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# IEP Focus Group Research

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## Final Report



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## Executive Summary

BC Hydro's updated Integrated Energy Plan (IEP) must address a projected electricity shortfall that is estimated to occur in 2007, based on increasing demand for electricity in the Province. This provides an immediate challenge in terms of public communications activity regarding the Plan.

- Almost all respondents were "shocked" that a deficit has been projected and that BC has been a net importer of power. The general perception is that BC produces an ongoing surplus of electricity that can satisfy the needs of the Province over the long term.
- There is scepticism about BC Hydro's projections and about the motives for publicizing this issue. Some see this as a scare tactic that will be used to pave the way for privatization.
- The IEP will also draw negative attention to the issue of Trade. A major concern is that the deficit situation will exist because BCH is tied into long term export contracts and/or that BCH would prefer to sell BC power to the highest bidder, before meeting the needs of the Province.

When taking BCH projections at face value, responses to and preferences for acquiring various resource types were generally consistent across all markets. Above all, conservation programs (e.g. Power Smart) are viewed as essential and perceived as BC Hydro's responsibility. In addition, residents would like to see BCH acquire a mix of resources to meet future energy needs, anchored by Large Hydro (Site C development) and supplemented by Run-of-River Small Hydro, Geothermal and Biomass. There is significant interest in Wind, but after some examination, overall costs appear to outweigh the benefits. Coal and Natural Gas were the least preferred resource types.

Reaction to the resource types was driven by the following priorities:

1. Potential impact on the environment
2. Potential impact on the economy (job creation)
3. Long term rate impact

## Large Hydro

- Support was based on the planned Site C location and its large and dependable electricity output. Site C is in a remote location, it's a proven site and environmental damage may be minimized based on prior experience in the area.
- Key concerns are related to the potential environmental impact of creating a new reservoir. An independent environmental review will be important in securing public support.
- Support for Site C was solidified only after a detailed review of the costs and benefits related to other resource types. As a result, a similar public education process will be critical in securing broad support for this option.

## Run-of River Small Hydro, Geothermal, Biomass

- Believed to be excellent supplemental sources of electricity that have little or no negative environmental impact, are relatively inexpensive to build and have the potential to stimulate local economies through job creation.
- Concerns are related to the overall regulation of multiple smaller operations, especially if they are privately owned. It will be critical for BCH to take a stewardship role in managing these operations.
- The extent of the transmission infrastructure required to support these multiple, smaller installations was poorly understood. The public will require more information about the possible environmental consequences in order to fully assess these resource types.

## Coal, Natural Gas

- The perceived drawbacks in using fossil fuels (non-renewable resources) to generate electricity outweigh the benefits.
  - Coal suffers from the stigma (driven largely by impressions of mines in the United Kingdom) of being a very dirty fuel, with severe environmental consequences.
  - Natural Gas, while viewed as cleaner than Coal, was rejected based on past and future price volatility.
- Public support for these methods could be increased by a focus on:
  - Local/provincial job creation and economic benefits

- Utilization of new technology to “clean” coal and natural gas emissions
- Managing/minimizing potential rate impacts

### Wind

- There is significant interest in alternative energy sources such as wind, solar and tidal. They are viewed as completely “green” in that they have minimal impact on the environment and use existing, unlimited natural resources.
- Wind is of interest because it is already used in Alberta and Palm Springs. However, concerns include a relatively low electricity output, poor dependability and the need to clear large tracts of land.
- Given that there is significant support for these green resource types, BCH should promote any ongoing research and development in this area. It will also be important to manage public expectations. Many have high expectations regarding the potential of these resources but know little about the benefits and drawbacks.

In terms of future planning and policy development, residents would like to see BCH focus on...

- Conservation programs (Power Smart) and related educational initiatives. This is viewed as essential in meeting the Province’s future energy needs and there is support for significantly more public education as well as legislation to enforce conservation practices.
- Research & development into new, cleaner energy technologies (e.g. wind, tidal, solar) versus relying on “old school” solutions (e.g. dams, fossil fuels).
- Encouraging self-sufficiency at the household, community and regional levels in terms of electricity generation (e.g. Geothermal, Run-of-River Small Hydro and solar installations).

### Independent Power Producers/Customer-based Generation

There appears to be support for increasing the role of IPP’s/Customer generation as long as their growth is carefully regulated by BCH and/or a body consisting of several interest groups (e.g. BCH, government, environmental). The preference is towards BC-owned firms in order to stimulate local economies and to keep more control over pricing and rates.

*“If it’s not regulated carefully, we could be worse off.”*

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## Background & Objectives

BC Hydro's Integrated Electricity Plan (IEP) provides a blueprint for the Province in terms of acquiring new resources for meeting customers' future electricity requirements. Public consultation in the form of focus groups is an important part of the planning process.

As part of the development of the 2003/2004 IEP, BC Hydro's planning team wished to understand how various options for acquiring new resources to meet customer's electricity requirements would be received at the community level. Focus groups were commissioned in order to inform the development of the 2003/2004 IEP and future public communications regarding resource acquisitions.

The primary purpose of the research was to understand how citizens evaluate various resource types that could be acquired by BCH in order to meet B.C.'s future electricity needs. Additional objectives of the research were as follows:

- Gain insight into awareness and understanding of BC Hydro's current power generation resources;
- Explore awareness/understanding of BC Hydro's future load requirements and expectations as to how future needs should be addressed;
- Explore awareness/understanding of BC Hydro's transmission infrastructure, including regional challenges;
- Gain insight into attitudes towards several resource types by exploring their economic, social and environmental implications and;
- Understand which options are preferred and reasons for preferences.

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## Methodology

Ten focus groups were conducted the week of June 16, 2003 in Vancouver (2), Cranbrook (2), Prince George (2), Kamloops (2) and Victoria (2). Respondents were community-minded and had an interest in economic, social and environmental issues affecting the Province.

All respondents satisfied the following:

- Age 25-59
- Household utility decision makers
- Currently employed full or part time
- 3+/week newspaper readership
- Voted in last provincial election
- High school graduates

In addition, one group in each market consisted of individuals who had some level of higher education and were involved in community service activities in the past two years.

### Discussion Guide

The focus groups were designed to educate respondents about BC's current electricity infrastructure, future electricity requirements and regional challenges before introducing the resource types under consideration. The following outlines the key stages of the discussion (copies of stimuli are attached in the Appendix where indicated):

1. General unaided discussion of BC Hydro's current electrical generation resources.
2. Introduction of resource types using a short, neutral description (Appendix).
3. Discussion of BC Hydro's dependable energy supply using pie chart illustrating 2001 scenario (Appendix).
4. Unaided discussion of transmission infrastructure. Presentation and discussion of BCH transmission infrastructure map (Appendix).
5. Introduction of projected electricity shortfall using fictitious newspaper article (Appendix).
6. Detailed discussion of resource types BC Hydro could acquire to meet electricity shortfall. Respondents were provided with "fact sheets" for each type outlining potential locations, transmission requirements, environmental costs, capital/operations/maintenance costs, rate impacts,

risks, resource potential, dependability as well as an estimated electricity output value.

- The resource types outlined were Power Smart, Biomass, Large Hydro, Run-of-River Small Hydro, Natural Gas, Coal, Geothermal and Wind. (Appendix)
7. Finally, the group was split into 2-3 smaller groups. Each group was tasked with designing an “energy solution” for BC Hydro that would total 1000 units of new electricity output. Output for each resource type was calculated based on BCH needing a total of 1700 mw over the next ten years. For ease of calculation, individual resource type output values were indexed to 1000 units of total energy (corresponding with 1700mw needed). The summary output chart including all resource types is attached in the Appendix.

All resource types listed above were presented in each group with the exception of Biomass and Power Smart. Both of these options were unquestionably favoured and in some cases prevented thorough consideration of the other resource types. As a result, in some groups they were removed from the final resource allocation exercise.

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## Interpretation of Findings

While focus group findings can provide rich insights, the results of the study should be interpreted as directional given the limited number of respondents and the qualitative nature of the discussion.

## Detailed Findings

### Overall Observations

While careful attention was given to recruiting respondents who were aware of current issues and events, a majority (outside one or two well-informed respondents in each group) lacked knowledge of key electricity-related issues affecting BC. In part, this may have been due to the fact that many were relying on various forms of energy outside of electricity to operate their households (e.g. natural gas, wood, oil). As electricity was only used as supplemental energy it made up a smaller proportion of total household energy expenditure. As a result, there appeared a low level of interest in/awareness of electricity-related issues.

Instead, respondents were most concerned about political issues receiving recent media attention, including privatization and electricity exports to the US. Many felt a strong sense of entitlement to and ownership of BC Hydro's assets (electricity generation & transmission). Many held strong beliefs that BC residents have a "right" to low cost electricity and must maintain control over electricity generation in the Province.

An additional issue of note was natural gas pricing. For many who used natural gas as a primary heating fuel, recent price increases and volatility in the market were of great concern. This experience also drove negative perceptions of this resource type as a potential electricity generation source.

### Perceptions of BC Hydro

BC Hydro is generally thought to control electricity generation and delivery to the end user. However there is some initial awareness of privatization initiatives on the heels of the current provincial government's mandate to contract out many public service functions to the private sector.

Electricity exports also continue to be top-of-mind based on the energy crisis in California in 2000/2001 and BC's exports to the State. Many believe that BC has not been paid for that electricity and are concerned about this and other energy contracts entered into by BCH.

Both of these issues appear to frame public perceptions of BCH. However, perceptions in many cases are based on incomplete and inaccurate information. This has created a sense of mistrust and skepticism concerning BCH activities and initiatives.

Discussing privatization and exports in detail was not part of the mandate of this project. However, detailed discussion in the groups on resource types and transmission issues served to educate respondents on other areas of BCH responsibility. This led to a conclusion among some that BCH should refocus its priorities in order to address more pressing long-term energy issues affecting the Province. These new priorities should include the following:

- Research & development into new, cleaner energy technologies (e.g. wind, tidal, solar) versus relying on “old school” solutions (e.g. dams, fossil fuels).
- Placing top priority on conservation programs (Power Smart) and related educational initiatives.
- Encouraging self-sufficiency at the household, community and regional levels in terms of electricity generation (e.g. Geothermal, Run-of-River Small Hydro and solar installations).

## Privatization

The current BC government's focus on privatizing operations in several sectors currently under Crown jurisdiction has received considerable media attention. However, while privatization as a general concept is top-of-mind, few were aware of specific privatization initiatives related to BCH.

Among those who were aware, possible privatization of the BCH transmission infrastructure was the issue discussed most. There was very little awareness re. outsourcing the billing/customer service function and private partnerships on new capital projects.

The concept of privatization as it relates to BCH is (mis)interpreted as involving a move to a total free market system where BCH assets would be sold on the open market. There is no sense of BCH's continued role in a stewardship or regulatory capacity. As a result, there is significant resistance to the concept.

Respondents fear the outcome of such privatization will entail dramatic rate increases and a loss of control over BC resources. This feeling of entitlement to and ownership over provincial electricity generation and transmission assets was a common theme throughout the groups.

*"Rather than looking after us, who supposedly own the resources, they're looking after the profits."*

*"It's better for them (BCH) to be responsible more than profitable."*

*"Everyone looks at hydro as an asset...do you really want to get rid of all your assets?"*

## Trade

BCH's trading activity is poorly understood. Most recall California's electricity crisis of 2000/2001 and BCH's role in supplying power to the State. There is a common perception that BC has not yet been paid for that electricity and this contributes to an overall level of skepticism and criticism of BCH's export policies. Some also believe that BCH is locked into long-term electricity contracts with out-of-province buyers, which could jeopardize electricity supply to BC residents.

*"Once we start exporting to the Americans then we can't turn off the tap."*

BCH's exporting activity reinforces the perception that BC is a net exporter of power and has ongoing surplus power production. When respondents are made aware that BC has recently been a net importer of power, there is significant resentment about the possible role of trade contracts in contributing to the electricity deficit.

While most appear to support trade if it helps BCH sell excess electricity at a profit, or purchase cheaper electricity, there is significant concern about having to rely on imports to meet the Province's energy needs.

*"It's not as if you can stockpile it (electricity) like vacation time for when you have a bad year. If you can't store energy, you might as well sell it and make some money."*

*"I don't like the slippery slope of depending on imports or IPP's."*

## Independent Power Producers/Customer-based Generation

There was virtually no real knowledge of the definition or role of independent power producers (IPP's) in B.C. While a few were aware of the concept of co-generation or customer-based generation - both large scale (e.g. Alcan, Weyerhaeuser) and small scale (e.g. pulp mills burning

wood waste, private run-of-river operations) - they tended to see all IPP and co-generation activity as similar. Both types of operations were loosely defined as companies producing electricity to use themselves or sell to BCH (whether a byproduct of another operation or not).

In general, respondents support an increased role for both types of operations in contributing to the Province's energy supply. There is significant interest in encouraging small, independent power production to service local communities and in supporting any initiative that uses waste (e.g. wood waste, landfill emissions) to create electricity. However the assumption is that these IPP's would be BC-owned. If the market is opened to companies from out-of-province (especially US), there is considerably more concern about rate impacts and loss of control.

Whether local or foreign owned, if the role of IPP's and customer-based generation is to increase it appears essential that they be carefully regulated by the government, or a body consisting of several interest groups (e.g. BCH, government, environmental representatives). It is critical that these companies operate in an environmentally responsible manner and that rates not be adversely impacted. There is a perception that BC residents should benefit "first" from these new generation sources and that the electricity be available at a reasonable rate (e.g. not US or global market rates.)

## Transmission

Unaided awareness of the transmission infrastructure in BC is very low. Most have the general impression that each area of the Province is served by a dam in the vicinity.

On an aided basis, respondents are generally surprised at the primary role of the Columbia and Peace region dams in supplying the Lower Mainland and Vancouver Island. A few, more knowledgeable respondents were aware of potential power loss and reliability implications of long distance transmission and the concept is easily understood once it is explained.

As a result, there is general support for BCH's preference for new electricity generation resources being built closer to the load. It is important however to note that for some (especially in the Interior) this provides additional rationale for addressing a perceived imbalance (politically motivated) between the relative contributions of the Lower Mainland versus the rest of BC (especially when it comes to use of natural resources).

## BC's Future Electricity Needs

Virtually all respondents were "shocked" at BC's recent status as a net-importer of electricity. There was a strong perception that BCH generates surplus electricity and therefore considerable suspicion at the role of trade in creating the deficit.

The factual information about BC's challenges in meeting the demand for electricity in 2007 and beyond met with some skepticism. Respondents questioned everything from the assertion that population was growing in BC to the motives for raising such an "alarm".

*"I think growing up in BC we take our resources for granted. I never thought of running out of hydro, we don't often think about it."*

*"They (BCH) need justification to privatize. Whether these are facts or manipulated we'll never know."*

Overall, the key worry is that the situation will exist because BCH is tied into long term contracts and is exporting too much and/or that BCH would prefer to sell the power outside the Province in order to get a higher price.

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## Evaluation of Resource Types

### Market Overview

*We observed unique characteristics in each market that influenced respondents' evaluation of electricity generation resource types.*

#### Vancouver

Lower Mainland residents generally take electricity generation and supply for granted. They exhibited a low level of involvement and interest in electricity issues versus respondents in other areas of the Province. Attitudes towards the local economy and employment outlook were also considerably less negative than we observed in the Interior.

In fact, the top-of-mind energy-related issue in the Lower Mainland was natural gas price increases. Gas was the primary energy source in many homes and the common bill (until recently) with BCH seemed to contribute

to the perception that electricity rates have increased in similar proportions. There was virtually no awareness that BCH rates had been frozen for 10 years.

## Victoria

Victoria residents were also generally apathetic about electricity issues and unaware of Vancouver Island's unique and vulnerable electricity supply situation. There was no unaided awareness (or apparent concern about) the poor condition of the submarine cables supplying electricity to the area, nor about the proposed Duke Point natural gas facility.

As in Vancouver, Victoria residents were most concerned about natural gas prices. They seem to feel as if they were "duped" into converting to natural gas by BCH and the gas company's years ago. They strongly resent the price increases (especially given the price 'guarantees' that were made in order to induce conversion from oil to gas) and there was some awareness of a local movement to convert back to oil from gas for this reason. As a result, Victoria respondents seemed particularly skeptical of any energy information from BCH or the provincial government.

Respondents also held strong environmental opinions on resource types with little apparent consideration of the full costs and benefits. They tended to mistrust the BCH "facts" presented in the groups and the motives of BCH and the government. For example, there was significant discussion about wind and tidal generation methods because both were abundant in the area. Regardless of the poor feasibility of both in meeting the entire Island's future needs, many were unwilling to consider any other alternatives.

## Cranbrook

Natural gas was the primary household energy source for most in the groups, supplemented by wood and electricity. Overall, electricity expenditures appeared relatively small at the household level.

The economy in Cranbrook seemed depressed and there was a real concern about jobs. When evaluating various resource types, respondents exhibited more sensitivity to potential rate increases. As a result, they tended to favour options like Large Hydro and Coal that had less potential to cause rate increases over the long term. Coal was also seen as having the potential to create jobs in the area.

There was significant support for initiatives that promoted self-sufficiency (e.g. IPP's, co-generation, Run-of-River Small Hydro, solar power). The perception was that this would encourage job creation and that electricity might be made available locally at less expensive rates.

There was some resentment towards the Lower Mainland based on the sense that it “takes” more resources from the rest of the Province than it contributes. On that basis, Cranbrook residents were supportive of any new electricity generation being built closer to the Lower Mainland.

## Prince George

Prince George residents used the broadest mix of household energy sources including natural gas, wood pellet stoves, oil, propane and electricity. They believed that relative to the rest of the Province they likely used more energy based on their cold winters and fewer daylight hours. They displayed considerably more interest and involvement in energy-related issues.

Prince George respondents also had the greatest awareness of electricity generation due to their proximity to the Columbia and Peace region dams. The Bennett and Kenney (Alcan) dams were top-of-mind as well as Williston Lake (created by the Bennett dam). The relatively negative perceptions of Williston Lake (significant debris, tree stumps) drove some negative reaction to the concept of building a new dam in order to meet future electricity needs.

There was also heightened concern about BCH privatization due to a local MLA, Paul Nettleton, breaking from Liberal Party ranks to oppose government privatization initiatives (especially BCH). This has generated significant media attention in Prince George and as a result there is increased awareness of and opposition to privatization activity.

As in Cranbrook, we noted significant support for self-sufficiency initiatives, a depressed economy and concern about jobs as well as some Lower Mainland resentment.

## Kamloops

As in Prince George, Kamloops residents relied on a mix of energy types (natural gas, wood pellet, electricity) to power their homes. In addition, there was heightened awareness of alternative energy possibilities. A new housing development has been built in the area (Sun River) that relies on geothermal (heat pump) energy to heat and cool the subdivision. Many were aware of solar initiatives in the area and co-generation activity at the local Weyerhaeuser plant.

There was significant support for self-sufficiency initiatives and resource types like Coal that might stimulate the local economy and create jobs. While there seemed less resentment toward the Lower Mainland, there was support for new electricity generation being built close to the load. This would encourage self-sufficiency in all regions and minimize electricity loss.

## Terminology- Clean vs. Green

The difference in meaning between the two terms was vague and ill defined. Neither term appeared stronger than the other in communicating environmentally “friendly” resource types.

“Green” is recognized as a more political term (used by environmental activists) and as a result is less industry-friendly. It is generally seen as describing renewable resources that are directly related to the earth (e.g. wind, solar, wave) and that generate no waste or by-products.

“Clean” has meaning in the context of the term “clean-burning” (like natural gas). It is associated with resource types that have minimal (versus no) environmental impact. Clean is also a more industry friendly term.

Green methods are clean, but not vice versa. For example, Natural Gas and dams are not considered “green” because they can impact the environment negatively, but they could be described as “clean” energy sources (especially relative to Coal).

Other suggested descriptors for ‘green’ energy include the following:

- Alternative energy
- Enviro-friendly
- Renewable
- Sustainable
- Natural

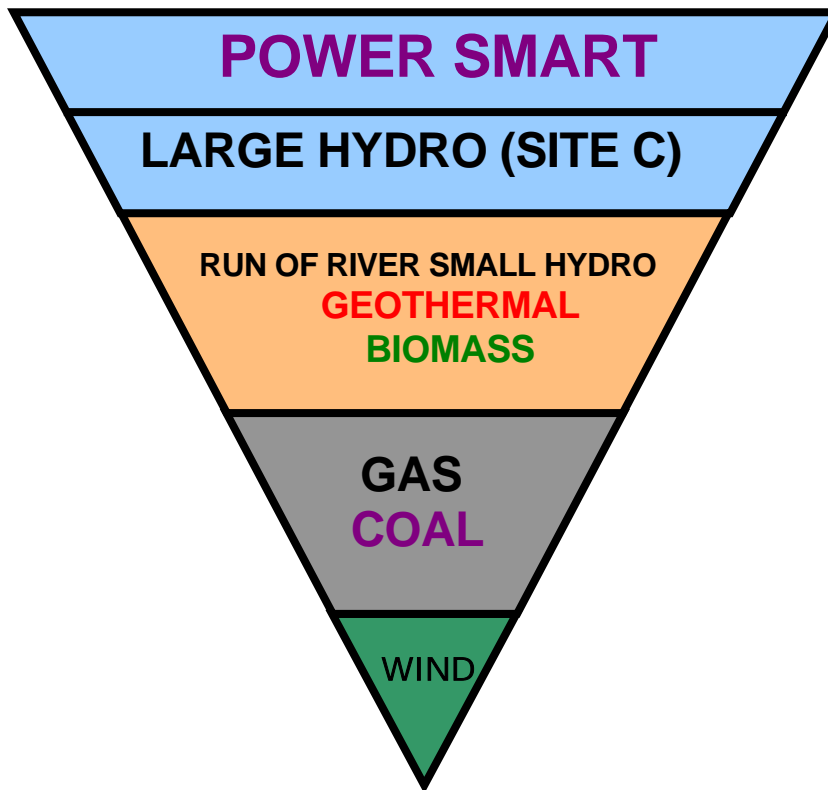
## Resource Types- Evaluation Criteria

Reaction to the resource types presented in the groups was consistently driven by the following priorities...

- Potential impact on the environment. This was a key driver across all groups and framed most of the discussion on the resource portfolios.
- Potential impact on the economy (job creation). This was particularly important in the Interior and overrode many NIMBY concerns.
- Long-term rate impact. While minimizing rate increases was important (especially in the Interior), it was a secondary concern relative to the environment and the economy. Many respondents appeared willing to accept higher rates in order to encourage conservation, or to develop alternative, more environmentally friendly forms of electricity generation.

## Consumer Preference Hierarchy

Responses across all groups were relatively consistent in terms of the preferred resource types. The following chart outlines respondents' preference hierarchy.



When tasked with designing a “solution” to meet the Province’s future energy needs, respondents tended to pick a portfolio of three or more resource types, rather than focusing on one or two options.

- Power Smart/conservation activity was viewed as essential in any future solution, regardless of other resource types acquired.
- Large Hydro was preferred based on the Site C location as well as its large and dependable electricity output.
- Run-of-River Small Hydro, Geothermal and Biomass were viewed as excellent supplemental sources of electricity based on their regional applicability and minimal perceived environmental impact. There was significant support for using Biomass (using wood waste or landfill emissions) opportunities as this would be using a resource that would otherwise be discarded.

- Natural Gas and Coal were generally viewed as having several drawbacks that outweighed potential benefits.
- Wind, while initially favoured, was rejected based on its relatively low output and poor dependability.

*The following section outlines detailed reaction to each resource type, based on the fact sheets provided (attached in the Appendix) and discussion in the groups. Reaction to each is presented in terms of perceived benefits and drawbacks. Also noted are areas where respondents required more information as well as issues to be mindful of in any future communications activity.*

## Power Smart

### *Benefits*

- Conservation activity is viewed as "essential" and likely the most important component in balancing supply and demand. Respondents believe that both households and businesses have significantly more potential to conserve electricity.
- It is an activity in which everyone can participate and benefits areas where the usage is. Respondents tend to think of conservation both in terms of behaviour change (i.e. turning off lights) and capital spending (e.g. insulating homes, replacing windows). Responses suggest both activities are viewed as equally important.
- Respondents believe conservation can and should be legislated and enforced. They suggest the first step would be to force electrical appliance manufacturers to make only energy efficient products.
- There is also recognition that higher rates (e.g. a stepped approach based on usage) may provide the primary incentive for conservation behaviour.

### *Drawbacks*

- Many say there is no downside to encouraging conservation activity.
- Others recognize that conservation alone won't address the Province's future energy needs, as the potential returns are finite. However most believe that businesses and households are less than 25% of the way in terms of reaching that "maximum" conservation point. It also requires user participation at many levels and is hard to enforce so it could be some time before the returns begin to decrease.
- While respondents urge emphasis on conservation, they also recognize the significant upfront costs involved in making homes and businesses more energy efficient. This appears to be a key barrier for participation unless incentives are provided. The expectation is that it is BC Hydro's role to provide these financial incentives based on experience with Power Smart rebate programs in past.

### *Unanswered Questions*

- Respondents appeared to have a basic understanding of conservation issues and most had engaged in some type of conservation activity in the past (behavioural and/or making their homes more energy efficient).

- Responses suggest that more information on energy saving at the household level would be welcomed. There is some sense that BCH Power Smart programs/education have been scaled back. Many also support educational programs in the schools so children learn early on to practice conservation.
- More information on energy-saving practices undertaken by businesses may also help consumers benchmark progress in that sector. Currently, many businesses are seen as wasteful, evidenced by both small businesses (where respondents were personally aware of excessive energy use) as well as large office buildings where the lights are left on overnight.

### *Communication Notes*

- The financial expenditure required in retrofitting a household or business is substantial. It is important that Power Smart program sales and industry partners are trained in communicating a balanced picture of the up front investment versus the long-term payoff. It may also be useful to talk about long-term benefits at the individual household level as well as at the community/provincial level.
- Business/industry are viewed by some as the worst offenders. Communications activity should also highlight progress in this sector so that individuals feel that their contributions will not be lost in the face of wasteful activity on the part of large electricity consumers.
- There is a perception that public education efforts are critical in encouraging conservation. Respondents would like to see more BCH presence in the media, through community programs and in the schools.

## Large Hydro

### *Benefits*

- There was general support in all markets for a new Large Hydro facility at the Site C location. Responses suggest that reaction would be significantly more divided if another location were chosen.
- The key benefit of a new dam would be a large and reliable electricity output. In addition, it is a proven river system and the Site C location is in an area where BCH has had considerable experience with the effects of a dam.
- The potential environmental consequences were easily rationalized. There is a perception that the worst damage has already been incurred from the current installations on the Peace River. Respondents also hope/assume that the environmental effects would be better understood today and could be minimized.
- Relative to the other options tested, Large Hydro is not only reliable, it provides a longer term solution to the Province's energy needs and would likely have less impact on rates. Respondents were generally struck by the significantly greater overall efficiencies (output, reliability, rates) provided by Large Hydro relative to all the other resource types reviewed. This was also sufficient to overcome many potential environmental objections.
- This would be an easy, "out of sight, out of mind" solution as well. The Site C location seemed far removed from the markets in which we conducted research, alleviating NIMBY concerns. The exception was a few respondents in Prince George who were concerned about environmental costs based on their experience with Williston Lake.
- The reservoir created by the dam was seen as having some positive benefits in terms of tourism and outdoor recreation.
- One respondent interpreted an additional benefit as being able to use the reservoir water from the Bennett dam three times instead of twice- a similar principle to successive run-of-river installations.

## *Drawbacks*

- Large Hydro detractors were few, but represented in all markets and vehement in their opposition. Their key concerns are largely environmental (e.g. loss of farmland, flooding, impact on fish/wildlife).
- Prince George residents were familiar with problems at Williston Lake from varying water levels to debris, tree stumps etc. Environmental destruction is evident and the lake is generally viewed as an eyesore.
- There is also a concern that Large Hydro is an “old solution” and that more resources should be allocated to research & development for newer, more environmentally friendly options.
- The initial capital cost was also a concern, although this was partially offset by the promise of longer-term rate stability. The option of partnering with a private entity to build the dam was discussed very briefly but respondents found it difficult to assess this alternative without more information. They were concerned about who would retain control over the land and the electricity generated from the dam, as well as the potential impact on electricity exports and rates.
- There was minor concern about the distance between Site C and the Lower Mainland (where the majority of the use is), but this was mostly among Interior residents who believed that the Lower Mainland should be more self-sufficient and reduce their reliance on resources from the rest of the Province

## *Unanswered Questions*

- Respondents were concerned about the potential environmental impact of Site C and did not feel the fact sheet provided in the groups outlined enough information on the possible consequences. The expectation was that a thorough environmental assessment would be completed and that the public would be made aware of the full implications as part of the planning process.
- There was also some question as to the feasibility of other sites in the Province that might be closer to the Lower Mainland,
- As indicated under the *Drawbacks* section above, respondents wished more information on options for financing the initial cost of building the dam. This would include the impact on provincial debt & taxes and the feasibility of a private partnership.

## *Communications Notes*

- Overall, there appears inherent resistance to the concept of building a new dam. It only became a preferred option based on a comparison of the costs and benefits relative to the other resource types discussed in the research and the specific Site C location. As a result, public education and an independent environmental assessment will be critical in generating support for this initiative Province-wide.
- There may also be an opportunity to capitalize on the overall support for Run-of-River Small Hydro by reinforcing the similarities at the Site C location (e.g. re-use of reservoir water from Bennett and Peace dams).

## Run-of-River Small Hydro

### *Benefits*

- Within the context of the resource types discussed in the groups, Run-of-River Small Hydro was believed to be one of the best examples of “green” power. Based on the information provided, it was viewed as having almost no negative impact on the landscape or environment.
- Several in the Interior were aware of private run-of-river installations where individuals generated electricity from streams on their property and sold excess power to the grid. This notion of self-sufficiency appealed to many.
- Developing this resource type on a larger scale was also perceived as potentially having important local community benefits. Along with fostering self-sufficiency, it could facilitate the creation of independent, BC-owned businesses and jobs in the area. There was widespread support for the notion of small IPP’s run by BC residents helping supply electricity to local communities.
- Respondents liked that run-of-river installations were relatively inexpensive to install and operate and that there were many potential sites in the Province. This would help many communities become more self-sufficient and provide generation closer to the load.

### *Drawbacks*

- Respondents were most concerned about dependability due to seasonal temperature and water flow issues. Run-of-River Small Hydro also provides a smaller electricity output relative to other options and numerous installations would be required to make a significant impact on the power supply. As a result, most saw this resource type as useful at the community level as a supplemental form of generation only.
- While there was some concern over the environmental impact of creating a supporting transmission infrastructure, many questioned the validity of the information provided in the groups. The tendency was to rationalize any environmental impact based on a perception that the relatively small size of the run-of-river facility would require minimal roads & related infrastructure. Roads and right-of-ways were also seen as considerably less disruptive than other types of environmental impacts (e.g. reservoirs, emissions).

### *Unanswered Questions*

- The key issue remained the “true” extent of the transmission infrastructure required for multiple run-of-river installations and the related environmental consequences.
- A related concern was how a large number of independent installations would be managed and regulated to ensure minimal impact on the environment.
- There was also some question as to the potential locations of Run-of-River Small Hydro sites in the Province, specifically those close to the Lower Mainland. Respondents wanted to be able to assess the feasibility of relying on this resource type to service high load areas (e.g. Lower Mainland, Vancouver Island).

### *Communications Notes*

- Conceptually, this resource type received significant support based on the perceived lack of negative environmental impacts and the potential local economic benefits. It has the potential to position BCH as encouraging regional enterprise and caring for the environment.
- If Run-of-River Small Hydro is heavily relied on in future, it will be important to clarify the overall management/regulation of the installations (if privately owned) and the environmental consequences of the transmission infrastructure. Responses suggest that public support would be less enthusiastic if the facilities were foreign-owned and/or if BCH or the provincial government were not overseeing their development.

## Geothermal

### *Benefits*

- Like Run-of-River Small Hydro, geothermal energy was viewed as “green” energy. It uses available natural resources with little apparent adverse impact.
- Respondents liked this resource type because for many it is new technology that demonstrates innovative thinking and has many promising applications for the future (due to a perceived long term availability of the resource).
- The fact that the geothermal sites that have been identified are close to the Lower Mainland also addresses the desire to have generation closer to the load and to reduce the Mainland’s reliance on resources from the rest of the Province.
- Many liked that the installations were relatively inexpensive to build and maintain and could encourage self-sufficiency at the household as well as the community level. In Kamloops, a new subdivision has been built that promises “geothermal” heating and cooling, making the area self-sufficient. While this is really a heat pump technology, the concept was embraced as representing a new concept in self-sufficiency and clean energy.

### *Drawbacks*

- The perceived drawbacks of Geothermal were few other than the relatively small electricity output of an installation. There was also some question as to the potential for an increase in rates over the long term (as outlined in the fact sheet) given the small output potential. Some did not take BCH facts at face value.
- There was also minor concern among respondents in the Interior over the possible reaction of Whistler residents to the installation of geothermal facilities in the area. There was also some discussion of the esthetics (size and design) of the geothermal plant.

### *Unanswered Questions*

- The key area of confusion involved the reasons for potential long-term rate increases if Geothermal was heavily relied upon.
- Very secondarily, respondents wanted more information on the size and appearance of a geothermal facility.

## *Communications Notes*

- Geothermal is viewed as a new and progressive idea. It would help position BCH as on the forefront of green technology and as investing in new technologies. As with Run-of-River Small Hydro, developing Geothermal has the potential to position BCH as encouraging regional enterprise and caring for the environment.

## Biomass

*This resource type was tested in only one group in Vancouver because response was so favourable. The concern with continued exposure was that in designing an electricity generation "solution" respondents would not fully consider other resource types.*

- The general preference was to maximize Biomass energy opportunities wherever possible. The use of waste (organic wood waste, landfill gas) to generate electricity had significant appeal as it was viewed as using a resource that would otherwise be discarded. This reaction was consistent with the overall support (across all groups) of customer-based generation activity.
- There appeared little concern over the emissions implications of burning biomass material to generate electricity. However on the Biomass fact sheet provided to respondents, environmental costs were described as minimal (which likely influenced assessments of this resource type).

## Coal

### *Benefits*

- While the drawbacks of Coal generally outweigh the benefits, respondents did view this resource type as having some advantages. There was also awareness across all groups of new technology that results in "cleaner" coal emissions and some sense that emissions could be reduced based on the grade of coal being burned. Both these factors have the potential to minimize negative reaction to this resource type.

*"The way (coal) plants are built today, they can build it so high-tech that you wouldn't even know it was coal."*

- The key benefit was the potential for job creation in depressed areas (i.e. Kootenays/Cranbrook). There was also some support among Interior residents for a coal plant on Vancouver Island to help make the Island more self-sufficient.
- Coal is inexpensive and abundant in BC. A few respondents were aware that BC exports coal to Japan for steel production and felt it would be better used in creating electricity for the Province. They also liked that the long-term rate impact would likely be minimal.
- Coal plants also have a better output potential versus Run-of-River Small Hydro, Geothermal and Wind. This was appealing to some who were concerned about having to build so many small facilities to make an impact on the electricity supply.

### *Drawbacks*

- Coal suffers from a very negative public image that is difficult to counter. The key concern is environmental. There is an overriding perception that coal is a “dirty” fuel (coal dust, smoke, foul emissions, smog, acid rain) and there is concern for the health of coal miners.
- Coal also represents an old technology and for some, an outmoded resource type (like dams). It is a non-renewable resource and therefore seems like a step back instead of forward.

### *Unanswered Questions*

- There was considerable discussion about the extent to which coal emissions could be minimized using new technology. This would be a critical area of interest and essential information to provide the public if coal was under consideration.
- Many in making their evaluations also questioned the size and longevity of the coal resource in BC.

### *Communications Notes*

- Even supporters acknowledge that Coal would be a hard “sell” in BC due to negative public perceptions. Acceptance is almost completely dependent on the extent to which emissions can be “cleaned”.
- Development of this resource type would have significant communications challenges and potential negative implications for BC Hydro’s image if not managed carefully.

## Natural Gas

### *Benefits*

- Like Coal, the perceived drawbacks of Natural Gas appear to outweigh the benefits, however there were a few supporters in the groups.
- Natural Gas has fewer perceived negative environmental impacts relative to Coal and many have the perception that it is a relatively clean burning fuel. It was actually the natural gas fact sheet introduced in the group that outlined potential emissions issues that caused several to reconsider their view on its environmental consequences.
- Like Coal, some respondents liked that natural gas plants could be built close to areas of greatest demand (e.g. Vancouver Island) and that there would likely be job creation benefits in BC's offshore natural gas production industry.
- Natural gas plants also have a better electricity output potential versus Run-of-River Small Hydro, Geothermal and Wind. On this basis, there was minor support (in Vancouver and Kamloops) among some who rejected Coal, but liked the better output capacity of fossil fuels.

### *Drawbacks*

- Rate volatility is a critical issue and the key reason Natural Gas was generally rejected. Based on past experience there is an expectation that increased dependence on natural gas would cause prices to rise even further, resulting in higher heating costs (for those who use natural gas furnaces) as well as higher electricity costs... *"a double whammy"*.
- The fact that natural gas is a non-renewable resource was also troubling given that there is strong global demand for it. This was also perceived as having the potential to put long-term upward pressure on prices.
- Respondents were also concerned about the risks of gas storage facilities. They are viewed as vulnerable to explosion, earthquakes and potentially, terrorism.

### *Unanswered Questions*

- Respondents were most interested in understanding the real impact natural gas generation would have on long term hydro rates.
- Based on the information provided in the groups, there was also some question as to the actual emissions impact of the fuel. Prior to the groups, many viewed natural gas as relatively clean, however a review of the

emissions costs in the groups (global warming, smog, etc.) raised some question as to the validity of these going-in perceptions.

### *Communications Notes*

- Natural gas does not appear to suffer from the environmental stigma attached to Coal, so it does not carry the same communications challenges. However, many have personally experienced its price volatility and they reject it on that basis.
- BCH has also lost some credibility (especially in the Lower Mainland and on the Island) by encouraging gas conversion in past. Communications about potential rate impacts will likely be met with considerable scepticism so credible third-party support may be required.

## Wind

### *Benefits*

- Wind is a top-of-mind alternative energy source and there was significant interest in its development in BC. There was some awareness of windmill farms in Alberta and Palm Springs that led respondents to believe it was a feasible resource type that could be applied here.
- While respondents' appeared to know little about it, Wind is believed to be a completely "green" energy that uses existing unlimited natural resources. There was support for wind developments on the Island among Victoria respondents.

### *Drawbacks*

- While initially a preferred option across all markets, based on the facts introduced in the groups respondents came to believe that the potential costs would outweigh the benefits.
- Key concerns were the relatively low output of a wind development, the reliability of the resource and potential environmental issues related to land clearance. However, we noted some scepticism regarding the information provided in the groups. Respondents questioned the reliability issue, suggesting that there were areas of the Province that were always windy. There was also some question about windmill placement and the need for land clearance.
- On balance, many felt that Wind could only play a minor role as a supplement to other resource types in satisfying the electricity needs of the Province.

### *Unanswered Questions*

- Wind is a popular resource type and respondents wanted to disprove BCH facts re. environmental costs. Several questions were raised including...
  - The space required for developments (e.g. could they not be built in the ocean, on top of trees, mountaintops).
  - Potential locations (could Vancouver Island and other areas closer to the Lower Mainland be possible sites).
  - The amount of land clearance required in the Peace Region (several believe the landscape in that area is just low scrub).
  - The actual reliability of Wind. There is a perception that in several areas (e.g. North Coast, Victoria) Wind would be 100% reliable.

- The reasons for potential long term rate increases given the relatively low output and minimal up front cost of a wind development.

### *Communications Notes*

- The positive reaction to Wind suggests that BCH should promote any ongoing research and development efforts in this area (as well as tidal/wave).
- However, significant education appears required about the infrastructure needed for a typical wind development. Respondents were not well informed about the potential costs or environmental impacts of relying on Wind and were in some cases unwilling to seriously consider the drawbacks. There could be intense public pressure on BCH to develop Wind if the issue is raised, necessitating more thorough public education of its benefits and drawbacks.

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## Appendix

1. Discussion guide
2. Definitions of electricity generation resource types
3. BC's dependable energy supply (2001) pie chart
4. Transmission infrastructure map
5. Fictitious newspaper article
6. Resource fact sheets
7. Resource Type output summary chart.

## Final

### DISCUSSION GUIDE Energy Sources

#### 1.0 Introduction (10 min)

Thanks for attending

Who we are, what we do

Interested in honest opinions, speak from the heart, no right or wrong answers

Ok to disagree

Please speak clearly, loudly, one at a time

Review of room- glass/taping

Cell phones/pagers off

Self-introduction of respondents (first name, family structure, home ownership/rent, how long, employment)

#### Gen Pop grp:

- If you could live anywhere else in the world (assuming jobs/family would come with you), where would it be and why?

#### Opinion grp:

- Thinking about over the last 2 years, what is the most fulfilling role you've played in the community, in a club or association or politically and why?

#### 2.0 Preliminary Assessment of Current Energy Sources (10 min)

What type(s) of energy do you use in your home (i.e. natural gas, electricity, other)? What is used in your workplace?

Who supplies/delivers \_\_\_\_\_ to your home/work? Who creates/generates it?

What's the difference (if any)?

How is the electricity that is used in your home/office generated? (E.g. hydro, coal, natural gas, other)

Where is it generated? Probe for regional awareness, import/export issues.

What role does BC Hydro play in the system? (Probe awareness of Independent Power Producers)

Are you aware of any unique challenges/issues your own community faces with regards to electricity use or generation?

### 3.0 Assessment of current/future supply vs. demand (10 min)

Does BC Hydro generate more electricity than they need to supply the Province, just what they need, or are they not able to meet the demand for electricity?

*Explain that it varies from year to year based on stream flow and on time of year (highest capacity in Spring/melting snowpack) & demand (i.e heating).*

What does BC Hydro do with electricity they can generate that is over and above what is needed to supply BC residents?

What happens if they can't generate enough electricity? How do they compensate?

To your knowledge, most of the time is BC Hydro in a surplus or deficit position in terms of electricity? Is that likely to change in future? How? When?

Long term, how prepared is BC Hydro for serving the needs of an increasing BC population?

### 4.0 Assessment of current electrical resources (15 Min)

What are all the means or sources BC Hydro has at its disposal to generate electricity or meet the needs of the Province? Probe for unaided awareness of:

- Hydro-electric, with and without reservoirs
- Natural gas
- Coal
- Clean/green resources (small hydro, biomass, cogen, wind, solar, geothermal, tidal, wave)\*
- Power Smart (demand side management)
- Trade

\*Note terminology used (if raised) re. clean vs. green resources. Probe perceived difference between two terms.

#### Aided discussion of resources

*Here are the various means or sources that BC Hydro has at its disposal to help balance supply with demand. (Show each on a large card and explain briefly in neutral, factual terms. Post on wall.)*

Discuss any surprises, concerns. Probe perceived percentage contribution of each resource type.

Probe any perceived differences between/preferences for “clean” vs. “green” nomenclature.

### **IPP’s & Customer-based generation:**

What is meant by the term, independent power producers?

- How do they generate power?
- How important are they to the current system?
- What do you know about their cost/efficiency as an energy source? Probe concerns/issues, pros/cons?

*Explain definition/current role of IPP’s and probe for additional issues, pros/cons. (Read description provided by BCH and provide examples.)*

What is meant by “customer-based generation”?

- Probe issues, pros/cons if aware.

Explain concept (*read description provided by BCH and provide examples*) and probe for additional issues, pros/cons.

### **Reality**

Show current “reality” of BC Hydro’s total power supply, including roles of trade, IPP’s and customer-based generation. (*Pie diagrams provided by BCH*)

Discuss surprises? Concerns

## **5.0 Assessment of transmission function (10 min)**

Where is the electricity you use in your home and workplace generated? How does it get there?

- Probe unaided awareness of current and auxiliary transmission facilities, where they are located and the distances traveled.

*Show large BC map outlining transmission infrastructure, hydroelectric dams, Burrard thermal steam turbine, cities where research will be conducted.*

Briefly discuss where existing facilities are located, who they serve. *Highlight fact that the further electricity must travel to the end user, the more electricity will be lost and, that more roads, right-of-ways, transmission infrastructure etc. are required. Therefore it is more efficient/least costly to have generation close to the load.* Probe perceptions, issues/concerns. NIMBYism etc.

## 6.0 Addressing BC's growing need to balance supply and demand (15 min)

*Provide respondents with a mocked-up newspaper article outlining the future outlook of BC's electricity situation, including transmission issues and possible expansion of resource types.*

If this article were in the local paper tomorrow, what would your reaction be?

*Probe:* Credibility? Primary concerns? Short and long term implications?

Thinking about the sources we discussed earlier, which would you like to see expanded to meet increasing demand?

If BCH had to focus primarily on acquiring only one type of resource, what should it be? *Discuss each source separately and perceived implications of expansion.*

## 7.0 Detailed Resource Type Assessment (45 min)

*I'd like to spend the rest of our time together discussing some of the resource types that BC Hydro could acquire to meet increasing demand (assuming that BCH will continue to manage BC's entire electricity infrastructure and that imports stay the same). Not all will have the same impact on the environment and on local communities. Some are easier to expand than others. And, not all come with the same price to you as a ratepayer and user of electricity.*

- A. Natural Gas
- B. Coal (*highlight that this would be a new resource type for BCH*)
- C. Hydro-electric with reservoir
- D. Hydro-electric without reservoir
- E. Biomass
- F. Wind/Geothermal

Present options one-by-one by distributing individual handouts detailing transmission requirements, environmental, social & economic costs and rate impacts.

- Before group discussion of each, have each respondent write down best part of, and biggest concern they have with option (to minimize group bias effect)
- Group discussion of strengths and weaknesses
- Probe perceived impact on their region and region where it's generated

What "costs" are most important to you?

Present/discuss potential roles for IPP's and customer-based generation.

## Proposed Solutions

*Split group into 2-3 smaller groups.* Ask respondents to prepare a solution for addressing BCH's future electricity needs for 2007 and beyond. If BC Hydro needs 1000 units of energy, what options would they want to BCH to acquire (totalling to 1000 units). They should also consider the roles of IPP's & Powersmart. Ask them to add/consider other thoughts/direction for BC Hydro that may have occurred to them during the discussion.

Each small group will present their solutions and larger group will discuss.

### **8.0 Conclusion (5 min)**

Moderator to check with viewers re. additional questions.

Thank & Release

## Description of Resource Types

### Large Hydro

A hydroelectric facility where water is stored in a reservoir behind a dam. When released, the water travels through turbines, which drive the generators, creating electricity.

Example: W.A.C Bennett Dam, Mica Dam

### Run-Of-River Small Hydro

A hydroelectric facility that runs using only available stream flow. The facility does not have a large reservoir so electricity generation can occur only when water flow is sufficient enough to turn the turbines

### Natural Gas (Thermal Powerplant)

Natural gas is burned to create steam to turn a turbine and generate electricity.

Example: Burrard Thermal

### Coal

Coal is burned to create hot air or steam to turn a turbine and generate electricity.

### Biomass

Organic material and landfill gas are burned to produce hot air or steam to turn a turbine and generate electricity, such as at a pulp mill.

Example: Pulp & paper mills burning wood residue

### Wind

The kinetic energy of wind is captured by a system of airfoils or blades (windmills) that turn turbines and generate electricity.

### Geothermal

Water heated by the earth's core flows or is pumped to the earth's surface where it is converted to steam to turn a turbine and generate electricity.

### Tidal

The kinetic energy of the natural rise and fall of the tide in an estuary or bay of the ocean is harnessed to turn turbines and generate electricity.

## **Wave**

The kinetic energy of the natural rise and fall of waves in the ocean is harnessed to turn turbines and generate electricity.

## **Purchases (imported from out of province)**

Energy is purchased from outside the Province to take advantage of favourable market rates and excess capacity elsewhere. Short-term and long-term contracts are negotiated to meet electricity demand obligations.

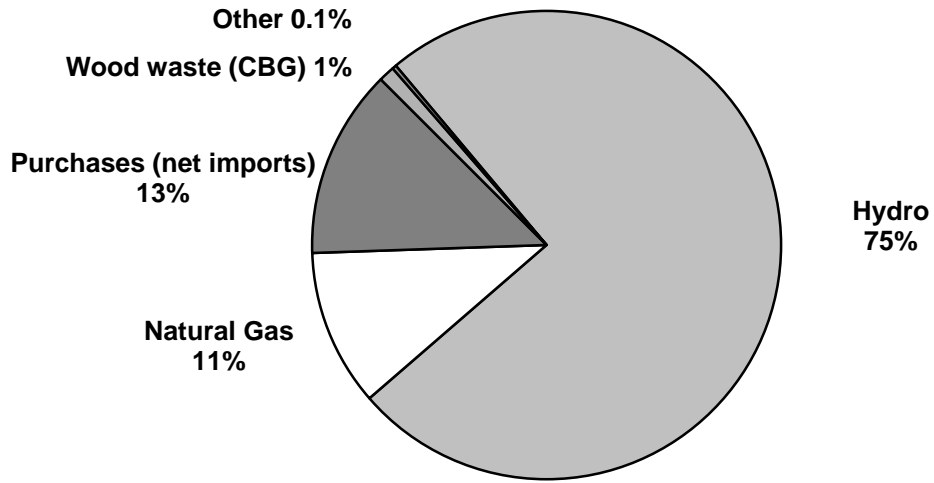
## **Cogeneration**

When electricity is produced as a by-product of a company's regular operations. For example, several mills in the BC forest sector generate steam and produce electricity from wood waste. The excess electricity can then be sold to BC Hydro.

## **Power Smart**

Energy efficiency programs to help households, business, and industry save energy and money.

# BC Hydro's Total Power Supply by Resource Type (2001)



# BC Hydro Electric System

## Major Facilities Only



(Fictitious Newspaper Article)

## BC Hydro's Integrated Electricity Plan Ensures Reliable Future Energy Supply

If you knew you were going to need more electricity to run your home each year, but didn't want to spend more to pay for it, what would you do?

A smart homeowner would simply find ways to conserve or reduce the use of his or her energy. But when you are a company responsible for providing a reliable source of energy to nearly four million people, you might not have that option. That's why BC Hydro will have to consider how to supplement its current supply with additional energy sources through its Integrated Energy Plan, an assessment of the company's ability to meet its customers' current electricity needs.

The plan will outline how the company will acquire new resources to supply existing and new domestic electricity to customers in the future. The demand for electricity in British Columbia is expected to increase by 1.7 per cent a year for the next 10 years. The need will be greatest in the Lower Mainland and Vancouver Island regions, which consume about 70 percent of the province's electricity. Demand is increasing due to population increases, and an expanding economy (business and industry).

"The Integrated Electricity Plan shows BC Hydro does not have enough existing and committed resources to meet additional customer demand beyond 2007," said BC Hydro's Strategic Issue manager Ron Monk. "In order to meet demand beyond 2007, Hydro is examining various resource options which will be selected based on technical planning criteria, corporate objectives, policy directions and public input. The options we are looking at include hydroelectric, natural gas, coal, woodwaste and alternative technologies such as wind and geothermal. The Integrated Electricity Plan will ensure that the province continues to have enough electricity at a reasonable cost."

*"The challenges that we're facing within the integrated system are mainly within the Lower Mainland and Vancouver Island areas because this is where electricity demand is the greatest," says Ron. "With this in mind, it is always beneficial building or acquiring new generation as close to the area that needs it as possible so as to cut down on line losses and the possibility of transmission outages."*

BC Hydro's generation system extends throughout the various regions of the province, and includes 29 integrated hydroelectric generating stations, one thermal steam station and two combustion turbine stations. About 80 percent of BC Hydro's installed generation capacity is at hydroelectric installations in the Peace and Columbia River basins.

## RESOURCE TYPE FACT SHEETS

### NATURAL GAS

**Location:** Lower Mainland, Vancouver Island, Central Interior

**Transmission Requirements:** update transmission system, additional pipelines for natural gas supply, construction of gas storage facilities, access roads

**Environmental Costs:** green house gases (global), emissions (e.g. smog), transmission requirements (as above)

**Capital/Operations/Maintenance Costs:** smaller up-front capital investments, larger long-term operations & maintenance costs. Facility/plant has shorter life span than hydro facilities (30 years versus 60 years)

**Rate Impacts:** over the long-term, rates would be impacted by fuel prices

**Risks:** to fuel price volatility

**Resource Potential:** abundance of natural gas inside and outside of the province, but a depleting fossil fuel

**Dependability:** near 100% dependable assuming the fuel is available. Time-outs required for maintenance

**Energy Output:** 130 units per facility

## **COAL**

**Location:** East Kootenays, mid/north Vancouver Island

**Transmission Requirements:** upgraded/new infrastructure would be needed for the East Kootenays; negligible for the Island – infrastructure primarily in place

**Environmental Costs:** green house gases (global), and emissions (e.g. smog) worse than for natural gas, transmission requirements (as above)

**Capital/Operations/Maintenance Costs:** smaller up-front capital investments, larger long-term operations & maintenance costs

Facility/plant has shorter life-span than hydro facilities (30 years versus 60 years)

**Rate Impacts:** coal is traditionally low cost, avoids price volatility of natural gas; over the long-term, rates could be impacted by the cost risks associated with emissions

**Risks:** emissions costs uncertain due to Kyoto (and much more significant than for natural gas)

**Resource Potential:** abundance of coal inside and outside of the province, but a depleting fossil fuel

**Dependability:** near 100% dependable assuming the fuel is available. Time-outs required for maintenance

**Energy Output:** 190 units per facility

## **LARGE HYDRO (facility with reservoir)**

**Location:** Northern B.C. (Peace River)

**Transmission Requirements:** negligible – infrastructure primarily in place

**Environmental Costs:** construction of a new dam, river flow/level impacts

**Capital/Operations/Maintenance Costs:** largest up-front capital investment, but well defined/predictable and relatively small operations & maintenance costs

**Rate Impacts:** low-cost generation, with minimal impact on rates over the long-term

**Risks:** a reliable source of electricity supply, but reservoir levels may be subject to seasonal weather variations (snow pack and rainfall), long-distance transmission (electricity loss, outages, security)

**Resource Potential:** very good, as a likely location for a new dam would be on an existing and proven reservoir/river system

**Dependability:** fairly dependable, but varies with weather, reservoir size, etc.

**Energy Output:** 530 units per facility

## **RUN OF RIVER SMALL HYDRO**

**Location:** various/throughout province (close to 900 identified potential sites)

**Transmission Requirements:** numerous individual transmission inter-connections required, land clearance, new access roads, rights of way construction, etc. – all due to remoteness and inaccessibility

**Environmental Costs:** minor in-stream disturbances, transmission requirements (as above)

**Capital/Operations/Maintenance Costs:** relatively small up-front capital investment per facility, well defined/predictable and relatively small operations & maintenance costs

**Rate Impacts:** over the long-term, rates would increase even more so if run of river was heavily relied upon to meet future needs

**Risks:** Seasonal variations in weather and thus, variation in river flows, freeze-up of rivers, electricity losses

**Resource Potential:** Good due to steepness of mountain terrain and high rainfall in B.C.

**Dependability:** Less dependable than large hydro due to stream flows and rainfall (no reservoir), but more dependable than wind

**Energy Output:** 6 units per facility

## **WIND/GEOTHERMAL**

**Location:** Wind – Peace Region and North coast; Geothermal – Pemberton, Lillooet, Whistler

**Transmission Requirements:** numerous individual transmission inter-connections required, new access roads, rights of way construction, etc.,

**Environmental Costs:** removal of vegetation/forest for wind development (40 turbines per wind development, and 40 hectares per wind development), transmission requirements (as above)

**Capital/Operations/Maintenance Costs:** relatively small up-front capital investment, but well defined and predictable operations & maintenance costs

**Rate Impacts:** over the long-term, rates would increase even more so if wind/geothermal was heavily relied upon to meet future needs

**Risks:** variations in weather patterns, availability of natural resources, electricity losses

**Resource Potential:** Wind - good potential, but much of it remote with difficult accessibility; Geothermal - good

**Dependability:** Wind – the least dependable of all resources due to variable wind and weather; Geothermal - dependable

**Energy Output:** Wind – 25 units per facility (maximum of 15 facilities possible); Geothermal – 35 units per facility (maximum of 3 facilities possible)

## **BIOMASS**

**Location:** various/near forestry industry

**Transmission Requirements:** negligible due to existing industry tie in to transmission lines

**Environmental Costs:** considered neutral as it is part of the natural carbon cycle

**Capital/Operations/Maintenance Costs:** relatively low/moderate up-front capital investment, well defined/predictable and relatively small operations & maintenance costs

**Rate Impacts:** Over the long-term, no significant impact on rates

**Risks:** availability of fuel varies with the state of the forestry industry

**Resource Potential:** varies with the state of the forestry industry

**Dependability:** near 100% dependable assuming the fuel is available.

**Energy Output:** 10 units per facility (maximum of 10 facilities possible)

## **POWER SMART**

**Location:** various/throughout province

**Transmission Requirements:** No transmission reinforcement likely, since Power Smart will most likely reduce transmission constraints especially when located in the Lower Mainland and Vancouver Island

**Environmental Costs:** None

**Capital/Operations/Maintenance Costs:** Capital costs to implement energy efficiency initiatives and projects. No long-term operations or maintenance costs

**Rate Impacts:** Over the long-term, downward pressure on rates as there would be less growth of consumption

**Risks:** Degree of customer participation has some uncertainty

**Resource Potential:** Proven, very good potential

**Dependability:** Short-term dependability, long-term variable dependability due to natural conservation catching up with induced conservation

**Energy Output:** 235 units

# RESOURCE POTENTIAL

<b>Type</b>	<b>Energy Output Per Facility</b>	<b>Maximum Facilities Possible</b>	<b>Total Energy Potential</b>
<b>Natural Gas</b>	130 units	No maximum	Unlimited
<b>Coal</b>	190 units	No maximum	Unlimited
<b>Large Hydro</b>	530 units	No maximum	Unlimited
<b>Run of River Small Hydro</b>	6 units	<b>900 facilities/sites</b>	5400 units
<b>Wind</b>	25 units	15 facilities	375 units
<b>Geothermal</b>	35 units	3 facilities	105 units
<b>Power Smart</b>	235 units	N/A	235 units
<b>Biomass</b>	10 units	10 facilities	100 units

**SOLUTION MUST TOTAL APPROXIMATELY 1000 UNITS.**