LEGISLATIVE ASSEMBLY OF ALBERTA

COMMITTEES
OF THE LEGISLATIVE ASSEMBLY

Standing Committee on Resource Stewardship

Review of the Potential for Expanded Hydroelectric Energy Production in Northern Alberta

Twenty-Eighth Legislature
First Session
March 2013

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STANDING COMMITTEE ON RESOURCE STEWARDSHIP

March 2013

To the Honourable Gene Zwozdesky
Speaker of the Legislative Assembly
of the Province of Alberta

I have the honour of submitting, on behalf of the Standing Committee on Resource Stewardship, its final report pursuant to standing order 57.02(2) on the **Review of the Potential for Expanded Hydroelectric Energy Production in Northern Alberta.**

Sincerely,

[Original signed by chair]

Donna Kennedy-Glans, MLA
Chair, Standing Committee
on Resource Stewardship

c. Dr. David McNeil
Clerk of the Legislative Assembly

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28th Legislature, First Session

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[§] Substitution for Genia Leskiw, October 24 and 29, 2012.
[**] Substitution for Rick Fraser, October 29, 2012.
[††] Substitution for Deron Bilous, December 3, 2012.
[‡‡] November 19, 2012.
[§§] November 26, 2012.
[***] November 26, 2012.
[†††] February 5, 2013.

[‡‡‡] Substitution for David Xiao, December 3, 2012.
[§§§] Substitution for Ron Casey, December 13, 2012.
[****] Substitution for Rob Anderson, February 4, 2013.
[††††] Substitution for Jason Hale, February 27, 2013.
[‡‡‡‡] Substitution for Genia Leskiw, February 27, 2013.

1.0 INTRODUCTION

The Standing Committee on Resource Stewardship is one of three legislative policy committees appointed by the Legislative Assembly of Alberta. Standing Order 52.01(1)(c) indicates that the Committee's mandate is related to the areas of Environment and Sustainable Resource Development, Transportation, Municipal Affairs, Treasury Board and Finance, and Energy. Under Standing Order 52.07 the Committee has the ability to initiate a review of any matter of public policy within its mandate. Having initiated any such review, the Committee must conclude the inquiry and issue a substantive report to the Assembly within six months.

On September 27, 2012, the Standing Committee on Resource Stewardship passed the following motion to undertake a study of the potential for expanded hydroelectric energy production in northern Alberta:

> **Moved by** Mr. Rowe that in the interest of encouraging sustainable development and exploring methods to reduce Alberta's carbon footprint, the Standing Committee on Resource Stewardship undertake a study of the potential for expanded hydroelectric energy production in northern Alberta and that the scope of the review shall include the following:
>
> - potential for development;
> - trade-offs between run-of-the-river projects and storage dam projects;
> - potential for partnerships with Aboriginal people, provinces, and territories;
> - barriers to development;
> - environmental advantages and disadvantages;
> - economic, environmental, and social implications of development; and
> - the economics of investment in long-payoff projects
>
> but shall seek to avoid those issues within the mandate of the Retail Market Review Committee, the Critical Transmission Review Committee, and the regulatory enhancement project to reduce duplication of effort.

As part of the hydroelectric potential study the Committee held meetings on September 27, 2012; October 24 and 29, 2012; November 5, 19, and 26, 2012; December 3 and 13, 2012; and February 4, 5, and 27, 2013. Throughout these meetings the Committee received 16 presentations from identified stakeholders (Appendix C) and conducted site visits to TransAlta Corporation dam sites on the Bow River on February 1, 2013.

At the direction of the Committee a working group consisting of representatives from each caucus was established. The original members of the working group included Donna Kennedy-Glans (PC), Bruce Rowe (W), Kent Hehr (AL), and Deron Bilous (ND). With the consent of the Committee the working group initiated the plans and procedures necessary for the Committee to complete its study of hydroelectric development.

After completing the information-gathering process and discussing the issues raised throughout the review, the Committee delegated to the working group the authority to prepare a draft report on hydroelectric development for review by the Committee. The Committee also agreed to add Mr. Ron Casey (PC) to the working group for this part of the process.

In accordance with the instructions of the Committee the working group met to determine the content of the Committee's report on hydroelectric development. A draft report was prepared and distributed to all Committee members. On February 27, 2013, the Committee met to review and approve the final report, this document, for submission to the Legislative Assembly.

This report contains the recommendations of the Standing Committee on Resource Stewardship following its deliberations on the potential for expanded hydroelectric energy production in northern Alberta. This report is not intended to be a comprehensive record of the Committee's proceedings, nor is it a review of

individual projects or proposals. For a complete record reference should be made to the *Alberta Hansard* transcripts of the Committee proceedings, including the oral presentations made to the Committee; the summary of presentations; the research reports that were prepared by the Legislative Assembly Office's Research Services; and other related documents that were submitted to the Committee (See Appendices C and D).

2.0 SUMMARY OF COMMITTEE RECOMMENDATIONS

The Standing Committee on Resource Stewardship makes the following recommendations with respect to the potential for expanded hydroelectric energy production in northern Alberta.

ECONOMIC VIABILITY OF HYDROELECTRICITY AND CAPITAL FINANCING

The Committee recommends that the relevant government departments examine the following policy options, which may reduce capital financing risk while meeting existing policy goals:

a. By considering long-term power-purchase agreements by industrial or commercial users given Alberta's Climate Change Strategy's electricity production emissions reduction targets of 37 megatonnes by 2050.

b. By considering generation portfolio greenhouse gas emission targets as a formal mechanism to achieve Alberta's Climate Change Strategy's goal.

c. By considering the negotiation of generation portfolio greenhouse gas emission targets for Alberta in response to federal government regulation.

d. By examining the feasibility of undertaking projects as public-private partnerships (but not excluding any and all options) to develop hydroelectric resources on Alberta's northern rivers.

INTERJURISDICTIONAL ISSUES

The Committee requests an update on the bilateral water agreements under the Mackenzie River Basin Transboundary Waters Master Agreement upon the completion of each individual agreement.

ABORIGINAL CONSULTATION

The Committee understands that hydroelectric development in northern Alberta cannot be achieved without adequate consideration of traditional land uses, treaty rights, and non-treaty Aboriginal rights. The Committee further acknowledges that consultation with Aboriginal peoples is essential to the success of any application for a hydroelectric development project in northern Alberta and encourages the Alberta Government's adoption of First Nations and Métis consultation processes.

Given the potential for employment, contracting, and investment opportunities with the construction of a hydroelectric project, the Committee recommends that future development of hydroelectricity in Alberta's north include opportunities for partnerships with First Nations and Métis.

ENVIRONMENTAL CONSIDERATIONS

The Committee observes that run-of-the-river hydroelectric projects avoid many of the environmentally negative effects of storage dam hydroelectric projects and, therefore, should be considered as the preferential development model.

The Committee sees value in the completion of a baseline study prior to the advancement of a hydroelectric project in relation to any one of Alberta's three major northern rivers.

The Committee recommends that the Government of Alberta work with the federal government to assess the impact of hydroelectric development projects on flora and fauna and the negative effects on fish and wildlife habitats.

The Committee recommends that in future regulatory proceedings the Alberta Utilities Commission address the issue of resource conservation by ensuring that a proposed hydroelectric site not unduly limit the energy capacity and, therefore, the development of other hydroelectric generation sites on a river or greatly underutilize a high-potential generation site.

3.0 DEFINITIONS

Hydroelectric	Relating to or denoting the generation of electricity using flowing water to drive a turbine which powers a generator.
Storage dam	A structure impounding a large quantity of water and increasing available head, creating substantial changes to the natural seasonal flow of water beyond the dam in response to hydroelectric production demand.
Head-pond dam	A structure impounding a small quantity of water and increasing available head, allowing hourly and daily changes to the flow of water beyond the dam in response to hydroelectric production demand.
Off-stream diversion	A structure designed to allow a portion of the natural flow of a river to bypass a natural river feature, which generates a natural head and returns water to the river following hydroelectric production.
Dispatchable generation	Generation that can be controlled by the system operator and can be turned on and off to supply electricity and network reliability services, including in hydroelectric developments.
Intermittent generation	Generation that typically cannot be controlled or economically dispatched by system operators based on economic criteria in the same way as dispatchable technologies. The output of intermittent generating units can vary widely from hour to hour or minute to minute, depending on the technology. Rather than controlling how much and when an intermittent generator is dispatched, system operators must respond to production in real time by calling on dispatchable generators to balance supply and demand continuously.
Run-of-the-river project	A hydroelectric project which does not substantially change the natural seasonal flow of water beyond the dam or diversion structure.
Feed-in tariff	A program that provides stable prices through long-term contracts for energy generated using renewable resources through either direct subsidy from government or cross-subsidization by consumers.

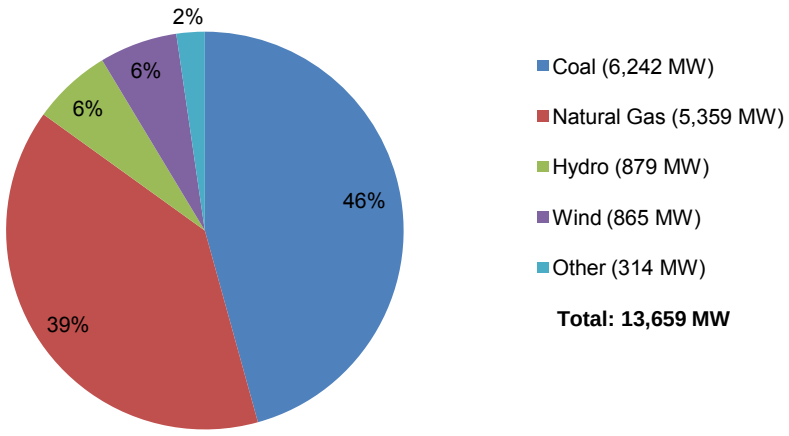
4.0 RECOMMENDATIONS

4.1 INTRODUCTION

4.1.1 Electricity Supply

According to the Alberta Electric System Operator (AESO) 2012 Long-Term Outlook over 2,500 megawatts (MW) of generation capacity has been added to the electric system since 2007 through coal-fired, gas-fired, wind, and various other sources. Notably, 46 per cent of Alberta's current installed capacity is generated by coal, 39 per cent is generated by natural gas, and six per cent is produced through hydroelectric generation. Figure A displays Alberta's generation mix as of December 31, 2011.

Figure A: Installed Generation Capacity in Alberta, as of December 31, 2011



Source: Alberta Electric System Operator, AESO 2012 Long-Term Outlook, (Calgary: AESO, 2012), p. 41.

By way of comparison, Canada's electricity generation mix comprises 60 per cent hydro, 25 per cent combustible fuels, with over half produced from coal, 14 per cent nuclear, and one per cent from other sources such as wind and solar.

4.1.2 Electricity Demand

The Alberta Electric System Operator (AESO) projects an increase in demand from the majority of electricity consumers over the next 20 years, with overall demand growing at a rate of 2.4 per cent annually until 2032. The AESO classifies electricity consumers by sectors: industrial, excluding oil sands (46 per cent of total electricity consumption); oil sands (18 per cent of total electricity consumption); commercial (20 per cent of total electricity consumption); residential (13 per cent of total electricity consumption); and farms (three per cent of total electricity consumption). Over the next 10 years the AESO forecasts that oil sands development will continue to be the primary driver of economic growth and energy consumption.

In his presentation to the Committee Dr. James Feehan commented that demand for electricity in Alberta would increase due to growth in local demand as populations increase. Strong economic growth may result in consumers owning bigger houses and, consequently, consuming more electricity. Moreover, unanticipated energy-intensive industrial development may also increase demand for electricity beyond forecast levels. Combined with continued oil sands development, these factors will produce an increased need for electricity generation in Alberta. The AESO estimates that Alberta will require approximately 11,878 MW of new generation capacity within 20 years.

The AESO expects a shift in Alberta's generation mix from predominately coal-fired to natural gas-based generation. Alberta has six coal-fired power generation facilities with a total installed capacity of 6,242 MW. However, the AESO 2012 Long-Term Outlook anticipates that there will be a net decrease of 3,366 MW of coal capacity by 2032 due to the retirement and decommissioning of existing coal facilities. This is in part the result of federal regulations such as the *Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations*, SOR/2012-167, which have been developed to limit the impact of coal-fired generation facilities on the environment through the reduction of greenhouse gases. The retirement of electricity facilities fuelled by coal is expected to reduce the proportion of coal in Alberta's generation mixture to 25 per cent by 2022 and 12 per cent by 2032.

As part of Alberta's Climate Change Strategy the Government of Alberta has committed to reducing greenhouse gas emissions by 200 megatonnes, or 50 per cent below projected business as usual and 14 per cent below 2005 levels, by 2050. Greening Alberta's energy production through methods other than carbon capture and storage is projected to reduce Alberta's emissions by 37 megatonnes by 2050 according to this strategy.

As part of the Climate Change Strategy the Government of Alberta currently directs funding for low-carbon energy production through the Climate Change and Emissions Management Corporation.

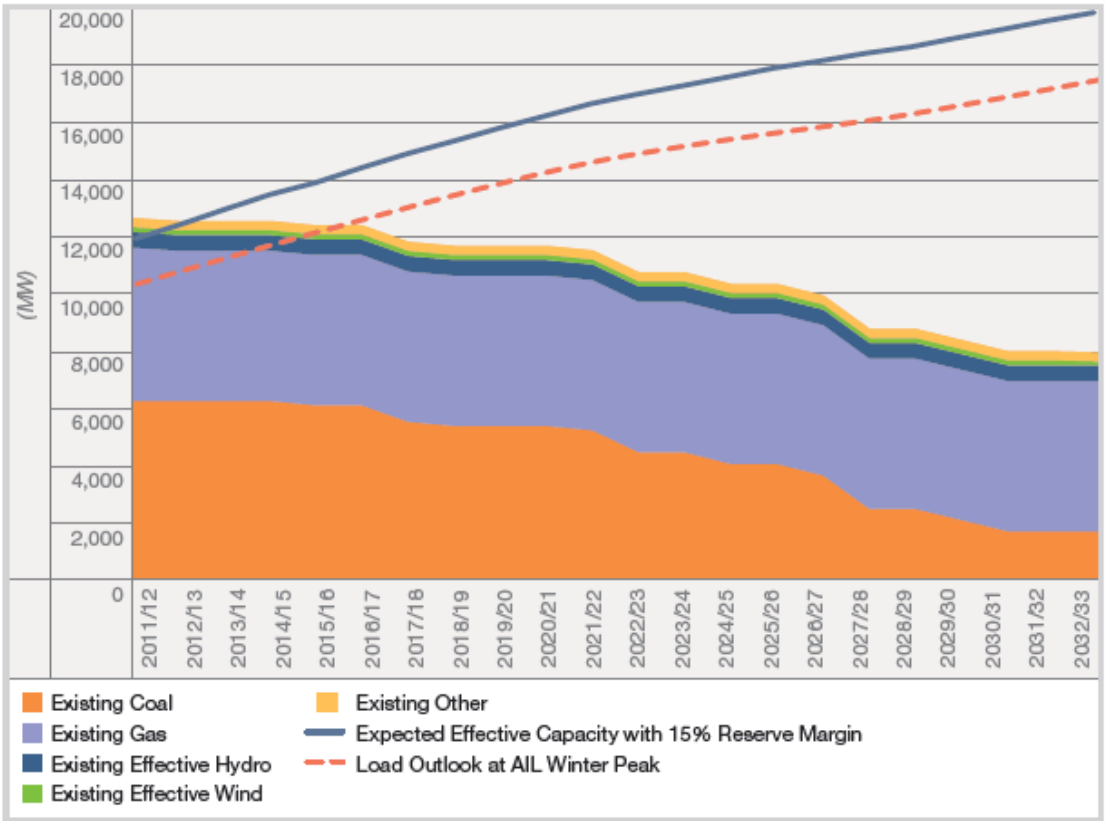
Alberta currently incorporates renewable energy into its portfolio mix in the form of wind power (1,087 MW) and hydroelectricity (894 MW). The carbon intensity of Alberta's generation is currently regulated at the facility level through the *Specified Gas Emitters Regulation*, AR 139/2007, not through portfolio standards.

Internationally, climate change initiatives such as renewable energy certificates in the United States support the purchase of renewable energy and encourage the development of renewable energy projects by requiring utilities to purchase a portion of their electricity from renewable sources. Renewable energy certificates are tradable and create a market-based incentive to develop low-carbon electric generation facilities.

It is important to note that not all renewable energy is created equally, with only certain technologies being capable of responding to rapid fluctuations in demand or generation from intermittent generation sources such as solar or wind. Hydroelectric production at storage dam or head-pond dam facilities is capable of providing backup to wind and solar generation as it is dispatchable.

Figure B below displays the decreasing capacity of existing installed generation and the increasing electrical demand which is projected to occur over the next 20 years.

Figure B: Expected Generation Capacity Requirements (MW)

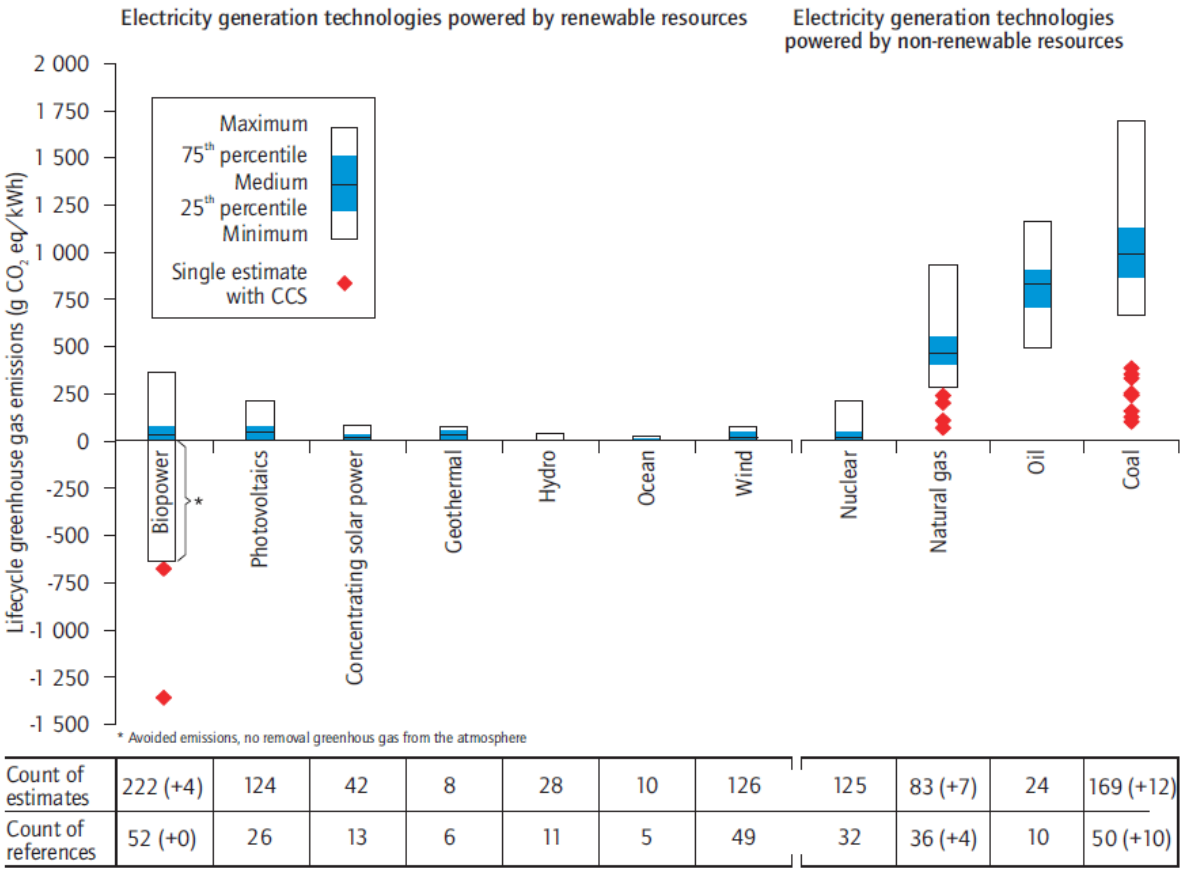


Source: Alberta Electric System Operator, AESO 2012 Long-Term Outlook, (Calgary: AESO, 2012), p. 39.

4.1.3 Demand Supplied by Hydroelectricity

Hydroelectricity may serve as an alternative to coal generation due to the fact that in some installations it is less costly to produce over the long term and it is readily dispatchable. Hydroelectric facilities can generate electricity for a hundred years or longer, approximately four times longer than the life cycle of natural gas facilities. Furthermore, hydroelectricity has fewer atmospheric environmental impacts than coal, clean coal, or natural gas. Figure C displays the life-cycle greenhouse gas emissions of various renewable and nonrenewable resources.

Figure C: Estimates of Life-cycle GHG Emissions in Electricity Generation (Excluding Land-Use Changes)



	Biopower	Photovoltaics	Concentrating solar power	Geothermal	Hydro	Ocean	Wind	Nuclear	Natural gas	Oil	Coal
Count of estimates	222 (+4)	124	42	8	28	10	126	125	83 (+7)	24	169 (+12)
Count of references	52 (+0)	26	13	6	11	5	49	32	36 (+4)	10	50 (+10)

Source: International Energy Agency, Technology Roadmap: Hydropower, (France: IEA, 2012), p. 30.

As shown in the graph, coal generation produces the most greenhouse gases of the generation technologies examined, and natural gas, while having less of an impact on the environment than coal, still produces emissions. Hydroelectricity generates the fewest greenhouse gases of all the sources of electricity generation highlighted. In hydroelectric developments greenhouse gases primarily become a concern if there is a reservoir planned and flooding of land is required.[*]

4.1.4 Hydroelectric Potential

While hydroelectricity constitutes only six per cent of Alberta's current electricity portfolio mixture, it makes up, as indicated, approximately 60 per cent of Canada's electricity generation portfolio. According to the Canadian Hydropower Association Alberta is ranked fourth in Canada for undeveloped hydroelectric potential. The Final Report for Alberta Utilities Commission: Update on Alberta's Hydroelectric Energy Resources (Hatch report), produced by Hatch Ltd., estimates that only four per cent of Alberta's total energy potential of 53,000 gigawatt hours (GWh) per year has been developed.[†] The Hatch report examined the hydroelectric potential of nine river basins throughout Alberta and found that there is the most potential for development of hydroelectricity in Alberta's northern river basins. In particular, 75 per cent of the ultimate developable potential of the five main river basins in Alberta (Athabasca, North

[*] Greenhouse gases are in large measure caused by decomposing plant and organic soil materials that are flooded beneath a reservoir.

[†] 53,000 GWh is equal to 6,050 MW.

Saskatchewan, Peace, Slave, and South Saskatchewan) is contained within the Athabasca, Peace, and Slave River basins. Hatch estimates that up to 20 per cent of this potential could be developed within the next 30 years. In the three northern river basins Hatch identified 36 sites for potential hydroelectric development: 17 sites on the Athabasca River, 18 sites on the Peace River, and one site on the Slave River. These 36 sites have the potential of an average annual energy output ranging from approximately 4.6 MW to 828 MW.

4.2 ECONOMIC CONSIDERATIONS, INCLUDING THE ECONOMIC VIABILITY OF HYDROELECTRICITY AND CAPITAL FINANCING

4.2.1 Levelized Cost of Electricity

In assessing the viability of hydroelectricity, it is instructive to compare the cost of hydroelectricity to other forms of fuel sources for electricity generation. This can be achieved by comparing the levelized costs – i.e., the total cost of building and operating a generating plant over its economic life converted to equal annual payments – for the different energy generation systems, as is displayed in Figure D.

Figure D: Minimum and Maximum Levelized Cost of Electricity Generating Technologies

Technology	Bioenergy	Bioenergy co-firing	Geothermal	Solar PV	CSP	Hydro	Wind onshore	Wind offshore	New coal	New gas CCGT	Micro hydro	Small-scale Solar PV	Small-scale Biogas
min USD/ MWh	80	80	35	155	160	20	50	140	40	40	35	185	110
max USD/ MWh	250	140	200	350	300	230	140	300	90	120	230	600	155

Source: International Energy Agency, Technology Roadmap: Hydropower, (France: IEA, 2012), p. 39.

The table shows that the levelized cost for hydroelectricity ranges from $20 (USD) per MWh to $230 per MWh, with the low end of the range reflecting low-cost, high-capacity factor projects and the high end reflecting the opposite: high-cost, low-capacity factor projects. Hydroelectric generation compares favourably with wind, new coal, and natural gas at the low end of the scale but is not as cost-effective nearer the high end. It should be noted that smaller projects, which include most run-of-the-river facilities, tend to have a higher average levelized cost of electricity than larger, reservoir hydroelectric projects and can cost as much as USD $227 per MWh. Due to the long project life cycle of hydroelectric development and the nature of compound interest over the term levelized cost may not reflect the true opportunity of very low operating costs and is subject to major adjustments due to changes in projected interest rates and inflation.

The ATCO Group compared the life-cycle cost for baseload generation, relating to the Committee that the levelized cost of energy for hydroelectric is approximately $100 per MWh compared to natural gas, which, depending on the price of the commodity, could range from $60 to $95 per MWh (without the price of carbon included). However, ATCO noted that it is important to take into consideration that hydroelectric facilities will produce power for 100 years whereas a natural gas facility will last approximately 25 years. Hydroelectric development can therefore be considered a strategic, long-term investment.

The Pembina Institute also submitted that on average hydroelectric power has a high levelized cost of energy. In the short term hydroelectricity compares unfavourably with alternatives such as natural gas. In

the long term the Pembina Institute agreed with the ATCO Group that hydroelectric power is a good investment because hydroelectric installations can generate power for a hundred years or longer.

4.2.2 Financial Challenges

The major capital costs associated with the construction of hydroelectric projects as set out by the International Energy Agency (IEA) include the civil engineering works (dam, tunneling, and powerhouse), electromechanical equipment, access roads, transmission lines and related engineering, procurement, and construction management expenditures. Planning, feasibility assessment, permits, environmental impact analysis, mitigation of impacts, resettlement, and maintenance of water quality are other significant costs.

a) Capital Financing

Hydroelectric development is capital intensive but has very low operating costs. Long construction periods and large upfront capital costs are necessary to complete hydroelectric projects. The return on investment varies depending on such factors as reliability of water supply and economic factors such as the cost of electricity, inflation, and interest rates.

Financing of the capital requirements is one of the greatest development challenges of hydroelectric projects. The ATCO Group, TransCanada Corporation, Manitoba Hydro, and TransAlta Corporation all related to the Committee that hydroelectric development requires a large capital investment and that a long period of time is required to recover that capital. In most countries hydroelectric projects have traditionally been developed by the public sector. In Canada, as pointed out to the Committee by Professor Jean Thomas Bernard and Professor James Feehan, after an initial period of private development hydroelectric projects have also been either financed publicly or governments have provided loan guarantees to their hydro Crown corporations. However, as the IEA argues, "[p]ublic funding for new hydroelectricity projects has diminished substantially with the electricity industry evolving towards liberalization, with private financing, operation and ownership." Moreover, Professor Feehan submitted that the private sector is often involved in large projects such as in the oil sands, and if there are reasonable prospects of profitability, there will be enough private investment without public sector involvement. However, he cautioned the Committee that Alberta not rule out Crown corporations or public private partnership (P3) approaches, which, as the IEA elaborates, are a possible solution to the capital financing challenge in that through a combined financial effort, "risks and returns are shared between private investors and the public sector, to provide the synergies for a positive outcome."

Manitoba Hydro commented on the issue of capital financing by suggesting that power purchase agreements are critical to successful hydroelectric development. Without a power purchase agreement energy developers, including those who develop wind power and hydroelectricity, cannot get their projects financed.

The Committee inquired about the possibility of using transparent feed-in tariffs as a means by which to reduce risk for capital investors and increase the potential return on investment. Dr. Bernard believes that feed-in tariffs are a viable alternative. With a feed-in tariff, he explained, there is incentive for the private industry to develop hydroelectricity at a lower cost in order to make money and increase their return on investment.

Recommendation(s):

The Committee recommends that the relevant government departments examine the following policy options, which may reduce capital financing risk while meeting existing policy goals:

a. By considering long-term power purchase agreements by industrial or commercial users given Alberta's Climate Change Strategy's electricity production emissions reduction targets of 37 megatonnes by 2050.

b. By considering generation portfolio greenhouse gas emission targets as a formal mechanism to achieve Alberta's Climate Change Strategy's goal.

c. By considering the negotiation of generation portfolio greenhouse gas emission targets for Alberta in response to federal government regulation.

d. By examining the feasibility of undertaking projects as public-private partnerships (but not excluding any and all options) to develop hydroelectric resources on Alberta's northern rivers.

4.3 INTERJURISDICTIONAL ISSUES – THE MACKENZIE RIVER BASIN TRANSBOUNDARY WATERS MASTER AGREEMENT

The Mackenzie River basin is the largest watershed in Canada, covering approximately 1.8 million square kilometres, or about 20 per cent of Canada's land mass. It is the largest and longest river system in Canada and spans five jurisdictions. Transboundary agreements among the jurisdictions within the watershed are essential to ensuring co-operation in the management and preservation of shared resources such as water.

The Mackenzie River Basin Transboundary Waters Master Agreement was signed on July 24, 1997, by the governments of Canada, the Northwest Territories, Yukon, British Columbia, Alberta, and Saskatchewan to establish "common principles for the cooperative management of the aquatic ecosystem of the Mackenzie River Basin." The agreement encourages signatory provinces and territories to develop bilateral water management agreements, and the Mackenzie River Basin Board was established to facilitate this process. Through the Mackenzie River Basin Transboundary Waters Master Agreement Alberta has committed to establishing bilateral water management agreements with each of its neighbouring jurisdictions: British Columbia, Saskatchewan, and the Northwest Territories. These bilateral agreements will define transboundary objectives for water quality and the use of shared water resources in order to maintain the integrity of the aquatic ecosystem of the Mackenzie River basin. They will also address protocols for information exchange, notifications in the event of an emergency, and dispute resolution processes. Alberta Environment and Sustainable Resource Development estimates that the three bilateral agreements will be concluded in 2013.

The Mackenzie River Basin Transboundary Waters Master Agreement is significant to hydroelectric development because the resulting bilateral agreements between Alberta and its neighbouring jurisdictions will regulate the upstream and downstream impacts of construction, including hydroelectric development, on the rivers. The construction and operation of hydroelectric facilities is not without environmental and resource conservation implications. Consideration must be given to the terms of the bilateral agreements if hydroelectric facilities are to be located on waterways that cross jurisdictional boundaries.

Manitoba Hydro, in commenting on how transboundary agreements affect hydroelectric development and in providing Alberta advice in this respect, made the following recommendation to the Committee: ". . . make sure that you've got the upstream provinces – well, B.C. I guess is the only upstream one – and the downstream ones onboard with you. Otherwise, you're going to be tied up forever in arguing about the fundamental management of the resource." The Environmental Law Centre (ELC) agreed with this point and cautioned that interprovincial conflicts may arise from any downstream impacts resulting from hydroelectric development. The ELC emphasized the importance of finalizing multilateral and provincial-territorial agreements to ameliorate these issues.

The Paddle Prairie Métis Settlement, the Little Red River Cree Nation, and the Smith's Landing First Nation all made submissions to the Committee illustrating the harmful effects to the environment and to economic activities of Aboriginal peoples caused by the disruption to the flow regime of the Peace River, the result of upstream hydroelectric development in British Columbia. (The Environmental Considerations section below details concerns about disturbances to flow regimes.) Transboundary agreements are an

important component in establishing a framework for mitigating the impacts of hydroelectric development on downstream communities.

Recommendation:

The Committee requests an update on the bilateral water agreements under the Mackenzie River Basin Transboundary Waters Master Agreement upon the completion of each individual agreement.

4.4 ABORIGINAL CONSULTATION

Consultation with Aboriginal people is critical to the successful development of hydroelectricity in Alberta. Hydroelectric development affects the cultural, social, and/or economic way of life of the Aboriginal people in areas affected by such development. Aboriginal groups have the right to be consulted.

Treaty 8, as the Little Red River Cree Nation explained, "affirmed the right of the Crown to take up land for settlement and development, but the treaty also affirmed and guaranteed the First Nations' right to use all lands not taken up by the Crown to continue their way of life and their usual vocations of hunting, trapping, and fishing. Water was not mentioned at all in the treaty or during the discussion of the treaty." Hence, a "nation-to-nation" or a "government-to-government" relationship is needed to discuss matters pertaining to hydroelectric development and its impacts, including its effects on the traditional rights of First Nations people.

The Métis Nation of Alberta (MNA) stated that hydroelectric development will affect the rights and way of life of the Métis. Therefore, the MNA recommends that the Committee lay a foundation for a meaningful consultation with Métis on any future hydroelectric developments. The Government has a duty to consult with the Métis; however, the MNA notes that while Alberta has a First Nations consultation policy, it does not yet have a Métis consultation policy. The MNA added that a Métis consultation policy needs to be put into place prior to commencing a hydroelectric project.

Due to the fact that a consultation policy does not currently exist, in 2010 the MNA created its own policy, which is a guideline for industries to conduct a meaningful consultation process with the Métis people, but this policy is not recognized by the Government of Alberta. The MNA states that one of the biggest problems it faces is that it lacks the resources to implement this policy. The MNA cites Ontario's consultation process as a model to which Alberta should aspire as there is a strong relationship between the Métis Nation of Ontario and the Ontario government.

The Little Red River Cree Nation stated that it has not been offered enough funding to properly engage with the process of development and has not received enough consultation funding in relation to project-specific consultations. It believes that British Columbia, since entering into an economic benefit agreement with the Treaty 8 First Nations in northeast British Columbia, provides a better level of resourcing to First Nations to consult with the government. Additionally, the level of funding that it receives to consult with industry is more substantial than the funding that is provided by Alberta.

Recommendation:

The Committee understands that hydroelectric development in northern Alberta cannot be achieved without adequate consideration of traditional land uses, treaty rights, and nontreaty Aboriginal rights. The Committee further acknowledges that consultation with Aboriginal peoples is essential to the success of any application for a hydroelectric development project in northern Alberta and encourages the Alberta Government's adoption of First Nations and Métis consultation processes.

4.4.1 Partnerships with Aboriginal People in Developing Hydroelectric Power

With hydroelectric development comes the very real risk of disruption to the traditional economic (hunting, fishing, and trapping) and cultural activities of Aboriginal peoples; however, opportunities for investment and employment are also associated with such development. Depending on the size and nature of the development, the building of a hydroelectric generation plant could result in the creation of a multitude of construction and related, or "spin-off," jobs and/or investment opportunities. Construction employment would benefit the entire province but would be most beneficial to the nearby communities. Once the construction is completed, jobs would be available for the operation and maintenance of the facility.

Manitoba Hydro described partnerships it established with Aboriginal groups in which the Aboriginal partners have some of their funds invested in a project, receive construction contracts, and are directly employed by the developer at the dams. Approximately 45 per cent of the employees at northern Manitoba facilities are Aboriginal. Manitoba Hydro also pointed out to the Committee the benefits of engaging Aboriginal communities when building transmission lines and of avoiding disturbing areas of significant interest such as historical and cultural landmarks.

Following consultation between the Métis people and the Government, which the MNA argues would be a crucial first step in any hydroelectric development, the Métis in Alberta want to have the opportunity to participate completely in any potential projects. The MNA states: "We want to work with government and industry to build mutually beneficial relationships. We want to look at potential ownership and equity positions. We also want to make sure that there is employment for our people, contracts for our businesses, and contracts for our business entrepreneurs."

The Little Red River Cree Nation submitted that it, too, is seeking employment and business opportunities for its members. As the Little Red River Cree Nation pointed out, "We have no viable business to employ our peoples, and it's one of the reasons that most of them sustain themselves to this day by hunting, trapping, and fishing. We are as interested as any other peoples within Alberta in jobs and business opportunities, but we believe that the government needs to address the matter of cultural sustainability before it tries to talk about what we call equitable benefit, which is jobs and business opportunities."

Recommendation:

Given the potential for employment, contracting, and investment opportunities with the construction of a hydroelectric project, the Committee recommends that future development of hydroelectricity in Alberta's north include opportunities for partnerships with First Nations and Métis.

4.5 ENVIRONMENTAL CONSIDERATIONS

4.5.1 Water

a) Changes to Habitat

Inundation is perhaps the most widely known of the environmental impacts of hydroelectric projects. The effects of inundation range from changes to habitat to the displacement of humans and fauna. Perhaps less well known is the impact that the creation of reservoirs has on the production of greenhouse gases, which was discussed above.

Run-of-the-river projects have the advantage of minimizing the amount of land that needs to be inundated as compared to traditional hydroelectric projects, and as a result, the impact of inundation is correspondingly lessened. Off-stream diversion facilities have no reservoir and, consequently, require that no land be inundated.

b) Evaporation and River Inflows

The Water Matters Society of Alberta (Water Matters) discussed water supply in Alberta and the implications of climate change on water supply, particularly as it relates to hydroelectric generation. Water supply in Alberta is declining, not necessarily solely due to the lack of precipitation but also because of greater evaporative losses into the atmosphere, particularly in southern Alberta.

According to Water Matters, water supply is closely tied to such factors as precipitation, temperature, and evaporation, and the predictability of water relies largely on the release of water in the spring from snowmelt. However, there have been declines in the amount of snowmelt due to the fact that there are more midwinter melts and less snow falling. Rivers in Alberta rely in large part on glaciated headwaters; however, glaciers in the eastern Rockies have been substantially declining in size for the last century.

Hydroelectric projects have the potential not only to disrupt natural flows but also to consume water through additional evaporative loss, thereby negatively impinging on volumes contained within bodies of water. As Water Matters explained, hydroelectric facilities which have large dams with reservoirs are susceptible to considerable evaporation loss. Run-of-the-river type of hydroelectric projects result in very low evaporative loss, a fact, says Water Matters, which "should be of interest to anyone who's interested in power generation in a water-constrained environment."

Water Matters stated there is a lack of baseline data for regulatory agencies to make decisions for hydroelectric development, which substantially modify river flow regimes.

The Committee inquired about the quality of baseline water data and how this can be improved to better assist decision-making. Water Matters responded that there are few long-term data sets available for studying water supply. However, there has been no substantial study of what is needed for in-stream flow needs for rivers in Alberta other than the South Saskatchewan River. Information that is collected on groundwater and surface water is often the proprietary information of the energy industry and not available for the public or academic utilization. Furthermore, Water Matters suggests that there needs to be long-term monitoring and sampling conducted on the river network (over 30 or 40 years) in order to obtain enough data to understand the changes that are occurring in the rivers and what is causing them.

4.5.2 Natural Flow Regime

Presenters to the Committee also remarked on the impact that existing hydroelectric projects have on the natural flow regimes. To illustrate the effect, the Little Red River Cree Nation submitted that "restoration of the natural flow regime of the Peace River would be the top priority for restoring the ecological integrity of the Peace-Athabasca delta . . . Every time B.C. Hydro has released water outside of their hydroelectric flow regime – and they've released water in historic, large water releases a number of times over the last 10 years – these deltas have been recharged and have stayed recharged for varying lengths of time. So the relationship between large-scale releases of water at the proper time and the ecology of the delta is well understood both within the scientific community and within the traditional knowledge community, that are working on the Peace-Athabasca delta reports."

The Paddle Prairie Métis Settlement also commented on the impact of the disruption of the natural flow regime. This stakeholder argued that the Peace River is a "market-driven" river and that the rises and declines of the river are dependent upon the operation of upstream dams by B.C. Hydro. When electricity demand is highest, the river rises considerably. This is the result of the release of water from reservoirs upstream of the dams located on the British Columbia side of the border downstream into the Peace River into Alberta and eventually into Lake Athabasca. As the Paddle Prairie Métis Settlement explained, during times when the natural river flows used to be at their highest levels (i.e., prior to hydroelectric development), in June and July, the river levels are now lower due to lower electricity demand. Paddle Prairie Métis Settlement concludes that ecological habitats and the way of life of the people living within the Peace River basins are negatively impacted as a result of the unnatural fluctuation of river flow.

4.5.3 Impact on Ice Formation and Consequential Effects

The construction of a hydroelectric project may have an impact on the "ice regime" within a river, meaning that the project may inhibit the formation of ice or alter the characteristics of the ice that is formed and how and when breakup occurs. The impact of altered and delayed ice formation is that river ice, when formed, may be thicker and, therefore, cause higher than pre-project water levels at certain points in the river. Bankside communities may be impacted by flooding depending on where the water rises. Ice jams forming in the river where none typically occurred pre-project is another risk. Changes in ice formation and characteristics may also threaten bridges, including ice bridges used as transportation links to cross rivers in winter.

Ice damming may also be negatively affected by the disruption of the natural flow of rivers caused by reservoir hydroelectric facilities. The Little Red River Cree Nation explained to the Committee that before hydroelectric dams were built, ice damming would occur at major river confluences. In the case of Little Red River, ice dams formed at the Wabasca River and the Mikkwa River. Significantly, the ice dams caused "the river to overflow relatively low banks and flood and recharge extensive wetland complexes. When the flow regime was changed, these ice dams occurred much less regularly. Consequently, these wetland complexes were not recharged as often, and through a process of vegetational succession a lot of them turned from being sedge meadow complexes into large stands of willows. They're much less viable as wildlife habitats." The Little Red River Cree Nation added that this phenomenon has been studied for a number of years in the Peace-Athabasca delta, and "the effect has been to diminish the wetland complexes by 40 to 50 per cent. In the area surrounding Jean D'Or Prairie and Fox Lake this same level of degradation and drying up has occurred, but it has not been as extensively documented because nobody has had the money to do it."

4.5.4 Potential Effects on Fish and Wildlife

a) Fish

A project on a major river in northern Alberta would affect the pre-existing aquatic environment and, therefore, may have an impact on fish habitat, populations, migration, and fish movement more generally. Fish populations may be deleteriously affected by development because of the loss of spawning sites (e.g., shoals). Changes in channel morphology, sedimentation, and the creation of head ponds and/or headworks among other factors, including stratification and supersaturation, left unmitigated may cause a decrease in habitat. Habitat compensation plans may be devised and implemented in an effort to create new habitat such as spawning grounds to compensate for habitat loss due to development.[*]

A hydroelectric project may also have implications with respect to the movement of fish within their riparian habitat. The issue relates to fish corridors through which fish travel upstream and downstream and the fact that development would disrupt these corridors. The establishment of "fishways" is a potential mitigating factor in that they allow fish to circumvent the hydroelectric development and, therefore, move upstream in the river. A concern is that fishways would not enable the passage around the development of 100 per cent of the fish, particularly smaller fish or fish unable to find the fishway entrance. As a result, there may be a decrease in the number of fish that spawn and, therefore, a decline in fish populations.

Fish passage sluiceways are an adaptive means by which fish may move downstream in spite of the hydroelectric plant, from the reservoir to downstream. Sluiceways may be placed between the powerhouse and the spillway and/or near the fishway(s) and between the turbine units.[†]

The Canadian Hydropower Association submitted that the advances in technology involved in hydroelectric production have been achieved in environmental protection. This has resulted in fish-friendly turbines and other methods of protecting species that may be affected by a dam.

[*] As an example, a head pond may be suitable for spawning of certain fish species at or near hydroelectric sites.
[†] Note that fish exclusion racks may be installed around the development in order to guide fish towards the sluiceways.

b) Wildlife

Run-of-the-river hydroelectric projects have the advantage over storage dam projects of limiting or eliminating (with off-stream diversion projects) the inundation of land within the project area. Nevertheless, projects of this nature may still affect water levels around the development and, therefore, have an impact on wildlife species. The Water Matters Society of Alberta pointed out that while run-of-the-river projects may be less environmentally disruptive, they can still represent substantial disturbance, particularly if there is diversion of water flow. Nesting, forage, and cover along rivers and streams can be temporarily or permanently lost as a result of hydroelectric development. Larger reservoirs may block the traditional migration of animals, including beaver, muskrat, and others, along or across rivers. The changes that are caused by development may result in unsuitable habitat for some species and even a loss in population.

There are, however, in some cases ways to mitigate the effects of habitat change. Operators of hydroelectric plants and reservoirs may assist wildlife habitat by, as one example, providing resting and feeding points for geese and other migratory birds and waterfowl. Reservoirs may even increase the shoreline of an original lake or river, which can expand wildlife habitat for some animal species.

In its submissions to the Committee the Environmental Law Centre discussed jurisdiction over fish and wildlife. The ELC submitted that the federal government has powers over inland fisheries which it exercises through provisions in the *Fisheries Act* regarding habitat protection, fish passages, and allowances for fishways. The federal government is also responsible for species at risk, migratory birds, and navigable waters (which it exercises through provisions in the *Navigable Waters Protection Act*). The province plays a large role in environmental management and protection by managing wildlife impacts, facilities impact, and the impacts of transmission and infrastructure related to the developments.

4.5.5 Resource Conservation

An issue raised during the Committee's stakeholder submission process was that of resource conservation. Specifically, what is the effect of the development of one hydroelectric facility in one stretch of a river on the remaining hydroelectric capacity of the same river? In other words, in approving fairly small facilities, is the capacity to build future projects with larger hydroelectric capacity undermined?

The Committee heard that the capacity of plant can be a chief determinant in the remaining hydroelectric capacity of the river. The ATCO Group pointed out that it is "terribly important that we don't squander any of the sites we do have. When you look at hydro potential in any one of these rivers, it's important that we optimize the resource with any facility that we put in place. You know, we have an example of that right now on the Peace River, where there's a current project proposed that's only 150 megawatts. That river has a potential of well over 1,000 megawatts, but that little 150-megawatt project will prevent that larger project from ever going ahead. So in that whole permitting process it's important to look at making sure we optimize the resource. If we're going to disrupt the flow of the river, let's get every bit of electricity out of it that we can."

Recommendation(s):

The Committee observes that run-of-the-river hydroelectric projects avoid many of the environmentally negative effects of storage dam hydroelectric projects and, therefore, should be considered as the preferential development model.

The Committee sees value in the completion of a baseline study prior to the advancement of a hydroelectric project in relation to any one of Alberta's three major northern rivers.

The Committee recommends that the Government of Alberta work with the federal government to assess the impact of hydroelectric development projects on flora and fauna and the negative effects on fish and wildlife habitats.

The Committee recommends that in future regulatory proceedings the Alberta Utilities Commission address the issue of resource conservation by ensuring that a proposed hydroelectric site not unduly limit the energy capacity and, therefore, the development of other hydroelectric generation sites on a river or greatly underutilize a high-potential generation site.

5.0 ACKNOWLEDGEMENTS

The Committee wishes to acknowledge the valuable contribution of those who appeared before the Committee to provide Committee members with information about hydroelectric development and its impacts.

The Committee also wishes to acknowledge the assistance of Legislative Assembly Office support staff.

Ms. Shannon Dean
Ms. Leah Kirtio
Mr. Duncan Leung
Dr. Philip Massolin
Ms. Jody Rempel
Mrs. Karen Sawchuk
Mr. Chris Tyrell
Ms. Nancy Zhang
Hansard staff
Security staff

6.0 STAKEHOLDER PRESENTATIONS

As part of the study on the potential for expanded hydroelectric energy production in northern Alberta the Standing Committee on Resource Stewardship identified stakeholders in the issue and invited these individuals and organizations to make presentations to the Committee as part of the review process. A total of 16 presentations on hydroelectric development were made to the Committee. A list of presenters is provided in Appendix C of this report.

A number of issues were raised in the presentations to the Committee with respect to the hydroelectric development, including

- hydroelectric potential on Alberta's major northern rivers;
- opportunity for consultation and partnership with Métis and First Nations peoples;
- economic feasibility, impact, and opportunities;
- requirement for significant upfront capital expenditures followed by long-term returns on investment;
- environmental challenges and benefits; and
- complex and time-consuming regulatory environment.

APPENDIX A: MINORITY REPORT – KENT HEHR, MLA

Minority Report by Kent Hehr, MLA

In Response to the Report of the Standing Committee on Resource Stewardship: Review of the Potential for Expanded Hydroelectric Energy Production in Northern Alberta

March 2013

Minority Report

Kent Hehr, MLA
Calgary-Buffalo

To the Committee,

I would like to thank the committee for embarking on the Review of the Potential for Expanding Hydroelectric Production in Alberta. Throughout this process, the committee has embodied the spirit of openness and transparency. Moreover, we worked closely with a wide range of community stake holders, experts, and legislators. The submission made by the Committee will likely have an impact on future generations of Albertans and it is my belief that we have undertaken this task with the utmost prudence. The following are my recommendations based on the most recent draft of the Committee's report.

4.2.2. Recommendation A – Crown Corporation

Much evidence was presented to the committee with regard to ways in which Alberta could finance hydroelectric generation in Northern Alberta. These projects require a significant injection of capital and require a long-term view in terms of the return on capital invested. Although somewhat indicated in the majority report, the Alberta Liberal Caucus strongly urges the Alberta government to consider all avenues of establishing hydroelectric generation in the province with the goal of maximizing revenue returns to the people of Alberta. Hydroelectric generation occurs on waterways and lands that belong to the Province and thus to all Albertans. The Alberta government should fully explore whether or not the establishment of a Crown Corporation is the best vehicle to maximize these returns. Of course, there are other avenues of financing these projects that were canvassed and discussed in the majority report.

When and if the government decides to pursue the development of hydroelectric generation in Alberta, it should do so by making the case that whatever avenue is decided on to both finance and operate the project, is that it is in the best interests of Albertans over the entire 100 year lifecycle of the project. In short, the Alberta Liberal Caucus, channeling the spirit of Peter Lougheed, would like the government to "think like an owner" when developing these projects.

4.4 Aboriginal/Metis Rights

There exists a high degree of possibility that the development of hydroelectric projects in Alberta will affect the rights of aboriginal peoples. These rights span the spectrum of scope and scale; from the right to use and occupy the land, to the right of natural resource extraction. Aboriginal rights fall clearly under Federal jurisdiction and it is the Province's duty to uphold these rights. There exists a great deal of case law that outlines the roles, responsibilities, and duties of governments with regard to working with aboriginal peoples in such situations as we are discussing in this Committee. Cases that are of particular relevance are:

1. *Delgamuukw* v. *British Columbia,* [1997] 3 S.C.R. 1010

2. *Haida Nation* v. *British Columbia (Minister of Forests),* 2004 SCC 73

3. *Taku River Tlingit First Nation* v. *British Columbia (Project Assessment Director),* 2004 SCC 74

4. *Mikisew Cree First Nation* v. *Canada (Minister of Canadian Heritage),* 2005 SCC 69

Keeping such case law in mind, the Alberta Liberal Caucus urges the government to adopt the best practices that have been developed over decades of relations between aboriginal peoples and governments. Moreover, I urge the government to work with aboriginal people, wherever possible, as partners in this process. This will allow the Province to work with affected Aboriginal groups to avoid or mitigate possible negative impacts. The following are questions that I urge the government to take into consideration when working with aboriginal groups throughout this process:

1) Is it a Crown activity, a disposal of land, an authorization for a third party project or issuance of permit?
2) What are the details of the project and have these been clearly described to the Aboriginal group?
3) Has any third party provided a detailed project description?
4) What are the key decisions to be made and the timeline surrounding those decisions?
5) Is the project site clearly mapped?
6) What other departments, agencies, governments, corporation or authorities are involved in this project?
7) Have there been issues raised in the past by the affected Aboriginal group regarding this or other similarly proposed activities?

The Supreme Court of Canada has also ruled that a Duty to Consult exists if the analysis indicates that the proposed activity may adversely impact potential or established Aboriginal or Treaty rights. The Court has established guiding principles to sum up the key elements of a meaningful consultation process. These principles are:

1. A Crown approach that is forthcoming, flexible and responsive. Notify the Aboriginal group(s) of the proposed activity, provide a government contact for any questions or concerns, and, where appropriate, offer to meet to discuss the proposed activity and any concerns they may have about it

2. Inclusive processes to manage issues, decision-making and ensure accountability. In a timely manner, provide Aboriginal groups with clear and relevant information relating to the proposed activity to enable them to provide meaningful feedback

3. Early consultation and policy-based discussions with communities on accommodation with the objective of avoiding or minimizing adverse impacts. To ensure that Aboriginal groups are adequately notified and able to meet timelines, government departments and agencies should send information to them by a variety of means including registered

mail, email and fax. Using registered mail ensures that recipients have an original copy on file; however, this method of correspondence can be slow. E-mails and faxes ensure timely receipt of documents.

4. Pro-active solicitation of Aboriginal involvement and active listening to their concerns. Confirm who is authorized to represent Aboriginal group(s) in relation to their Aboriginal or Treaty Rights and related interests. Identify and determine the nature of any overlapping claims that may exist in the area of the activity
5. Real opportunities to inform and influence decisions before they are made. It is important to provide the Aboriginal group(s) with enough time to assess any adverse impacts of the proposed activity on their rights and to prepare their views on the matter.
6. Assistance to support Aboriginal groups' meaningful participation in a consultation process;
7. Time lines for information-sharing and responses that are appropriate and adapted to the specific circumstance;
8. Serious consideration of feedback during the consultation process and prior to any decisions being final.
9. Clear and direct responses on how concerns have been addressed or why they cannot be addressed. Depending on the nature of the concerns, ensure that the third party proponent is involved in the discussion of measures to prevent or reduce any potential adverse impacts of the project. A proponent is typically in the best position to alter the project to avoid or mitigate adverse impacts (e.g., routing of pipelines, alignment of roads, etc.)
10. Better coordination, cooperation and collaboration between Crown and industry with respect to Aboriginal consultations;
11. Consideration of accommodation as part of a meaningful consultation process. When looking at accommodation options, seriously consider Aboriginal perspectives, concerns and options for addressing impacts on potential or established Aboriginal or Treaty rights and related interests;
12. Sustainable economic development balanced by an awareness of cumulative impacts and environmental stewardship. Review periodically, throughout the consultation process, the extent to which environmental assessments or regulatory processes, as they are implemented, can be relied upon and how the information generated in those processes can be used to fulfill the Crown's duty in whole or in part
13. Openness to altering the original proposal and if necessary, not going forward at all with the project or decision.
14. Follow agreed upon dispute resolution mechanisms to resolve conflicts as they arise, and to avoid litigation related to the consultation and accommodation process.

To reiterate, relevant case law has developed a path for relations with aboriginal peoples in situations such as the one we are discussing on the committee. Thus, it would be prudent for the government to consider aboriginal groups as partners in this process in order to maintain good

relations, respect aboriginal culture and land, and to mitigate potential conflict in the production of hydroelectric projects in Alberta.

Responsible Sustainable Development

During committee deliberations, much evidence was presented regarding the environmental impacts and mitigation thereof of hydroelectric power generation. In the main, the report references many of the opportunities and challenges with these projects. Accordingly, we will not go through in painstaking detail the evidence presented in the report. That said, The Alberta Liberal Caucus urges the government to use scientific evidence and best sustainable practices in the development of hydroelectric power generation in this province.

Conclusion

I would like to thank the committee and all of its members for their contributions to this process. The application of hydroelectric energy production in Alberta is an endeavour that will span generations; thus, the outcome of this process could affect millions of Albertans. It is my opinion that the committee has done an eminently reasonable job of conducting research, engaging stakeholders, and drafting a proposal. That said, I would strongly urge the government to consider further two of my recommendations:

1. The government should fully explore whether or not the establishment of a Crown Corporation is the best vehicle to maximize returns to Albertans with regard to the production of hydroelectric facilities in the province.
2. Take into greater consideration the potential affect that the development of hydroelectric projects might have on aboriginal populations. This would include but, is not limited to, reviewing relevant case law on aboriginal-government relations, referring to aboriginal groups as partners in this process, and taking into consideration the seven questions that I have listed above.
3. Use scientific evidence and best sustainable practices in the development of hydroelectric power generation in Alberta.

Again, I would like to thank the committee and its members for their hard work and dedication. I humbly submit this minority report to you for your consideration.

APPENDIX B: MINORITY REPORT – DERON BILOUS, MLA

Deron Bilous, MLA
Edmonton-Beverly-Clareview (ND)

1. Introduction

The NDP Opposition caucus agrees with the Standing Committee on Resource Stewardship regarding the need to examine the potential for expanding hydroelectric energy production in northern Alberta. There are, however, three important issues relating to hydroelectric development that are not adequately addressed in the Final Report of the Standing Committee on Resource Stewardship. Firstly, the Report does not urge the Government to consider all policy options for financing hydroelectric development, including Crown corporations. Secondly, the Report does not adequately recognize Alberta's obligation to consult First Nations and Métis governments. Thirdly, the Report should include additional comments regarding environmental protection and the regulatory hearing process so as to better reflect what the Committee heard from stakeholders.

2. Policy Options for Funding Hydroelectric Development

The Committee has heard that hydroelectric development entails significant upfront capital investments, long construction periods, and variable returns over the long-term. Indeed, the Committee has found that financing presents one of the greatest challenges to the development of hydroelectric projects in Alberta.

The Report notes the historic role that the public sector has playing in financing hydroelectric projects across Canada and throughout the world. In section 4.2.2.a, the Committee writes:

> In most countries, hydroelectric projects have traditionally been developed by the public sector. In Canada, as pointed out to the Committee by Professor Jean Thomas Bernard and Professor James Feehan, after an initial period of private development, hydroelectric projects have also been either financed publicly or governments have provided loan guarantees to their hydro Crown corporations.

It is also stated in the Report that Dr. Feehan "cautioned the Committee that Alberta not rule out Crown corporations" as one of several viable options for financing the development of Alberta's hydroelectric energy potential.

Unfortunately, the Committee has pre-empted the work that must be done by prematurely rejecting the policy option of creating a Crown corporation through which the province would pursue future hydroelectric development projects. The Committee has recommended that the relevant government departments examine specific policy solutions, including:

- Consider long-term power purchase agreements of low-carbon electricity
- Consider generation portfolio greenhouse gas emission targets as a formal mechanism and in response to federal government regulation
- Examine the feasibility of undertaking projects as public-private partnerships to develop hydroelectric resources on Alberta's northern rivers.

The Committee has, as such, disregarded Dr. Feehan's advice and ruled out the use of a Crown corporation as a viable policy option deserving of further study. The NDP Opposition caucus finds it imperative that all options be examined and that a Crown corporation option not be dismissed without due analysis. The finding of one policy option as unpalatable by the current government is not a sufficient reason to disregard a public policy option that has worked successfully in other Canadian jurisdictions.

3. Consultation with First Nations and Métis

The Report states, in section 4.4, that "Consultation with Aboriginal people is critical to the successful development of hydroelectricity in Alberta." The formal recommendation of the Report states:

> The Committee understands that hydroelectric development in northern Alberta cannot be achieved without adequate consideration of traditional land uses, treaty rights, and non-treaty Aboriginal rights. The Committee further acknowledges that consultation with Aboriginal peoples is essential to the success of any application for a hydroelectric development project in northern Alberta, and encourages the Alberta Government's adoption of First Nations and Métis consultation processes.

There is no question that hydroelectric development affects the cultural, social, and economic ways of life of Aboriginal peoples. As such, sustainable resource development requires strong, collaborative partnerships with First Nations and Métis governments in Alberta. Aboriginal peoples are equal partners in hydroelectric development, and should receive employment, investment, and educational opportunities through the construction and operation of hydroelectric projects.

Unfortunately, "adequate consideration" is an undefined term that adds unnecessary confusion to the existing resource development consultation framework, which has been defined by the Government and is opposed by many First Nations governments across Alberta. The Supreme Court of Canada has, in landmark decisions, concluded that federal and provincial governments have an obligation to uphold the honour of the Crown by engaging in consultation with Aboriginal peoples and accommodating their specific interests in balance with other interests. Moreover, the NDP Opposition caucus understands that the processes by which consultations are undertaken must be formulated collaboratively between the provincial government and First Nations and Métis governments.

4. Stewardship

4.1 Environmental Assessments

In section 4.5.5, the Report recommends that "the Government of Alberta work with the federal government to assess the impact of hydroelectric development projects on flora and fauna and the negative effects on fish and wildlife habitats." The NDP Opposition caucus regrets that significant changes have occurred recently, at both federal and provincial levels of government, which undermine environmental protections in relation to resource development. Bill C-45 (Canada) and Bill 2 (Alberta) will have detrimental impacts. The NDP Opposition caucus believes that environmental assessments for hydroelectric development are important processes that should take place provincially, as well as federally.

4.2 Regulatory Hearings

In section 4.5.5, the Report recommends that "in future regulatory proceedings, the Alberta Utilities Commission address the issue of resource conservation by ensuring that a proposed hydroelectric site not unduly limit the energy capacity, and therefore the development of, other hydroelectric generation sites on a river, or greatly underutilize a high-potential generation site."

The Committee heard from stakeholders that the Committee should look at who gets to participate in the public consultation process. The NDP Opposition caucus believes that non-industrial stakeholders and members of the public, including Aboriginal peoples, non-governmental organizations, and landowners, should have adequate opportunities to represent their interests. The Alberta Utilities Commission should enable a breadth of participation by stakeholders and ensure that all participants in regulatory hearings for potential hydroelectric development projects are given the full opportunity to represent their interests at such hearings.

APPENDIX C: ORAL PRESENTATIONS TO THE COMMITTEE

ORGANIZATION	PRESENTER	DATE OF PRESENTATION
Canadian Hydropower Association	Mr. Jacob Irving	October 29, 2012
Hatch Ltd.	Mr. Lance Bendiak	October 29, 2012
ATCO Group	Mr. Siegfried Kiefer Mr. Doug Tenney	November 19, 2012
TransCanada Corporation	Mr. Geoff Murray Mr. Alex Pourbaix	November 19, 2012
TransAlta Corporation	Ms. Lora Brenan Mr. Don Wharton	November 26, 2012
Environmental Law Centre	Ms. Cindy Chiasson Mr. Jason Unger	December 3, 2012
Manitoba Hydro	Mr. Ken Adams	December 13, 2012
Pembina Institute	Mr. Jason Switzer	December 13, 2012
Water Matters Society of Alberta	Dr. William Donahue	December 13, 2012
Memorial University	Dr. James Feehan	February 4, 2013
University of Ottawa	Dr. Jean-Thomas Bernard	February 4, 2013
Alberta Utilities Commission	Mr. Doug Larder	February 4, 2013
Natural Resources Conservation Board	Mr. Bill Kennedy	February 4, 2013
Métis Nation of Alberta	Mr. Aaron Barner Mr. Darrell Ghostkeeper	February 4, 2013
Little Red River Cree Nation	Mr. Jim Webb	February 4, 2013
Paddle Prairie Métis Settlement	Mr. Alden Armstrong	February 4, 2013
Smith's Landing First Nation	Mr. Jeff Dixon Mr. Rick Hendriks Mr. Jerry Paulette Mr. Peter Paulette Ms. Allisun Rana Mr. John Tourangeau Chief Andrew Wanderingspirit	February 4, 2013

APPENDIX D: ANNOTATED BIBLIOGRAPHY

1.0 RESEARCH DOCUMENTS

1.1 Economic Issues

Forte Business Solutions Ltd. *Northern Alberta Development Council: Electric Power Generation Options for Northern Alberta's Municipalities, Organizations and Residents – Final Report.* Available at http://www.nadc.gov.ab.ca/Docs/electric-generation.pdf **(accessed October 23, 2012)**.

The Northern Alberta Development Council (NADC) is an organization that promotes economic development in northern Alberta's businesses and communities. This report reviews northern Alberta's electric power needs, opportunities, and challenges regarding power generation and distribution and possible initiatives that could be undertaken by municipalities, organizations, and individuals.

1.2 Environmental Issues

Bednarek, Angela T. "Undamming Rivers: A Review of the Ecological Impacts of Dam Removal." *Environmental Management* 27 no. 6 (2001): 803-814.

Dam removal continues to garner attention as a potential river restoration tool. The increasing possibility of dam removal through the Federal Energy Regulatory Commission (FERC) relicensing process as well as through federal and state agency actions makes a critical examination of the ecological benefits and costs essential. This paper reviews the possible ecological impacts of dam removal using various case studies. Restoration of an unregulated flow regime has resulted in increased biotic diversity through the enhancement of preferred spawning grounds or other habitat. Fish passage has been another benefit of dam removal. However, the disappearance of the reservoir may also affect certain publicly desirable fisheries. Short-term ecological impacts of dam removal include an increased sediment load that may cause suffocation and abrasion to various biota and habitats. Although monitoring and dam removal studies are limited, a continued examination of the possible ecological impacts is important for quantifying the resistance and resilience of aquatic ecosystems. Dam removal, although controversial, is an important alternative for river restoration.

Bodaly, R.A. et al. "Experimenting with Hydroelectric Reservoirs." *Environmental Science & Technology* 38 no.18 (2004): 346A-352A.

Hydroelectric power reservoirs require the flooding of land, which has environmental impacts such as the release of greenhouse gases and accelerated production and bioaccumulation of methyl mercury. This article provides scientific explanations for the environmental impacts of hydroelectric dams and discusses the implications on policy.

Dusyk, Nichole. "Downstream Effects of a Hybrid Forum: The Case of the Site C Hydroelectric Dam in British Columbia, Canada." *Annals of the Association of American Geographers* 101 no. 4 (2011): 873-881.

Attempting to scale up the deployment of renewable energy technology has come with considerable controversy and opposition. Research exploring this opposition has highlighted the importance of project control and decision-making structures, including public engagement and consultation. This article contributes to the discussion by considering how participatory processes might have varying effects across space and time. Combining the concept of hybrid forums with spatial theories of change, it explores participatory processes and how they can result in uneven change in sociotechnical networks. It applies this theoretical framing to one hydroelectric project in northeastern British Columbia (Site C) to show how lessons learned from this project and from the legacy of hydroelectricity more generally are not consistent throughout the province and how attempts to manage these differences have led to further conflict and opposition.

Filion, Yves. "Climate Change: Implications for Canadian Water Resources and Hydropower Production." ***Canadian Water Resources Journal*** **25 no. 3 (2000): 255-269.**

In this paper the possible effects of climate change on Canada's water resources and the attendant implications for hydroelectric production are discussed. A change in climatic conditions could spawn drastic changes in the way that the Canadian hydroelectric subsector manages the operations of its hydroelectric power stations.

Ghindă, Theodor and Theodora Ardeleanu. "Environmental Protection Improvement Possibilities for Small Hydropower Plant Projects." ***Present Environment & Sustainable Development*** **6 no. 1 (2012): 157-167.**

The existing solutions for small hydropower plants were considered convenient from the technical point of view over a long period, while general environmental concerns of society increased in all directions during the last decades. This paper refers to how to include environmental protection measures during the selection of the sites for a small hydropower plant and its water intake, during the preparation of the project, and subsequently during operation. Investments for modernization of old, small hydropower plants have to also include improvements regarding the protection of the river ecosystem. Specific environmental training for those who will be designers of small hydropower plants can be useful for environmental protection improvement in such projects.

Hicks, Faye. "An Overview of River Ice Problems: CRIPE07 Guest Editorial." ***Cold Regions Science and Technology*****. 55 (2009): 175-185.**

This introductory paper provides an overview of the river ice cycle, highlighting both the typical and the unusual phenomena encountered. Winter ice roads and ice bridges are the primary means of transportation in the sparsely populated northern regions of Canada, Russia, the United States (Alaska), and many other remote northern regions. However, river ice can cause flooding, restrict hydropower production, block water intakes and outfalls, adversely impact fish habitat, expose toxins by disrupting bed sediments, threaten structures such as bridges and culverts, and hamper river navigation.

International Renewable Energy Agency. "Hydropower." ***Renewable Energy Technologies: Cost Analysis Series*** **1 no. 3: 1-44.**

The International Renewable Energy Agency (IRENA) is an intergovernmental organization dedicated to renewable energy. This working paper is one of a set of five on renewable energy technologies and aims to provide objective cost data for these technologies. The report provides insights into the current state of deployment, types of technologies available, and their costs and performance. The analysis is based on a range of data sources with the objective of developing a uniform data set that supports comparison across technologies of different cost indicators – equipment, project, and levelized cost of electricity – and allows for technology and cost trends as well as their variability to be assessed.

Lee, Peter G. et al. ***Hydropower Developments in Canada: Greenhouse Gas Emissions, Energy Outputs and Review of Environmental Impacts.*** **Edmonton: Global Forest Watch Canada, 2011.**

This report presents an examination of the impact of Canada's large hydropower reservoirs and dams on our climate and our environment. It focuses primarily on the greenhouse gas emissions associated with reservoir flooding in Canada but also outlines several of the associated general global environmental impacts of hydropower development with examples from Canada.

Steele, R.J. and K. E. Smokorowski. *Review of Literature Related to the Downstream Ecological Effects of Hydroelectric Power Generation.* Sault Ste. Marie, ON: Fisheries & Oceans Canada, Great Lakes Laboratory for Fisheries & Aquatic Sciences, 2000.

This article is a review of literature related to population level effects of hydroelectric generation on aquatic biota (fish and invertebrates), fish microhabitat use, fish migration, and egg/embryo development. The article reviews and evaluates the mitigative actions currently employed to lessen the effects of hydroelectric generation on aquatic life and habitats. It considers the opportunities that exist for review agencies to enhance the ecological conditions in rivers by placing restrictions on the operating regime of hydroelectric facilities.

1.3 Regulatory Reports

Alberta, Department of Environment. *Slave River Hydro Feasibility Study, Final Report.* Edmonton: Department of Environment, June 1982.

This report is a feasibility study conducted on the Slave River hydroelectric project in 1982. Several issues are addressed such as Alberta's electric supply system, financial considerations, environmental impact, hydrology and hydraulics, Slave River development alternatives, facilities design, and social and economic implications of development.

Alberta, Department of Utilities and Telephones. *Slave River Hydro Feasibility Study: Synopsis.* Alberta: Department of Utilities and Telephones, June 1982.

This is a synopsis of the Slave River Feasibility Study listed above.

Alberta, Joint Review Panel. *Report of the Joint Review Panel: Glacier Power Ltd. Dunvegan Hydroelectric Project Fairview, Alberta.* Alberta: Joint Review Panel, December 19, 2008.

This report is a review of the Dunvegan hydroelectric project on the Peace River proposed by Glacier Power Ltd. The Joint Review Panel (consisting of the Alberta Natural Resources Conservation Board, the Alberta Utilities Commission, and the federal government of Canada) completed an assessment of the environmental and socio-economic effects of the project. With the considerations of submissions from participants and interveners incorporated into the assessment, the report concludes that the project is in the public's interest.

Alberta, Joint Review Panel. *Report of the EUB-NRCB Joint Review Panel: Glacier Power Ltd. Dunvegan Hydroelectric Project Fairview, Alberta*. Alberta: Joint Review Panel, March 25, 2003.

This report is a review of the Dunvegan hydroelectric project on the Peace River proposed by Glacier Power Ltd. The Joint Review Panel (consisting of the Alberta Natural Resources Conservation Board, the Alberta Energy and Utilities Board) completed an assessment of the environmental and socio-economic effects of the project. With the considerations of submissions from participants and interveners incorporated into the assessment, the report concludes that the potential negative social, economic, and environmental effects of the project outweighs the potential social and economic benefits. Therefore, the application was denied.

Alberta Utilities Commission. *Hydroelectric Power Generation Development Inquiry.* Calgary: Alberta Utilities Commission, 2011.

This report by the Alberta Utilities Commission reviews the regulatory processes for hydroelectric developments in Alberta and examines opportunities to simplify and clarify the regulatory processes for future hydro developments. The report describes the current regulatory processes in Alberta, identifies approximately 40 pieces of relevant legislation, and discusses and illustrates how they are implemented by the agencies. Also presented are the perspectives and recommendations of the inquiry participants.

Hatch Ltd. *Final Report for Alberta Utilities Commission: Update on Alberta's Hydroelectric Energy Resources*. Calgary: Hatch, February 2010.

This report discusses the hydroelectric potential of bodies of water in Alberta. It assesses the general physiography, climate, and hydrology of the province and provides a technical appraisal of the energy potential in nine river basins in Alberta.

1.4 Interjurisdictional Issues

Henderson, Chris. "Power of the First People." *Alternatives Journal* 35 no. 6 (2009): 18-19.

The article discusses the plans of the Canadian government to develop sources of electricity through hydropower projects. It states that hydroelectric power is already 60 per cent of the country's electricity supply, and the continuous demands for electric energy have prompted the government to increase its reliance on renewable energy since it is relatively inexpensive and naturally abundant. This article discusses the involvement and influence of Aboriginal communities in these sustainable energy solutions.

Hill, Carey et al. "Harmonization Versus Subsidiarity in Water Governance: A Review of Water Governance and Legislation in the Canadian Provinces and Territories." *Canadian Water Resources Journal* 33 no. 4 (2008): 315-332.

Given the high degree of variation in water governance practices across Canada and the rapid rate of water-related legislative change in some provinces over the past decade, the purpose of this paper is to provide a systematic review of water legislation and governance that examines all 13 provinces and territories, focusing on formal legislation and policies governing drinking water, watershed management (including source water protection), water rights, and water exports. Legislative variation is analyzed to assess the rationale for differing approaches to federal and provincial involvement in water policy. The review suggests that while variation may be appropriate, fragmentation is not. The authors argue that some water issues would benefit from greater harmonization.

Martin, Thibault and Steven M. Hoffman. *Power struggles: Hydro Development and First Nations in Manitoba and Quebec.* Winnipeg: University of Manitoba Press, 2009.

This book examines the evolution of new agreements between First Nations and Inuit and the hydro corporations in Quebec and Manitoba, including the Wuskwatim Dam project, La Paix des Braves, and the Great Whale project. In the 1970s both provinces signed so-called "modern treaties" with First Nations for the development of large hydroelectric projects in Aboriginal territories. This book reflects on the evolution of these new agreements in each province.

Waldram, James B. *As Long as the Rivers Run: Hydroelectric Development and Native Communities in Western Canada.* Winnipeg: University of Manitoba Press, 1993.

This book examines the politics of hydroelectric dam construction in the vast Canadian northwest. Focusing particularly on the negotiations and agreements between the developers and the Aboriginal communities, the author reveals how little has changed in our treatment of Aboriginal peoples over the past hundred years.

1.5 General Information about Hydroelectricity

ABS Energy Research. *Hydropower Report: Large & Small Hydropower.* London, UK: ABS Energy Research, 2009.

The article focuses on the status of the global hydropower industry. In 2006, 21 per cent of the world's electricity generating capacity came from hydropower. Forty-eight per cent of hydropower was generated by the United States, Canada, Brazil, and China. Twenty-seven per cent of the world's hydroelectric generation came from Asia, followed by 22 per cent from North America and 21 per cent from Latin

America. It is expected that construction activity for new hydroelectric plants will change the world balance of hydropower.

Alberta Electric System Operator. *2012 Long-Term Outlook.* Calgary, AB: Alberta Electric System Operator, 2012.

The 2012 Long-Term Outlook is the Alberta Electric System Operator's (AESO) long-term forecast of Alberta's expected future demand and energy requirements over the next 20 years along with the expected generation capacity to meet those requirements. It also provides information about current generation capacity and the energy potential of various resources.

Braun, Will. "Canada Looks to Expand Hydro Exports to US." *World Rivers Review* 27 no. 1 (2012): 4-5.

The article focuses on the plans of the Canadian hydropower industry to spend 55 to 70 billion Canadian dollars on hydroelectric dams across the country. It says that the industry claims the resulting energy will reduce continental greenhouse gas (GHG) emissions. It mentions that the proposed dams' major projects will involve alterations to remote rivers and rely on existing diversions. It adds that hydropower proponents will displace carbon-intensive energy forms in the United States

Campbell, Graham et al., *Progress Toward Clean Electricity: Case Studies of Three Canadian Jurisdictions*. Ottawa: Conference Board of Canada, 2010.

This assessment of selected changes made to the electricity systems in three contrasting jurisdictions – Quebec, Ontario, and Alberta – shows that the progress being made is contributing positively to the transition to clean electricity in Canada. The changes studied are in the areas of electricity policies, generation mix, transmission capacity and grid management, and conservation and energy efficiency. Each jurisdiction has taken a customized approach matched to its own circumstances. Three case studies provide valuable information and useful reference points for other jurisdictions pursuing the complex pathway to clean electricity. This research report concludes that good progress is being made, but there is still some way to go in developing clean electricity systems in Canada.

Froschauer, Karl. *White Gold: Hydroelectric Power in Canada*. Vancouver: UBC Press, 1999.

During the past 50 years Canadians have seen many of their whitewater rivers dammed or diverted to generate electricity, primarily for industry and export. The rush to build dams increased utility debts, produced adverse consequences for the environment and local communities, and ultimately resulted in the layoff of 25,000 employees. This work looks at what went wrong with hydroelectric development, with the predicted industrial transformation, with the timing and magnitude of projects, and with national and regional initiatives to link these major projects to a trans-Canada power grid.

International Energy Agency. *Technology Roadmap: Hydropower*. Paris, France: International Energy Agency, 2012.

This publication discusses the advantages of hydropower as a renewable energy resource, the current uses of hydropower in energy production, and what the future of hydropower looks like. It details action needed from policy-makers to allow hydroelectric production to increase and addresses necessary conditions for development, including resolving environmental issues and gaining public acceptance.

International Institute for Environment and Development. *Dams and Development: A New Framework for Decision-making. Overview of the report by the World Commission on Dams.* London, UK: IIED, 2001.

This paper is a summary of the final report produced by the World Commission on Dams listed below.

Mackenzie River Basin Board. *2012 Issues Report: Oil sands development, hydroelectric development, and climate change in the Mackenzie River Basin*. Yellowknife, NWT: Mackenzie River Basin Board, 2012.

This document provides an overview of the “key pressures” in the Mackenzie River basin, as identified by the Mackenzie River Basin Board. These “key pressures” include oil sands development, hydroelectric development, and climate change. It is a follow-up to the *State of the Aquatic Ecosystem Report 2003*, which was published by the Mackenzie River Basin Board in 2003 and identified that there were significant information gaps that limited the assessment of aquatic ecosystems in the Mackenzie River basin. This report combines traditional knowledge and published scientific literature.

Schmalensee, Richard. "Evaluating Policies to Increase Electricity Generation from Renewable Energy." *Review of Environmental Economics & Policy* 6 no. 1 (2011): 45-64.

Using the United States (U.S.) and the European Union (E.U.) as case studies, this article brings forth four main propositions concerning policies aimed at increasing electricity generation from renewable energy. The first concerns short-run costs of programs to subsidize electricity generation from renewable resources. The second considers the feed-in tariff schemes worldwide and renewable portfolio standard (RPS) programs. The third addresses the E.U.’s approach to reducing carbon dioxide emissions and its renewables program. The fourth proposition is regarding the RPS programs in the U.S. and provides a description of the markets for renewable energy credits and their shortcomings.

United States, Department of the Interior. *Hydroelectric Power.* Washington DC: Bureau of Reclamation, 2005.

This document is written by the United States Bureau of Reclamation, which oversees water resource management. It provides an overview of how hydroelectric power is generated and transmitted and studies the past and future of hydroelectric power in the United States.

World Commission on Dams. *Dams and Development: A New Framework for Decision-Making.* London, UK and Sterling, VA: Earthscan, 2000.

The final report produced by the World Commission on Dams (WCD) is the product of over two years of intense study on all aspects of dams by the WCD, the WCD stakeholders’ forum, and hundreds of individual experts. It provides a comprehensive, global review of dams’ performance and contribution to development. Building on an analysis of how and why dams succeed or fail to meet development objectives, the report addresses key issues in the debate on dams and recommends fundamental changes in the manner in which water development options are assessed and project cycles are planned, implemented, and monitored.

1.6 Website Sources

Centre for Energy: http://www.centreforenergy.com

The Centre for Energy is a not-for-profit organization that provides information about energy in Canada. It works with other organizations to explore energy and environmental issues and to develop energy-related editorial content and educational resources to support and promote Canada’s energy system. This website provides information about the various sources of energy in Canada and offers more general information, news, and statistics about Canada’s energy system. Specifically, it provides a history and overview of hydroelectricity, how it is generated, and how it is transmitted to market. It also discusses environmental impacts, challenges, and opportunities. This website also provides several videos about hydroelectric power.

Pembina Institute: http://www.pembina.org/re/sources/hydro-power

The Pembina Institute is a Canadian not-for-profit think tank that advances sustainable energy solutions through research, education, consulting, and advocacy. The Pembina Institute provides policy research and education on climate change, energy issues, green economics, energy efficiency and conservation, renewable energy, and environmental governance. The website provides information on how hydroelectric power is captured, the potential of small hydropower, and discusses benefits and challenges of this energy source.

United States Energy Information Administration: http://www.eia.gov/energyexplained/index.cfm?page=hydropower_environment

The United States Energy Information Administration (EIA) collects, analyzes, and disseminates independent and impartial energy information to promote sound policy-making, efficient markets, and public understanding of energy and its interaction with the economy and the environment. This website provides a basic overview of hydroelectric power within the United States, discusses various technologies of hydroelectric dams, and provides insight into the environmental impacts of this energy source.

2.0 STAKEHOLDER BRIEFS AND OTHER MATERIAL

Alberta, Ministry of Environment, and Fisheries and Oceans Canada. *Water Management Framework: Instream Flow Needs and Water Management System for the Lower Athabasca River.* Edmonton, AB; Ottawa, ON: Alberta Environment; Fisheries and Oceans Canada, February 2007.

This document describes the water management framework designed by Alberta Environment and Fisheries and Oceans Canada as a precautionary approach to managing the river. This approach preserves the river over the short term while allowing for innovation and leading research to help guide future management actions to safeguard the river. The water management objective has been divided into two phases, balancing scientific research on instream flow needs with current demand and available water management options and determining the modifications required to meet environmental and socio-economic goals over the long term.

Alberta, Ministry of Environment. *A Desk-top Method for Establishing Environmental Flows in Alberta Rivers and Streams*. Edmonton, AB: Alberta Environment, 2011.

This publication is a technical report that identifies a method to estimate an ecologically-based flow regime on the basis of reductions from natural flow or the per cent exceedance from natural flow. It also provides background information and a jurisdictional review of current environmental flows (commonly known as instream flow needs) knowledge in North American and international rivers.

ATCO Group. *Large Scale Hydro Development in Alberta: A Submission to the Standing Committee on Resource Stewardship*. Unpublished presentation.

This document provides background information about hydroelectric power and its undeveloped potential in Alberta's main river basins. It also provides details about potential hydroelectric projects on the Slave River and Athabasca River.

Clipperton, G. Kasey. et al. *Instream Flow Needs Determinations for the South Saskatchewan River Basin, Alberta, Canada*. Edmonton, AB: Alberta Environment and Sustainable Resource Development, 2003.

This document is a technical study of the instream flow needs (IFN) of the South Saskatchewan River basin. The goal was to develop an IFN determination that ensured a high level of protection for the aquatic ecosystems. The study is conducted with consideration of four ecosystem components to

represent the full extent of the aquatic ecosystem: water quality, fish habitat, riparian vegetation, and channel maintenance.

Donahue, William and Julia Ko. *Sharing Our Rivers: How Albertans Can Maintain Healthy Rivers, Communities and Economies*. Canmore, AB: Water Matters Society of Alberta, 2012.

This document examines how we can maintain healthy aquatic ecosystems in ways that satisfy basic human needs and enable us to achieve our economic and social goals. Through discussions with senior water users representing a variety of sectors (including irrigation, oil and gas, municipalities, hydropower, and water utilities), this publication examines the policy and operational solutions that are needed in Alberta to address water shortages and to ensure that our rivers are managed and maintained according to a sound scientific understanding of ecosystem health.

Environmental Law Centre. *Submission of the Environmental Law Centre to the Alberta Utilities Commission Re: Regulatory Process for Hydroelectric Power Generation Development*. Edmonton, AB: Environmental Law Centre, 2010.

This document is a submission made by the Environmental Law Centre to the Alberta Utilities Commission in its review of the hydroelectric development regulatory process. It discusses the importance of having a robust regulatory process to determine the appropriate development of hydroelectric power generation within the province. It also provides a discussion on public participation, determining public interest, managing jurisdictional issues, and case studies of pre-existing and proposed dams.

Ko, Julia and William Donahue. *Allocating Our Water: Changing to Meet the Public Interest*. Canmore, AB: Water Matters Society of Alberta, 2012.

This publication discusses why, in the opinion of the Water Matters Society of Alberta, Alberta's current system of water rights and laws are insufficient to address growing conflicts among water users or for preserving and protecting the health of Alberta's rivers. It also provides recommendations to restructure water management in Alberta in ways that will facilitate more effective and equitable redistribution of water among users when water is scarce while also satisfying basic human needs and protecting the public interest in maintenance of healthy rivers.

Ko, Julia and William F. Donahue. *Moving Waters: Water Management Options to Achieve Social, Economic, and Environmental Goals*. Canmore, AB: Water Matters Society of Alberta, 2012.

This publication discusses possible ways of achieving a more equitable distribution of water rights that responds to social, environmental, and economic challenges that were less evident when Alberta's water management system was first put in place such as access to water being prioritized by the date of application for a water licence.

Little Red River Cree Nation. *LRRCN Statement on Hydroelectric Development and Ecological Integrity*. Alberta: Little Red River Cree Nation, 2013.

This document was provided by the Little Red River Cree Nation as a summary of its viewpoints on hydroelectric development. The document emphasizes the importance of retaining the ecological integrity of the boreal wetlands so that First Nations people can use them to sustain their culture and way of life.

Schindler, D.W. and W.F. Donahue. "An Impending Water Crisis in Canada's Western Prairie Provinces." *Proceedings of the National Academy of Sciences of the United States of America,* 103 no. 19 (2006): 7210-7216.

This article discusses how climate warming and human modifications to catchments have significantly reduced the flows of major rivers of the western prairie provinces during the summer months, when

human demand and instream flow needs are greatest. The article predicts that in the near future climate warming, through its effects on glaciers, snowpacks, and evaporation, will combine with cyclic drought and rapidly increasing human activity in the western prairie provinces to cause a crisis in water quantity and quality with far-reaching implications.

Smith's Landing First Nation. *Submission to the Standing Committee on Resource Stewardship: Study of the Potential Hydroelectric Energy Production in Northern Alberta*. Unpublished presentation.

This document describes the ways in which a Slave River hydroelectric development reservoir may interact with the Smith's Landing First Nation reserve lands. This includes direct inundation of the land, erosion, long-term instability of the reserve land adjacent to the Slave River, landslide-generated waves, and water table increases. The document also makes recommendations for improving the regulatory process for hydroelectric development and electricity resource planning in Alberta.

Legislative Assembly Office. Research Services. *Summary of Issues Regarding Hydroelectric Development in Alberta*. Unpublished document.

This document was created by the Legislative Assembly Office's Research Services to provide a summary to the Committee of the issues regarding hydroelectric development in Alberta. These issues include economic, environmental, geotechnical, regulatory, and interjurisdictional considerations.

Legislative Assembly Office. Research Services. *Summary of Stakeholder Presentations Regarding Hydroelectric Development*. Unpublished document.

This document was created by the Legislative Assembly Office's Research Services to provide a summary to the Committee of the presentations by the stakeholders that were invited to present before the Committee. It also incorporates information from various documents provided by the stakeholders in their presentations.

3.0 TRANSCRIPTS

Legislative Assembly. Standing Committee on Resource Stewardship. September 27, 2012, *Hansard* Transcripts No. 28-1-2, RS-7 to RS-17.

Legislative Assembly. Standing Committee on Resource Stewardship. October 24, 2012, *Hansard* Transcripts No. 28-1-3, RS-19 to RS-24.

Legislative Assembly. Standing Committee on Resource Stewardship. October 29, 2012, *Hansard* Transcripts No. 28-1-4, RS-25 to RS-31.

Legislative Assembly. Standing Committee on Resource Stewardship. November 5, 2012, *Hansard* Transcripts No. 28-1-5, RS-33 to RS-41.

Legislative Assembly. Standing Committee on Resource Stewardship. November 19, 2012, *Hansard* Transcripts No. 28-1-6, RS-43 to RS-50.

Legislative Assembly. Standing Committee on Resource Stewardship. November 26, 2012, *Hansard* Transcripts No. 28-1-7, RS-51 to RS-58.

Legislative Assembly. Standing Committee on Resource Stewardship. December 3, 2012, *Hansard* Transcripts No. 28-1-8, RS-59 to RS-64.

Legislative Assembly. Standing Committee on Resource Stewardship. December 13, 2012, *Hansard* Transcripts No. 28-1-9, RS-65 to RS-87.

Legislative Assembly. Standing Committee on Resource Stewardship. February 4, 2013, *Hansard* Transcripts No. 28-1-10, RS-90 to RS-127.

Legislative Assembly. Standing Committee on Resource Stewardship. February 5, 2013, *Hansard* Transcripts No. 28-1-11, RS-129 to RS-140.

These transcripts provide a verbatim account of the Committee deliberations and stakeholder presentations between September 27, 2012, and February 5, 2013.