for the Lower Churchill Project illustrate that:

- large-scale hydroelectric projects can be associated with many significant environmental effects; and
- adequate information is often unavailable to make a confident determination with respect to the “consequences of changes to...land...flora, and fauna”.

Cumulative Effects

At the end of this process, it is the view of the Panel that Nalcor’s approach to cumulative effects was less than comprehensive and that participants raised valid concerns that contributed to a broader understanding of the potential cumulative effects of the Project. ...

Participant input regarding the residual effects of the Churchill Falls development highlighted the limitations of Nalcor’s approach of including the effects of past projects in baseline conditions, without clearly acknowledging these effects. Generally, Nalcor’s approach illustrates the limitation of project-specific cumulative effects assessment, namely that the end result is the potential for incremental decline in the biophysical and socio-economic environments with each successive development. ...

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation, in collaboration with the provincial Department of Labrador and Aboriginal Affairs and other relevant departments, identify regional mechanisms to assess and mitigate the cumulative effects of current and future development in Labrador.⁷⁸ (our underlining)

The findings and recommendations of the Lower Churchill Panel are in many ways similar to those of the Eastmain-1 Rupert Panel, namely that cumulative effects of the interaction between existing and proposed hydroelectric projects are poorly understood and contribute to uncertainties regarding the “consequence of the changes” to the environment and the “potential significance of those changes.”

⁷⁸ *Ibid.*, at p.xix

Cultural Heritage

The Panel concludes that the Project would cause a significant adverse effect to culture and heritage after mitigation particularly with respect to the “loss of the river” as a highly valued cultural and spiritual landscape. This effect ... would be irreversible and would last for the duration of the Project.

I draw this conclusion to the attention of the Board because it was mentioned also in the dissenting opinion for the Eastmain-1 Rupert Panel and was a substantial issue in the review of the proposed Site C Clean Energy Project, discussed below.⁷⁹ In the case of the Rupert River, on which there has been no prior hydroelectric development, it is perhaps not surprising that diversion of a “pristine” river should raise concerns. However, in the case of the Churchill River in Labrador, the Churchill Falls Project already inundates about 50% of the Churchill River and the area is essentially unusable and culturally unrecognizable. Similarly, 60% of the Peace River in British Columbia is already inundated by the existing reservoirs with essentially no use by the affected First Nations. And yet, despite the extensive loss of the existing river valleys, inundation of the remaining portions was still considered highly significant. This reality speaks to the enduring and exceptional cultural value of large river valleys.

In reviewing the Terms of Reference for this proceeding, I noted that cultural and spiritual impacts are not captured by either the definition of macro environmental impact or by the definition of socio-economic impact in Order 92/13. Yet, in the case of the three large hydroelectric projects I considered in this review, these issues were considered to be of very high importance. As such, I recommend that the Panel be open to considering information in regards to potential cultural and spiritual impacts of the PDP or of the alternative plans that may come forward during the hearings phase of this process.

4.3.3 Peace River (British Columbia)

Historic Facilities

BC Hydro owns and operates two hydroelectric generation facilities on the Peace River in northeastern British Columbia. Developed beginning in the 1950s, pursuant to British Columbia’s Two Rivers policy, the W.A.C. Bennett Dam was completed in 1968 and the Peace

⁷⁹ Treaty 8 First Nations (T8FNs) Community Assessment Team. 2012. Telling a Story of Change the Dane-zaa Way. (Site C EIS, Volume 3, Appendix b7), p.vi-xxii. CEAR #421 <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

Canyon Dam in 1980. Similar to the La Grande River and Churchill River developments, the Peace River hydroelectric projects have had substantial implications for local Aboriginal groups.⁸⁰

The Peace River hydroelectric developments include the following:

- The W.A.C. Bennett Dam, with a total installed capacity of 2,730 MW
- The Peace Canyon Dam, with a total installed capacity of 694 MW, located approximately 23 km downstream from the WAC Bennett Dam
- Williston Reservoir behind the WAC Bennett Dam, totaling 1761 km²
- Dinosaur Reservoir behind the Peace Canyon Dam, totaling 8 km²
- Three 500 kV AC transmission lines and several interconnecting lines at lower voltages, totaling over 1500 km

Site C Clean Energy Project

Project Description

In May 2011, BC Hydro filed a project description with Provincial and federal agencies to initiate an environmental assessment of its proposed Site C Clean Energy Project. The Project consists of the following components:

- The Site C generating station, a 1100-MW facility on the Peace River approximately 83 kilometres downstream from the existing Peace Canyon Dam, generating 5.1 TWh/year
- Two 500 kV AC transmission lines between Site C and Peace Canyon Dam (77 km)
- An 83 km² reservoir above the proposed dam, extending to the tailrace of the Peace Canyon Dam
- Realignment of several highways sections totaling approximately 30 km⁸¹

Aboriginal Groups

The Project has the potential to affect several Aboriginal groups, with 6-8 Treaty 8 First Nations being the primarily-affected Aboriginal groups.⁸² Of these First Nations, most are opposed to

⁸⁰ *Ibid.*, at p. 86-99.

⁸¹ Site C Clean Energy Project Environmental Impact Statement Volume 1: Introduction, Project Planning, and Description Section 4: Project Description. CEAR #421 <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

the proposed Project. BC Hydro has entered into preliminary discussions with a couple of First Nations and indicated its intended objectives for these discussions during the recent Joint Review Panel hearings, as follows:

- To provide cash payments, both lump sum and payments streams over time
- To support education, training, and community infrastructure
- To consider land compensation through Crown land transfers
- To implement land protection measures or special land management designations to compensate for lost lands⁸³

Environmental Assessment

A joint review panel assessment of the proposed Site C Project was initiated in May 2011 and is continuing with submission of a Joint Review Panel report in April 2014. The environmental assessment was conducted pursuant to a Joint Review Panel Agreement between the Provincial and Federal governments.

The three-member Panel was appointed in August 2013 and mandated to conduct a review of the environmental effects of the Project, and to report to the federal Minister of the Environment. The review included a sufficiency review of the EIS, and hearings in several Dane-zaa and Cree communities, local municipalities, as well as Prince George and Peace River, Alberta.

Since the Panel has yet to issue its report, the materials below present the findings of the Proponent with respect to significant adverse environmental effects and some key relevant observations of the Panel and participants during the environmental assessment and hearings process respecting cumulative effects and perspectives on previous hydroelectric developments.

Significant Effects Identified by BC Hydro

BC Hydro identified a number of significant adverse environmental effects associated with the development of its proposed Site C project, as follows:⁸⁴

⁸² *Ibid.*, Volume 5: Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests and Information, Environmental Management Plans, and Federal Information Requirements Section 34: Asserted or Established Aboriginal and Treaty Rights, Aboriginal Interests, and Information Requirements

⁸³ CEAR #2201, p.24, lines 5-21. <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

- Fish and Fish Habitat
 - Potential for loss (i.e. extirpation) of several harvested fish species in portions of the reservoir and affected tributaries as a result of changes to fish habitat and the fish assemblage
- Wildlife resources
 - At risk population of migratory bird species and their habitat would be affected by the creation of the reservoir
 - Cumulative effects of the Project with the residual effects of other projects and activities on the loss and fragmentation of wildlife habitat, disturbance or displacement, and mortality for certain species
- Vegetation and Ecological Communities
 - Potential alteration and fragmentation of unique terrestrial ecosystems and loss of rare plant species
 - Cumulative effects of the Project with the residual effects of other projects and activities on future loss of rare plants and rare and sensitive ecosystems
- Current Use of Lands and Resources for Traditional Purposes
 - Loss of some important multi-use, cultural areas and valued landscapes for local First Nations
- Greenhouse Gas Emissions
 - Cumulative effects of the Project related GHG emissions, though relatively small, with the GHG emissions from the many source globally

In addition to a number other residual effects that were determined not to be significant, the Proponent also identified what it viewed as potential positive environmental benefits of the project (e.g. increased total fish biomass) but did not conclude that any of these were significant.

It is important to note that the above list reflects only the views of the Proponent, and that the Joint Review Panel may reach somewhat different conclusions. Similar to the Lower Churchill Project and the Eastmain-1 Rupert Diversion, proceeding with the development of large-scale

⁸⁴ Summarized from BC Hydro. January 2013. Site C Clean Energy Project: Environmental Impact Statement Executive Summary, at pp.34-35.

hydroelectric projects very often requires justification of many significant environmental effects.

Cumulative Effects

BC Hydro in conducting its cumulative environmental effects assessment determined that the effects of the existing hydroelectric facilities could be considered to be “reflected” in the description of current environmental conditions. The primary reason provided by BC Hydro for taking this approach was a lack adequate data concerning conditions prior to the development of the existing dams. The Panel questioned this approach:

[PANEL MEMBER] BEAUDET: Some groups said, you know, that there was existing data and you disagreed. ... Now, the Lower Churchill also did the same thing as you did. And they had lots of participant views that disagreed. I'd like to know more about the arguments that you've used and managed; they must be magical. And managed to convince the agency and environmental assessment office of the Province to go ahead and exclude the two dams.⁸⁵

MS. BEAUDET: Do I understand that the major argument was that you didn't have the data? I mean, the Peace Canyon Dam had the Environmental Impact Assessment done. The Bennett Dam -- when you build a dam, you have data. I mean, even if it's 1957, you would have data.⁸⁶

The observations are in many ways similar to those of the Eastmain-1 Rupert Panel and the Lower Churchill Panel, namely that cumulative effects of the interaction between existing and proposed hydroelectric projects are very often not properly assessed and this contributes to uncertainties regarding the “consequence of the changes” to the environment and the “potential significance of those changes.”

Perspectives on Previous Developments

MS. SUSAN YURKOVICH [BC Hydro]: As a third dam on the Peace River, the project would make valuable use of the existing Williston reservoir to generate 35 percent of the output of the Bennett Dam with 5 percent of the reservoir footprint.⁸⁷

⁸⁵ CEAR #2697, at p.194, l.22 to p.195, l.17. <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

⁸⁶ CEAR #2697, at p.197, l.24 to p.198, l.13. <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

⁸⁷ CEAR #2059, at p.53, l.23 to p.54, l.2. <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

The above comments, made by the BC Hydro Vice President form one of the Proponent's key arguments in favour of the proposed Project, namely that the proposed Project is better than the ones that came before it.

During the hearings, Parks Canada representatives made the following comments in regards to the effects of the prior dams and reservoirs:

MR STEVE OATES [Parks Canada]: Okay. I think our main concern is that the -- by incorporating the flow regulation and the impacts associated with that with the existing two dams into the baseline, it assumes or presupposes that the impacts of the existing dam operations are to a certain extent acceptable, and I think we would rather have seen a more robust assessment ... specifically focused in on what is the actual impacts of operating the two existing dams in terms of how they actually flow manage...⁸⁸
(underlining added)

These comments from Parks Canada are consistent with those raised in their written submissions to the Panel:

BC Hydro's approach to cumulative effects assessment for the Site C project is based on accepting the present state of the Peace River and the PAD as the baseline condition upon which to add the incremental impacts from construction and operation of the Site C dam. This approach doesn't fully consider the cumulative impact from all BC Hydro's flow management operations against an unregulated, undammed river. The point here is that the WAC Bennett dam was proposed, and constructed, in a time when no environmental assessment legislation or process was in place. If the Bennett dam project was [sic] proposed today it is very unlikely that such dramatic regulation of the flow regime on the Peace River would be found to be justifiable in the circumstances. The project would then either be modified to limit the scope of the impact to the hydrology of the Peace River, or the project would be cancelled.⁸⁹ (underlining added)

These observations by Parks Canada raise similar concerns to those raised for the Eastmain-1 Rupert Diversion Project, namely that viewing additional impacts in the context of larger impacts that occurred historically and that are or may no longer be acceptable is not appropriate.

⁸⁸ CEAR #2420, p.293, l.13 to p.294, l.3. <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

⁸⁹ CEAR #922 <http://www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=63919>

Secondly, the views expressed suggest an evolving perspective about what is acceptable in terms of macro environmental and socioeconomic impacts from hydroelectric developments. This evolving perspective exists also in the utility industry itself, as proponents move towards project redesigns intended to reduce effects as in the case of Eastmain-1 and the Keeyask Project, smaller-scale renewables, and a greater emphasis on demand-side management. In my opinion, as costs of the alternatives continue to decline and as the means for addressing capacity requirements improve, the trend towards viewing the impacts of prior hydroelectric developments more negatively is likely to continue. How future generations view the choices we make today may be very different than the way we see them ourselves.

5 CONCLUSIONS

In reviewing the available evidence for this proceeding with respect to the determination of macro environmental impact, it is clear that the challenge facing the PUB is that it needs to be able to compare the macro environmental impact of the resources composing the PDP to those composing the alternative plans.

Much of the analysis in the PDP and evidence submitted respecting macro environmental impact focuses only on the “consequences of changes” for air. Regardless of ones views on whether the PDP has “net environmental benefits” in terms of greenhouse gas emissions, an additionally important question, and the one that matters most to the Board, is whether or not these net environmental benefits exceed those that could be obtained through pursuing an alternative plan.

The conclusions and recommendations to government provided by the CEC, though necessary to the NFAT, will apply only to a single component of the PDP and to those alternative plans that contain Keeyask as a plan component. The findings of the CEC will not apply at all to those alternative plans that do not contain Keeyask.

As a result, other means to determine the likelihood of significant adverse environmental changes or effects as well as the “consequences of these changes” need to be used in the absence of information from additional environmental assessments of PDP and alternative plan resources.

The apparent lack of comprehensive information concerning the residual environmental effects of the existing hydroelectric facilities on the Nelson River is unfortunate. This kind of information would be very valuable in characterizing the potential consequences of changes to the environment resulting from future hydroelectric developments on the Nelson River, whether in relation to the PDP, to the alternative plans, or to some other future hydroelectric development in the Province.

The PDP is the largest hydroelectric development that has been contemplated in the Province for several decades. It is my view that the observations of other independent tribunals who have considered similar developments and contemplated similar issues and trade-offs is valuable to the Board in the absence of detailed environmental assessment information for some components of the PDP and of the alternative plans. I encourage the board to consider the conclusions and recommendations of these other independent tribunals in carrying out its review.

APPENDIX A

Table A-1: Historic and proposed facilities on the Nelson River system⁹⁰

Date ⁹¹	Existing Component	Salient Data
1961	Kelsey Generating Station	<ul style="list-style-type: none"> ▪ 250 MW ▪ Three 138-kV AC lines to Thompson ▪ One 138-kV AC line feeding Split Lake ▪ Two 138-kV AC lines to Gillam (which feed Gillam, Ilford, Churchill)
1974	Kettle Generating Station	<ul style="list-style-type: none"> ▪ 1220 MW ▪ 138 kV AC to Radisson Converter Station ▪ ±450 kV DC to Winnipeg
1977	Churchill River Diversion	<ul style="list-style-type: none"> ▪ A control dam at Missi Falls, the natural outlet of Southern Indian Lake, controls the outflow and also raises the lake level three metres. ▪ An excavated channel from South Bay of Southern Indian Lake to Issett Lake creates a new outlet to allow Churchill water to flow into the Rat River-Burntwood River-Nelson River system. ▪ A control dam at Notigi on the Rat River regulates the flow into the Burntwood-Nelson system.
1979	Jenpeg Generating Station	<ul style="list-style-type: none"> ▪ 129 MW ▪ Transmission line 230-kV to Ponton
1979	Long Spruce Generating Station	<ul style="list-style-type: none"> ▪ 230 kV AC to Radisson Converter Station ▪ 230 kV AC to Henday Converter Station ▪ ±450 kV DC to Dorsey Converter Station
1990	Limestone Generating Station	<ul style="list-style-type: none"> ▪ 1340 MW ▪ 230-kV AC to the Henday Converter Station ▪ 500-kV DC to Winnipeg
2012	Wuskwatim Generating Station	<ul style="list-style-type: none"> ▪ 200 MW ▪ One 230-kV line from Wuskwatim to Birchtree Station (Thompson); ▪ Two 230-kV lines from Wuskwatim to Herblet Lake Station
Date	Approved Component	Salient Data
2019	Bipole III	<ul style="list-style-type: none"> ▪ ±450 kV DC from Keewatinoow Converter Station to Riel Converter Station ▪ 230 kV transmission line linking the Keewatinoow Converter Station

⁹⁰ https://www.hydro.mb.ca/corporate/facilities/generating_stations.shtml;
https://www.hydro.mb.ca/corporate/water_regimes/churchill_river_diversion.shtml

⁹¹ Indicates in-service date

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Date	Approved Component	Salient Data
		to Henday Converter Station and the Long Spruce Switching Station
2020	Keeyask Generating Station	<ul style="list-style-type: none"> ▪ 695 MW ▪ Keeyask Transmission Project
2026	Conawapa Generating Station	<ul style="list-style-type: none"> ▪ 1485 MW ▪ Conawapa Transmission Outlet Project
2026	North-South Transmission Line	<ul style="list-style-type: none"> ▪ Upgrades to existing 230 kV AC system and existing DC system ▪ New 230 kV to support additional 185 MW of north-south transmission
2020	Manitoba-Minnesota Transmission	<ul style="list-style-type: none"> ▪ 500 kV AC transmission from Dorsey Station to US border