SUMMARY

In August 2013, the federal and provincial governments named a Joint Review Panel to examine and to hold a public hearing on BC Hydro's proposed Site C Clean Energy Project, a third hydroelectric facility to be built on the Peace River, near Fort St. John. This is the report of the Panel's assessment of the Project, which the governments are required to publish. The Panel was mandated to inquire into the environmental, economic, social, health, and heritage effects of the Project and their significance, to examine proposals for the mitigation of adverse effects, and to record assertions of Project effects on the Aboriginal rights and treaty rights of the affected First Nations and Métis peoples.

Any large industrial project carries with it some costs that are not captured in a narrowly economic analysis. The question is whether the benefits from the project outweigh those costs. It is in the nature of a public hearing process that the advocates for each side speak as forcefully as they can, and that there would appear to be no middle ground. The Panel's mandate required it to weigh both sides, and to present a balance sheet, accounting for its associated recommendations, to allow elected provincial and federal governments to determine if the benefits justify the costs. The decision on whether the Project proceeds is made by elected officials, not by the Panel.

The benefits are clear. Despite high initial costs, and some uncertainty about when the power would be needed, the Project would provide a large and long-term increment of firm energy and capacity at a price that would benefit future generations. It would do this in a way that would produce a vastly smaller burden of greenhouse gases than any alternative save nuclear power, which B.C. has prohibited. The Project would improve the foundation for the integration of other renewable, low-carbon energy sources as the need arises. The Project would also entail a number of local and regional economic benefits, though many of these would be transfers from other parts of the province or country. Among them would be opportunities for jobs and small businesses of all kinds, including those accruing to Aboriginal people.

There are other economic considerations. The scale of the Project means that, if built on BC Hydro's timetable, substantial financial losses would accrue for several years, accentuating the intergenerational pay-now, benefit-later effect. Energy conservation and end-user efficiencies have not been pressed as hard as possible in BC Hydro's analyses. There are alternative sources of power available at similar or somewhat higher costs, notably geothermal power. These sources, being individually smaller than Site C, would allow supply to better follow demand, obviating most of the early-year losses of Site C. Beyond that, the policy constraints that the B.C. government has imposed on BC Hydro have made some other alternatives unavailable.

There are other costs, however, and questions of where they fall. Replacing a portion of the Peace River with an 83-kilometre reservoir would cause significant adverse effects on fish and fish habitat, and a number of birds and bats, smaller vertebrate and invertebrate species, rare plants, and sensitive ecosystems. The Project would significantly affect the current use of land and resources for traditional purposes by Aboriginal peoples, and the effect of that on Aboriginal rights and treaty rights generally will have to be weighed by governments. It would not, however, significantly affect the harvest of fish and wildlife by non-Aboriginal people. It would end agriculture on the Peace Valley bottom lands, and while that would not be significant in the context of B.C. or western Canadian agricultural production, it would highly impact the farmers who would bear the loss. The Project would inundate a number of valuable paleontological, archaeological, and historic sites. It would have modest effects on health, which could be mitigated, although the health effects of methylmercury on people who eat the reservoir fish

require more analysis to be sure. For most users, outdoor recreation and tourism, transportation, and navigation would also experience effects but not significant effects. Because of the significant adverse effects identified on some renewable resource valued components in the long-term, there would be diminished biodiversity and reduced capacity of renewable resources, should the Project proceed. The Project would not have any measureable effect on the Peace-Athabasca Delta.

Risks and associated environmental effects due to potential accidents and malfunctions have been appropriately mitigated by BC Hydro through project design and planned project management.

There would be the usual health and social risks common to boom towns. The low local unemployment rate would mean that most of the Project workers would come from other parts of the province and Canada. However, increased local demand would mean that a broader range of goods and services would become available to all residents of Fort St. John. The local economic upside would largely provide the resources to deal with possible problems, including those related to health, education, and housing, especially if the arrangements BC Hydro is willing to make with local authorities can be concluded.

The Peace River region has been and is currently undergoing enormous stress from resource development. In this context, the Panel has determined that the Project, combined with past, present and reasonably foreseeable future projects would result in significant cumulative effects on fish, vegetation and ecological communities, wildlife, current use of lands and resources for traditional purposes, and heritage. In some cases, these effects are already significant, even without the Project.

BC Hydro proposed a suite of mitigation measures which the Panel accepts. The Panel arrived at its own conclusions about the impact of the proposed Project and made recommendations in consequence. The Panel evaluated all proposals by participants and believes that the ones carried forward here represent a complete and practical list.

For ease of reference, the Panel's specific conclusions are in shaded text boxes in each of the chapters, followed by any necessary recommendations. A complete list of the Panel's conclusions and recommendations to be taken into account under section 5 of the *Canadian Environmental Assessment Act, 2012* is in Appendix 1.

Harry Swain
Jocelyne Beaudet
James Mattison

APPENDIX 1 LIST OF PANEL'S CONCLUSIONS AND RECOMMENDATIONS

The Panel was required to conduct an assessment of the Project in a manner consistent with the requirements of the Terms of Reference. The Panel has identified those conclusions and recommendations that relate to the environmental effects to be taken into account under section 5 of CEAA 2012. See endnote.

The following provides the Panel's conclusions on the significance of the effects of the Project and potential impacts on asserted or established Aboriginal rights or treaty rights in the area of the Project and its recommendations.

A number of the Panel's recommendations are addressed to governments rather than BC Hydro and are not to be interpreted as conditions to be attached to Project approvals. Rather, they are put forward to assist governments and proponents with assessments of this and future projects.

The Panel has reached conclusions and makes recommendations as follows.

Alternative Means of Carrying out the Project

The Panel concludes that the Proponent's assessment of alternative means of carrying out the Project is appropriate.

Aquatic Environment

The Panel concludes that the Project would make small changes to the hydrology of the Peace River, and such changes would be attenuated by the time the flows reach Peace River, Alberta.[4]

> **RECOMMENDATION 1**
> With respect to minimum flow, the Panel recommends that, if the Project proceeds, a minimum release of 390 cubic metres per second from the Site C dam be a condition of approval.

The Panel concludes that there may be some risk to existing infrastructure in Alberta from low flows and that this risk has not been assessed.[2]

> **RECOMMENDATION 2**
> With respect to potential transboundary effects on hydrology, the Panel recommends that, if the Project proceeds, the Proponent must consult with the Province of Alberta and jointly develop an adaptive management plan to manage risks to infrastructure downstream caused by low flows during reservoir filling and operation. The plan should include:
>
> - Assessment of risks to infrastructure;
> - Monitoring of flows;
> - Identification of problems; and
> - Necessary mitigation through flow regulation or adjustment to Alberta infrastructure to minimize impacts.

The Panel agrees with BC Hydro's assessment that there would not be a change in ice thickness, break-up time, or freeze-up water levels with the Project, downstream at Shaftsbury near Peace River Alberta.[2]

The Panel agrees with BC Hydro's study results that indicate the downstream extent of Site C's influence on the ice regime would be approximately 550 kilometres downstream of the dam site at Carcajou.[2]

The Panel concludes that the Project would result in negligible changes to fluvial geomorphology and sediment transport.[4]

The Panel concludes the Project would result in localized adverse effects on groundwater that would not be significant.[4]

The Panel concludes that there would be a risk of acid generation and metal leaching from construction activities and reservoir creation. However, if the Panel's recommendation is implemented, the effects would not be significant.[4]

> **RECOMMENDATION 3**
> To address the potential risk of acid rock drainage and metal leaching from the Project activities, the Panel recommends that, if the Project proceeds, BC Hydro must consult with Environment Canada, Natural Resources Canada, and Ministries of Environment and Forests, Lands and Natural Resource Operations to design a program to monitor water quality and procedures to mitigate related issues that may arise and to implement the program if necessary.

The Panel concludes there would be no effects from the Project on any aspect of the environment in the Peace Athabasca Delta, and a cumulative effects assessment on the PAD is not required.[2]

Fish and Fish Habitat

The Panel agrees with BC Hydro that the Project would cause significant adverse effects on fish and fish habitat.[1]

The Panel concludes that the construction of the Project would result in significant adverse cumulative effects on fish.[1]

Vegetation and Ecological Communities

The Panel agrees with BC Hydro that the effects of the Project on at-risk and sensitive ecological communities would be significant.[4]

> **RECOMMENDATION 4**
> In order to improve the accuracy and reliability of the baseline mapping and habitat interpretations and to inform mitigation measures and compensation, the Panel recommends that, three month before any activity affecting these habitats, BC Hydro must review its modeling and complete the field work needed to improve identification of rare and sensitive communities and aid in delineation of habitats that may require extra care in the development and operation of the Project.

The Panel disagrees with BC Hydro and concludes that the Project would have a significant adverse effect on wetlands, in particular valley bottom wetlands.[1]

RECOMMENDATION 5
The Panel recommends that, if the Project proceeds, BC Hydro must conduct an assessment of wetland functions lost to the Project that are important to migratory bird and species at risk (wildlife and plants). The Panel also recommends BC Hydro monitor construction and operation activities that could cause changes in wetland functions. The results must inform the development of the mitigation measures to ensure wetland functions at least meet federal and provincial regulatory and policy requirements. BC Hydro must consult with Environment Canada and the Ministry of Forests, Lands and Natural Resource Operations on the duration and frequency of monitoring in relation to migratory birds, species at risk and other wildlife using wetlands.

RECOMMENDATION 6
The Panel recommends that, if the Project proceeds, BC Hydro must complete a Wetland Compensation Plan that includes the results of the functions assessment, surveys, and monitoring program identified above. In developing the Wetland Compensation Plan, BC Hydro must:

a) Discuss migratory birds and species at risk with Environment Canada, the Ministry of Forests, Lands and Natural Resource Operations and Aboriginal groups;
b) Ensure that the Wetland Compensation Plan achieves a full replacement of the wetlands lost in terms of functions and compensates in terms of area;
c) Consult with interested and implicated agencies on the draft Wetland Compensation Plan to ensure effects on Crown land are considered; and
d) Submit the final Wetland Compensation Plan to Environment Canada and other relevant authorities no later than three months prior to any activity affecting the wetlands.

The Panel agrees with BC Hydro that the Project would cause significant adverse effects on rare plants.[4]

RECOMMENDATION 7
The Panel recommends that, if the Project proceeds, BC Hydro must undertake surveys no later than three months prior to any activity affecting rare plants to determine whether the rare plant species potentially facing extirpation are found elsewhere in the region. If the plants cannot be found elsewhere, appropriate conservation methods to ensure the viability of the rare plant species must be put in place, such as ensuring that seeds are kept or relocation of plant communities is attempted.

Given the lack of assessment by BC Hydro, **the Panel cannot conclude** on effects of the Project on plants of interest to Aboriginal groups.[3]

RECOMMENDATION 8
The Panel recommends that, if the Project proceeds, BC Hydro must conduct a comprehensive assessment of effects on traditional plants in collaboration with Aboriginal groups, three months before any activity affecting the plants, to identify areas where plants of interest may be. The results should be used to improve the measures needed to fully mitigate any adverse effects of the Project on plants traditionally used by Aboriginal groups.

RECOMMENDATION 9
The Panel recommends that, if the Project proceeds, BC Hydro be prohibited from using herbicides and pesticides near locations of plants of importance to Aboriginal groups.

The Panel agrees with BC Hydro that cumulative effects on vegetation and ecological communities would be significant.[1,3,4]

Wildlife Resources

The Panel concludes that the Project would likely cause significant adverse effects to the following species that may see their status of protection elevated. These species are: Nelson's sparrow; yellow rail; eastern phoebe; Le Conte's sparrow; old world swallowtail, *pikei* subspecies; Alberta arctic; striped hairstreak; great spangled fritillary, *pseudocarpenteri* subspecies; coral hairstreak, *titus* subspecies; common wood-nymph, *nephele* subspecies; Uhler's arctic; tawny crescent; arctic blue, *lacustris* subspecies; Aphrodite fritillary, *manitoba* subspecies; sharp-tailed grouse, *jamesi* subspecies and Baltimore oriole.[1,3,4]

The Panel disagrees with BC Hydro and concludes that the Project would likely cause significant adverse effects to the western toad.[4]

The Panel disagrees with BC Hydro and concludes that the Project would likely cause significant adverse effects to broad-winged hawk, short-eared owl, eastern red bat, little brown *myotis* and northern *myotis*.[4]

The Panel agrees with BC Hydro that the Project would not likely cause significant adverse effects on fisher and grizzly bear.[3]

The Panel concludes that the effects on caribou as a result of the Project would not be significant.[3]

RECOMMENDATION 10
The Panel recommends that if the Project proceeds, the Proponent must conduct field work to verify the modeled results for surveyed species at risk and determine, with specificity and by ecosystem, the habitat lost or fragmented for those species. The Proponent shall use these data to inform final project design and to develop additional mitigation measures, as needed, in consultation with appropriate authorities.

RECOMMENDATION 11
The Panel recommends that if the Project proceeds, the Proponent must track updates to the status of listed species identified by the Province, the Committee on the Status of Endangered Wildlife in Canada, and the *Species at Risk Act*. Should the status of a listed species change during the course of the Project, the Proponent must work with Environment Canada and the Ministry of Forests, Lands and Natural Resource Operations to mitigate effects of the Project on the affected species.

RECOMMENDATION 12
The Panel recommends that Environment Canada complete a recovery strategy, in a timely manner, for the species listed under schedule 1 of the *Species at Risk Act* for which recovery strategies have not yet been developed (Canada warbler, olive-sided flycatcher and common nighthawk, rusty blackbird and short-eared owl and western toad).

The Panel concludes that the Project would likely cause significant adverse effects to migratory birds relying on valley bottom habitat during their life cycle and these losses would be permanent and cannot be mitigated.[1]

RECOMMENDATION 13
The Panel recommends that, should the Project proceed, BC Hydro must develop a monitoring and mitigation program in consultation with Environment Canada to avoid the loss of active migratory bird nests in the reservoir area and downstream of the dam.

RECOMMENDATION 14
The Panel recommends that, should the Project proceed, BC Hydro must develop mitigation measures specific to migratory bird species in the Project area that address the changes in aquatic and riparian-related food resources and other habitat features associated with the change from a fluvial to a reservoir system, in consultation with Environment Canada.

RECOMMENDATION 15
The Panel recommends that, should the Project proceed, BC Hydro must conduct a risk assessment for bird collisions under the current transmission line design. BC Hydro must determine if additional mitigation measures (e.g. line marking and diversions) could be implemented to reduce the risk, in consultation with Environment Canada.

RECOMMENDATION 16
The Panel recommends that, should the Project proceed, BC Hydro be required to develop a Compensation Plan for non-wetland migratory birds in consultation with Environment Canada, and implement the plan to address significant adverse effects on Canada warbler, Cape May warbler, and bay-breasted warbler. The plan must be submitted to Environment Canada three months prior to any activity affecting the habitat.

The Panel agrees with BC Hydro that the Project would not likely cause significant adverse effects on moose, elk, white-tailed deer and mule deer.[1]

RECOMMENDATION 17
The Panel recommends that, if the Project proceeds, the Proponent must, in collaboration with the Province, determine whether additional lands owned by BC Hydro or Crown Lands could be maintained as winter range for ungulates.

RECOMMENDATION 18
The Panel recommends that, if the Project proceeds, the Ministry of Forests, Lands and Natural Resource Operations must conduct bi-annual ungulate surveys in Wildlife Management Units overlapping with the LAA during Project construction and for a period of 5 years after. This information must be provided to the Proponent to confirm the effects of the Project and used by the Ministry to determine if mitigation is required (for direct or indirect effects).

The Panel concludes that the wildlife species that would experience significant effects as a result of the Project would also experience significant cumulative effects.[1,3,4]

The Panel concludes that given that fisher are blue-listed and likely already impacted by human pressures, the Project effects in combination with past, existing and future projects may cause significant cumulative effects.[3]

The Panel concludes that the Project would not likely cause significant cumulative effects on ungulates.[3]

Current Use of Lands and Resources for Traditional Purposes

The Panel disagrees with BC Hydro and concludes that the Project would likely cause a significant adverse effect on fishing opportunities and practices for the First Nations represented

by Treaty 8 Tribal Association, Saulteau First Nations, and Blueberry River First Nations, and that these effects cannot be mitigated.[3]

The Panel disagrees with BC Hydro and concludes that the Project would likely cause a significant adverse effect on hunting and non-tenured trapping for the First Nations represented by Treaty 8 Tribal Association and Saulteau First Nations, and that these effects cannot be mitigated.[3]

The Panel concludes that the Project would likely cause a significant adverse effect on other traditional uses of the land for the First Nations represented by Treaty 8 Tribal Association, Saulteau First Nations, and Blueberry River First Nations, and that some of these effects cannot be mitigated.[3]

The Panel concludes that the Project would likely cause significant adverse cumulative effects on current use of lands and resources for traditional purposes.[3]

RECOMMENDATION 19
The Panel recommends that, if the Project does not proceed, the Province, after consultation with affected local parties, remove the flood reserve in a manner that preserves the agricultural, wildlife and heritage values of the Peace River valley.

RECOMMENDATION 20
The Panel recommends that the Province set aside the hunting, fishing and trapping rights in the Peace Moberly Tract for people holding Section 35 rights under the *Constitution Act*, *1982*. The Panel also recommends that the Province and affected First Nations enter discussions on the Area of Critical Community Interest with a view to the harmonious accommodation of all interests in this land.

Other Harvest of Fish and Wildlife Resources

The Panel agrees with BC Hydro that the effects of the Project on harvest of fish would not be significant.[5]

The Panel agrees with BC Hydro that the effects of the Project on harvest of wildlife would not be significant.[5]

The Panel concludes that, if the Project proceeds, some tenured trappers and outfitters would be adversely affected by the construction and operation activities of the Project. If the Panel's recommendation is implemented, this effect would not be significant.[3,5]

RECOMMENDATION 21
The Panel recommends that, if the Project proceeds, fair compensation should be offered to affected tenured trappers and outfitters for long term losses.

The Panel concludes that more information is needed to assess the effects of the Project on harvest of wildlife resulting from an influx of workers from outside the Peace region and the opening of the territory by the construction of new access roads and the improvement of the road system.[3,5]

RECOMMENDATION 22
The Panel recommends that, if the Project proceeds, BC Hydro must determine, in collaboration with applicable agencies, stakeholders and Aboriginal groups, what enforceable restrictions can be put in place with respect to the Project access road, and

which existing roads in the vicinity and new roads built during construction should be decommissioned.

The Panel agrees with BC Hydro that the cumulative effects on harvest of fish and wildlife would not be significant.[3,5]

Agriculture

The Panel concludes that the permanent loss of the agricultural production of the Peace River valley bottomlands included in the local assessment area of the Project is not, by itself and in the context of B.C. or western Canadian agricultural production, significant. **The Panel further concludes** that this loss would be highly significant to the farmers who would bear the loss, and that financial compensation would not make up for the loss of a highly valued place and way of life.[5]

The Panel agrees with BC Hydro that the Project would not cause cumulative effects on agriculture.[5]

Effects on Other Resources Industries

The Panel concludes that the Project would have negligible effects on the regional oil and gas, forest, and mineral and aggregate industries.[5]

Transportation

The Panel concludes that the traffic at some places on Highway 97 is already dangerous, and during the period of construction, the Project would add to that, but there would be no residual effects after the construction period. If the Panel's recommendations are implemented, this effect would not be significant during construction.

RECOMMENDATION 23
As proposed by BC Hydro, the Panel recommends that, if the Project proceeds, it must establish a current baseline of fog occurrences at Taylor Bridge and its approaches in Taylor, as well as follow-up monitoring during the first years of operation to evaluate the magnitude of any changes as a result of the Project.

RECOMMENDATION 24
The Panel recommends that, if the Project proceeds, BC Hydro must conduct monitoring of the Level of Service and road safety. Monitoring and a follow-up program shall focus on the following locations:

- Highway 97 at Old Fort Road in Fort St. John,
- Highway 97 at 100th Street in Fort St. John,
- Highway 97 at 85th Avenue in Fort St. John,
- Canyon Drive in Hudson's Hope,
- Beattie Drive in Hudson's Hope,
- Clarke Avenue in Hudson's Hope.

RECOMMENDATION 25
The Panel recommends that, if the Project proceeds, BC Hydro's Traffic Monitoring and Management Plan and associated work schedules must be prepared, subject to safety considerations, to minimize delays and nuisance caused by the realignment of Highway 29, particularly during peak visitor periods.

Air Navigation

The Panel concludes that the Project would not result in significant adverse effects on air navigation.[4]

Water Navigation

The Panel concludes that the Project would have adverse effects on navigation use of the Peace River but that they would not be significant because the river would still be navigable above and below the dam site. **The Panel further concludes** that the loss would be significant for the small number of people who traverse the dam site.[4]

The Panel concludes that there would be no cumulative effects on navigation of the Peace River if the Project proceeds.[4]

Outdoor Recreation and Tourism

The Panel concludes that the construction period would have an adverse effect on outdoor recreation activities associated with the Peace River, but this effect would not be significant.[5]

The Panel concludes that the cumulative effects on outdoor recreation and tourism would not be significant.[5]

Population and Demographics

The Panel concludes that population effects would be primarily limited to the construction phase of the Project, when modest increments to the local and City population would occur. Because most of these effects would be limited to the construction phase, the Panel concludes these effects would not be significant.

Housing

Considering the mitigation commitments presented by BC Hydro to address housing issues related to the Project, **the Panel is satisfied** that there would not be significant adverse effects on housing solely as a result of the Project.

RECOMMENDATION 26
The Panel recommends, regardless of whether or not the Project proceeds, that the Province give sympathetic attention to an extension of Fort St. John's municipal boundaries so that contiguous urbanizing areas, plus a reserve, are brought within the planning, service, and taxation ambit of the City's government.

Community Infrastructure and Services

The Panel concludes that the general stress on community infrastructure and services caused by the Project could be managed with sufficient resources. The Panel is confident that mitigation in the form of additional resources would be provided by BC Hydro and appropriately managed by the communities (including municipalities) such that effects would not be significant.

RECOMMENDATION 27
The Panel recommends that, should the Project proceed, BC Hydro must include in its agreement with the City of Fort St. John expenses for Project-related costs of child and family welfare services.

Employment, Labour Markets and Local Residents

The Panel concludes that the Project would further tighten a labour market where the unemployment rate is only 3.6 percent, and that it is in everyone's interest to ensure that local Aboriginal workers are as well-equipped as possible to compete in that market.

The Panel further concludes that, with the implementation of the proposed mitigation measures, there should be no significant adverse effects on the labour market.

RECOMMENDATION 28
The Panel recommends that, if the Project proceeds, BC Hydro must work with training institutions to focus on employment in indirect and induced sectors for Aboriginal workers, as these jobs are likely to be longer lived than those related strictly to construction.

Local Government Revenue

The Panel concludes that revenues to be received from existing sources, together with payments contemplated in negotiations between the Proponent and local governments, would generally be sufficient to maintain current service quality levels. Several such agreements are already in place. No significant adverse effects are foreseen, nor are cumulative effects.

The Panel further concludes that the negotiations of Impact and Benefit Agreements with local affected Aboriginal groups would generally be sufficient to maintain current service quality levels both on- and off-reserve.

Regional Economic Development

The Panel concludes that there would be excellent opportunities for new and existing jobs and businesses during the construction phase.

Human Health

The Panel concludes that, if the Project proceeds, there is a potential for health effects from a degradation of air quality in the region of Fort St. John, Taylor, Hudson's Hope and for Aboriginal groups using areas close to the construction activities of clearing and burning, the construction of access roads and the realignment of Highway 29. The predicted results would have to be confirmed through monitoring and the mitigation measures adjusted if needed. These effects could be overcome with proper mitigation. If the Panel's recommendation is implemented, there would be no residual effects.[3,5]

RECOMMENDATION 29
The Panel recommends that, if the Project proceeds, BC Hydro must:

- Add monitoring at sensitive receptor group locations to the monitoring plan for dust and smoke;
- Prolong the monitoring proposed for the construction period into the first two years of operation for particulate matter and dustfall. In case of exceedances, appropriate mitigation measures must be implemented;
- Identify places of high Aboriginal group use and develop mitigation measures should adverse effects be predicted at those locations; and
- Ensure procedures are developed to warn and protect sensitive populations in cases of exceedance.

The Panel disagrees with BC Hydro that there would be no effects on individual wells. There would be a risk of exceedances of drinking water quality guidelines for a number of wells. If the Panel's recommendation is implemented, there would no residual effects.[5]

RECOMMENDATION 30
The Panel recommends that, if the Project proceeds, BC Hydro be required to monitor potentially affected wells, starting as soon as Project approval is received. Monitoring must be done twice a year for 10 years. If any changes are observed the owners must be informed. If any functionality problems such as poor water quality or low yield result from the Project, BC Hydro must work with the well owner(s) to provide an alternate source of potable water.

For the City of Fort St. John's and the District of Taylor's water supply wells, **the Panel agrees** with BC Hydro that exceedances of drinking water quality guidelines are not anticipated.[5]

The Panel concludes that there are predicted exceedances of the BC Oil and Gas Commission guidelines and changes in sound levels at some receptors - above 5 dBA at one residence and above 10 dBA at worker camps. If the Panel's recommendation is implemented, there would be no residual effects.[5]

RECOMMENDATION 31
The Panel recommends that, if the Project proceeds, BC Hydro must:

- Design a work and noise management schedule that allows an uninterrupted eight hour sleep schedule for workers; and
- Manage Project noise to provide quiet enjoyment to residents, even if it means temporary relocation.

The Panel agrees with BC Hydro's conclusion that no adverse health effects associated with exposure to electric and magnetic fields are expected.[3]

RECOMMENDATION 32
The Panel recommends that, if the Project proceeds, BC Hydro must measure post-construction electric and magnetic field levels at the right-of-way edge where habitation sites exist and communicate the results to occupants. If monitoring determines an exceedance of the International Commission on Non-Ionizing Raditation Protection guidelines (4.2 kV/m) at a habitation site, BC Hydro must provide the necessary resources for relocation.

Regarding fish consumption data used by BC Hydro in the Mercury Human Health Risk Assessment, **the Panel concludes** there are no reliable data available at this point.[3,5]

RECOMMENDATION 33
The Panel recommends that, if the Project proceeds, BC Hydro must work cooperatively to obtain site-specific data from Aboriginal groups. The dietary information to be collected from potentially impacted groups should include:

- Species and size of fish caught for consumption;
- Location where fish are caught for consumption;
- Consumption of fish by age group;
- Parts of fish consumed;
- Fish preparation methods;

- Fish meal sizes by age group;
- Fish meal frequency; and
- Other relevant consumption information (e.g. events where consumption is higher over a short period of time such as a camping event).

The Panel concludes that only monitoring of the fish in the reservoir and the consumption habits of the people would provide an adequate base for the development of effective mitigation measures for methylmercury.[3,5]

RECOMMENDATION 34
The Panel recommends that, if the Project proceeds, the monitoring program must require the collaboration of Health Canada and include:

- Involving local Aboriginal communities and the First Nations Health Authority in the design, implementation, management and interpretation and communication of results from the methylmercury monitoring program for fish;
- Collecting representative data through collaboration with Aboriginal communities to enable meaningful sampling of the appropriate fish species and fish size in areas where groups harvest fish. The spatial extent of the sampling program should include tributaries used by Aboriginal groups; and
- Working with all levels of government to communicate information to Aboriginal groups and others regarding potential fish consumption advisories and other health-related bulletins or information as may be necessary.

RECOMMENDATION 35
The Panel recommends that, in the event that Health Canada determines a consumption advisory is needed, the Chief Medical Officer of Northern Health must be notified by Health Canada. The advisory should be designed and implemented in accordance with federal and provincial procedures for issuing fish consumption advisories. It should be issued using good practice including:

- Culturally appropriate communications to Aboriginal groups;
- Mechanisms to receive and respond to inquiries from local communities in regards to the advisories; and
- A collaborative monitoring process with Aboriginal and other communities.

RECOMMENDATION 36
The Panel recommends that, if the Project proceeds, effective communication with Aboriginal communities and other stakeholders is required by Health Canada whether an advisory is needed or not. This should include:

- Communication of the results of the Mercury Human Health Risk Assessment, including guidance for people consuming more than one species of fish and how they can continue to eat multiple species without exceeding the provisional tolerable daily intake for methylmercury; and
- Communication of consumption limits in grams per week rather than servings per week. Further guidance should be provided as to what a gram of fish is equivalent to in order to make the communications more user-friendly.

The Panel concludes that some homes close to the construction of the dam and in Hudson's Hope shoreline protection activity area would experience an increase in noise combined with a degradation of the ambient air quality.[3,5]

RECOMMENDATION 37
The Panel recommends that, if the Project proceeds, where monitoring indicates that homeowners are experiencing serious nuisance as a result of the Project, BC Hydro be required to mitigate those effects, up to and including relocation if necessary.

The Panel agrees with the Proponent that there would be no significant adverse effects on human health taking into account the mitigation measures proposed by the Proponent and the Panel recommendations.[3,5]

Because of the uncertainty in the assessment, **the Panel concludes** that there is no need at present to do a cumulative effects assessment on health indicators but that one may be required once effects are confirmed through monitoring.[3,5]

Heritage Resources

The Panel concludes that residual adverse effects on physical heritage resources caused by the Project would be adverse and significant.[3,5]

RECOMMENDATION 38
The Panel recommends that, if the Project proceeds, BC Hydro must monitor reservoir erosion during occurrences of low reservoir levels and investigate, according to the requirements of the Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations, any potentially new-found sites and carry out emergency salvage.

RECOMMENDATION 39
The Panel recommends that, if the Project proceeds, BC Hydro must conduct monitoring of shoreline erosion downstream (for approximately 2 km) as part of its chance find procedures to determine if physical heritage resources are affected. The Panel recommends that BC Hydro undertake this monitoring for any spills from the Project reservoir, for a period of 2 years.

RECOMMENDATION 40
The Panel recommends, if the Project proceeds, that BC Hydro must continue its collaboration with First Nations and the Métis Nation British Columbia, for the days committed on ground truthing for the identification of any burial sites that the Project may disturb.

RECOMMENDATION 41
The Panel recommends that, if the Project proceeds, BC Hydro must provide sufficient funds to local accredited facilities in close proximity to the Project to curate and display the recovered resources. The Panel further recommends that these funds be provided only to facilities that agree to work with Aboriginal groups on the display and curation of those artifacts.

The Panel concludes that the cumulative adverse effects on heritage resources would be significant.[3,5]

The Panel concludes that there would be significant adverse effects of the Project on cultural heritage resources for both Aboriginal and non-Aboriginal people.[3,5]

The Panel concludes that the effect of the Project on visual resources would be a significant adverse effect.[3,5]

GHG Emissions

The Panel concludes that the Project would produce more power per gram of CO_2e than any alternative (non-nuclear) over its lifetime.[2]

The Panel agrees with BC Hydro that the Project's effects on greenhouse gases would not be significant.[2]

The Panel agrees with BC Hydro that the contribution of the Project to the provincial, national and global problem would not be significant.[2]

Effects of the Environment on the Project

The Panel concludes that the design of the Project adequately accounts for possible adverse effects of the environment on the Project.

Accidents and Malfunctions

The Panel concludes that the effects of the Project from minor accidents and malfunctions are not likely to be significant and that BC Hydro has demonstrated appropriate diligence in its analysis and proposed mitigation.

The Panel concludes that a Site C dam breach would result in significant adverse effects, but that the probability of failure occurring is remote. **The Panel further concludes** that any effects of a cascading dam failure would result in significant cumulative effects, but that the probability of cascading failure is extremely remote.

> **RECOMMENDATION 42**
> The Panel recommends that, if the Project proceeds, BC Hydro be required to conduct an assessment of the impacts of a multiple cascading dam breach and share the results of that study with the Government of Alberta and the authorities of the towns that would be affected. The Panel recommends that BC Hydro consult with Alberta and emergency management officials in both provinces on communication and contingency plans to address the potential occurrence of a multiple cascading dam breach.

Cumulative Effects Assessment

The Panel concludes that, whether the Project proceeds or not, there is a need for a government-led regional environmental assessment including a baseline study and the establishment of environmental thresholds for use in evaluating the effects of multiple, projects in a rapidly developing region.

> **RECOMMENDATION 43**
> Given the rapid developments foreseen for northeast B.C., Ministers may wish to consider commissioning a regional baseline study and environmental assessment as a public good and a basis for planning and regulating all activities requiring review. Such a study would greatly assist future proponents in all sectors, notably oil and gas, forestry, mining and energy production.

Because of the importance of cumulative effects assessment, **the Panel concludes** that there is a need to improve and standardize cumulative effects assessment methods.

RECOMMENDATION 44
Whether the Project proceeds or not, the Panel recommends that the Canadian Environmental Assessment Agency undertake, on an urgent basis, an update of its guidance on cumulative effects assessment, taking into account the views of the provinces.

Capacity of Renewable Resources

The Panel concludes that because of the significant adverse effects identified on some renewable resource valued components in the long-term, if the Project is to proceed, there would be diminished biodiversity and reduced capacity of renewable resources.

Environmental Management Plans, Follow-up and Monitoring

Subject to the recommendation below, **the Panel is satisfied** with the Proponent's environmental management, including its mitigation measures, monitoring programs, and follow-up programs.

RECOMMENDATION 45
The Panel recommends that, if the Project is to proceed, all recommendations of the Panel directed to BC Hydro and mitigation measures proposed by BC Hydro become conditions of Project approval.

Purpose of the Proposal

The Panel rejects, as a governing purpose, the maximization of the hydraulic potential of the Peace River.

Project Benefits

The Panel concludes that the Project must rest on its main claims - that it would supply electricity that B.C. customers need and would pay for, at a lower combination of cash and external costs than any alternative - and not on regional economic benefits.

Project Costs

The Panel cannot conclude on the likely accuracy of Project cost estimates because it does not have the information, time, or resources. This affects all further calculations of unit costs, revenue requirements, and rates.

RECOMMENDATION 46
If it is decided that the Project should proceed, a first step should be the referral of Project costs and hence unit energy costs and revenue requirements to the BC Utilities Commission for detailed examination.

Demand

The Panel concludes that BC Hydro's forecasting techniques are sound, but uncertainties necessarily proliferate in long-term forecasts.

The Panel concludes that it is unlikely that the transmission and liquefaction energy requirements of the new liquefied natural gas industry will be satisfied by any source except natural gas itself, and thus that BC Hydro's *Integrated Resource Plan* sensitivity scenario of "Low Liquefied Natural Gas" forecast is most likely correct.

The Panel concludes that, basing a $7.9 billion Project on a 20-year demand forecast without an explicit 20-year scenario of prices is not good practice. Electricity prices will strongly affect demand, including Liquefied Natural Gas facility demand.

> **RECOMMENDATION 47**
> The Panel recommends that BC Hydro construct a reasonable long-term pricing scenario for electricity and its substitutes and update the associated load forecast, including Liquefied Natural Gas demand, and that this be exposed for public and Commission comment in a BC Utilities Commission hearing, before construction begins.

Demand Moderation

The Panel concludes that the demand-side management yield ought to at least keep up with the growth in gross demand, and therefore the potential savings from 2026 to 2033 may be understated.

Using BC Hydro's price elasticity of demand of -0.57, accepting BC Hydro's forecast of gross demand, and positing a real price increase of 50 percent from 2014 to 2033, **the Panel concludes** that net demand in 2033 is likely to be about 65 terawatt hours.

The Panel concludes that demand management does not appear to command the same degree of analytic effort as does new supply.

Supply: Energy and Capacity

The Panel concludes that methodological problems in the weighing and comparison of alternatives render unitized energy costs only generally reliable as a guide to investment. The Panel is more confident about the ranking of BC Hydro's projects, or independent power producers' projects, or demand side management projects considered as separate lists. Uncosted attributes such as the ability to follow load, geographical diversity, or the ability to assist with the integration of intermittent sources need more analytical attention.

The Panel concludes that a number of supply alternatives are competitive with Site C on a standard financial analysis, although in the long term, Site C would produce less expensive power than any alternative.

The Panel concludes that relying on exports to absorb surplus production would likely be very expensive.

Research

The Panel concludes that a failure to pursue research over the last 30 years into B.C.'s geothermal resources has left BC Hydro without information about a resource that BC Hydro thinks may offer up to 700 megawatts of firm, economic power with low environmental costs.

The Panel concludes that analytic efforts to quantify the potential benefits of geographic diversity and climate-induced changes to hydrology could allow a better characterization of important resources.

RECOMMENDATION 48
The Panel recommends, regardless of the decision taken on Site C, that BC Hydro establish a research and development budget for the resource and engineering characterization of geographically diverse renewable resources, conservation techniques, the optimal integration of intermittent and firm sources, and climate-induced changes to hydrology, and that an appropriate allowance in its revenue requirements be approved by the BC Utilities Commission.

Policy Constraints on Supply

The Panel concludes that, under the Low Liquefied Natural Gas case, available resources could provide adequate energy and capacity until at least 2028.

Panel's Overall Analysis on Need for the Project

The Panel concludes that B.C. will need new energy and new capacity at some point. Site C would be the least expensive of the alternatives, and its cost advantages would increase with the passing decades as inflation makes alternatives more costly.

The Panel concludes that the Proponent has not fully demonstrated the need for the Project on the timetable set forth.

RECOMMENDATION 49
The Panel recommends that, if Ministers are inclined to proceed, they may wish to consider referring the load forecast and demand side management plan details to the BC Utilities Commission.

RECOMMENDATION 50
Regardless of its decision on Site C, the Province should update its guidance on the social discount rate or rates to be used for the analysis of societal costs and benefits for projects built or procured by public sector entities.

[1] CEAA 2012, s. 5(1)(a)
[2] CEAA 2012, s. 5(1)(b)
[3] CEAA 2012, s. 5(1)(c)
[4] CEAA 2012, s. 5(2)(a)
[5] CEAA 2012, s. 5(2)(b)