

RUNNING ON EMPTY



SHIFTING TO A SUSTAINABLE ENERGY PLAN FOR BC



by Dale Marshall
with Jodi-Lyn Newnham

AUGUST 2004



CCPA
CANADIAN CENTRE
for POLICY ALTERNATIVES
BC Office



David
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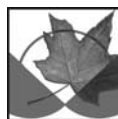


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Summary

The BC government released *Energy for Our Future: A Plan for BC* in November 2002. Contrary to its claims, the energy plan undermines energy security, sustainability, and economic development opportunities in our energy sector. The main themes of the government's energy plan are:

- Increasing oil and gas production at the expense of long-term job creation, community stability, and environmental sustainability;
- Privatizing BC Hydro, compromising efficiency, cost-effectiveness, and security;
- Weakening the regulatory environment for the province's energy sectors, including allowing coal-fired power, offshore oil development, and coalbed methane production; and
- Moving towards short-term electricity and oil and gas exports rather than protecting long-term energy security.

There are smart, practical alternatives to the policies outlined by the government's energy plan. This paper both critiques the government's current energy plan, and then outlines a new more sustainable direction for the future.

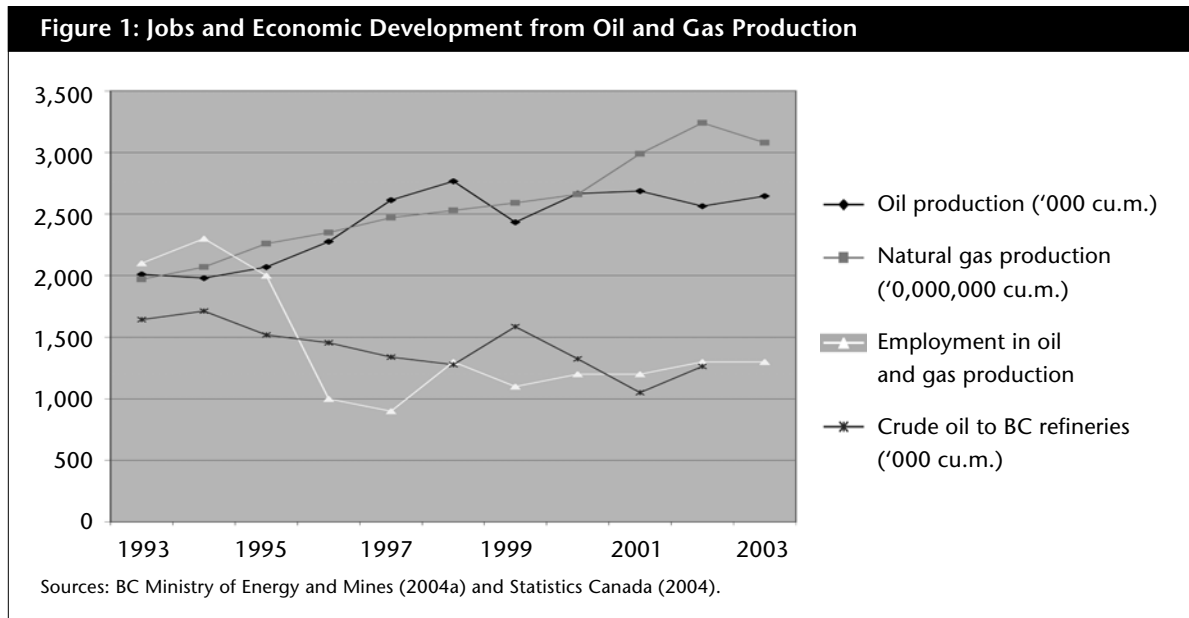
First, BC can do more with its valuable oil and gas resources. A more strategic and sustainable direction would see BC generating more jobs, economic development, and government revenue from its valuable oil and gas resources. This would entail raising oil and gas royalties and establishing a permanent fund, as has been done in Alaska, Norway, and other petroleum-rich jurisdictions. A strong regulatory regime would decrease the impact of oil and gas development, not expand it to frontier areas.

Second, instead of privatizing electricity production and deregulating the province's electricity sector, BC Hydro should be directed to do what an integrated public utility is best able to do: undertake long-term electricity planning so that BC has a secure, environmentally sustainable electricity supply. The province's additional electricity needs can be met during the next two decades with a combination of conservation, energy efficiency, and clean, renewable power.

Finally, with respect to electricity and oil and gas, the province's energy security needs to be placed ahead of energy exports. The province should also work with communities to develop a transition plan following the depletion of non-renewable energy resources, and provide the resources to do so with a permanent oil and gas fund.

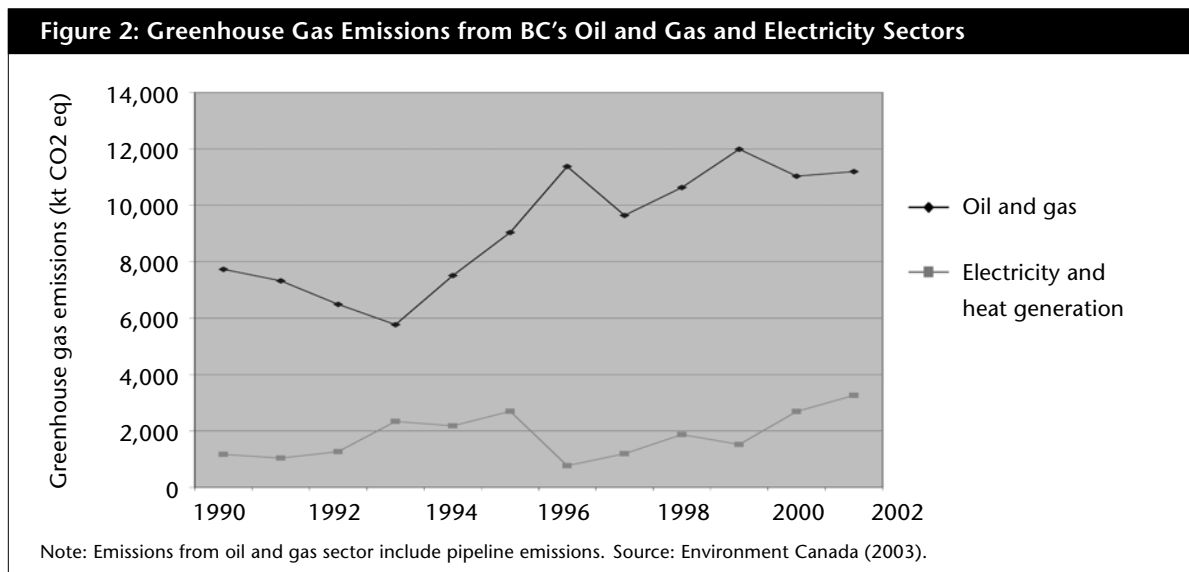
Recent Trends in BC's Energy Sector

During the last decade, BC has created fewer jobs and generated less economic development from its oil and gas resources (Figure 1). Despite rapid increases in both oil and natural gas production, fewer people are employed in extracting oil and gas in the province.¹ As well, British Columbians make up only one-fifth of oil and gas production workers employed in the province.² In terms of economic development opportunities, less crude oil ends up at BC refineries than in the past and the province has yet to develop any value-added natural gas industries.³



In electricity, more and more supply is coming from more expensive, private power. BC Hydro now spends more on purchased power from private firms (making up 10 per cent of supply) than it does on the 90 per cent it generates itself.⁴ BC also depends increasingly on burning fossil fuels – coal, diesel, and natural gas – for electricity.

The result is that greenhouse gas emissions from the electricity and oil/natural gas sectors have increased by 179 per cent and 45 per cent respectively between 1990 and 2001 (Figure 2).⁵ Canada, as a



signatory to the Kyoto Protocol, committed itself to cutting emissions to 6 per cent below 1990 levels. BC is failing to accept responsibility for protecting our global climate despite the fact that the implications of climate change are already devastating for BC, e.g. forest fires, drought, insect infestations, and flooding.

Energy exports, in both the electricity and oil and gas sectors, are also increasing dramatically. This increasingly ties BC's energy resources to continental markets rather than securing energy resources for the province's needs. BC's oil and natural gas reserves now stand at 10 and 12 years of production respectively.⁶

The BC Government's Energy Plan: Continuing Down the Same Road

The government's energy plan leads the province's energy sectors further down the same troubling road: more oil and gas production, higher greenhouse gas emissions, minimal jobs in the energy sector, more expensive private electricity, more energy exports, and less energy security. In sharp contrast to the government's promises to British Columbians, the energy plan calls for reduced royalties from – and increased subsidies to – oil and gas development. The intent is clear: no matter how inaccessible the oil or gas (geographically or geologically), no matter how marginal the operation, the BC government will try as hard as possible to make it economical for industry to access it. The province is therefore asking less and less for its non-renewable – and strategically important – energy resources, while leaving the task of figuring out energy security to future generations.

The energy plan also weakens the regulatory environment by streamlining environmental assessments and the oil and gas approval process, and intervening in the land use process to favour oil and gas development over all other options. Many of these policies, in addition to those reducing royalties and increasing subsidies, have already been implemented.

Meanwhile, the energy plan is completely silent on value-added economic development opportunities. The BC government claims that producing more oil and gas from more and more remote areas of the province will provide jobs, even though this approach has led to a decline in jobs over the last decade.

The energy plan calls for even more dramatic changes to the province's electricity policy, many of which have already been instituted. Despite the advantages of a public electric utility, BC Hydro has been broken up and increasingly privatized, while the sector as a whole has been deregulated. The advantages of the old system – cost-based pricing, greater energy security, and a greater ability to undertake long-term planning and conservation (known as demand-side management) – have been undermined for the benefit of independent power producers (IPPs).

With BC Hydro restricted from developing new capacity under the new rules, and IPPs given unfettered access to sell to wholesale markets outside the province, there is a trend towards more private power generation for export. British Columbians are left wondering what happened to a major goal of the energy plan: energy security.

The energy plan also calls for environmentally risky, dirty energy development. Fundamentally at odds with greater environmental responsibility (another stated goal) and a greenhouse gas strategy (a proposed policy), the BC government wants to burn coal for electricity, put BC's marine ecosystem at risk from offshore oil development, and develop marginal gas reserves through coalbed methane projects.

The government's energy plan leads the province's energy sectors further down the same troubling road: more oil and gas production, higher greenhouse gas emissions, minimal jobs in the energy sector, more expensive private electricity, more energy exports, and less energy security.

A More Sustainable Vision for the Province's Energy Sector

This report lays out an alternative road – a more sustainable direction – for BC's energy sector. British Columbians should be benefiting more from its oil and gas resources by increasing royalty fees (Norway's royalties, for example, are 146 per cent higher than BC's)⁷ and eliminating subsidies to the industry. The province should also establish a permanent oil and gas fund – as many other jurisdictions have – that can be used to diversify regional economies dependent on non-renewable energy resources, while planning for long-term economic transition.

Rather than opening up fragile ecosystems to oil and gas development, BC should be trying to get more economic development out of reduced production. Increased in-province refining and value-added activities would make the most out of non-renewable resources, and would ensure that BC takes full responsibility for guaranteeing that these activities are done under maximum environmental safeguards.

Consistent with these goals is a strong regulatory environment. That would include developing a climate change plan to reduce the province's greenhouse gas emissions to levels committed to under the Kyoto Protocol, with deeper emission cuts in the future. It would also mean evaluating the long-term, cumulative impact of energy development and examining how to reduce that impact over time.

Rather than opening up fragile ecosystems to oil and gas development, BC should be trying to get more economic development out of reduced production. Increased in-province refining and value-added activities would make the most out of non-renewable resources.

Changes already undertaken in the electricity sector must be reversed. BC Hydro should be reestablished as an integrated public utility and mandated to provide electricity security for the province. That would mean the province mandating that the public utility estimate electricity demand in the future and meet that demand entirely through conservation, energy efficiency, and renewable electricity supplies. BC Hydro's own numbers show this can be done cost-effectively.

Independent power producers should be allowed to contribute to a sustainable, distributed electricity system only where they can do so cost-effectively. The emphasis should be on domestic electricity security over export opportunities. The government's current policy of precluding BC Hydro from building new generating capacity must be rescinded.

The provincial government can help the province's utilities meet clean energy goals by working to make BC's economy more energy efficient. *The Energy Efficiency Act* should be updated to allow sales of only the most energy-efficient furnaces, appliances, motors, and electrical equipment. Building codes should require the most efficient building design: R-2000 and C-2000 standards for residential and commercial buildings. A building retrofit program should also be implemented for the province's existing building stock.

A clean energy vision for BC would prohibit coal-fired electricity and a natural gas pipeline to Vancouver Island, especially since clean energy alternatives exist. Energy efficiency gains can be made less expensively than adding new power supplies. The remainder of the gap between projected demand and supply for the next two decades can be met with cost-effective renewable electricity sources, including wind, micro hydro, solar, biomass, geothermal, and tidal power.

Key Policy Recommendations

Oil and Natural Gas

- Develop and implement a climate change action plan that allows BC to meet its Kyoto targets and undertake deep emission cuts beyond 2012.
- Eliminate all subsidies to oil and gas production and increase oil and gas royalties to levels found in Alaska or Norway.
- Establish a permanent oil and gas fund by earmarking a portion of oil, gas, and coal tax and royalty revenues to a fund that invests in economic development projects that diversify local and regional economies dependent on non-renewable resources.
- Maintain the moratorium on offshore oil exploration and development, as supported by a majority of British Columbians who appeared before the federal offshore oil panel.
- Develop a cumulative impact assessment process to assess the full environmental impact of many energy projects that can be logically grouped together, with the mandate to turn down development activities that hold too high an environmental cost.

Electricity

- Reverse the deregulation of BC's electricity sector by re-establishing BC Hydro as an integrated public utility whose mandate is to undertake long-term electricity planning and provide a secure electricity supply.
- Update and expand the *Energy Efficiency Act* to mandate the sale of only the most energy-efficient appliances, furnaces, motors, and other electrical equipment.
- Establish a renewable portfolio standard for all new electricity production in BC that mandates that all new supply be from low-impact renewable power sources (i.e. not including large hydro dams).
- Ban electricity generation from coal, both in power plants and co-generation facilities.
- Create a public benefit fund, by applying a 0.3-cents/kWh charge to all electricity sold in the province, with the revenue allocated to conservation, energy efficiency, renewable energy, and programs for low-income households.

(See Appendix 1 for the full list of policy recommendations.)

Introduction

There are many reasons for British Columbians to pay close attention to new developments in the province's energy industries and how public policy shapes those industries. Oil and natural gas are becoming an increasingly important component of the provincial economy, while electricity remains one of the key inputs for BC's major industries. Taxes and royalties from oil and gas development now contribute more to provincial revenue than the forest industry, while BC Hydro has continued to pay substantial dividends, water rentals and other financial contributions to the BC government.

BC's energy industries are important to rural, resource-dependent communities. However, the provincial government's increasing focus on the development of capital intensive oil and gas production for export, coupled with minimal refining or value-added activity within BC, means that provincial employment in the energy sector is still relatively low. Whereas forestry employs 90,000 British Columbians, oil and gas production employs only 1,300 and the electricity sector employs approximately 5,000.

The strategic importance of BC's energy resources cannot be overstated. Energy is the lifeblood of economies, required to heat and light our homes, move ourselves around, and undertake commercial and industrial activity. There are few daily activities that would not be affected if energy supplies ran out.

Oil and natural gas are also non-renewable. When they're gone, they're gone. In addition to oil and gas's importance as energy sources, they also serve as inputs for higher value-added products such as plastics and petrochemicals. These applications create much greater economic development and job opportunities compared to simply extracting and exporting oil or natural gas.

Given the strategic economic role of oil and natural gas, and their finite nature, it would seem prudent to maximize the return to the province through a long term energy management strategy rather than maximizing current exports. Although many other sources of energy need to be developed in BC – renewable energy sources such as wind, micro hydro, solar, biomass, geothermal, and tidal power – fossil fuels such as oil and natural gas will continue to be needed in the future. Therefore, we should be thinking strategically about how much oil and natural gas to use now, how much to hold onto for future generations, and how to maximize the economic value to BC (as opposed to the quantity) of what we do produce.

The province's energy policy is also important because of its significant environmental consequences. Climate change is perhaps the most critical global challenge facing humanity today. The burning of fossil fuels and the subsequent release of carbon dioxide is the most important factor in the worrisome trend of global warming. Burning fossil fuels also creates local air pollution that endangers human and ecosystem health. And even before we use energy to meet our needs, the production and transportation of energy resources has important impacts on our forests, lands, and marine environment.

In light of the strategic significance of energy to BC's economy and the economic and environmental issues associated with energy production, transportation and use, the approach of the provincial government to this issue is clearly a key public policy issue for the people of BC.

In November 2002, the BC government released its key energy policy framework, *Energy for Our Future: A Plan for BC*.⁸ The document lays out the government's overall policy priorities for the province's energy sector, including electricity, oil, and natural gas. The government maintains that its BC energy plan will provide a secure, reliable supply of all energy sources; continuing public ownership of BC Hydro; more private sector opportunities; and environmental responsibility.

The energy plan has been implemented through a number of pieces of legislation, regulations and related policy directives over the past 18 months. With respect to oil and gas development, policies implemented over this period include:

- Lower royalties for a variety of oil and gas development activities;
- Subsidies for building and/or maintaining oil and gas development roads;
- Weakening the *Environmental Assessment Act*;
- Legislation allowing a road through Graham-Laurier Provincial Park;
- A directive favouring oil and gas development in the Muskwa-Kechika Management Area; and
- Amendments to legislation that will allow a greater density of drilling wells (to facilitate coalbed methane development).

In the electricity sector, policy changes include:

- Legislation creating a separate transmission entity – the BC Transmission Corporation (BCTC) – to take over BC Hydro's transmission grid;
- Legislation creating the Heritage Contract, stipulating that BC Hydro's dams and power plants cannot be sold;
- Emission guidelines for coal-fired power plants, though BC presently has no such plants; and
- Amendments to the *Utilities Commission Act* giving the BC Utilities Commission additional jurisdiction over BC Hydro's (and the new BCTC's) revenues, rates and other business operations.

While the energy plan is written in a manner meant to reassure the average British Columbian that it will provide secure, reliable and relatively cheap energy for the future, a closer look reveals glaring inconsistencies between the plan's stated objectives and the actual policies the government is implementing. The plan entails a radical change in the direction of energy policy. It will further integrate BC into the US energy market, not only for oil and natural gas, but electricity as well. It will lead to unwarranted price increases for consumers and a further loss of public control over future energy policy decisions. It will also move the province further away from environmental sustainability. This approach to important, non-renewable energy resources fundamentally undermines the future prosperity of British Columbians.

There are four main themes in BC's energy policy direction. First, the plan seeks to increase production of oil and gas by lowering royalties, expanding subsidies, and cutting environmental regulations. This implicitly puts the priority on short term returns to provincial revenue over long term energy security or maximizing value-added economic development opportunities from the province's energy resources.

Second, the plan envisions an expanded role for the private sector in BC's electricity system, coupled with an ill-advised restructuring of BC Hydro. In various ways, public ownership and oversight is being deliberately eroded, though BC Hydro remains technically a public utility. BC Hydro has been broken up, with the transmission system carved out into a separate company, the BC Transmission Corporation. The government has also directed that virtually all new electricity generation must come from the private sector. Though some independent power producers are small, locally based electricity generators, other IPPs are large domestic and US-based multinational energy companies such as Duke Energy, Calpine Canada, Fortis (the new owner of West Kootenay Power) and Alcan. To meet BC's projected energy needs, BC Hydro is being required to take out long-term energy supply contracts with IPPs at prices significantly higher than it would cost the utility to produce the power itself.

Third, BC's regulatory capacity is being weakened. With respect to economic regulation of the electricity industry, the new policy reflects the government's desire to implement a US style, deregulated, electricity

market based on the standard US Federal Energy Regulatory Commission (FERC) model. These regulatory policy changes are intended to give private power producers and marketers access to BCTC's grid to sell to major customers inside BC and to export power to Alberta and the US. Large industrial customers are now able to buy power from suppliers other than BC Hydro. These changes transform BC's electricity grid from one whose priority is secure, domestic supply based on cost of generation and an assessment of BC's energy needs to a market-oriented system where energy prices fluctuate according to supply and demand in an unregulated electricity market. Once fully implemented, this approach will mean that BC customers will end up bidding against their counterparts in Alberta and western US states for electrical energy.

Environmental deregulation of the electricity, oil, and natural gas sectors means less stringent protection of BC's natural resources. Provincial policies encouraging coal-fired electricity generation, coalbed methane production, and offshore oil development – BC presently has none of these industries – threaten BC's air and water quality. Enforcement of existing environmental legislation is being hamstrung by policies that promote industry self-regulation. This is exacerbated by the government's decision to reduce the number of enforcement personnel.

Finally, the BC energy plan focuses on energy exports. Deregulating the electricity system and allowing private producers to sell to anybody will make more BC electricity available to the western North American grid (including Alberta, the Pacific Northwest, California, and much of the US southwest). More oil and gas production, without encouraging refining or other value-added opportunities, will result in greater raw exports, particularly since energy production is already surplus to the province's needs.

The energy plan does include favourable policies too, such as initiatives intended to improve the efficiency with which we use electricity and increase the supply of renewable energy. Most of these measures, however, are unfortunately voluntary.

The inconsistencies and contradictions in the BC energy plan put in question the real motives of the provincial government. The public rationale of the plan and its actual policy measures are deeply at odds with one another. For example, the energy plan calls for a climate change plan that addresses BC's greenhouse gas emissions. But addressing climate change in a meaningful way is impossible when the province's stated goals are to double oil and gas production and introduce coal-fired power – measures that will substantially increase the province's greenhouse gas emissions. They are also incompatible with the establishment of a deregulated market framework in which energy companies have a major incentive to expand rather than limit energy consumption.

As noted, the energy plan formally calls for continued public ownership of BC Hydro. But many of the plan's measures erode public ownership and oversight while jeopardizing the benefits of a vertically integrated public utility.

The net result of the policies contained in the energy plan will be increased energy exports, both of electricity and fossil fuels. However, growing energy exports put at risk the goal of providing BC with a secure, reliable supply of energy (a stated principle of the energy plan).

THE REMAINING SECTIONS OF THIS PAPER EXAMINE THE BC GOVERNMENT'S ENERGY POLICIES IN MORE DETAIL and propose an alternative approach that reflects a commitment to sound public policy and effective energy conservation and development. The alternative direction presented here is intended to show that nothing the BC government proposes is inevitable; that, in fact, it is possible to develop BC's energy industries in a smarter, more strategic, and more sustainable way.

The following page of this section recommends economic, social, and environmental indicators that can be used to evaluate the BC energy plan. In many cases, these indicators are more explicit than those laid out in the plan.

Part 2 addresses BC's oil and natural gas sectors. First, BC's oil and gas sector is described. Then, a critique of the BC energy plan's policies relating to oil and gas is presented. Finally, a more strategic vision for BC's oil and gas industries – one that focuses more on economic development and energy security – is laid out.

Part 3 focuses on BC's electricity sector. The provincial electricity sector is described, a critique of the direction of the energy plan's electricity policies is presented, and a more positive and sustainable vision for the province's electricity sector is laid out.

Criteria to Assess BC’s Energy Sector: Economic, Social, and Environmental Indicators

Before assessing a jurisdiction’s long-term energy plans or its present energy industries, one must assess the fundamental reasons for supporting those industries. An obvious rationale for energy production is to fulfill a province’s energy needs, whether it involves heating, lighting, transportation, or industrial activity. However, other criteria are also important. Social and economic benefits in the form of job creation, economic development opportunities, and revenues to government are necessary. And while energy security and economic benefits are important, we would like these to be realized at the lowest environmental cost. Most British Columbians would prefer to have better air quality in our cities and rural areas and want the province to meaningfully address climate change.

Table 1 outlines a suite of criteria (economic, social, and environmental) that should be considered when envisioning the kind of energy industry that would be best for British Columbia. These indicators can be used as a yardstick to measure any jurisdiction’s performance with respect to its energy industries.

In this paper, *Energy for Our Future: A Plan for BC* is assessed using these principles and indicators.

Table 1: Economic, Social, and Environmental Indicators for BC’s Energy Sector	
Principles of a Sustainable Energy Sector	Indicators
Economic	
Provide affordable and reliable energy, now and for future generations.	<ul style="list-style-type: none"> • Continue to meet the province’s projected electricity demand. • Set appropriate pricing of electricity that has equity across the province and across socioeconomic classes. • Maintain and increase projected period of oil and natural gas reserves.
Encourage economic diversification.	<ul style="list-style-type: none"> • Increase percentage of energy generated from renewable sources. • Increase local value-added production of energy resources. • Use energy revenue to diversify regional energy-dependent economies.
Ensure adequate return on the province’s energy resources.	<ul style="list-style-type: none"> • Increase amount of government revenue generated per unit of oil and gas production.
Social	
Create jobs throughout the province.	<ul style="list-style-type: none"> • Increase total number of jobs in the energy sector.
Seek community participation.	<ul style="list-style-type: none"> • Establish meaningful public input – including from First Nations – in decision-making.
Retain provincial autonomy.	<ul style="list-style-type: none"> • Decrease percentage of oil and gas production that must be exported because of NAFTA’s proportionality clause. • Maintain provincial autonomy with respect to planning of electricity generation and transmission.
Pursue development that does not have adverse health effects on the population.	<ul style="list-style-type: none"> • Decrease emissions of harmful air contaminants (SO₂, NO_x, particulates, sour gas, and heavy metals such as mercury).
Environmental	
Protect the climate.	<ul style="list-style-type: none"> • Decrease greenhouse gas emissions generated by energy sector. • Decrease greenhouse gas emissions generated from energy exports (including coal).
Promote energy conservation.	<ul style="list-style-type: none"> • Decrease per capita electricity consumption. • Decrease per capita energy consumption.
Decrease impacts on wilderness areas and wildlife habitat.	<ul style="list-style-type: none"> • Maintain amount of pristine wilderness areas. • Decrease risk to terrestrial and marine wildlife and habitat from energy development.

BC's Oil and Natural Gas Sector

Though the oil and gas sector has been seen as a bright spot in the BC economy, the benefits from oil and gas expansion have mostly come in the form of government revenue. Recent events have in fact moved the province away from energy security and environmental sustainability, and at the same time have compromised the economic and employment benefits to British Columbians.

BC's Oil and Gas Industries

Oil and gas production in BC originates exclusively from the Western Canada Sedimentary Basin in the province's northeast, though pilot projects for coalbed methane are also underway (see Figure 3). Because oil and natural gas are often found in the same basins and are produced in the same operations, parallel trends exist for production and reserves. Oil production in BC has increased by 25 per cent in the last decade, reaching 2.56 million m³ in 2002 – about 2 per cent of Canadian oil production. BC's rise in natural gas production has been even more dramatic, rising from 17.5 billion m³ in 1992 to 32.4 billion m³ in 2002 (an 85 per cent increase).⁹ BC now produces approximately 14 per cent of Canada's natural gas.¹⁰

Exploration without commercial success has occurred in other parts of the province. Fifty wells have been drilled in the Fernie-Flathead area in BC's southeast over the last century. The central interior has several sedimentary basins, including the Bowser, Nechako, and Whitehorse basins, which are predicted to have some hydrocarbon potential. The Georgia Basin, predicted to have some potential for natural gas, extends from the eastern part of Vancouver Island to the Fraser Valley on the mainland. Finally, BC has some offshore basins – the Queen Charlotte, Tofino and Winona basins – that were explored without commercial finds before provincial and federal moratoria on offshore development were put in place. Nonetheless, the offshore basins are predicted to hold the greatest hydrocarbon potential of the non-commercial basins in the province.

Although there is predicted to be some coalbed methane (CBM) potential in the province's northeast and southeast, with much smaller amounts on Vancouver Island, officially there are no recognized coalbed methane reserves.¹¹ This is because none of the potential has been shown to be commercially viable.

CBM is methane (a natural gas) found in coal seams, often in abandoned coalmines. CBM production is a fairly expensive operation, since the natural gas is more diluted, requiring a greater concentration of wells than conventional natural gas drilling. More wells, and more roads to access them, lead to significant ecological impacts, including habitat fragmentation. Also, a significant amount of water often needs to be pumped out of the coal seams in order to access the CBM. This pumping process can take over a year, with gas production starting relatively slowly at first.

BC has benefited from oil and gas production, primarily through royalty, tax, and fee revenue to the provincial government. These revenues have increased from \$361 million in 1998/99 to \$1.5 billion in 2002/03, a four-fold increase.¹² Increased production has contributed, but the jump is mostly due to soaring oil and gas prices. Per unit government revenue has increased over the past few years, from \$4.10 per barrel of oil equivalent (boe) in 1999 to \$8.10/boe in 2002, but this can be attributed to increased commodity prices for oil and natural gas.¹³

Other trends have not been so positive, mostly because the province has focused on increasing production and exports, rather than maximizing economic development or establishing energy security. Employment in oil and natural gas production in BC has decreased from 2,500 in 1992 to 1,300 in 2003 (Figure 4), mostly due to productivity increases.¹⁴ Meanwhile, very few opportunities exist for processing or value-added petroleum products, the equivalent of exporting all BC's harvested timber as raw logs.

Figure 3: Map of Oil and Gas Basins

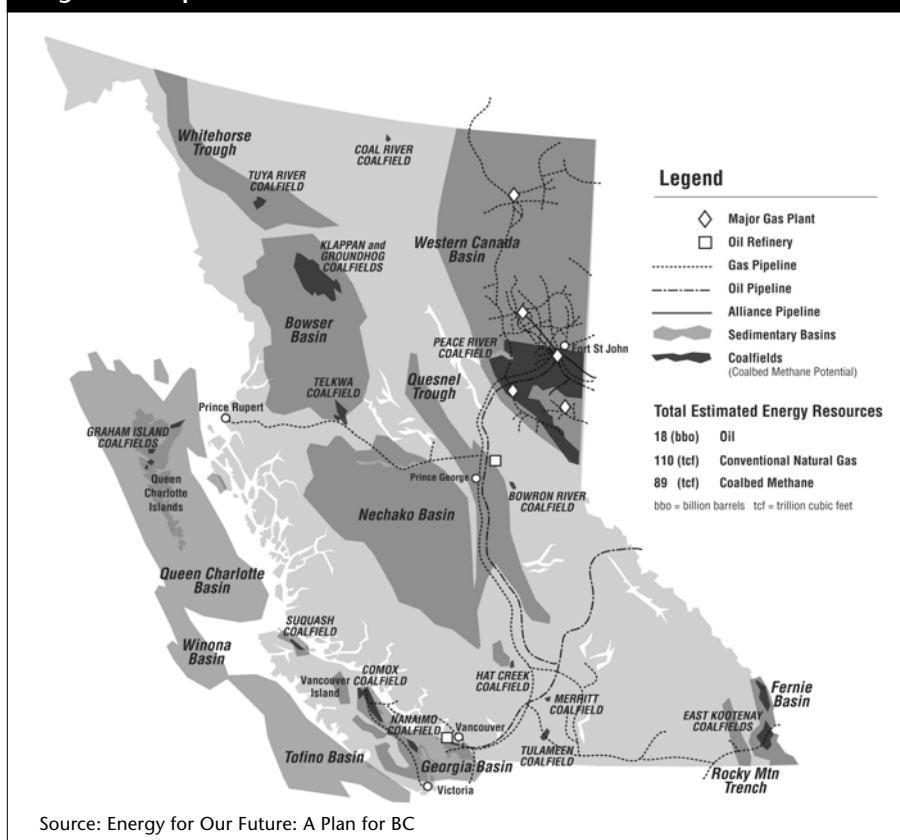
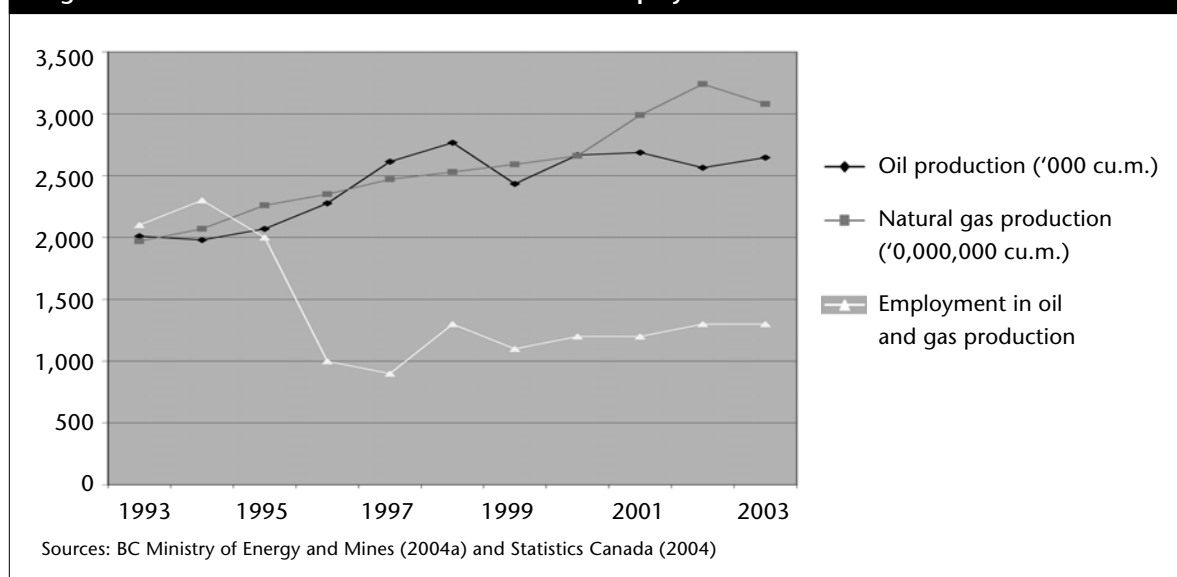
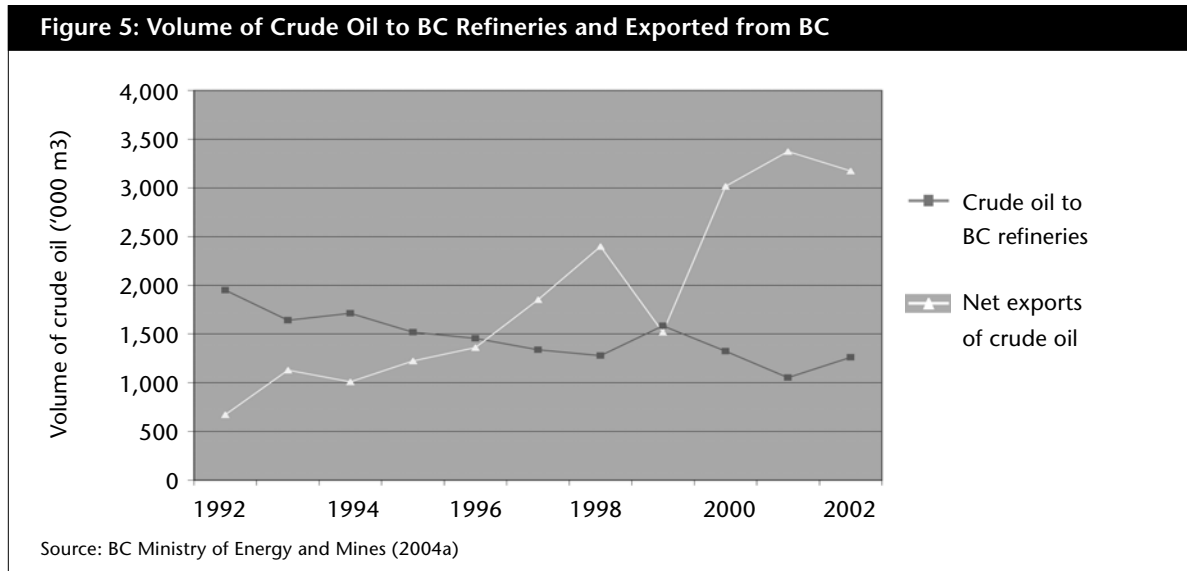


Figure 4: BC Oil and Natural Gas Production and Employment



Exports

The majority (74 per cent) of BC's crude oil production is exported, mostly to Alberta, with a very small portion going to the US.¹⁵ BC has only two small refineries (the Chevron refinery in the Lower Mainland and the Husky refinery in Prince George), so an increasing proportion of its crude oil production leaves the province unrefined. In fact, over the last decade, the portion of BC's crude oil production going to BC refineries has declined by 35 per cent while crude oil exports have increased almost fivefold (Figure 5).¹⁶ A significant amount of Alberta crude flows into BC, but not enough to make up for the decline in BC crude delivered to the province's refineries.



Exports of natural gas from BC have increased to 72 per cent of production, with the vast majority heading to the U.S (Table 2).¹⁷ In fact, the proportion of BC's natural gas production that heads south of the border has increased from 30 to 50 per cent in the last decade. A smaller portion of BC's natural gas heads to Alberta and Ontario.¹⁸

Oil and Gas Reserves: Part of BC's Energy Security

BC's future energy security is not at all assured by the provincial government's policies. Oil production has increased less than what would be suggested by drilling activity. A 51 per cent increase in the number of wells was needed to increase production by 25 per cent,¹⁹ since all of the best oil fields have been tapped. BC now has less than 10 years of oil reserves, based on current production.²⁰ The low reserves added per well drilled has led the Ministry of Energy and Mines to conclude that the Western Canada Sedimentary Basin has reached maturity.²¹

Like oil, natural gas reserves continue to shrink. BC now has fewer than 12 years of natural gas reserves, its lowest point ever.²² In the last decade, the number of producing wells has more than tripled, but production per well has been decreasing.²³ Wells drilled after 2000 now have annual production declines of 30 per cent per year, compared to 16 per cent declines 10 years earlier.²⁴

Jurisdiction	Exports (% of Production)
United States	50
Alberta	16
Ontario	6
Total	72

Source: Statistics Canada (2002b)

One of the major finds that allowed increased production happened near Ladyfern. Production from the Ladyfern Field peaked in 2002 after only three years of production.²⁵ Reserves will be exhausted, and the project shut down, by the end of 2004. In

short, the future for natural gas is rather uncertain. The province needs another major find like Ladyfern, or the number of natural gas wells needed just to maintain production will have to increase exponentially.²⁶

The same phenomenon is occurring across Canada. The country's natural gas production is expected to decline by 3 per cent between 2002 and 2005 because many of the new fields coming onstream are small and quickly depleted.²⁷

With oil and gas reserves shrinking everywhere, and considering their strategic and economic importance, it would make sense to guard our petroleum resources more carefully, and to try to make the most of their production. This means long-term planning for BC's non-renewable resources, decreasing production to maintain reserves for more than this generation of British Columbians, and maximizing job and royalty benefits of production. The alternative – depleting our petroleum reserves at faster and faster rates – compromises the security of the energy supply for this and future generations.

The BC Energy Plan: The Wrong Direction for BC's Oil and Gas Sector

The course set out in *Energy for Our Future: A Plan for BC* will further the alarming trends in the province's oil and gas sector. With respect to oil and gas development, the main themes of the energy plan include:

- A focus on increased oil and gas production at the expense of economic development and environmental sustainability;
- A weakened regulatory environment for the oil and gas sector, including allowing offshore oil development and coalbed methane production; and
- A movement towards greater energy exports rather than ensuring provincial energy security.

With oil and gas reserves shrinking everywhere, and considering their strategic and economic importance, it would make sense to guard our petroleum resources more carefully, and to try to make the most of their production.

Oil and Gas: More Production, but No Economic Development

A key theme that emerges from the BC energy plan is a clear urgency from the BC government to facilitate more and more oil and gas development. Partly, this manifests itself in decreased environmental regulations, including allowing new, risky energy developments like offshore oil and coalbed methane. But it also involves doing everything possible to make the economics of production as favourable as possible for oil and gas companies by extending subsidies and dropping royalties. Little consideration is given to getting a fair price for the province's resources, an especially important issue given that oil and natural gas resources are non-renewable. Worse, while the long-term energy security of the province is alluded to – it *is* one of the plan's main principles – it is not meaningfully addressed.

Subsidies to Oil and Gas Companies

The energy plan proposes subsidies to oil and gas development in a variety of ways. As mentioned above, the plan lends support to coalbed methane development (Policy 10 in *Energy for Our Future*). In part, this included a \$50,000 tax credit for every coalbed methane well drilled in the province (up to February 2004).²⁸

Another proposal in the plan that has already been implemented is subsidizing the construction and upgrading of roads that access oil and gas resources (Policy 18), a policy held over from the last provincial government. In 1999, the BC government committed \$103 million to upgrade roads used by the oil and gas industry in northeastern BC. Since then, the new government promised \$10 million per year in royalty credits towards road development into oil and gas areas. In 2003, a request for proposals led to “over-subscription” in the plan and the Ministry of Energy and Mines increased the royalty credit for that year to \$30 million.²⁹ Then, in June 2004, the BC government signed a \$40 million agreement with a private company to upgrade the Sierra Yoyo Desan Resource Road in order to “generate an increase in oil and gas exploration and development activities in the northeast.”³⁰

There is no justification for subsidizing the oil and gas industry at any time, especially not when commodity prices for oil and natural gas are so high. Worse, subsidizing road development is one of the worst examples of a perverse incentive, giving money to companies to increase ecosystem fragmentation, wilderness destruction, and impacts on wildlife and biodiversity. Subsidizing fossil fuel production means also subsidizing the deterioration of human health, since significant air pollution is created from producing and burning oil and natural gas.

Royalties: How Low Can They Go

Another form of subsidy is the deep discount BC is offering on its oil and gas royalty rates. Given a fixed price for oil and natural gas, royalty rates have declined in BC since the last election. The government has established a favourable royalty regime for “unconventional” resources such as tight gas, shale gas, and coalbed methane, part of Policy 10’s plans to “encourage” coalbed methane production. The government has also decreased royalties for more expensive forms of production (Policy 17). This includes royalty cuts for deep well drilling, defined as drilling at a depth of 2,500 metres or more.³¹ Royalties have been reduced for summer drilling, when it is more difficult and expensive to navigate over the northern landscape, in order to get oil and gas companies to operate year round.³² Royalties have even been reduced for “marginal” wells – those that produce natural gas when only an oil license exists, or those that produce only a small amount of natural gas.³³

The push for offshore oil will have to follow the same path. A paper peer reviewed by the provincial government shows that royalty rates will be at most 4 per cent of the value of the produced oil and gas, far below the already low royalty rates for conventional oil and gas production.³⁴ This is because offshore oil development is a highly expensive undertaking, and those high costs have to be recovered before royalties can be applied or increased. (Royalty rates vary considerably depending on the type of oil or gas and the cost of production. BC’s royalty rates begin at 0 and increase to a maximum of 35 per cent of the value of the petroleum.)

The intent is clear: no matter how inaccessible the oil or gas (geographically or geologically), no matter how marginal the operation, the BC government will try as hard as possible to make it economical for industry to access it. The increase in current production has meant a steep increase in revenue to the provincial treasury. Nevertheless, if extraction of a non-renewable resource is encouraged through reduced royalties (as is the case), it represents a loss of income for current and future British Columbians.

Exporting Oil and Natural Gas

The energy plan will result in increased exports of oil and natural gas. Increasing oil and gas production alone will do this, since more than 70 per cent of BC’s natural gas production is already being exported and the province has little refining capacity to process BC-produced crude oil. Streamlined regulations, additional subsidies, and reduced royalty rates will only push production up – especially with high international prices for oil and natural gas – increasing the total volume and proportion of exports.

But there is also at least one policy in the plan that will increase natural gas exports even more: allowing the market alone to dictate the construction of natural gas pipelines (Policy 7). The BC government should ensure that the distribution and use of BC’s natural gas is undertaken in a way that meets the energy needs of the province while minimizing their environmental impact. The market is a poor delivery mechanism for either of these objectives.

Expensive investments in expanded natural gas pipeline capacity within the province will need to be amortized over time, pushing the province towards greater and greater reliance on natural gas. This could squeeze out cost-effective projects that are renewable and more environmentally friendly, and result in increased greenhouse gas emissions.³⁵ This would happen with the natural gas pipeline across the Georgia Strait. The BC Utilities Commission turned down the natural gas pipeline across the Georgia Strait to Vancouver Island (a consequence of Policy 6), but this ruling may be temporary if BC Hydro’s call for tenders does not bring forward cheaper alternatives. However, cheaper, more sustainable sources of power are available.

Expansion of natural gas pipelines to the US will only increase competition for British Columbia gas with southern consumers. Presently, the flow of natural gas to the US is limited by pipeline capacity. As pipeline capacity increases, British Columbians will have to pay more for their own natural gas.³⁶

A Weakened Regulatory Environment

BC's environmental regulations are being eliminated through policies set out in the energy plan. In some cases, deregulation is occurring under the guise of "streamlining" processes. In other cases, the energy plan allows and encourages new and risky energy developments: coalbed methane, offshore oil development, and coal-fired power.

Environmental Deregulation in Oil and Gas

"Streamlining" environmental protection, a theme of the current government's administration, continues in the energy plan. As part of the plan (Policy 25), the government passed Bill 38, an amendment to the *Environmental Assessment Act*. This act grants a government appointee discretionary power to determine whether an assessment is necessary. This diminishes the usefulness of environmental assessments as a tool to ensure that projects do not negatively impact the environment.³⁷

Policy 25 also refers to the province's *Waste Management Act*, which has been changed to the *Environmental Protection Act* and amended so that permits will not be required for low- and medium-risk waste. The BC government expects that 80 per cent of activities that create pollution will have neither a permit nor a code of practice to adhere to.³⁸

With this track record, it is difficult to feel optimistic that a "streamlined" approval process for oil and gas development under the Oil and Gas Commission (Policy 17) will not also entail fewer environmental safeguards and less oversight. Policy 17 means oil and gas companies will submit only one application for a development project, rather than one for each individual part of a project: e.g. roads, wells, and pipelines. This would be welcome if the full project was also subject to an environmental assessment. Environmental assessments would be more useful and meaningful if they were more holistic, looking at cumulative impacts of whole projects (and multiple projects) on overall sustainability. However, the further watering down of the environmental assessment process moves in the opposite direction.

The plan even intervenes in the land use process in order to favour oil and gas production over all other cultural or economic activities (Policy 18). Land use processes were intended to be a place for different BC stakeholders (industry, First Nations, environmental organizations, community groups, and government) to come together and decide which activities will be undertaken in different regions of the province. Provincial government officials were meant to be participants in, but not drivers of, these processes.

The intent of this energy plan policy, however, becomes most evident when one considers the BC government's interference in the Muskwa-Kechika Management Area. The Muskwa-Kechika area, in the province's Northeast, has significant oil and gas and mineral resources as well as incredible cultural and ecological value. It is home to the Kaska Dena and Treaty 8 First Nations and includes 16 million acres of wilderness, 50 roadless watersheds, and a rich diversity of plant and animal life. The stakeholders, including oil and gas, mineral, and forestry interests, agreed to a management plan that was enshrined in legislation by the previous BC government.

The present government has undermined the agreement in several important ways:³⁹

- Instituting a "prime directive" towards oil and gas development, sidelining other stakeholders;
- Reducing promised financial resources in the trust fund by 66 per cent;
- Spending most of the remaining trust fund resources to plan oil and gas development before conservation science is in place; and
- Granting approval to oil and gas companies to build a road into a provincial park, Graham-Laurier, in the Muskwa-Kechika area.

These activities have diminished the cultural and economic interests of the First Nations.

The intent is clear: no matter how inaccessible the oil or gas (geographically or geologically), no matter how marginal the operation, the BC government will try as hard as possible to make it economical for industry to access it.

This policy appears to be a continuation of government manipulation and a rolling back of environmental protection in order to attain what appears to be its primary goal to “improve access to oil and gas resources” to generate short-term revenues for government and oil and gas companies.

Coalbed Methane

Coalbed methane development holds high environmental and human health risks. The high concentration of wells means greater impacts on the landscape than conventional oil and gas development. Because operations pull large volumes of water from underground, considerable contaminated water needs to be disposed of, impacting surrounding ecosystems. This holds especially high risks if that produced water has a high salt content, as it often does.

The BC energy plan seeks to develop coalbed methane (Policy 10). The government has made regulatory and fiscal changes in order to “encourage” development, including:

- Labeling new coalbed methane wells as “experimental” for their first three years, excluding them from the full regulatory framework;
- Resisting the need to carry out baseline studies before development, so that the environmental impacts can be monitored;
- Extending a \$50,000 subsidy for every new well; and
- Setting lower royalty rates than for conventional oil and gas production.

In order to allow the very high concentration of wells required for coalbed methane development, provincial regulations have been weakened to allow wells to any density.

Meanwhile, throughout the province, opposition to coalbed methane development is mounting. The Union of BC Municipalities passed a resolution in September 2003 calling on the province to halt development until local communities and First Nations have been consulted, their concerns addressed, and appropriate regulations put into place. The town of Fernie in the East Kootenays and the Comox-Strathcona Regional District on Vancouver Island passed similar resolutions. The town of Hudson’s Hope and the Peace River Regional District (both in the Northeast) have also officially expressed concern.

Despite this, the provincial government has stuck to its plan and begun approving coalbed methane development. Development plans in the East Kootenays received the green light in March 2004.

Offshore Oil Moratorium

There has been a federal moratorium on offshore oil and gas development in BC since 1972 and a provincial moratorium since 1981. The principle concern is the risk of a major spill from one of the rigs, from tankers carrying the oil to market, or from pipelines carrying natural gas. The West Coast’s earthquake activity magnifies this risk. Other significant concerns include: the impacts of seismic testing on fish, marine mammals, and the marine ecosystem; the systematic release of drilling mud from offshore operations; and the impact on climate change of tapping every oil and gas reserve, no matter how remote.

The BC energy plan expresses a bias towards lifting the moratorium (Policy 11), though the exact language is ambiguous: it calls for the Ministry of Energy and Mines to both “develop a provincial position” on the moratorium and “move...toward development of offshore resources.” In this and other ways, the BC government has attempted to appear impartial while pushing hard for lifting both moratoria.⁴⁰

Climate Change: No Real Commitment

A policy yet to be acted upon is that of developing a management plan for BC’s greenhouse gas emissions and air quality in threatened airsheds (Policy 24). A climate change plan with ambitious, mandatory targets is essential. The provincial government was instrumental in having Washington State’s Sumas II proposal turned down, going so far as obtaining intervenor status and presenting evidence to oppose the plant.

However, the BC energy plan as a whole, like Sumas II, will both worsen air quality and increase greenhouse gas emissions. This is the inevitable result of doubling oil and gas production, expanding pipeline capacity, and encouraging coal-fired power generation. British Columbia has a responsibility to reduce its greenhouse gas emissions, as does the rest of the industrial world. BC should not be a free rider.

A Different Direction for BC's Fossil Fuels: Making the Most of Non-Renewable Resources

Rather than pulling oil and gas resources out of the ground as quickly as possible to fill short-term budget shortfalls, the province needs to safeguard these resources and consider the short, medium, and long-term implications of their development.

Domestic Security vs. Exports

Policies concerning fossil fuels, especially oil and natural gas, need to be carefully considered in light of fossil fuels being non-renewable and energy being so vital to our economy and wellbeing. The BC government should therefore be thinking of the long-term energy needs of British Columbians.

With North American reserves dwindling, natural gas will only become more valuable in the future. Given this scenario, BC should be making the most of oil and gas resources now – increasing royalties on production and encouraging jobs and economic development – and slowing production so there are some resources and revenues left for the province's needs in the future. Instead, the provincial government is looking for significant production increases.

Worse, BC is binding itself to continued energy exports to the US, even in the face of a looming domestic supply crunch, because of the North American Free Trade Agreement. Chapter 6 of NAFTA binds exporting nations to continue exporting the same proportion of its energy resources as over the last three years. For natural gas, that is now over 50 per cent. And the US's appetite for energy resources appears to have no end. That doesn't mean we have to stop all energy exports. But it does mean that BC should secure its own supply now and into the distant future.

The government should also ensure it is getting fair value for its valuable oil and gas resources, discussed in the next two sections.

Oil and Natural Gas Subsidies

The BC government should abandon all subsidies to the oil and gas industry. Given the high environmental costs of developing our oil and natural gas resources compared to renewable energy (due to impacts on human and ecosystem health), it makes more sense to level the playing field by favouring renewable energy production.

Subsidies to be eliminated include matching grants for road building, recently expanded from \$10 million per year to \$30 million for 2003. Direct subsidies to coalbed methane projects – \$50,000 per well drilled – should also be eliminated.

Royalties

As described above, BC has dropped royalty rates on marginal oil and gas projects, including deep well drilling, summer drilling, "marginal" wells, and "unconventional" resources such as tight gas, shale gas, and coalbed methane.

Before the rates were cut, BC revenue from oil and gas royalties, taxes, and lease bids were higher on a per unit basis than in other western jurisdictions, including Alberta and the territories.⁴¹ A significant reason for this is that oil and gas companies operating in Alberta have received deep discounts on royalty rates over the last decade. Alberta Premier Ralph Klein's government now receives only 25 per cent of the revenues per barrel of oil collected by the Peter Lougheed administration of the 1970s and early 1980s.⁴² When BC petroleum revenue is compared to international jurisdictions such as Alaska and Norway, however, it is clear that British Columbians are selling their oil and gas resources for a song. For 2002, provincial

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royalties and taxes (on a per barrel basis) were 23 per cent lower than in Alaska and 55 per cent lower than in Norway.⁴³

The BC government trumpets the many ways it has improved the competitiveness of the province's taxation and royalty regime for oil and gas development.⁴⁴ The other way of looking at it is that the province is asking and getting less for its public resources compared to international jurisdictions. There is a trade-off between these two approaches: being competitive and getting a fair price. The government's complete focus on the former means it is not delivering the latter.

The BC government should be rethinking its wholesale giveaways of oil and gas resources. Instead of focusing exclusively on balancing the fiscal books now, the province should eliminate the recent "incentives" and set royalty rates at levels comparable to Norway.

Some will argue that increasing royalties to a more appropriate level would decrease production. This is almost certainly true, and indeed the point. Raising royalty rates is an explicit recognition that oil and natural gas are important, strategic resources and that they are non-renewable, two good reasons to ask more for them now and preserve some for later.

A Permanent Oil and Gas Fund

One way the BC government could help turn our non-renewable natural resources into renewable financial resources is by putting a portion of every year's oil and gas royalties into a permanent fund. The rationale for doing this includes saving a portion of public resources for future generations, moderating boom-and-bust cycles, stimulating economic development and diversification, and mitigating the social and environmental costs of resource exploitation.⁴⁵

Several jurisdictions have developed these types of funds, including Alberta, Alaska, and Norway, though they differ in their goals, strengths, and weaknesses. The intent of trust funds determines its details: how the funds are collected, how they're invested, how they're managed, and how the dividends are spent.

The goals of BC's permanent fund should be twofold. In the short and medium term, the fund should be used to leverage investment in economic development ventures – especially in BC's resource-dependent communities – to create employment opportunities. In the long run, the intent should be to diversify local economies that are based on non-renewable resources so that when those resources are gone, economic stability remains. The BC government currently has no contingency for when resources run out. Obvious investment opportunities for the fund include energy efficiency and renewable energy projects.

Revenue going to the fund could be a fixed percentage of oil and gas royalties. However, the price of – and the revenues generated from – coal, oil, and gas fluctuate greatly. One way to stabilize the resource royalties going to provincial general revenue would be to have a sliding scale for revenue to the permanent fund, i.e. a higher percentage of resource royalties would go to the fund when prices are high (with the remainder going to general revenue), and a lower percentage when prices are low. That way, the government would lose less revenue when it may need it the most, that is, when British Columbians most need government spending to see them through a recession.⁴⁶

Revenues to the trust fund can also be supplemented by placing an excess profits tax on oil and gas companies. When these companies are making windfall profits, as they did in 2000 and 2001, a portion of the tax can be placed in the trust fund.

Expanding Job Opportunities

The unfortunate reality of oil and gas development is that the social and economic benefits enjoyed by nearby communities is dwarfed in comparison to the high value of the resource extracted from their region. Drilling for oil and natural gas creates on average only seven jobs per one million dollars invested.⁴⁷

One way to create more employment from the province's oil and gas resources is to expand value-added opportunities. A decreasing volume of BC's oil production ends up at one of only two small oil refineries in the province.⁴⁸

Also, about 90 per cent of the organic chemicals we use (plastics, pharmaceuticals, and others) come from petroleum products, yet BC has minimal manufacturing in these sectors. This is an economic and job boom waiting to happen. The 20 per cent of Canadian natural gas production that goes to petrochemicals generates almost twice as much revenue as the more than 50 per cent that is exported.⁴⁹ Instead, increased natural gas production is going to export, and BC still does not have value-added energy industries.

There are, of course, environmental and social implications to developing these kinds of activities. Oil refineries and plastics manufacturers produce environmental impacts, and may adversely affect human health, in the communities within which they operate. Thus, a necessary protocol for engaging in these types of activities would involve a strong regulatory framework and infrastructure (which BC is currently lacking) and community engagement and participation (so that local concerns are considered, and local benefits are maximized).

While acknowledging these important caveats, BC should nonetheless be encouraging investment in energy value-added industries where and when it is warranted. Instead of simply putting up oil and gas tenures to the highest bidder, the province should add other criteria, such as ironclad commitments to process oil in the province. The Oil and Gas Commission could make job creation one of the determining factors when granting oil and gas development permits.

British Columbians aren't even necessarily the ones being hired for current oil and gas production. Only one out of every five jobs in the Northeast oil patch are held by British Columbians. The vast majority of jobs go to Albertans, some of whom are flown in to fill the positions.⁵⁰

One proposal that would encourage the hiring of British Columbians would be to index the royalties paid by companies for our oil and gas to the personal income taxes paid to the province by its workers.⁵¹ Oil and gas companies would make up any revenue shortfall (in the form of higher royalties) that results from employing out-of-province workers and having their income taxes leave the province. This would give oil and gas companies an incentive to train and employ British Columbians.

Instead of simply putting up oil and gas tenures to the highest bidder, the Oil and Gas Commission could make job creation one of the determining factors when granting oil and gas development permits.

An Environmental Framework for Oil and Gas Development

Upon coming to power, the BC government split the Ministry of the Environment into the Ministry of Water, Land and Air Protection and the Ministry of Sustainable Resource Management. In most instances, the Ministry of Water, Land and Air Protection's role has been secondary to the Ministry of Sustainable Resource Management, which tends to favour development over environmental stewardship.⁵² The government's "one window" approach to getting projects approved may speed up that process, but too often it means that economic development ministries and agencies – Forestry, Energy and Mines, the Oil and Gas Commission, etc. – make decisions with no input or oversight from the Ministry of Water, Land and Air Protection.

The BC government needs to realize that there is a balance to be struck within its own mandate. Working with industry to develop the province's resources and provide jobs is important. So is protecting the long-term health of the province's people and ecosystems – in fact, these are critical to our long-term prosperity. The direction that development takes should be shaped by government to provide the former without endangering the latter.

The province's ecological resources need to be given the same consideration as its oil and gas resources. Wild spaces can contribute to the province's economic development in a variety of ways. For example, many people travel to British Columbia to experience its wildlife and natural beauty. BC's tourism industry generated \$5 billion in economic activity in 2002.⁵³ A healthy environment is also vital to other consumptive sectors of the economy, such as forestry and fisheries. All these industries can be sustainable and renewable, if we adequately protect them from damaging activities.

Nature also provides a high quality of life for the people of the province. It is one of the reasons that BC cities, such as Vancouver, often rank higher on quality of life indices than other Canadian cities.

For these reasons and others, the BC government needs to put much more emphasis on environmental protection. The province should develop a process to undertake a cumulative impact assessment for provincial energy projects. The environmental assessment process has always been piecemeal, investigating one project at a time. Also, its intent has not been to turn down projects that are environmentally unsustainable or risky, but rather to make projects more “environmentally-friendly,” no matter how fundamentally unsustainable they are. Cumulative impact assessments would investigate the full environmental impact of many projects that can be logically grouped together (proposed oil and gas developments or micro hydro projects or wind farms in a whole region of the province) and have the mandate to turn down development activities that hold too high an environmental cost.

The Oil and Gas Commission also needs to be reformed to have a stronger environmental mandate. The deciding vote on OGC decisions is now made by a senior official of the Ministry of Energy and Mines, a person appointed by the government. This prioritizes oil and gas development over environmental protection and ecosystem integrity. Instead, a representative from the Ministry of Water, Land and Air Protection should be a voting member of the Commission.

Government involvement in land use processes should be as a participant, not a driver. Input to the process should include as many officials from the Ministry of Water, Land and Air Protection as there are from economic ministries, such as Energy and Mines.

Coalbed Methane

The BC government must not issue any new coalbed methane leases. The elements required to undertake CBM projects – a more thorough consultation process with British Columbians, baseline studies to examine the impact of coalbed methane development, and adequate environmental safeguards – are not in place.

For those leases already issued, a regulatory framework should be developed to address all CBM development impacts, including the disposal of produced water from coalbed methane operations. This is particularly important when the produced water is saline.

Offshore Oil Development

The BC government should maintain its moratorium on offshore oil exploration and development. Environmental risks remain. A 2003 Royal Society of Canada report on the scientific knowledge of offshore drilling points to information gaps with respect to offshore oil exploration and development, and recommends that legislation be implemented that addresses those holes. Meanwhile, the BC government – as legislators – is falsely stating that science has declared offshore oil to be safe. With the regulators and scientists pointing at each other for answers, environmental protection is not safeguarded.

Using the East Coast as a case study, the economics are also not favourable. Wade Locke, a Newfoundland economist, concluded offshore oil development on the East Coast to be “marginal” and “unviable without government subsidy.”⁵⁴ In the end, he was right. The federal and Newfoundland governments contributed billions to various components of offshore oil development: the Bull Arm facility where Hibernia was built, the transshipment terminal, and the Hibernia and Terra Nova rigs. Not every subsidy could be calculated, but they totalled at least \$1.04 billion in grants, \$2.36 billion in loans and loan guarantees, an almost \$1 billion equity position, and \$200 million in tax exemptions.⁵⁵

Worst, offshore oil has not had a significant positive effect on the East Coast economy. The disappointment is vividly portrayed in newspaper headlines: *Nova Scotia still waiting for big petroleum payoff*⁵⁶; *Oil: The saviour that failed Newfoundland*⁵⁷; and *Hopes fade for offshore Canada boom*.⁵⁸

The Royal Society of Canada concluded the same thing in a recent investigation of Newfoundland's position in Canada.⁵⁹ Offshore oil, it found, would not change Newfoundland's economic position "to any material extent" unless:

- Three more substantial fields are found;
- These fields are developed before the three existing ones are depleted; and
- The price of oil remains at US\$30 per barrel.⁶⁰

Newfoundlanders know not to hold their breath.

BC's offshore oil potential is even more marginal. The Geological Survey of Canada has estimated that BC's offshore has less natural gas reserves and less than half the oil reserves of the East Coast. BC's geology is also more complex, with more faults and smaller oil and gas pockets, making development more expensive.

The other reason that BC should keep the offshore oil moratorium is due to the limited potential for employment, especially in the next two decades. Oil and gas companies always use contractors for exploration, and they bring in their own crews.

Rig construction contributes a significant pulse of jobs, but an assistant deputy minister working on this file has admitted that it is "unlikely" that the rigs will be built here.⁶¹ That would be an understatement, since BC has no rig building industry and other jurisdictions do (China and South Korea, most prominently), while providing cheaper labour and generous government subsidies. As a point of comparison, BC Ferries' next fleet of ships will be built offshore *despite the fact that BC has a shipbuilding industry*.⁶²

BC would therefore have to wait until production begins to see more than a few local jobs. That wait was predicted to be 16 years by the scientific panel report, but will likely be longer. Hibernia took 18 years from discovery to production and BC's reserves have not yet been found. Furthermore, before exploration begins, the province and the federal government will have to resolve Aboriginal claims to the offshore resources. Several First Nations, including the Haida and Tsimshian, are officially opposed to offshore development, and the Haida are just beginning what will likely be a decade-long battle in the courts to prove Aboriginal title over offshore resources.

Several First Nations, including the Haida and Tsimshian, are officially opposed to offshore development, and the Haida are just beginning what will likely be a decade-long battle in the courts to prove Aboriginal title over offshore resources.

In the end, there are two risks. One is environmental. Even before development begins, exploration will involve seismic testing that holds risks to fish, marine mammals, and the marine ecosystem. Developing more oil and gas will further endanger the climate.

The second involves an opportunity cost. The BC government – and certain communities, such as Prince Rupert – are so focused on this economic Eden there is a real risk that they will ignore or eschew economic opportunities that have the potential to create more jobs (in a shorter time frame) and without posing risks to other coastal industries.

BC's Electricity Sector

For over 40 years, BC's electricity sector, dominated by BC Hydro, has generated reliable electricity for residential, commercial, and industrial customers. Creeping privatization and an increased reliance on dirty power are undermining the historical advantages of the system. The course set out in *Energy for Our Future: A Plan for BC* will, unfortunately, continue these trends.

BC Hydro and the Rest of BC's Electricity Sector

BC's electricity sector, which generates 12 per cent of Canada's electric power, has served British Columbians very well since BC Hydro was created as a Crown corporation in 1962. Electricity is a high value commodity and, as such, is a significant contributor to the overall value of the energy sector. In 2000, BC's electricity sector had sales of \$3.5 billion, accounting for 38 per cent of the value of the province's total energy production.⁶³ The sector also directly employs 5,000 administrative and operating employees who earn \$261 million annually,⁶⁴ though including contractors and employees of independent power producers would increase those numbers significantly.

Because BC Hydro made major investments in hydroelectric facilities during its first 35 years of operation, BC residents now benefit from the very low cost of public power based on assets acquired at historic costs. Hydroelectricity dominates BC's electricity mix (contributing 87 per cent of the energy generated),⁶⁵ and has proven to be a very reliable and secure generating system. The key advantage hydro systems have is storage. Reservoirs contain enormous amounts of energy that can be brought on stream at very short notice, providing BC Hydro with broad flexibility compared with thermal or nuclear systems that predominate in most other jurisdictions in North America.

The dams and reservoirs required for hydroelectric systems, however, have had high environmental impacts. Air emissions, including greenhouse gases, may be lower for hydroelectricity than for coal, oil, or natural gas-based power, but BC's large dams have had devastating impacts on landscapes, wildlife, river ecosystems, and Aboriginal people.

Together, electric utilities and other industries generate 68,600 GWh of electricity annually in BC, with utilities being responsible for approximately 80 per cent of production. Industry (such as Alcan in Kitimat, Tech Cominco in Trail, and many pulp mills) generates the remainder.

BC Hydro is by far the largest electricity producer in the province.⁶⁶ Its electricity system has more than 11,000 MW of generating capacity, used to generate 43,000 to 54,000 GWh of electricity annually from 32

hydroelectric facilities, two gas-fired thermal power plants, and two combustion turbine stations.⁶⁷ (For a more detailed description of BC Hydro's assets and operations, see Appendix 2.)

BC Hydro is the third largest electric utility in Canada, serving more than 1.6 million customers in an area that contains 94 per cent of the province's population.⁶⁸ The electricity is distributed over more than 74,000 kilometres of transmission and distribution lines. There are also three interconnections between BC and Alberta and four to the US.

BC's electricity prices are among the lowest in North America because of BC Hydro's cost-based approach to pricing, and its low hydro-based production costs and high efficiency (Table 3). Historically, prices have been set to allow BC Hydro to recover costs, maintain infrastructure, and earn a fixed rate of return on investment. While payments to provincial and local governments in BC in the form of dividends, water rentals, school taxes, grants in lieu, and other items have fluctuated considerably in recent years, they have still made a significant contribution to government revenues (between \$500 million and \$800 million per year over the last five years).⁶⁹

Two important trends have occurred over the last decade. First, the role of private energy generators and marketers has increased significantly as the electricity system has moved towards a deregulated, market based system. The volume of privately supplied power has increased by 77 per cent in the last 10 years.⁷⁰ BC Hydro now acquires more than 10 per cent of its energy through purchases from independent

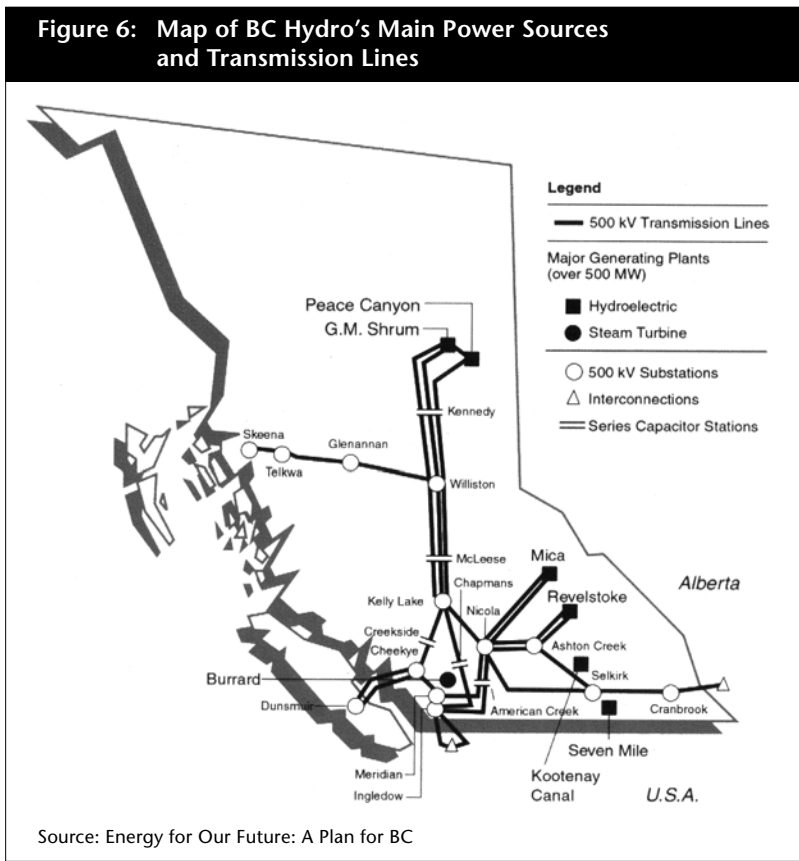


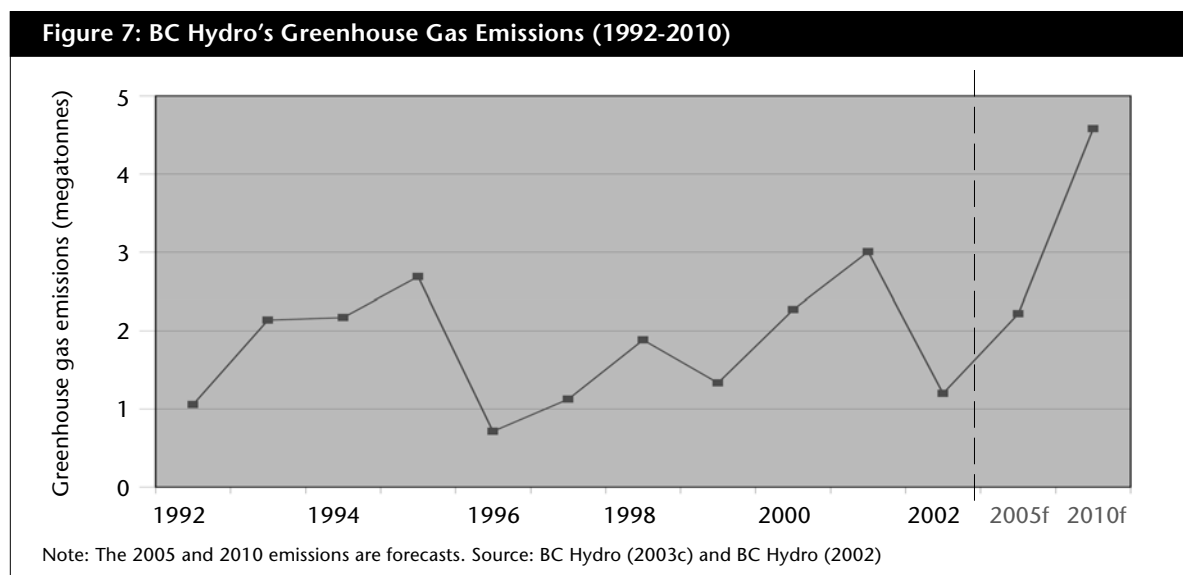
Table 3: Residential and Industrial Electricity Rates in Selected North American Cities (2002)		
	Residential (cents/kWh)	Industrial (cents/kWh)
Canada		
Winnipeg	5.89	3.23
Montreal	6.03	4.06
Vancouver	6.12	4.06
Halifax	9.40	5.57
Toronto	9.65	7.08
Edmonton	11.18	6.99
United States		
Portland	10.20	6.13
Chicago	12.20	9.23
Houston	13.02	10.90
New York	19.39	6.12
San Francisco	28.68	15.68

Source: Hydro Quebec

power producers.⁷¹ This total is expected to grow over the next five years, because the BC energy plan limits new generation to IPPs. Recent decisions by the BCUC have reinforced this shift towards private sector participation in BC's electricity system.

The second trend is towards more fossil fuel-based power, mostly using natural gas. For example, though Burrard Thermal (a conventional natural gas-fired generating station) was intended as a back up station, it now produces 7.5 per cent of BC Hydro's generation. A caucus of BC MLAs has recently deliberated on the future of Burrard Thermal – decommissioning the plant or retooling it as a more efficient combined-cycle gas turbine plant are two options – but no decisions have been made. The province has also allowed a pilot project for the Norske Elk Falls pulp mill near Campbell River to burn coal in its power boiler. (Norske backed away from doing the same at its Crofton mill due to community opposition.)

The end result is that BC Hydro's greenhouse gas emissions for 1998-2002 were 38 per cent higher than they were in 1989-1993, and are expected to increase a further 237 per cent by 2010 (Figure 7).⁷²



The BC Energy Plan: The Wrong Direction for BC's Electricity Sector

The BC energy plan's main themes with respect to electricity policy include:

- Increased privatization and deregulation of BC's electricity sector;
- An ill-advised restructuring of BC Hydro;
- A movement towards greater electricity exports rather than securing provincial electricity security; and
- Allowing coal-fired power.

Increased Privatization of BC Hydro

The BC government, in various places in its BC energy plan, attempts to reassure British Columbians that BC Hydro is to remain in public hands. "Public ownership of BC Hydro" is one of the plan's stated principles, and Policy 3 reiterates this claim.

However, significant privatization initiatives outlined in the plan have eroded the public control and oversight of BC Hydro. This coincides with another major theme of the BC energy plan: "more private sector opportunities." This is clearly a reference to our mostly public electricity sector and not our already private oil and gas industries. Overall, the *effect* of the plan contradicts the promise that BC Hydro is to remain public.

Privatizing BC Hydro Administration

The most obvious way that privatization has been undertaken is through the privatization of administrative services (Policy 4). As of April 2003, Accenture Business Services of British Columbia became responsible for many office functions of the utility, including billing, human resources, and finance. One-third of BC Hydro's labour force has been affected – their employment has shifted from BC Hydro to Accenture. The stated intent of the 10-year, \$1.28 billion contract is to make these functions more flexible and cost-effective. BC Hydro calls this outsourcing rather than privatization and claims that the customers remain those of BC Hydro, not Accenture.

A search for cost savings is desirable, even mandatory, for an entity that serves the public interest. However, to date there has not been a clear business case laid out for this change, or a plan for how to encourage public oversight. Financial data and comparisons have been blacked out in documents provided by BC Hydro.⁷³

There are several concerns with privatizing administrative services:

- Cost savings may be illusory;
- Any cost savings will likely be accomplished through job losses in BC or reduced services;
- No matter how badly Accenture performs, it will be very difficult to bring those operations back into BC Hydro's structure; and
- Significant transparency and accountability are lost.

First, according to BC Hydro's revenue requirement application (information provided to the BC Utilities Commission to justify rate increases), the \$1.28 billion expenditure on Accenture has a net present value of \$110.4 million, representing less than 1 per cent return on investment over the 10-year contract.⁷⁴ Thirty-six per cent, or \$40 million, of that value is accrued in the last year of the contract.⁷⁵ Such a small, end-loaded return puts the merits of the deal into question, especially given the significant disadvantages and risks involved.

Second, these types of contracts involve clear trade-offs. Cost savings can only be accomplished through a reduced workforce or reduced services. Is the loss of good-paying BC jobs worth the small, short-term financial advantage?

Third, there is also considerable concern about Accenture's performance in other jurisdictions.⁷⁶ But even if the Bermuda-based company does not perform well, or if cost savings do not materialize, it will be difficult for BC Hydro to reintegrate those services within its corporate structure. Ten years will have passed and much of BC Hydro's expertise in these administrative areas will be gone.

Finally, and possibly the worst aspect of this deal, is that it will be very difficult, if not impossible, to ever determine whether the deal was a good one. Confidentiality clauses in the Accenture contract override the public's right to scrutinize the deal and fully determine its merits and drawbacks. Freedom of Information rights, applicable to a Crown corporation like BC Hydro, apparently do not apply here. This loss of accountability and transparency is worrisome.

Increasing Privatization of Electricity Generation

Over time, privatization of the electricity sector will increase. According to the energy plan, BC Hydro will be limited to improving existing generating facilities, rather than investing in new supply (Policy 13). All new generating facilities are to be left exclusively to the private sector. There are several problems with this.

First, it makes no sense to limit a public utility from continuing to contribute to new electricity supply. BC Hydro has been responsible for electricity generation since 1962, experience that would clearly be useful in developing new generation projects. As a Crown corporation, it also holds certain advantages over private producers. Its credit rating is better, thus allowing it to seek outside financing at favourable

Significant privatization initiatives outlined in the plan have eroded the public control and oversight of BC Hydro. Overall, the effect of the plan contradicts the promise that BC Hydro is to remain public.

rates. Also, it is not required to generate profits, but when it does, the people of British Columbia benefit rather than corporate shareholders.

Second, the system will become increasingly private as BC Hydro's role diminishes and independent power providers become more involved in new generation.⁷⁷ This may compromise security of supply, since independent power producers are not required to ensure electricity supply and may not fully cover supply shortfalls unless rates increase substantially.

Excluding BC Hydro from new generation appears to be simply a way for the BC government to increase private sector opportunities – while increasing costs to BC customers – since in most cases BC Hydro can deliver power at cheaper rates. In 2003, BC Hydro spent more on purchased power from IPPs (making up 10 per cent of supply) than it did on the 90 per cent it generated itself.⁷⁸ In its application to increase electricity rates, BC Hydro states that the first “driver” of higher costs is the increased cost of energy.⁷⁹

Increasing private supply will also decrease accountability and transparency, in direct contradiction to the objectives of the BC energy plan. Like the Accenture deal, contracts with other private entities (those providing power) are often classified as “commercial information” and shrouded in secrecy.⁸⁰ As BC Hydro increases its supply from IPPs, more and more of its operations will be unavailable for public scrutiny.

Opening Up the System: Electricity Generation and Use

There are several advantages to a jurisdiction having its electricity needs met by a public utility, such as BC Hydro, whose mandate is to deliver a secure electricity supply at the best price. They include:

- A greater ability to undertake long-term, integrated electricity planning;
- Better energy security;
- Cost-based pricing that is buffered from sometimes volatile energy markets;
- An ability to engage in demand-side management of electricity; and
- Increased accountability and transparency available since Crown corporations are subject to greater public examination, as well as scrutiny under Freedom of Information legislation.

A public utility that is primarily responsible for providing a reliable electricity supply to customers can take a long-term and integrated view of its operations. Unencumbered by a profit motive, a public utility can objectively estimate electricity demand for many years into the future, investigate all supply and conservation options (including managing demand – see below), and determine what supply and demand-management options to undertake, based on a combination of reliability and cost. Self-sufficiency – relying as little as possible on purchasing electricity from outside the utility or outside the jurisdiction – leads to greater security.

In California and elsewhere, we witnessed the risks of distorting these objectives by relying on private companies that must also generate profits. Creating an artificial supply crunch in 2001, California electric companies and energy trading companies like Enron were able to drive up the spot price for electricity and generate substantial revenues. Clearly, the goal of providing reliable electricity supply is sometimes at odds with private interests.

A public utility can also charge its customers based on the cost of generating electricity and not on artificial and unpredictable signals from the market. BC Hydro is not entirely insulated from market forces since the cost of some natural gas-fired power depends on the market price for natural gas. But a more self-reliant public utility, especially one relying on renewable energy that has no fuel cost component, can have cost and price structures that are much more stable.

Large public utilities, especially Crown corporations such as BC Hydro, have other cost advantages over a deregulated sector dominated by private interests. A Crown corporation has a much better credit rating compared to even very large corporations, since it has the backing of provincial financing. Therefore, the costs of borrowing to spend on infrastructure projects are much lower. As mentioned earlier, private electricity companies must also generate significant rates of return to satisfy investors, revenue that gets built into prices charged to customers.

Finally, a public utility has a greater incentive to engage in demand-side management. Because its prime focus is providing electricity to customers, it can investigate what would be most cost-effective and reliable: providing more supply or managing/decreasing demand. Many demand-side management (DSM) programs are more cost-effective than generating new supply. Private companies, however, have no direct incentive to decrease demand. Their mandate is to sell more power, not less. Without this incentive, private companies must be provided with artificial incentives for decreasing demand. The added bonus in DSM is decreasing the substantial environmental impact of generating and using electricity.

However, the BC energy plan undermines all these advantages held by a vertically integrated public utility, advantages that BC Hydro has had for the better part of half a century. To facilitate more private sector involvement, an ill-advised restructuring of BC Hydro is being undertaken. The restructuring involves breaking up BC Hydro into generation, transmission, and distribution companies (Policy 8).

The new BC Transmission Corporation will be mandated to allow all suppliers and buyers “non-discriminatory access” to transmission capacity (Policy 15). Non-discriminatory access means that all electricity providers can sell electricity to wholesale markets, including those outside the province. IPPs are now signing long-term contracts with BC Hydro to provide very expensive power. If BC Hydro does not want to pay a high enough price, IPPs can sell their power elsewhere. In other words, British Columbians are now bidding against the Pacific Northwest consumers through long-term contracts and wholesale regional markets for access to power generated within the province. The result will be less electricity security and higher prices.

The other side of the equation is that a large electricity consumer can choose any supplier it wants (Policy 14). Commercial and industrial consumers can now choose to buy from their local utility (BC Hydro in most cases) or from IPPs, or generate their own electricity.

The province’s goal is clearly to allow large consumers to bypass BC Hydro and buy power from IPPs. As no safeguards have been proposed, large electricity consumers could rely on dirty power such as coal-fired generation, increasing local air pollution concerns and contributing greatly to climate change.

Put within this context, the impact of the break-up of BC Hydro is clearer. First, allow only IPPs to provide new power. Then, allow electricity generators to sell outside the province. This facilitates and increases trade (see below), especially trade between IPPs and foreign electricity consumers. The worst-case scenario would be an increasing amount of coal-fired power being generated in BC and exported to the US. This would do nothing to provide energy security for the province, but would generate significant amounts of air pollution. With coal being the most greenhouse gas-intensive power source, our Kyoto obligations move even further out of reach.

There are other cost issues involved in the deregulation/restructuring of BC’s electricity sector. Some efficiency is compromised when breaking up an integrated company into various components. An integrated company can coordinate generation, transmission, and distribution in a way that decreases the transaction costs of having three separate entities, with generation coming from a variety of sources. This may very well result in a less efficient system with higher prices for both residential and industrial customers.⁸¹

In fact, just the additional costs of creating and operating the BC Transmission Corporation are substantial. Information provided by BC Hydro shows that it cost \$17.5 million to establish the separate transmission company, with additional operational costs of \$17.8 million per year.⁸² That does not include other potential costs, for example the cost of providing new market services to IPPs or building new transmission infrastructure for IPP use.⁸³

A public utility has a greater incentive to engage in demand-side management. Because its prime focus is providing electricity to customers, it can investigate what would be most cost-effective and reliable: providing more supply or managing/decreasing demand.

Exporting Electricity: the Opposite of Energy Security

The BC energy plan has a clear focus on exporting more and more energy to the US and elsewhere. In fact, the plan is sometimes quite explicit about its intention to increase energy trade, especially exports. The stated goal of Policy 2 is to “maintain and increase” electricity trade with the United States.

BC Hydro has been able to generate significant revenue for the province by trading power in recent years. One of the reasons this is so lucrative is that large hydroelectric dams can store electricity in the form of water behind the dam. Historically, BC Hydro has always engaged in some energy trade at the border, in part because peak demand varies between BC and other jurisdictions, making trade mutually advantageous. BC Hydro has also been able to purchase energy when prices outside BC are low, store it in its reservoirs, and then sell it back when prices are high. BC Hydro has sold surplus power to the US in high precipitation years, or in the summer when local demand is lower.

Another recent development has been for PowerEx (which started as BC Hydro’s trading arm and is now a separate subsidiary) to engage in energy trading across the US, taking advantage of BC Hydro’s storage capacity. To do this, PowerEx required approval from the US’s Federal Energy Regulatory Commission (FERC). In the past few years, PowerEx has gone beyond the strategic use of BC’s hydro system to trade power. It now engages in power trading of all kinds, including speculative trading of electricity that lies completely outside BC’s electricity system. These activities are not tied in any way to securing reliable electricity for the province. (One of PowerEx’s more controversial actions was signing a three-year agreement to purchase electricity from a 116 MW coal-fired power plant in Montana, with the power to be sold in the US marketplace.⁸⁴)

Maintaining strategic exports would be fine, but increasing them is not. It implicitly places the priority on foreign sales rather than security of supply for British Columbians.

Unfortunately, the attraction of obtaining revenue from trading energy in the US market has also led to the (mistaken) view that BC must follow the FERC restructuring model within the province, even though NAFTA does not require reciprocity. In other words, the restructuring of BC Hydro is not required for BC Hydro to provide electricity to British Columbians or to engage in strategic electricity trading with the US. Manitoba, for example, has exported power to the US without the need for a new corporate structure that involves costs and risks.

The energy plan clearly envisions BC becoming more fully integrated into the western North American electricity grid, which will have two effects: BC will become an electricity supplier to surrounding jurisdictions, compromising the province’s energy security; and BC Hydro (as the newly formed BC Transmission Corporation) risks losing sovereignty over its own transmission grid.

Policy 15, giving private generation companies full access to the grid, makes it clear that power exports will increase. The stated goal laid out in the energy plan, however, of increasing exports is problematic. Maintaining strategic exports would be fine, but increasing them is not. It implicitly places the priority on foreign sales rather than security of supply for British Columbians. Independent power producers clearly want to trade more power and are looking for access to BC Hydro’s storage system so they can undertake strategic trading the same way BC Hydro has.

On the transmission side, not only has the province created a separate transmission company, BCTC, it has supported a process designed to integrate BC’s electricity grid with its counterparts in the US Pacific Northwest (as well as Alberta). This initiative has been encouraged by US energy companies and supported by FERC, which has attempted to set up similar regional arrangements across the US. FERC’s priorities (increased trade and alleviating congestion on the grid) confirm the move. In the end, BC’s participation on the grid will increasingly be towards becoming a supplier to the Pacific Northwest, possibly leading to supply problems and, more likely, driving up BC electricity rates.

The goal is to have a seamless energy market overseen by a new organization, Grid West (formerly RTO West), and based on the FERC restructuring model. It is intended to coordinate transmission planning and new investment for its member utilities, including BCTC (Policy 7).

The changes may also affect BCTC's (and BC's) sovereignty over its electricity resources. Grid West will have the "final decision-making authority" over transmission prices, system maintenance, and plans for system expansion.⁸⁵ Thus, it may mandate BCTC to invest in new grid capacity and grid interconnections for electricity flowing into Alberta or the US. While the final structure and mandate is still under discussion, BCTC's role would appear to be limited to, at best, one seat on a Board of Governors controlled by US utilities and, at worst, participation on a committee that serves only an advisory role.⁸⁶ Loss of control over the future development of BC's electricity grid will have enormous consequences for future energy policy in the province, particularly if the primary focus of new investments is to facilitate the export of power and the expansion of private generation interests within BC.

The Heritage Contract (Policy 1, implemented in 2004), the stated intent of which is to "preserve the benefits of BC Hydro's existing generation," is misleading and problematic. The policy is not required for BC Hydro to provide affordable electricity to the province's citizens. It has been doing this for over 40 years. The Heritage Contract appears to be merely a way to assuage the concerns of industrial electricity users that rates will not skyrocket, at least over the short term. In the end, though, this policy really guarantees nothing, since any government can simply reverse it through legislation of its own.

Coal-fired Power

The BC government approved the introduction of coal-fired power plants for the province (Policy 26), and then quietly passed emission guidelines in January 2003.⁸⁷ Allowing coal-fired generation is environmentally regressive. Burning it creates a suite of hazardous chemicals, including:

- Sulphur dioxide (SO₂) and nitrogen oxides (NO_x), which contribute to acid rain and smog;
- Mercury, a neurotoxin;
- Small particulates that are toxic and end up deep in our lungs; and
- Carbon dioxide, the major contributor to climate change.

Coal is much dirtier than any other electricity source. Coal power contributes 57 per cent of the US's electricity generation, but is responsible for 90 per cent of the sector's air emissions.⁸⁸ Similarly, coal power is a disproportionately large source of air pollutants in Ontario compared to its relative contribution to the electricity sector or the economy as a whole.⁸⁹

"Clean coal" is a term invented by the industry to give itself a makeover. It involves more efficient burning compared to conventional coal-fired power, but there are still significant concerns over air emissions. SO₂ and NO_x emissions are still higher than most other power sources. Coal-fired power is also one of the primary sources of mercury emissions in Canada.⁹⁰ Mercury is considered "toxic" under the Canadian *Environmental Protection Act* and is hazardous to human health at very low concentrations.⁹¹ Mercury also bioaccumulates, meaning it gets concentrated up the food chain and threatens human health through fish consumption.

Even "clean" coal contributes more greenhouse gas emissions than any other power source.⁹² Advocates of "clean" coal, the BC government included, usually tie coal-fired power to the capture and underground storage of carbon dioxide because the emissions of this climate-altering gas are so high. However, capturing carbon dioxide and storing it underground is still a completely unproven option.⁹³ It is not possible now, and may never be.

Not All Bad News

The BC energy plan does have some policies that would help to fulfill its stated goals, namely the goal of providing a secure energy supply for BC while maintaining environmental protection. The most progressive is the proposal to update and expand the *Energy Efficiency Act* (Policy 22). The 1991 act covers the efficiency of refrigerators, water heaters, heat pumps, woodstoves, electric motors, and street lighting, and the stated intent is to expand the Act to include building lighting, natural gas fireplaces, and water-use equipment.

Improved efficiency should be the first priority of governments and electric utilities. Not only should the *Energy Efficiency Act* be expanded to include more appliances and equipment, but the performance levels of every item should also be reviewed to ensure they reflect the performance of the best available technology. This review should be conducted on a regular basis.

There are many advantages to this kind of legislation. First, it helps consumers save money. The increased cost of more innovative, energy-efficient appliances is often quite small and recuperated within a fraction of the product's life. After the often-short payback period, consumers have more money in their pockets.

Energy efficiency standards also hold economic advantages. For example, the efficiency of the economy as a whole is improved. Standards encourage manufacturers to innovate, since they are continuously being updated to reflect the most efficient and reliable technology. People also spend energy savings elsewhere in the economy, increasing economic activity and creating jobs. In fact, investments in energy efficiency create five times more jobs than the same investment in new conventional energy supply.⁹⁴ Smart regulations such as these cost the government very little.

The commitment of the BC government to this policy, however, can be questioned since it has not yet been implemented, and there is no intention to back it up with government incentives. This is in sharp contrast to many of the regressive policies already discussed that have been quickly implemented, often with significant government dollars.

Other initiatives in the plan would be welcome, except they are entirely voluntary. One involves the provincial government working with the building industry, other levels of government, and various

stakeholders to improve energy efficiency in new and existing buildings (Policy 22). There are two issues involved here: policies for new buildings and policies for existing buildings. The BC government can address new buildings by setting a more ambitious building code that reflects existing technology. New buildings could be designed to be considerably more energy efficient. The advantages are the same as those for mandating improved energy efficiency of appliances: a more efficient and innovative economy, savings for energy users, and more jobs.

However, the BC energy plan's stated way to deliver better efficiency in new buildings is by providing "tools and information." This voluntary approach has not worked federally (through Natural Resources Canada) and it will not work here. Mandatory building codes are the best tools to deliver results.

Improving the efficiency of existing buildings is also important since, even with a strong code for new buildings, the turnover rate to a more efficient building stock is very long. Here, the goal should be to supplement the effort of the Greater Vancouver Regional District and Natural Resources Canada, which are establishing a revolving fund to retrofit

commercial and institutional buildings.

Another voluntary policy is for 50 per cent of the *new* electricity supply to come from "BC Clean Electricity" over the next 10 years (Policy 20). This policy will apply equally to the distribution businesses of BC Hydro, Aquilla Networks Canada (recently taken over by Fortis Inc.), and other investor-owned utilities.

Setting a target for "clean electricity" supply is akin to a renewable portfolio standard (RPS), except with important differences that make BC's stated policy much less effective in implementing renewable technologies as part of the electricity mix. The energy plan's policy is weaker because it is voluntary, "clean electricity" includes dirty power sources, and, in any case, the 50 per cent target is much too low (this last point is discussed below under *A Renewable Portfolio Standard*).

Either the goal of generating clean power is important and the government is committed to it (in which case the target should be mandatory), or the goal is not important, or the government is not committed to it. This begs the question: Why is the government proposing it other than for public perception?

Either the goal of generating clean power is important and the government is committed to it (in which case the target should be mandatory), or the goal is not important, or the government is not committed to it. This begs the question: Why is the government proposing it other than for public perception?

Another problem with this policy is the non-renewable electricity sources included in “clean electricity.” This target should apply only to truly renewable electricity sources. Therefore, burning municipal solid waste should be abandoned entirely. There is nothing renewable or clean about waste-to-energy initiatives. The practice, at the very least, discourages municipalities from dealing more effectively with their waste, for example through waste reduction, recycling and composting programs. At worst, it can give municipalities a perverse incentive to increase the amount of solid waste generated by its citizens and businesses.

Including co-generation as renewable electricity also raises concerns, depending on the source of fuel. Existing projects in BC, such as generating electricity by burning natural gas and/or coal in pulp mill power boilers, are clearly not renewable. Any electricity co-generation project that increases fossil fuel use should be excluded as part of this target. Some co-generation projects are renewable, including those that use a renewable source of biomass (organic material). This includes agricultural waste from sustainable farms or wood waste from forestry operations using ecosystem-based management.

A Different Direction for BC Electricity Policy: Protecting the Advantages of Public Ownership While Developing Cleaner Power

The BC energy plan proposes radical changes to BC’s electricity sector, changes that will undermine a system that, for all intents and purposes, has served British Columbians well. Reforms of a different kind are needed to harness efficiency improvements and ensure expanded use of clean energy technologies.

BC Hydro: An Integrated Public Utility

A transparent, accountable, and efficient BC Hydro would involve a different direction than the one set out in the BC government’s plan. First, the break-up of BC Hydro should be reversed. This would enable BC Hydro to undertake an integrated electricity plan for British Columbia that puts the emphasis on provincial electricity security, cost-based pricing, and conservation and efficiency initiatives (see below for more on the latter two points), rather than increased privatization and electricity exports. Increased efficiency, transparency, and accountability would also result.

BC Hydro must be allowed to invest in new generation to supply the province’s projected energy needs. The government’s current policy, which entails major subsidies to IPPs, must end. The expansion of the private sector has been a major factor in undermining BC Hydro’s capacity to guarantee cost-based, reliable power to BC residents. The future role of IPPs in the system must also be reviewed. Private power generators should be able to contribute to electricity generation, but only if they are cost-competitive and can provide the kind of power BC Hydro desires, e.g. low-impact renewable electricity (discussed below under *A Renewable Portfolio Standard*).

BC Hydro can ensure this by estimating its own marginal cost of renewable power supply and agreeing to buy renewable power that IPPs can generate for that cost or less. This would give IPPs the access they have been requesting, but without BC Hydro paying an undue premium for new power. To address transparency issues, BC Hydro should be required to make any signed agreements with IPPs available to the public.

As for the plan to have BCTC join Grid West – this amounts to the willful erosion of the province’s sovereignty over its electricity sector. BC Hydro should therefore withdraw from participation in Grid West’s formation. This will not jeopardize the province’s ability to export electricity in a way that serves the best interest of British Columbians.

Demand Side Management of Electricity

It is not by accident that demand-side management (DSM) is being addressed here before other considerations such as supply, pricing, or technology. When it comes to considering either the security of electricity supply or improvements in environmental performance and achieving sustainability, the first priority

must be to improve the energy efficiency of all sectors of the economy. The less electricity required to develop a diverse industrial base, to conduct commercial activity, and to heat and light our homes and run our appliances, the better. Nobody would advocate that we stop doing these things in order to save electricity. But we can improve the efficiency with which we undertake all of these essential activities. Energy experts have concluded that, by tapping into efficiency improvements, Canadian demand for grid electricity could be decreased by over 20 per cent within a decade.⁹⁵ Under this scenario, BC would increase its electricity surplus.⁹⁶

Improving the Energy Efficiency of Buildings and Appliances

In most cases, technologies exist to improve energy efficiency. We can construct buildings – commercial and residential – that require 60 per cent less energy by using better insulation and by relying more on passive sunlight rather than electricity for lighting and heating.⁹⁷ Research, development, and implementation of green building design have been going on for decades in other jurisdictions. The province should do more than just work with the building industry and other levels of government: it should legislate the use of a more stringent building code that relies upon these innovative designs – for example the C-2000 and R-2000 codes for commercial and residential buildings respectively. Otherwise, only developers specifically interested in sustainability issues will adopt designs that save the owners money but cost more initially.

Second, the turnover rate of any jurisdiction's building stock is so slow, it is important that the government also invest in retrofitting existing buildings. Existing buildings can be made 40 per cent more energy efficient using current technology.⁹⁸ A successful retrofit model is Toronto's Better Buildings Partnership. The initiative used a very modest investment of government dollars to improve the energy efficiency of 150 commercial buildings, reducing their operating costs by \$6 million and creating about 3,000 construction jobs.⁹⁹

Ensuring success in a retrofit program requires substantial oversight, however. Energy audits performed by certified experts should be completed before and after efficiency upgrades to guarantee that the work is of high quality and will lead to energy and cost savings. This can be undertaken under Natural Resources Canada's existing EnerGuide for Houses program.

It is heartening to see that a retrofit pilot project is being undertaken in Greater Vancouver in partnership with Natural Resources Canada. Given the successful implementation of a revolving fund elsewhere, though, the BC government should move more aggressively from the pilot project stage to a more far-reaching program.

The move towards greater energy efficiency can also be undertaken with respect to furnaces, water heaters, and other household appliances. For example, high efficiency furnaces can convert up to 97 per cent of a fuel's energy into space heat, but furnaces with efficiencies of 78 to 80 per cent are still on the market.¹⁰⁰ The efficiency of clothes washers, dishwashers, and hot water heaters can be improved by 100 per cent, 66 per cent, and 50 per cent respectively.¹⁰¹

What is required from the BC government is legislation that sets a floor for energy efficiency in these consumer products, and ratchets up that efficiency as technology improves. But simple reliance upon voluntary initiatives and education/information has shown dismal results elsewhere. The BC government can truly harness efficiency gains by fulfilling its commitment in the energy plan to update the *Energy Efficiency Act*.

Heating and Cooling Buildings Without Electricity

There are other technologies that decrease electricity demand by fulfilling building requirements for heating and cooling without the use of electricity. Specifically, these technologies include ground source heat pumps and solar hot water heaters.

At just a few metres of depth, the earth stays at an even 5 to 10°C all year round. By circulating water through an underground circuit of pipes, heat is exchanged from the water to the earth in summer or from the earth to the water in winter. Thus, heat pumps can be used to help both heat and cool British Columbian complexes and offices. In fact, the US Environmental Protection Agency has promoted these

systems as the most energy-efficient, environmentally friendly, and cost-effective way to heat and cool buildings.¹⁰² Larger up-front costs are usually recuperated through energy savings in less than five years.¹⁰³

Already, this technology has been adopted in various places in BC. Richmond's Bob McMath Secondary School heats and cools its 14,000 square metres of space with an earth energy system. A large commercial and residential office complex on 4th Avenue in Vancouver also has a ground source heat pump, as does the Interior's Blue River Resort.

Solar hot water heaters are sometimes referred to as passive solar technology, since the sun's heat is not converted to electricity (as in a photovoltaic, or PV, cell), but instead used directly to heat water pumped through a circuit, usually located on a building's roof. Solar water heaters can provide 35-50 per cent of the hot water needs of a typical home.¹⁰⁴ A local company, Taylor Munro, installs solar hot water heaters, mostly on commercial and institutional buildings.

As electricity prices increase in BC, these technologies will become even more cost-competitive. In the meantime, the attractiveness of ground source heat pumps and solar hot water heaters in new and existing buildings can be improved through government policy. The BC government can and should help by allowing installation costs to be fully deducted from provincial personal income taxes, decreasing the up-front investment required.

BC Hydro and PowerSmart

Finally, BC Hydro should invest more heavily in PowerSmart, a program targeted at electricity consumers to help them conserve and become more energy efficient. BC Hydro's numbers show that PowerSmart can save power at a lower cost than any technology can supply new power.¹⁰⁵ Right now, BC Hydro's cost threshold for engaging in demand-side management (DSM) programs is 2.5 cents/kWh. Projects that are more expensive than this are rejected, even though this level is well below the cost of adding new electricity supply. (Engaging in DSM programs can be expected only if BC Hydro remains the single provider of electricity. Under the government's plan to have many electricity companies selling to many customers, the mandate of each electricity supplier is to sell more electricity, not less.)

Assuming that the energy plan can be reversed and BC Hydro remains a monopoly electricity provider, it can be more aggressive with its DSM program. The utility could more than double its energy savings from PowerSmart at a total cost – to BC Hydro and its customers – of 5 cents/kWh, cheaper than its projected costs of buying new power.¹⁰⁶ In fact, BC Hydro could save 11,200 GWh of power per year, an astounding 73 per cent of the gap between demand and supply projected for the year 2023.¹⁰⁷ (Admittedly, these are BC Hydro's own numbers, which have been called into question.¹⁰⁸)

Nonetheless, there are other good reasons to make this investment in addition to cost savings for BC Hydro. First, customers also experience cost savings, since their power bills go down. In fact, until 2000, PowerSmart investments of \$338 million led to customer bill savings of \$1.1 billion.¹⁰⁹ Future PowerSmart investments are projected to cost \$691 million, and save customers \$2.28 billion.¹¹⁰ One could argue that the role of a public utility is to make cost-effective investments such as these, especially when they result in a more than threefold return for its customers.

Second, electricity efficiency and conservation mean that electricity generation with all its environmental impacts can be avoided. Less wilderness fragmentation, lower greenhouse gas emissions, and better air quality will be the result.

Finally, spending on energy efficiency is a labour-intensive process. Investments in energy efficiency create five times more jobs than investing in new energy supply.¹¹¹

Demand-side management programs *do* need to undergo rigorous scrutiny to ensure they are effective. Like other initiatives, DSM programs can be poorly designed so that they give incentives for the wrong activities and do not lead to a decrease in electricity use.

BC Hydro should invest more heavily in PowerSmart, a program targeted at electricity consumers to help them conserve and become more energy efficient. BC Hydro's numbers show that PowerSmart can save power at a lower cost than any technology can supply new power.

This is particularly so with respect to initiatives that provide subsidies to major industrial customers. For example, BC Hydro (as part of its industrial PowerSmart program) has recently spent large sums of money on at least two dubious projects. Partnerships with Weyerhaeuser (\$18.5 million) and Canfor (\$50 million) allowed the forestry giants to generate their own power.¹¹² These projects will reduce electricity demand to be supplied by BC's grid, but they do nothing to decrease the amount of electricity consumed and generated in the province, and they should not be subsidized by BC Hydro. The government should therefore direct BC Hydro to establish an independent audit system to ensure the integrity of the program.

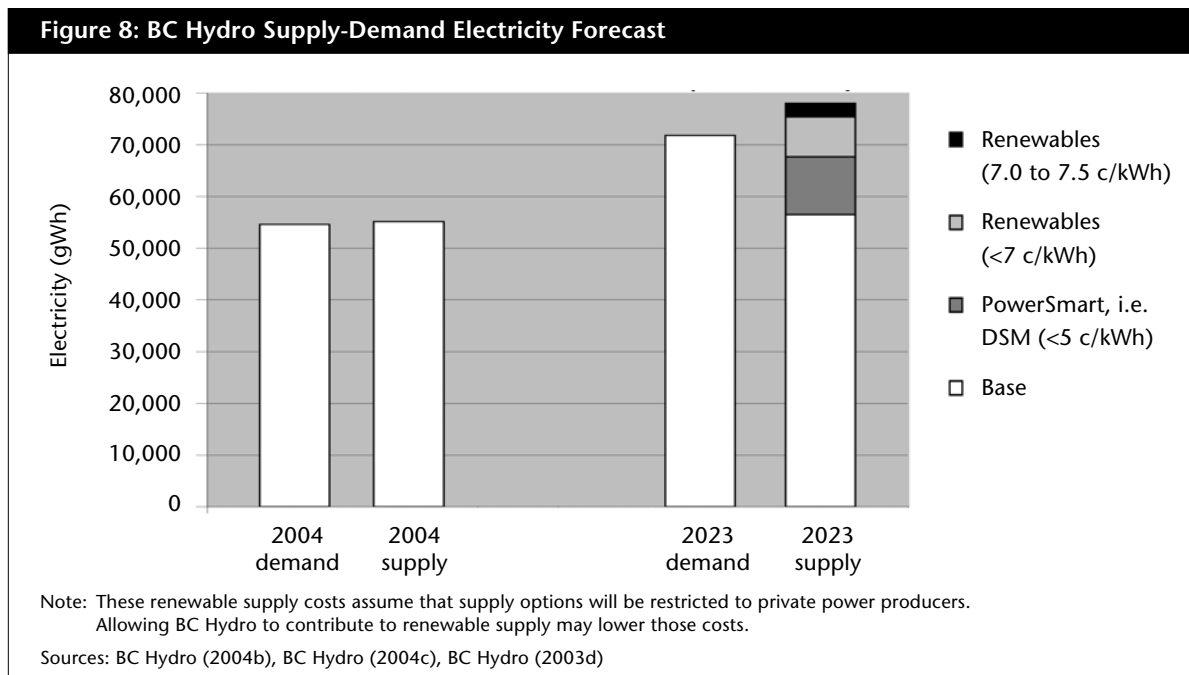
Experience elsewhere shows that well designed demand-side management programs can be very successful at curbing electricity use. DSM programs across 51 US states have been successful at reducing demand at a cost of only 1.9 US cents/kWh.¹¹³

A Renewable Portfolio Standard

A renewable portfolio standard (RPS) should be implemented for BC. An RPS involves legislating a target and timeline for implementing renewable power. Different jurisdictions (European countries, US states, and Australia) have decided on different RPS design options based on their particular circumstances.¹¹⁴ As discussed, the energy plan's RPS (see Policy 20) is poorly designed. The target should be mandatory rather than voluntary. And projects that qualify towards the target should be truly renewable, and not include coal and natural gas-fired power and waste-to-energy projects.

But another major problem is that the chosen target is much too modest. Setting the target too high can be problematic because it can be beyond what is possible within a reasonable cost increase.¹¹⁵ But this is not the case here.

BC Hydro estimates that 7,700 GWh could be supplied from renewable sources right now at a cost of 7 cents/kWh, admittedly above its projected cost threshold of 5.5 cents/kWh.¹¹⁶ This would include power from small hydro, biomass, geothermal and wind sources and increase the price of electricity by 4 per cent over 20 years. Combined with the DSM programs outlined above, this amount of renewable power could fully fill the gap between electricity supply and electricity demand forecasts beyond 2023 (Figure 8).¹¹⁷ Therefore, the province's RPS target for truly clean power – which excludes new large hydro dams – should be 100 per cent of all new generation. BC Hydro can fulfill the obligations of such an RPS by generating renewable power itself and using a feed-in law to allow IPPs to also contribute (feed-in laws are discussed below).



The cost of new renewable electricity supply would undoubtedly be lower over the short and long term, since costs are estimated from bids put forward by the private sector. If BC Hydro was allowed to develop new electricity supply – and it should be – it may be able to generate that power for cheaper, given its expertise and favourable borrowing rate.

Also, cost reductions have marked the evolution of renewable electricity technologies, and these are sure to continue in the future. For example, the cost of wind power is expected to decline by 33 per cent to 50 per cent in the next 10 years.¹¹⁸ Power from photovoltaic cells (admittedly fairly expensive now) will be 80 per cent cheaper over the same time frame.¹¹⁹

A coalition that includes many companies and utilities that generate power from conventional sources has estimated that Canada’s renewable potential is between 22 per cent and 71 per cent of present consumption.¹²⁰ This potential may be limited due to the grid’s stability and its ability to deal with intermittent power sources¹²¹ – as many renewables are – but this is much less a factor in BC’s situation, as discussed below.

There are many reasons to aggressively pursue the development of renewable energy in BC. First and foremost, the industry is a sustainable one. Because it depends on a renewable source of energy, it is not a sunset industry like thermal power from coal, oil, or natural gas. The opportunity exists to develop a homegrown industry where there are renewable resources, right here in this province. Delaying the implementation of renewable energy here means BC loses the opportunity to be a leader in the selling and exporting of green energy technology.¹²²

Renewable electricity production is not some science fiction fantasy. As shown by the BC Hydro example, some forms of renewable energy are very cost-competitive compared to conventional energy.¹²³ For others, the cost has been declining with technological innovation and economies of scale achieved through increased manufacturing.¹²⁴

Meanwhile, the cost of fossil fuel sources is increasing, as has the power derived from these fuels. In fact, the cost of most renewable sources of energy would already be below those of conventional sources if:

- Governments did not provide subsidies to conventional energy generation;
- The full costs of pollution were included in the cost calculation; and
- Renewable energy enjoyed the same economies of scale as conventional energy production.¹²⁵

To highlight the first point, the federal government alone gave \$40.4 billion in subsidies – on top of billions in loan write-offs – to the Canadian fossil fuel industry between 1970 and 1999.¹²⁶

Integrating renewable energy production would also provide supply and price security for BC. Supply security comes from diversifying our energy sources, especially since recent growth in electricity supply has been from burning non-renewable fossil fuels. Since the majority of the cost of renewable power is in manufacturing the infrastructure, the price of renewable power does not vary much compared to thermal power, whose costs fluctuate with commodity prices for its fuel sources.¹²⁷ A vivid demonstration is the wild swings in North American natural gas prices over the last five years, and the subsequent volatility in electricity prices in deregulated markets.

Renewable energy projects also have the advantage of being more quickly deployed and modular. Timeframes for project development are two to three years, compared to five to 10-year timelines for traditional power generation.¹²⁸ Their modular nature also makes many renewable projects more flexible. Installed capacity can start at a low to medium level, with capacity added as needed.

One shortcoming of renewable electricity production is its intermittent nature. When the wind does not blow, for example, wind turbines sit idle. However, BC’s broad base of hydroelectric power is best suited for adding renewable capacity.¹²⁹ Since hydro is the only form of electricity where long-term storage is feasible – in the form of water behind the dams – hydroelectric power can be used when renewable

If BC Hydro was allowed to develop new electricity supply – and it should be – it may be able to generate that power for cheaper, given its expertise and favourable borrowing rate.

sources are not generating power. Conversely, more water can be retained behind the dams when renewable sources are operating at or near capacity.

Finally, expanding renewable power production will create more jobs. On average, investing in renewable energy creates 60 per cent more jobs than investing in conventional energy production.¹³⁰ These jobs can be maximized for the province by developing a manufacturing base for these technologies right here in BC. Germany has created 35,000 permanent jobs by developing a homegrown wind power industry that manufactures turbines for both domestic and foreign buyers.¹³¹ The United Kingdom will have 20,000 people working in the wind industry by 2010.¹³² California’s RPS will create 119,000 person-years of employment over 15 years.¹³³

Canada has some domestic wind manufacturers – the Le Nordais wind farm in the Gaspé region, for example, uses Quebec technology – but all manufacture smaller wind turbines. Given the growth potential in wind production on BC’s coast, this province would be a perfect base for a manufacturer to produce large wind turbines or blades for the domestic and export markets.

Distributed Generation of Electricity

Most electricity systems in the world evolved in the same way, with power generation at a high scale – hundreds, even a thousand or more megawatts – and far from the location of electricity demand. Electricity grids transmit the power over long distances, and sub-stations transform the electricity into a form and scale that the average house or office can use.

BC is no different. The majority of BC’s electricity comes from just two river systems, the Peace and Columbia rivers, both a significant distance from large population centres where the majority of the province’s power is consumed.

Distributed generation, however, is an approach whereby electricity sources are of a smaller scale and closer to electricity demand.¹³⁵ Power is generated in a form that is already more usable. Reducing demand on transmission systems can improve reliability. And smaller, more local systems mean economic development opportunities happen at the community level (see Table 4).

There are environmental advantages as well. Smaller power sources and fewer transmission lines mean a smaller ecological footprint. Because power is generated close to where it is used, any waste heat from generators can be more easily captured for use, increasing total efficiency to 80-90 per cent.¹³⁶

Table 4: The Benefits of Distributed Generation

Benefit	Description
Modularity	Units can be more easily added or removed to match demand.
Short lead time	Small-scale power can be planned, sited, and built more quickly.
Fuel diversity and reduced price volatility	A more diverse, renewables-based mix of energy sources lessens exposure to fuel price fluctuations.
“Load growth insurance”	Some types of small power (cogeneration and end-use efficiency) can expand with growing loads.
Reliability and resilience	Small plants are unlikely to fail simultaneously and are easier to repair.
Avoided grid construction and losses	Power sources closer to demand can reduce grid losses and avoid or delay adding new grid capacity.
Local and community control	Distributed generation provides local choice and control and spur economic development.
Avoided emissions and environmental impact	Small-scale power has fewer emissions of air pollutants and can have a lower cumulative impact on land and water supply.
Source: Adapted from Dunn	

BC should gradually modify its electricity system to one that relies upon more distributed generation. This would facilitate the development of smaller renewable projects (in the 1 to 5 MW range) and micro projects that are smaller than 1 MW. The main policy that should be used to accomplish this is a “feed-in law” for renewable electricity, which guarantees electricity providers a certain price for renewable electricity they can supply. The price is guaranteed for a long period (15 or 20 years or more), but that price can be made to decline by a given amount (1 per cent or 2 per cent per year) to take into account expected technological improvements.¹³⁷

Since these projects use renewable power and are usually of a smaller scale, they are often more expensive than larger projects that have greater economies of scale and that can amortize administrative costs more easily.¹³⁸ Thus, the guaranteed price paid for this power will very likely have to be higher than the cost of BC Hydro’s base power. However, the price paid through the feed-in law should still have to be cost-competitive compared to BC Hydro’s cost of providing that power, so that the policy gives equal opportunity to both private and public power providers.

The three countries that have had the greatest market penetration of renewable electricity (Germany, Denmark, and Spain) have all had some form of renewable feed-in law. These international examples have shown that feed-in laws encourage participation from a variety of electricity providers, including co-operatives, farmers and other rural residents, and small businesses. Farmers can supplement their incomes by generating renewable power, such as wind, on their property.

The same mechanism, feed-in laws, can be used by renewable projects larger than 5 MW to contribute to electricity supply. Projects of this scale usually tap into the transmission grid, since the voltage of their electricity is higher. Projects of a smaller scale and lower voltage can feed-in at distribution sub-stations, taking some pressure off the transmission grid.

Though wind power is referenced more than other renewable options, there are smaller projects in the 1 to 5 MW range, including landfill gas capture and micro hydro, that could contribute to BC’s electricity

Distributed generation is an approach whereby electricity sources are of a smaller scale and closer to electricity demand. Smaller, more local systems mean economic development opportunities happen at the community level.

More Big Dams: Renewable, But Unacceptable

Renewable energy production includes electricity from wind, micro hydro, solar, biomass, geothermal, and tidal power and renewable energy sources like ground source heat pumps and solar hot water heaters. Though BC Hydro includes the Site C dam on the Peace River as one potential new source of electricity supply, big dams should not be included in a renewable portfolio standard for new generation capacity.

Large dams are technically renewable, but create significant environmental impacts. Consequently, a coalition of environmental, community, labour, and Aboriginal groups who work on energy and climate issues have come to a consensus position that no new large hydro dams should be built.¹³⁴

Large hydroelectric dams are not a sustainable form of electricity for at least three reasons. First, large dams result in massive changes to rivers, landscape and ecosystems (including fish, other aquatic organisms, and terrestrial animals flooded out of their habitat).

Second, large dams increase climate change. Flooding large expanses of land leads to decomposing organic material and significant methane emissions; methane is 21 times more potent as a greenhouse gas than carbon dioxide.

Finally, large hydro projects invariably have devastating effects on human communities, often Aboriginal. These impacts have never been fully taken into account or compensated in Canada.

When many of Canada’s hydroelectric projects were built, their impacts were either not well understood or ignored. Presently, there is little public appetite for more large dams.

supply while having little impact on air quality or the environment. Landfills contribute a considerable amount of Canada's methane emissions (25 per cent in 2001).¹³⁹ As discussed earlier, methane has 21 times the impact of the same emissions of carbon dioxide. Therefore, capping the landfill, collecting the methane, and burning it for electricity can reduce impacts on the climate.

Micro hydro projects – alternatively called run-of-the-river or small hydro – produce electricity from water flow but, unlike large hydro projects, do not store water behind a dam. One must be careful when assessing micro hydro projects because “*small hydro*” does not necessarily mean a smaller environmental impact. However, appropriate micro hydro projects can create moderate amounts of electricity while having little impact on fish and river ecosystems.

A feed-in law can also encourage very small projects (below 1 MW) to contribute renewable electricity. To facilitate these smaller projects, the David Suzuki Foundation has recommended in the past a policy called net metering – giving individual customers credit on their electricity bills for generating renewable electricity and putting it back into the grid when it exceeds their demand. To its credit, BC Hydro received approval from the BCUC in March 2004 for a net metering program. However, a feed-in law would give the same incentive and make a net metering policy unnecessary.

A Public Benefit Fund

Though electricity rates vary between classes of BC Hydro customers (industrial, commercial, and residential), customers within each class pay the same electricity rate no matter where they are in the province. This “postage stamp” rate is a fair and equitable way to charge electricity users. BC has benefited from a

relatively cheap hydroelectric power system that has provided the province with some of the lowest power rates in North America. However, the BC energy plan rightly foresees rate increases, since new supply will come from more expensive power sources.

Additionally, BC Hydro and other smaller utilities in BC should be required to create a “public benefit fund,” a new charge on electricity usage of 0.3 cents/kWh aimed at funding system improvements. Revenues for the fund would be strictly allocated to conservation, energy efficiency, renewable energy, and programs for low-income households (see below).¹⁴⁰ This would represent the best way to acknowledge and fund sustainability as an important factor in our electricity sector.

This approach would increase electricity rates only marginally (4 to 5 per cent). If BC Hydro fills the gap between supply and demand first with conservation and energy efficiency, many household electricity bills could actually fall because of lower demand. Whereas emissions from BC Hydro are currently projected to more than double between 2000 and 2010,¹⁴¹ this policy would fund conservation and clean power production, thereby avoiding increased emissions.

Reduced consumption will also result from modestly higher electricity rates, since higher rates send a price signal to electricity users. Over the course of one summer alone, the California government was able to reduce electricity usage by 7.5 per cent and peak demand by 10.4 per cent, in part by using innovative pricing mechanisms.¹⁴² Off-grid renewable energy technologies – such as ground source heat pumps and solar hot water heaters – will become more cost-competitive. Higher rates will reduce the payback period of energy efficiency investments for electricity users, such as increased insulation or energy-efficient appliances, making those choices more attractive.

The downside to increased power rates is that they have a regressive effect on electricity users, as increased energy costs have a disproportionately high impact on those with low incomes. Not only do low-income British Columbians have the smallest impact on our per capita energy use, but they also have little ability to improve energy efficiency through investment.

The downside to increased power rates is that they have a regressive effect on electricity users, as increased energy costs have a disproportionately high impact on those with low incomes. Low-income British Columbians have the smallest impact on our per capita energy use and little ability to improve energy efficiency through investment.

One way to mitigate this factor is through a low-income energy efficiency program (LIEEP). A good place to start would be BC's non-market housing stock, including social housing and co-op housing units. In Vancouver, these make up 8.5 per cent of the total housing stock.¹⁴³

The first step of an LIEEP is an EnerGuide for Houses audit. As explained above, this audit evaluates the energy efficiency of homes and makes suggestions to tenants on how to decrease energy use and save money. When required, other services could be provided, for example education, weatherization, or programmable thermostats. Research has shown that using money for an LIEEP has several advantages over providing energy rebates, a tactic used by the federal government in 1999 and 2000. The economic benefits to low-income British Columbians would be greater since energy savings last many years, emissions of greenhouse gases and other air pollutants are reduced, and between 700 and 1,300 person-years of employment could be created.¹⁴⁴

Abandoning the GSX and Coal-fired Power: Better Air Quality, Lower Greenhouse Gas Emissions

The BC Utilities Commission recently rejected a proposal for a gas pipeline crossing the Georgia Straight (GSX) to feed a gas-fired power plant at Duke Point near Nanaimo because it was seen as too costly. The idea may be revived again if BC Hydro's call for tenders on Vancouver Island does not produce enough power at a competitive cost.

However, there are reasons other than cost that make the GSX an ill-advised project. A study of the project found that investing in renewables (wood waste and small-medium hydro projects) and cogeneration would supply the same electricity needs at virtually the same price, while:

- Decreasing greenhouse gas emissions by 90 per cent;
- Decreasing NO_x emissions by 95 per cent;
- Creating more jobs across the province; and
- Decreasing the electricity cost risk.¹⁴⁵

Also, the high cost of a natural gas pipeline would have to be amortized over time by building several natural gas-fired power plants on Vancouver Island in addition to the one in Nanaimo. This would direct the island's power towards natural gas for decades, no matter its future environmental and economic costs.

The province should also abandon coal burning, either in newly built coal-fired power plants or in pulp mill power boilers. Several other provinces (Alberta, Saskatchewan, and Ontario for example) rely on coal-fired power as a significant source of electricity. However, Ontario, despite experiencing a widespread blackout in 2003, has committed itself to phasing out its coal-fired power plants because of human health concerns and other air quality considerations.

Burning coal, no matter what technology is used, is highly polluting. Still, the best reason for abandoning the burning of coal is that we do not need it. The province's electricity needs can be met through current supply, along with demand-side management of electricity, and an aggressive plan to expand renewable electricity generation. With renewables poised to be the technology of the 21st century, it is not smart or strategic to invest in 19th century power sources.

Conclusion

Since oil and natural gas will only become more valuable as global reserves decline, production should be slowed so that BC has some reserves left in the future. Rather than decrease royalties, they should be increased to the level other countries are requiring, so that the true value of oil and gas resources is reflected. Given that fossil fuels are finite resources, we must set aside some of the government revenue so that financial resources remain after the oil and gas is gone – money that can be used to diversify economies in the short term and transition them in the long run.

Since BC Hydro's own estimates show that BC could fulfill its long-term strategic electricity needs through conservation, energy efficiency, and renewable power, these should be developed rather than increasing natural gas and coal-fired power. Given that clean energy sources deliver greater economic, employment, and social returns than fossil fuel production, renewable energy sources should be developed to provide true economic advancement opportunities throughout the province.

Given that British Columbia should be engaged with the rest of the world in protecting the climate, an aggressive plan must be developed and implemented that decreases greenhouse gas emissions instead of setting us on the path of rapid emission increases.

This is not the direction outlined in *Energy for Our Future: A Plan for BC*. In fact, the policies within the plan, in most cases, are fundamentally at odds with the stated “big picture” goals. In part because of the policies laid out in the energy plan, BC has been getting an even smaller return – in terms of royalty revenue and jobs – for its oil and gas resources. Oil and gas royalties are decreasing and subsidies to the industry are on the rise.

Environmental regulation is also taking a back seat. Though the energy plan discusses a climate change strategy, BC's greenhouse gas emissions have increased – and will continue to do so – because of increased production of oil and natural gas. Dirty forms of electricity, such as coal-fired power plants, will have impacts on both the climate and BC's air quality. Other risky activities, like offshore oil and coalbed methane, are being promoted.

The plan also sets the stage for deregulation of BC's electricity sector, making it more difficult for British Columbians to undertake long-term planning in electricity, secure domestic supply, or engage in conservation and energy efficiency. The focus is clearly on electricity exports rather than energy security. An increased role for independent power producers also jeopardizes a system that has served BC very well.

British Columbians deserve better. We should be managing our important energy resources in a way that meets our social and economic needs while preserving the province's environmental quality and beauty that we all hold dear. BC should be committed to meeting its national commitments and international responsibilities outlined in the Kyoto Protocol.

The alternative direction laid out in this document intends to do just that by:

- Moving our energy industries away from sunset industries and towards clean, renewable sources of electricity and energy;
- Abandoning environmentally destructive energy projects such as offshore oil, coalbed methane, and coal-fired power;
- Removing subsidies to oil and gas production and ensuring that British Columbians are getting a fair price for our public resources;
- Ensuring the long-term economic stability of British Columbians, especially those living in resource-dependent communities that rely on non-renewable resources;
- Setting up a structure for BC Hydro that is truly open and accountable;
- Engaging more aggressively in demand-side management to provide energy security for the province; and
- Expanding economic development and job opportunities for BC through strategic management of the province's energy resources, both renewable and non-renewable.

All of these goals are possible.

Energy Policy Recommendations

Oil and Natural Gas

- Eliminate all subsidies to oil and gas production, including expenditures on road construction to access oil and gas exploration and development sites.
- Increase royalties on oil and gas production to levels found in Alaska or Norway.
- Establish a permanent oil and gas fund by earmarking a portion of oil, gas, and coal tax and royalty revenues to a fund that invests in economic development projects that diversify local and regional economies dependent on non-renewable resources.
- Direct the Oil and Gas Commission to include job creation as a determining factor when granting oil and gas development permits.
- Tie royalties on oil and gas development to BC employment such that any shortfall in income taxes when companies hire out-of-province workers is made up by increased royalties.
- Develop a cumulative impact assessment process to assess the full environmental impact of many energy projects that can be logically grouped together, with the mandate to turn down development activities that hold too high an environmental cost.
- Appoint a representative from the Ministry of Water, Land and Air Protection to the Oil and Gas Commission with a mandate to protect ecosystem integrity.
- Develop and implement a climate change action plan that allows BC to meet its Kyoto targets and undertake deep emission cuts beyond 2012.
- Respect the multi-stakeholder decisions made in the Muskwa-Kechika Management Area and other land use planning bodies.
- Respect the wishes of towns, regional districts, First Nations, community groups, and the Union of BC Municipalities by abandoning coalbed methane development.
- Maintain the moratorium on offshore oil exploration and development, as expressed by a majority of British Columbians who appeared before the federal offshore oil panel.

Electricity

- Reverse the breakup of BC Hydro into generation, transmission, and distribution companies by reestablishing it as an integrated public utility, with a mandate to provide British Columbians with a clean, reliable supply of electricity.
- Reverse the deregulation of the electricity sector, rescind the new rule precluding BC Hydro from building new power generation capacity, and do not allow independent power producers non-discriminatory access to the grid.
- Direct BC Hydro Transmission Corporation (and the newly reconstituted BC Hydro) to cease its discussions with Grid West to join the regional transmission operator.
- Legislate C-2000 and R-2000 building codes for residential and commercial buildings respectively.
- Use Toronto's Better Buildings Partnership as a model to establish a commercial building retrofit program.
- Update and expand the *Energy Efficiency Act* to mandate the sale of only the most energy-efficient appliances, furnaces, motors, and other electrical equipment.
- Fully deduct installation costs for ground-source heat pumps and solar hot water heaters from provincial income taxes for individuals and businesses.
- Direct BC Hydro to increase the cost threshold for investments in PowerSmart, and establish an independent audit system to ensure the integrity of the program.
- Establish a renewable portfolio standard for all new electricity production in BC that mandates that all new supply be from low-impact renewable power sources (i.e. not including large hydro dams).
- Mandate a feed-in law that guarantees access, at a set price, to BC Hydro's transmission or distribution grid to any renewable electricity supplier.
- Create a public benefit fund, by applying a 0.3-cents/kWh charge to all electricity sold in the province, with the revenue allocated to conservation, energy efficiency, renewable energy, and programs for low-income households.
- Establish a low-income energy efficiency program that undertakes audits of low-income homes (beginning with social housing and co-op units) and provides information and resources to decrease electricity consumption.
- Abandon the natural gas pipeline crossing the Georgia Strait.
- Ban electricity generation from coal, either in power plants or co-generation facilities.

BC Hydro

A More Detailed Description

BC Hydro has been a public utility since it was created in 1962. Though there are other public utilities in BC and private companies that generate power, BC Hydro remains by far the largest electricity supplier in the province. What follows is a more detailed description of the public utility's operations.

Electricity Generation

BC Hydro has 42 dams, 79 power-generating units at 31 hydroelectric facilities, and nine units at three thermal generation facilities. Approximately 87 per cent of the electricity generated by BC Hydro in the province is hydroelectric:

- The GM Shrum and Peace Canyon hydroelectric stations along the Peace River generate 29 per cent;
- The Mica and Revelstoke plants along the Columbia River generate 25 per cent;
- The Kootenay Canal and Seven Mile, also along the Columbia, generate 10 per cent; and
- The remaining 23 hydroelectric stations generate 14 per cent.

The Burrard Thermal Generating Station produces 7.5 per cent; and the remaining 10 per cent is produced through purchases and other transactions.

BC Hydro divides the province into the following five regions of service.¹⁴⁶

Coastal

In the coastal area, BC Hydro operates the Prince Rupert Gas Turbine and the Falls River Generating Station. The Prince Rupert facility is a 46 MW combustion turbine generating station, fired by natural gas and diesel back up, built to provide short-term energy transmissions if there are interruptions in the area. The Falls River station is near the mouth of the Skeena River. These two stations are connected to the electric system through transmission lines to Prince George and connections to the Alcan system. BC Hydro purchases surplus power from Alcan's Kemano project.

Columbia

There are 12 hydroelectric facilities along the Columbia River. In 1964, Canada and the United States signed the Columbia River Treaty to prevent periodic flooding and meet the demand for additional power. BC is entitled to half the power generated in the US that requires storage in Canada at any of the three dams built to accommodate American storage needs. Mica Dam, which forms the Kinbasket Reservoir, is the only one of the three to have a powerhouse. Revelstoke Dam and Generating Station, located 130 kilometres downstream from Mica, is not a part of the Columbia River Treaty but does benefit from additional storage in the Kinbasket Reservoir. Four small hydroelectric generating stations of between 5 and 12 MW are also located in the area.

West Kootenay Power also has four stations along the Kootenay River that operate as run-of-river generators: Corra Lin, Upper Bonnington, Lower Bonnington, and South Slokan.

Lower Mainland

The Bridge River complex is the third largest component of the BC Hydro system. It includes:

- The La Joie Dam and Generating Station near Bralorne (24 MW);
- The Terzaghi Dam on Bridge River;
- The Seton Generating Station near Lillooet (42 MW);
- The Wahleach Generating Station, west of Hope (60 MW);
- The Cheakamus Generating Station along the Squamish River (140 MW); and
- The Clowhom Generating Station at the north end of Salmon Inlet (33 MW).

The Stave River Generation Complex has three facilities with 163 MW of capacity. The two stations at Buntzen generate an additional 72.8 MW, as well as providing water for the Burrard Thermal Generating Station (950 MW).

Burrard, a conventional natural gas-fired generating station, is expected to assume a larger role in the system as demand increases and until new generating facilities are added. To date, it has mostly provided back up during low water years and transmission support and electrical supply security for the Lower Mainland, the region that consumes the majority of the province's electricity. Improvements and modernization have reduced its environmental impact, including reducing the emission of smog-forming pollutants by 90 per cent, eliminating chlorine from the cooling water, and reducing greenhouse gases.

Peace

There are two major generating stations in the Peace River Basin: GM Shrum and Peace Canyon. The 10 units at GM Shrum Generating Station, along with the W.A.C. Bennett Dam, produce 2,730 MW. The four units at the Peace Canyon Generating Station produce 700 MW, despite using the same amount of water as Shrum because the height of the dam is lower. There is also a thermal generating station using natural gas at Fort Nelson that is used during transmission outages (50 MW).

Vancouver Island

The Campbell River system includes three stations with 229 MW of capacity. The Jordan generating station (170 MW), located near Sooke on the southern end of the island on the Jordan River, can meet most of the needs of residential and commercial customers, although not industrial, if the island was ever disconnected from the mainland for a few days.¹⁴⁷ The Ash River powerhouse is located on the shore of Great Central Lake (27 MW). On the east coast near Courtenay, the Puntledge River project (24 MW) produces enough power for 15,600 homes.¹⁴⁸ The Keogh generating station, between Port Hardy and Port McNeil, while once capable of producing 90 MW, currently has one functioning generator producing 50 MW.¹⁴⁹ The Island Cogeneration plant near Port Alberni, owned by Calpine Canada, produces 240 MW.

Increased population and increased demand for electricity on Vancouver Island (expected to grow by 30 to 40 MW per year)¹⁵⁰ motivated BC Hydro to initiate plans to address future generation. Currently only 33 per cent of Vancouver Island's electricity is generated on the island; a series of underwater cables delivers the remainder from the mainland.

BC Hydro originally intended to decommission some of the aging cables between now and 2007, as it does not believe repair is an option. Cables also do not address additional generation or natural gas supply required for the Island Cogeneration Project (ICP) at Elk Falls near Campbell River. The ICP, built by Westcoast Energy, produces 245 MW of electricity for BC Hydro, in addition to generating steam for the Elk Falls pulp and paper mill. BC Hydro maintains that generating on the mainland and replacing the cables is also more expensive.

BC Hydro and Williams Gas Pipelines proposed to build a 136-kilometre natural gas pipeline from the Huntington/Sumas market hub on the Canadian/US border to Vancouver Island known as the Georgia Strait Crossing (GSX) pipeline project. Anticipated to cost \$340 million Canadian, the GSX would transport more than 100,000 GJ of natural gas per day for 30 years, beginning in October 2005.¹⁵¹ The gas would fuel electric generation at the Campbell River system and the proposed 265 MW natural gas fueled Vancouver Island generation project (VIGP), located in the Duke Point industrial area of Nanaimo. The

VIGP is a combined-cycle natural gas turbine plant, connected to the existing grid with an upgrade that also requires a short natural gas pipeline on the island.

In September 2003, the British Columbia Utilities Commission reviewed the VIGP and determined that the plan – budgeted at \$340 to \$370 million – was too expensive. It recommended that BC Hydro seek private partners to deliver cheaper electricity.

BC Hydro intends to proceed with a call for tenders as it is determined to have additional supply on the island before the winter of 2007/08. If the tender process does not identify a less costly alternative, BC Hydro could choose to go back to the BCUC with the VIGP. Without the facility at Duke Point, BC Hydro has not confirmed whether the GSX will proceed.¹⁵²

While some environmental groups are celebrating the BCUC's decision,¹⁵³ it also stated that the VIGP “would not seem to impede BC Hydro's ability to acquire 40 per cent of new supply from BC clean electricity over the next 10 years.”¹⁵⁴ An initial interpretation suggests that the BCUC is merely implementing the new energy plan by limiting BC Hydro's role and encouraging private sector development.

Transmission

BC Hydro's transmission system moves electricity from generating stations to distribution substations. It is transformed to lower voltages before it is distributed to customers. The system consists of 17,800 kilometres of transmission lines, with voltages between 60 kV and 500 kV, and accounts for approximately 20 to 25 per cent of the final cost of electricity.

The Kelly Lake Substation (Peace River System) and the Nicola Substation (Columbia River System) supply the Lower Mainland and Vancouver Island with electricity. The transmission system is also linked to Alberta and the United States. There is one 500 kV line from Cranbrook, BC to Calgary, AB, and two 138kV lines between Natal, BC and southern Alberta. There are four interconnections to the United States: two 500 kV lines from the Lower Mainland to Bellingham, Washington and two 230 kV lines that cross the border south of Trail, BC.

Distribution

BC Hydro serves 1.6 million customers, and an additional 6,000 customers in non-integrated areas within BC. After electricity is transported across the province in large quantities, it flows through distribution transformers to ensure it is at a safe and useable voltage. It then moves over 55,000 kilometres of distribution lines through meters to homes and businesses. Distribution includes retailing functions, such as procuring, pricing and selling, metering usage, and billings. The distribution system accounts for 25 to 30 per cent of the final cost of electricity.

Supply and Demand

BC Hydro's supply of hydropower is dependent on the amount of precipitation the province receives annually. Years of high precipitation lead to high volumes of water behind the dams, allowing BC Hydro to sell surplus electricity to other jurisdictions. In periods of low precipitation, BC Hydro purchases electricity from elsewhere.

BC Hydro expects demand to increase by 1.7 per cent a year for the next 10 years because of population growth and economic activity. It will be greatest in the Lower Mainland and Vancouver Island regions, which consume about 70 per cent of the province's electricity.

BC Hydro anticipates meeting a third of its future needs through conservation, including such initiatives as the PowerSmart program.¹⁵⁵

Pricing

BC Hydro electricity prices are among the lowest in North America. Pricing was set to allow BC Hydro to recover costs, maintain infrastructure, and earn a fixed rate of return on investment. The province receives 85 per cent of any surpluses. For the last 10 years, prices have been frozen.

Endnotes

- ¹ BC Ministry of Energy and Mines. 2004a. and Statistics Canada. 2004.
- ² Simpson.
- ³ BC Ministry of Energy and Mines. 2004a.
- ⁴ BC Hydro. 2003a. Cited in Calvert. p. 7.
- ⁵ Environment Canada. 2003. p. 190.
- ⁶ BC Ministry of Energy and Mines. 2003a.
- ⁷ Taylor et al. p. 17.
- ⁸ BC Ministry of Energy and Mines. 2002.
- ⁹ BC Ministry of Energy and Mines. 2004a.
- ¹⁰ Statistics Canada. 2002a.
- ¹¹ BC Ministry of Energy and Mines. 2003a.
- ¹² BC Ministry of Finance. 2003. p. 65.
- ¹³ Taylor et al. p. 17.
- ¹⁴ Statistics Canada. 2004.
- ¹⁵ Statistics Canada. 2002a.
- ¹⁶ BC Ministry of Energy and Mines. 2003a.
- ¹⁷ Statistics Canada. 2002a.
- ¹⁸ Ibid.
- ¹⁹ BC Ministry of Energy and Mines. 2003a.
- ²⁰ Ibid.
- ²¹ Ibid.
- ²² Ibid.
- ²³ Ibid.
- ²⁴ Ibid.
- ²⁵ Whitely.
- ²⁶ BC Ministry of Energy and Mines. 2003a.
- ²⁷ Energy Information Administration. 2004.
- ²⁸ BC Oil and Gas Commission. p. 17.
- ²⁹ BC Ministry of Energy and Mines. 2003b.
- ³⁰ BC Ministry of Energy and Mines. 2004b.
- ³¹ BC Ministry of Energy and Mines. 2003c.
- ³² BC Ministry of Energy and Mines. 2003d.
- ³³ BC Ministry of Energy and Mines. 2003e.
- ³⁴ G.E. Bridges & Associates Inc.
- ³⁵ Jaccard.
- ³⁶ Wilson. p. 13.
- ³⁷ West Coast Environmental Law. 2002a. pp. 24-25. See also West Coast Environmental Law. 2002b.
- ³⁸ BC Facts. 2003.
- ³⁹ Canadian Parks and Wilderness Society. 2003.
- ⁴⁰ Province of BC.
- ⁴¹ Taylor et al. p. 17.
- ⁴² Parkland Institute. p. 34.
- ⁴³ Taylor et al. p. 17.
- ⁴⁴ See, for example, BC Ministry of Energy and Mines. 2004c.
- ⁴⁵ Pretes.
- ⁴⁶ This policy was presented in Marshall. 2001a. pp. 32-33.
- ⁴⁷ Campbell et al. 1997. p. 10.
- ⁴⁸ BC Ministry of Energy and Mines. 2003a.
- ⁴⁹ Communications, Energy and Paperworkers Union. p. 40.
- ⁵⁰ Simpson.
- ⁵¹ West Coast Environmental Law. 2004.
- ⁵² West Coast Environmental Law. 2002a. p. 10.
- ⁵³ BC Ministry of Management Services. p. 7.
- ⁵⁴ Locke.
- ⁵⁵ Marshall. 2001b. p. 7.
- ⁵⁶ Cox.
- ⁵⁷ Fenwick.
- ⁵⁸ Simon.
- ⁵⁹ Royal Commission on Renewing and Strengthening Our Place in Canada. p. 64.
- ⁶⁰ Ibid.
- ⁶¹ O'Rourke, Patrick. Assistant Deputy Minister, Ministry of Energy and Mines. Panel discussion: Professional Engineers Association of BC dinner, North Vancouver, BC. February 26, 2004.
- ⁶² Gidney.
- ⁶³ BC Ministry of Energy and Mines. 2003f.
- ⁶⁴ Statistics Canada. 2002b. p. 19.
- ⁶⁵ Including non-BC Hydro generation. Statistics Canada figures (2002b) conclude that hydroelectricity is 86 per cent of British Columbia's total installed generating capacity. Hydroelectricity is produced by the kinetic energy of falling water.
- ⁶⁶ Independent Power Producers (IPPs) also generate some hydroelectricity in the province, including Alcan, Teck Cominco, Columbia Power Corporation, Island Cogen, Aquilla Networks Canada, and 40 other industrial self-generators.
- ⁶⁷ The commercial unit of electric power is the kilowatt (KW). One kilowatt represents the total amount of power needed to light ten 100-

- watt light bulbs. A kilowatt hour (kWh) is the commercial unit of electric energy needed to keep ten 100-watt light bulbs burning for an hour, the equivalent of 3.6 million joules. A kilowatt hour is equivalent to a watt hour multiplied by 10^3 ; a megawatt hour (MW.h) is equivalent to a watt hour multiplied by 10^6 ; a gigawatt hour is equivalent to a watt hour multiplied by 10^9 (or 100 kilowatt hours); and a terawatt hour is equivalent to a watt hour multiplied by 10^{12} . Generally, 1,000 megawatts are needed to supply a million average homes.
- ⁶⁸ BC Hydro. 2003b.
- ⁶⁹ BC Hydro. 2004a. p. 132.
- ⁷⁰ BC Hydro. 2003a. Cited in Calvert. p. 6.
- ⁷¹ BC Hydro. 2004b.
- ⁷² BC Hydro. 2003c. p. 14. and BC Hydro 2002. p. 14.
- ⁷³ Calvert. p. 20.
- ⁷⁴ BC Hydro. 2003a. Cited in Calvert. p. 19.
- ⁷⁵ Ibid. p. 20.
- ⁷⁶ Cohen. 2003a. p. 3.
- ⁷⁷ Ibid. p. 5-14.
- ⁷⁸ Some administration costs borne by IPPs may not be included in the cost analysis of BC Hydro power costs. However, including this factor still reveals a great discrepancy between the cost structures of public and private power. Figures from: BC Hydro. 2003a. Cited in Calvert. p. 7.
- ⁷⁹ BC Hydro. 2003a. Cited in Calvert. p. 7.
- ⁸⁰ Foley et al. p. 18.
- ⁸¹ Cohen. 2003a. p. 3.
- ⁸² Calvert. p. 16.
- ⁸³ For a fuller discussion of these costs, see Calvert. p. 15-18.
- ⁸⁴ BC Facts. 2004.
- ⁸⁵ Cohen. 2003b.
- ⁸⁶ Ibid.
- ⁸⁷ BC Ministry of Water, Land, and Air Protection.
- ⁸⁸ Walker. p. 46.
- ⁸⁹ Gibbons and Singh. p. 2.
- ⁹⁰ Environment Canada. 2004.
- ⁹¹ Ibid.
- ⁹² For a comparison of greenhouse gas emissions, see Lechtenbohmer et al. Efficiency gains from “clean” coal can be obtained from Eastman.
- ⁹³ Eastman.
- ⁹⁴ Campbell et al. 1997.
- ⁹⁵ Torrie et al. p. 105.
- ⁹⁶ Torrie et al. p. 107.
- ⁹⁷ Wiggin et al. p. 19; Torrie et al. p. 57.
- ⁹⁸ Ibid.
- ⁹⁹ Boyd. p. 14.
- ¹⁰⁰ Torrie et al. p. 32.
- ¹⁰¹ Ibid. pp. 35-36.
- ¹⁰² US Environmental Protection Agency.
- ¹⁰³ Solar Energy Society of Canada. p. 140.
- ¹⁰⁴ Torrie et al. p. 37.
- ¹⁰⁵ BC Hydro. 2004b. p. 8.
- ¹⁰⁶ Ibid.
- ¹⁰⁷ Ibid.
- ¹⁰⁸ For example, see Shaffer. 2004.
- ¹⁰⁹ BC Hydro. 2003d. p. 1.
- ¹¹⁰ Ibid. p. 3.
- ¹¹¹ Campbell et al. 1997.
- ¹¹² Both examples were cited in Shaffer. 2004.
- ¹¹³ York and Kushler. p. 17.
- ¹¹⁴ Berry and Jaccard. p. 263.
- ¹¹⁵ Ibid. p. 266.
- ¹¹⁶ BC Hydro. 2004c. Appendix C and D.
- ¹¹⁷ BC Hydro. 2004b. p. 5.
- ¹¹⁸ Makower and Pernick.
- ¹¹⁹ Frantzis and Katofsky. p. 5.
- ¹²⁰ Clean Air Renewable Energy Coalition. p. 6.
- ¹²¹ Ibid. p. 7.
- ¹²² Ibid. p. 2.
- ¹²³ Berry. 2001. p. i.
- ¹²⁴ Ibid.
- ¹²⁵ Berry and Jaccard. pp. 264-265.
- ¹²⁶ Commissioner of the Environment and Sustainable Development. 2000. p.11.
- ¹²⁷ Berry and Jaccard. 2001. p. 264.
- ¹²⁸ Clean Air Renewable Energy Coalition. p. 3.
- ¹²⁹ Ibid. p. 4.
- ¹³⁰ Campbell et al. 1997. p. 10.
- ¹³¹ Clean Air Renewable Energy Coalition. p. 4.
- ¹³² Ibid.
- ¹³³ Etcheverry et al. p. 22.
- ¹³⁴ Climate Action Network.
- ¹³⁵ The concept of distributed generation is presented in Dunn.
- ¹³⁶ Dunn. p. 73.
- ¹³⁷ This is the approach taken by Germany. See Fell.
- ¹³⁸ Pape-Salmon et al. p. 48.
- ¹³⁹ Environment Canada. 2003. p. 205.
- ¹⁴⁰ Colton. p. 1.
- ¹⁴¹ Pape-Salmon et al. p. 3.

- ¹⁴² A description of the program can be found at Etcheverry et al. p. 13-23
- ¹⁴³ City of Vancouver. p. vi and viii.
- ¹⁴⁴ This figure was extrapolated from a federal study: Helios Centre. 2001.
- ¹⁴⁵ Jaccard and Murphy.
- ¹⁴⁶ More detailed facility information is no longer available on BC Hydro's website for security reasons. All information on generation – unless otherwise identified – is from BC Hydro. Electronic database accessed on August 28, 2003 at www.bchydro.com/info/generation
- ¹⁴⁷ Waterose Environmental. 2003.
- ¹⁴⁸ BC Hydro. 2003e.
- ¹⁴⁹ Both generators are listed for sale on the BC Hydro website: www.bchydro.com/services/surplussales/surplussales3570.html. Steve Miller and Associates. 2003. p. 12.
- ¹⁵⁰ BC Hydro. 2003f.
- ¹⁵¹ BC Hydro. 2003g.
- ¹⁵² Duffy.
- ¹⁵³ Society Promoting Environmental Conservation. 2003.
- ¹⁵⁴ BC Utilities Commission. 2003.
- ¹⁵⁵ BC Hydro. 2004b.

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