# Climate Change 2: Canadian Technology Development

## "DEVELOPING GREEN ENERGY RESOURCES – A CASE STUDY IN B.C."

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**Prepared by Joanne McKenna and Penny Thompson**
**Green and Alternative Energy Division, BC Hydro**

## BACKGROUND

### BC Hydro's Commitment to Sustainability

BC Hydro, a Crown Corporation Utility Company, has embarked upon a journey to become a sustainable energy company. This commitment was formalized in February 2001 with Executive and Board approval of sustainability as BC Hydro's new strategic direction. An integral part of that commitment is to include reliable green and alternative energy sources in its generation mix. Within this sustainability framework, green and alternative energy contributes substantially to future investment decisions, revenue and competitive positioning in the market place.

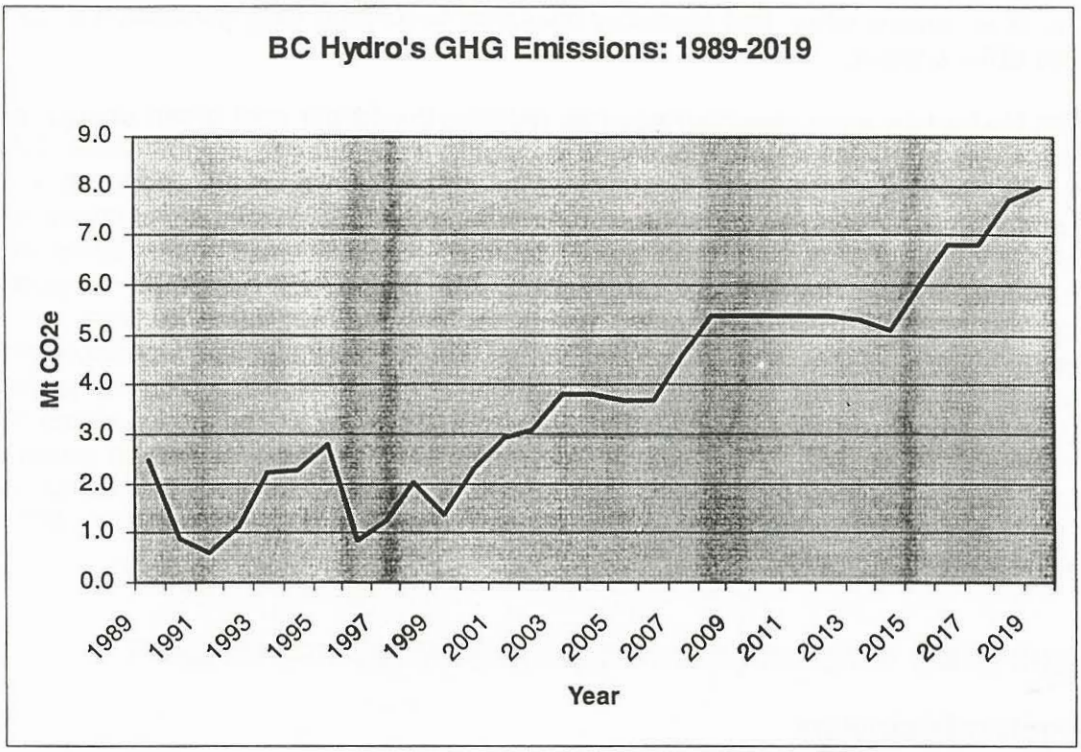
The origins of BC Hydro's journey to sustainability extend back, however, to before its formalization within the organization. One landmark was the 2000 Integrated Electricity Plan (IEP) Update - BC Hydro's plan for acquiring new resources to supply BC Hydro's existing and new domestic electricity requirements in which BC Hydro made the commitment to acquire green resources, in the order of ten per cent of load growth over the next ten years, as part of our supply portfolio. This voluntary resource portfolio standard of ten percent of load growth translates to 180 MW of capacity, equaling approximately 1100 GWh of annual output, to be in service by 2010. The decision on a green energy target was based on broad public support to develop new green resources in the province of B.C. and BC Hydro's anticipated need to mitigate greenhouse gas (GHG) emissions associated with gas-fired generation. There is speculation that this target is also up for debate as the new Provincial government has initiated a review of energy policy in B.C.

### BC Hydro's GHG Emissions

BC Hydro is among North America's leading providers of clean, GHG-free power. In 2000, BC Hydro accounted for only one per cent of the GHGs emitted by Canada's electricity sector and 0.2 per cent of Canada's total GHG emissions. BC Hydro's proportion of GHGs per unit of energy produced is also among the lowest on the continent, roughly 80 per cent lower than the Canadian average, and over 90 per cent lower than the U.S. average.[1] The reason for this exceptional record is BC Hydro's GHG-free hydro-electric system which, in 2000, accounted for approximately 91 per cent of the electricity supplied by the BC Hydro system.

However, BC Hydro's emissions are rising due to the growth in electricity demand and BC Hydro's decision to meet the majority of that growth through additional gas-fired capacity. Most of our direct GHG emissions result from fossil fuel combustion at the three thermal facilities that augment BC Hydro's regular hydroelectric production. A lesser amount results from small, diesel generating stations supplying local power to B.C. communities not connected to our provincial supply grid. The following graph depicts BC Hydro's GHG emissions from 1989 through 2019, based on the January 2000 Integrated Electricity Plan projections.

[1] BC Hydro. *Greenhouse Gas Report*. June 2001.




The decision to add natural gas-fired generation is an attempt to balance economic and environmental factors. Natural gas is the most cost-effective alternative fuel source next to hydroelectricity and is substantially less expensive than GHG-free alternatives such as hydro, wave and wind. Further, while it does emit GHGs, it is the least GHG intensive fossil fuel when you consider combined cycle gas-fired turbines (CCGT) or cogeneration against other thermal options such as coal.

However, BC Hydro's rising GHG emissions represent a liability in terms of financial and public support and pose a challenge for the corporation's sustainability direction. The financial liability has become more pronounced since the Canadian government announced its intention to ratify the Kyoto Protocol after the July 2001 Bonn agreement. If Canada ratifies the Protocol next year and introduces the necessarily tough regulations to achieve the country's Kyoto target, there is an increased likelihood that BC Hydro's GHG emissions will come under regulation by 2008. Therefore, BC Hydro has opted to manage and mitigate the potential business risk associated with potential climate change policy. BC Hydro's Greenhouse Gas report, submitted to the Voluntary Challenge and Registry (VCR) Inc., outlines a multi-pronged approach to managing these emissions through measures directed at internal operations, customer efficiencies, green energy purchases and emissions offsets.[2]

## Reducing GHG Emissions by Choosing Cleaner Power

BC Hydro's voluntary target to meet 10 per cent of new electricity demand with green energy is part of our goal to deploy cleaner energy sources with zero or minimal GHG

[2] BC Hydro. *Greenhouse Gas Report.* June 2001.

emissions. Electricity from green technologies is generally GHG-free and reduces overall GHG emissions when that electricity displaces GHG-producing generation elsewhere in the utility system.

BC Hydro has a two-tiered strategy for meeting the 10 per cent green energy target. In the short- to medium term, we intend to acquire conventional, commercially viable new green resources from projects developed by the province's private sector. A number of independent companies generate electricity for sale to BC Hydro, including several who produce their energy from clean energy sources – typically small hydro plants and wood residue. In the medium to longer-term, BC Hydro will continue to pursue the development of near-commercial resources that are expected to join the mix of commercially viable new green resources due to technological advancements and increasing gas prices. This essay will examine one such 'near-commercial' project – the 20 MW Vancouver Island (VI) Demonstration Project – as a case study of green energy development in B.C. The intent of this focus is to highlight issues in green energy development in the province that, if addressed, will serve to advance the development of green energy thus contributing to the economic growth of B.C. and reducing BC Hydro's GHG emissions profile.

## THE 20 MW VANCOUVER ISLAND (VI) DEMONSTRATION PROJECT

### Project Description

In June 2001, BC Hydro announced its intention to develop 20 MW of green energy on Vancouver Island in B.C. Vancouver Island was selected as the demonstration site since some of the earliest capacity additions will be required to reinforce the peak supply due to the planned retirement of the High Voltage Direct Current terminal equipment (HVDC) in 2007. Of particular concern is the reliability of supply to meet the *peak load demand* on VI, which occurs during cold winter months. Dependable capacity is required to meet peak load demand.

Following the completion of a targeted green and alternative energy resource assessment, a portfolio mix of wind, micro hydro, and wave energy was selected as offering the most promise. Of these, wind and micro hydro technologies are quite well known, whereas wave energy is relatively new to North America. The 20 MW scale of the project, sufficient to provide energy for up to 3,000 – 4,000 homes, was deemed an appropriate size to test these technologies and their application in B.C.'s diverse terrain.

Requests for Proposals have been issued to wind and wave developers, potential Joint Venture participants have been short-listed, and the project scope and business case for the portfolio of green energy resources are under development. For the micro-hydro component, BC Hydro is seeking expressions of interest from independent power producers (IPPs) to develop a number of run-of-river site(s) for the 6 to 8 MW portion of the demonstration (wind comprises 10MW and wave 3-4MW). The goal is to work with the private sector to apply the new micro hydro handbook (a tool that will provide IPPs – or residents of B.C. – with information on site assessment, project development and requirements for connecting to the grid), and track the process involved in development, interconnection and licensing to enable future deployment of micro hydro installations. In November 2001, joint venture participants for the wind and wave, private sector developers, and sites for the micro hydro component will be announced. Following

business case approval, the project's second phase will then commence with the application of approvals, data analysis, and contract design. The final phase will involve engineering procurement, contracting and construction.

### Rationale for Development

BC Hydro is actively pursuing the development of green energy resources in B.C. with the aim to identify viable green energy supply options for the province's future energy needs. The demonstration will be an important first step in evaluating the most viable green technologies on Vancouver Island and will provide valuable opportunities for BC Hydro to work with private sector developers who have expertise with these specific green energy projects. Through our experience with the demonstration project, BC Hydro will gain a better understanding of the trade-offs involved in the development of these green resources. Looking beyond the scope of this demonstration, we also hope to build capacity for future expansion of the project and stimulate economic growth in B.C. and local economies where the development is situated, as has been evidenced with wave energy development in other jurisdictions.

In addition, BC Hydro has internal objectives for the demonstration project. First and foremost, our objective is to *learn by doing* – i.e. to go beyond the study stage and *get the project done.* Since neither wind nor wave has been developed in B.C. before, BC Hydro will be creating a policy and regulatory push to move these projects forward. Once implemented, the project will enable us to establish: customer demand, resource potential, the cost of producing electricity and energy pricing, expertise on selecting partners, develop near-commercial projects through joint ventures, and enhanced employee capacity in new technologies.

## CONSIDERATIONS

The following sections outline a number of issues that will have relevance to other provinces in contemplating and ensuring the success of green energy projects similar to those proposed in BC Hydro's 20MW VI Demonstration Project.

### 1. GHG Emissions

### 1.1 Quantifying the GHG Impact of the Project

The VI Demonstration Project is projected to add significant value to BC Hydro's system. An effective method of quantifying its value is by calculating the GHG impact of green power produced for BC Hydro.

Green energy supply reduces GHG emissions by displacing the use of BC Hydro's thermal facilities. In general, two methods can be used to measure the GHG intensity of displaced thermal generation. One method, commonly referred to as the *marginal approach*, calculates the GHG intensity of the specific plant or technology operating on the margin (i.e as the swing resource that is either used or not, depending on demand) and displaced first. It is widely held that this approach represents a more accurate portrayal of GHG impact, but information required to calculate it is often unavailable. On the other hand, the *average approach* determines GHG intensity of all, or a set of, plants

on a system. In general, information required for this calculation is available but the results are not considered as accurate as those of the former method.

Within the BC Hydro system, the likely marginal resource is easy to identify – it is the Burrard Generating Station – and thereby allows for an accurate quantification of GHG benefits of green energy to BC Hydro. The VI Demonstration Project is projected to displace up to 31,000 tonnes of GHG per year.

### 1.2 Future Value of GHG Benefits from the Project

GHG reductions from the VI Demonstration Project also offer valuable future benefits to BC Hydro. As discussed earlier, BC Hydro's rising GHG emissions represent a financial liability which has become more pronounced since the Canadian government announced its intention to ratify the Kyoto Protocol. If Canada ratifies the Protocol next year and introduces the necessary tough regulations to achieve the country's Kyoto target, there is an increased likelihood that BC Hydro's GHG emissions will come under regulation by 2008. The benefit of introducing green power to BC Hydro's system in advance of that date is that it will decrease the company's GHG emissions, thereby decreasing future regulatory costs.

### 1.3 Ownership of GHG Emissions Reductions

A central issue regarding GHG emissions reductions from the VI Demonstration Project is one of ownership. BC Hydro plans to develop wind and wave components of the project through joint ventures and micro hydro through an independent power producer (IPP). These deal structures raise the question of who owns resulting GHG emissions reductions.

It is BC Hydro's position that we have exclusive entitlement to GHG reductions occurring at BC Hydro facilities, including GHG reductions resulting from our purchase of green energy from IPPs and joint ventures. As the sole owner of liabilities associated with BC Hydro facilities, BC Hydro is also the owner of all benefits that flow to it. Although we may release title to GHG reductions at BC Hydro facilities, initial ownership of those reductions reside with BC Hydro prior to doing so. Ownership of GHG credits brings with it two main types of rights:

- the right to include the reductions in a GHG inventory; and
- the right to any formal benefit or recognition granted by government for those reductions.

BC Hydro intends to retain title to all GHG reductions from green IPPs and joint ventures to reduce the company's net emissions and ensure that we capture any government recognition that may be granted to those reductions, providing the incremental cost of doing so reflects the actual value of those reductions to BC Hydro. This entitlement of GHG reductions will form an integral part of the negotiation process with respect to assigning a value to the emission reduction.

## 2. Regulatory Framework

In its current state, the regulatory framework in B.C. is not conducive to timely, flexible, and streamlined processes that promote efficient development of new green energy in the province. Instead, the regulatory framework is fraught with obstacles.

One obstacle is the isolation of regulating agencies' operations from one another. Depending on the nature and scale of an energy supply project, it may evoke any one of the following regulatory processes: the federal Canadian Environmental Assessment Act (CEAA), the provincial B.C. Environmental Assessment Act (BCEAA), B.C. Assets and Land's (BCAL) permit process, and the Ministry of Sustainable Resource Management's water licensing process. To date, these processes have been carried out independently of one another, with the exception of the harmonization agreement that exists between the CEAA and the BCEAA process. Despite attempts at improvements, this mechanism has been criticized for often creating more delays, confusion and overlap. A fragmented structure such as exists in B.C., tends to foster overlap, duplication, and complicated procedures for the project proponent. Furthermore, in the case of the Water Controller's Office where water licenses are granted only in sequential order to individual applicants and little distinction is made between the size and complexity of projects. As a result, proponents can experience lengthy waits before receiving responses to their application or decisions on approval. This impacts their ability to secure an energy contract.

The province's relative inexperience with regulating near-commercial or emerging green energy projects compounds this problem. Regulatory processes for renewable technologies are, for the most part, relatively undefined. In the case of wave and wind technologies, the regulatory processes have not been tested. In the case of micro hydro where processes do exist, proponents claim that they are protracted and cumbersome and could benefit from streamlining projects based on scale, complexity and sensitivities of the water course.

With the aim to promote development of green energy in the province, BC Hydro has taken the lead to work with government to alleviate this situation. Following the 2001 provincial election, there has also been a timely shift in regulatory management. The new Liberal government is promoting a pro-development platform and has accordingly directed ministries to streamline processes and reduce the amount of red tape associated with government interaction. This is anticipated to aid BC Hydro's initiative to create a balance with respect to matching the regulatory requirements to the level of environmental impact. In addition to the provincial processes, BC Hydro is collaborating with federal departments and agencies and pursuing opportunities to streamline and reduce duplication where a federal permit or approval is also required. This can be achieved through early notification and involvement at key intervals in the process prior to irrevocable decisions being made.

BC Hydro is not trying to circumvent its legislative responsibilities; rather, we are creating a "policy push" by exploring opportunities to be creative with the regulators. The 20 MW demonstration project requires multiple approvals (municipal, provincial and federal) and will need a coordinated and clearly defined approach in order to advance the project in a timely manner. We believe that our efforts spent on this project will shape the regulatory framework for the private sector as they develop future green energy projects.

## 3. Timely Implementation

The VI 20 MW Demonstration project will require a number of changes of BC Hydro to ensure alignment with private sector development – one of the most notable being timely implementation. Historically, BC Hydro's relationship with industry was shaped by the role we played as the developer of large hydro and our negotiations with IPPs for electricity purchase agreements. More recently, we gained experience with the private sector through joint venture partnerships for gas pipelines and combined cycle gas facilities. However, smaller projects, such as the VI 20 MW Demonstration project and other IPP initiatives, represent a divergence from our traditional role and will require an increase in internal capabilities to make more timely decisions.

We issued an open invitation to IPPs to submit proposals to BC Hydro to meet our ten per cent green energy target. This invitation has been met with an overwhelming response, and thus far a 25 MW small hydro project was negotiated through to an energy contract. To ensure a more timely delivery of additional energy contracts, BC Hydro is developing two streamlined processes with standardized contracts. BC Hydro anticipates a steady increase in the number of projects negotiated and advanced under this process. We also expect to apply our experience in this process to the development of the VI 20 MW Demonstration project, particularly to the micro hydro component projected to be developed by the private sector.

Our ability to obtain approvals in a timely manner will also be an important factor to the success of this initiative. Through our efforts working with regulators, we have heard willingness on behalf of both provincial and federal regulators to work in a cooperative and coordinated process to enable the development of this 20MW demonstration project in an efficient and effective manner.

Our new Chair and CEO along with the Provincial government are focused on supporting a larger role for the private sector in the development of green energy resources. Our reputation for being slow to evaluate and make decisions has been recognized and is being addressed.

BC Hydro has also committed a dedicated multi-disciplinary team to advance the three components of this project. We have committed to an open and transparent process where the public, ENGOs, and affected stakeholders are consulted and involved. It is our intention to make our decision-making process clear and traceable. Through communications and consultation we will engage stakeholders in the process at key project milestones.

We believe that the VI 20 MW Demonstration Project will afford BC Hydro the opportunity to demonstrate, to the private sector and our shareholder, our ability to act quickly and decisively. These efforts reflect a more explicit commitment to support the private sector in B.C. and to acquire the best, low-priced green energy for BC Hydro customers.

## 4. Cost of Development

The VI Demonstration Project faces significant financial hurdles that must be met within BC Hydro. There is recognition within the organization that new renewables need to be evaluated against existing energy sources such as combined cycle gas-fired turbines (CCGTs) or large hydro projects. For the 20MW demonstration project, BC Hydro is proposing to adopt a Life Cycle Value Assessment (LCVA) approach to create a level playing field for comparing near-commercial technologies against commercial ones. We will work closely with the Pembina Institute to apply this approach.

The LCVA methodology was developed by the Pembina Institute in the early 1990s to ensure that major environmental and economic impacts of a business decision are fully considered across the full life-cycle of a product or system. A systematic methodology is used to identify, quantify and analyze the environmental, financial, and social implications of each of the activities involved in producing and consuming a product or service. This analysis is extended beyond direct company activities to all life-cycle stages of a process or product and typically flows from extraction of raw materials, through manufacturing, transportation and customer use, to final disposal or recycling. As a result, decision-makers become aware of the total system impacts of a decision, and can avoid knowingly shifting costs or environmental burdens onto other people at later stages of the product's life cycle. LCVA can also be used in the design of a project or service while analyzing full costs and benefits of various options. Promoters of this method claim that it enables the measurement of multiple factors and is focused on developing practical recommendations and drawing bottom-line conclusions based on the balance of evidence available within a finite time and budget constraints.[3]

BCHydro foresees a number of challenges associated with using this tool. For instance, the level of detail required to collect the necessary data to complete a comprehensive evaluation is extensive and in some cases, very difficult to obtain or determine given the nascence of some technologies in B.C. Estimates may replace actuals, and this impacts the accuracy of the model. Secondly, the resources required to complete the scoping and inventory assessment are substantial and time consuming as each individual step or component of a project or service is broken down and mapped out in detail.

However, LCVA also provides a practical and systematic method for quantifying in a verifiable and credible manner, selected environmental outputs such as greenhouse gases which may have current or future economic value.[4] The early identification of potentially high environmental, social, economic and cultural impacts will allow BC Hydro to re-visit options and re-design where appropriate.

While the costs of the 20MW Demonstration project will be higher at the initial stages, BC Hydro will be in a position to evaluate the longer-term– and non-financial benefits that accrue from such a project. This information will be invaluable in assisting the corporation in making decisions regarding cost recovery options, as well as determining future scalability, investment and supply integration.

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[3] The Pembina Institute for Appropriate Development. *Workshop Agenda – BC Hydro*. September 2001.
[4] Ibid.

## CONCLUSION

The journey that BC Hydro has embarked upon will provide many new opportunities for learning and for developing our business beyond its current parameters, while shaping the green energy sector in B.C. BC Hydro is enabling the development of green energy resources in the province, while leading the charge to create a policy and market push for premium green products.

This is a tremendous opportunity for BC Hydro to explore future energy supply options in B.C. by engaging the private sector's expertise, the government's requirements for low cost, low impact energy, and the public's desires for a diverse energy portfolio reflecting their values.