

2004

Integrated Electricity Plan



Part 1 Introduction and Planning Objectives

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Executive Summary

BC Hydro is a commercial Crown Corporation owned by the province of British Columbia. As one of the largest electric utilities in Canada, BC Hydro serves more than 1.6 million customers in an area containing over 94 per cent of British Columbia's population. Its integrated electric system includes over 10,000 megawatts of generating capacity, two gas-fired thermal power plants and approximately 47,000 GWh of yearly energy on average from 29 hydroelectric facilities. Responsibility for managing these resources requires BC Hydro to be proactive and prudent in planning for the future.

BC Hydro's vision is to be the leading sustainable energy company in North America. This means BC Hydro will find a balance among social, environmental and financial factors when making decisions.

As a public utility, BC Hydro is obliged to meet customer demand. Failure to serve is not an acceptable option. Thus, BC Hydro's first and foremost responsibility is to ensure that it is able to reliably supply electricity as and when demanded by its customers.

The 2004 Integrated Electricity Plan (IEP) presents BC Hydro's long-term plan for acquiring the demand-side and supply-side electricity resources needed to meet anticipated customer needs. It includes a review of the economic and regulatory context in which BC Hydro conducts its electricity planning, the existing demand-supply outlook, an inventory of resource options and a comparison of alternative resource portfolios to meet electricity requirements. It estimates the nature and quantity of the resources that BC Hydro will need over the next 20 years and outlines specific follow up actions to meet that need in an Action Plan.

The strategic direction provided by the 2004 IEP will guide the management of BC Hydro's owned and contracted energy resources, as well as future acquisition processes.

BC Hydro's Business Environment

The 2004 IEP is being developed during a period of transition in the electric utility industry in B.C. and across North America. North American electricity and gas markets continue to evolve, as exemplified by:

- Substantive risks and uncertainties in the western North America electricity market, highlighted in 2000 by soaring prices and electricity supply shortages, and currently by a lack of clear direction regarding further electricity market reform;
- Increased stakeholder concern over project development and increased risk regarding regulatory time frames for project approvals;
- On-going, albeit slow and uncertain, development of regional transmission organizations (RTOs) to promote efficient wholesale electricity trading;
- Increased uncertainty regarding future sources and prices of natural gas; and
- Outcomes of the August 2003 power blackout in northeastern North America and its subsequent investigations.

In addition, the provincial government has implemented the B.C. Energy Plan, which includes the following key elements:

- Establishment of cornerstone policies guiding electricity rates and sources of supply;
- Creation of a separate corporation, the British Columbia Transmission Corporation (BCTC), to plan, operate and manage the bulk transmission system in B.C.;
- Direction regarding BC Hydro's existing generation resources ("The Heritage Contract"), stepped rates, and retail access for transmission-voltage customers;
- Direction requiring BC Hydro to acquire new sources of electricity from the private sector;
- Development of a voluntary BC Clean energy target for electricity distributors such as BC Hydro (50% of new supply over the next ten years and may raise electricity rates by 0.1 to 0.2 percent per year);
- Amendments to the *Utilities Commission Act* dealing with the review and treatment of expenditures relating to the acquisition of demand-side and supply-side resources; and
- Specific direction regarding regulatory review of the proposed Vancouver Island Generation Project.

Various other government policy and legislative developments, relating to Burrard Thermal Generating Station, water use planning, greenhouse gas controls and First Nations issues are also underway. In addition, BC Hydro faces a variety of other planning opportunities and challenges, such as the replacement of aging resources, the evolution of new technology, and the means to manage risk in a volatile business environment.

Status of the 2000 Action Plan and Recent Resource Acquisition Initiatives

In 2000, BC Hydro updated its 1995 IEP. BC Hydro's 2000 IEP Update identified a four-year Action Plan to acquire or maintain new projects and programs identified in the 20-year outlook. The 2004 IEP summarizes the current status of initiatives from the 2000 IEP Update.

In 2001, BC Hydro's management reviewed the 2000 IEP and undertook a number of new initiatives to meet future requirements in light of rapidly changing circumstances in the volatile conditions at that time. In particular, Power Smart and energy calls from the private sector were added to complement and defer the need for future larger gas-fired generators identified in the 2000 IEP.

Key resource acquisition programs initiated since the 2000 IEP Update include a 10-Year demand-side management (DSM) program (Power Smart Plan), a 2001 Green¹ Energy Call, a 2002 Green Energy Call and a 2002 Customer-Based Generation Call.

¹ The term "Green" refers to energy resources that meet BC Hydro's definition of energy that is renewable, environmentally and socially responsible and licensable.

Approach to the 2004 IEP

The 2004 IEP presents BC Hydro's long-term plan for acquiring new generation, transmission and demand-side resources. The process for developing this plan involves a series of steps, including:

- Developing a 20-year load forecast and assessing how existing and committed resources compare to it, as well as assessing the nature and magnitude of gaps in the resulting demand-supply balance;
- Engaging interested parties at key points in the process to inform them, obtain and document their feedback, and considering how to incorporate that feedback into the IEP;
- Determining and characterizing the resource options that are available to fill the gaps;
- Developing and comparing various resource portfolios, including transmission infrastructure needs, against established criteria, while also considering key risks and uncertainties; and
- Preparing an Action Plan that sets out near- to mid-term steps to help meet the identified needs.

2004 IEP Objectives

Electricity planning objectives provide the basis on which to identify and compare alternative portfolios. The 2004 IEP objectives, consistent with the B.C. Energy Plan objectives and BC Hydro's service plan, are summarized in Table E.1.

Table E.1. B.C. Energy Plan Objectives and 2004 IEP Objectives

B.C. Energy Plan Objectives	2004 Integrated Electricity Plan Objectives
Low electricity rates and public ownership of BC Hydro	Minimize long-term ratepayer costs by establishing the least cost sequence of resources on a risk-adjusted basis that meets customers' needs as well as other BC Hydro and provincial government policy objectives.
Secure, reliable supply	Maintain adequate dependable capacity and energy capability to meet customer needs through the application of relevant electric industry and BC Hydro reliability planning criteria.
Private sector development of new electricity generation	Seek proposals from the private sector to supply power to BC Hydro.
Environmental responsibility and no nuclear power sources	Enhance environmental and social responsibility with a voluntary 50 per cent BC Clean energy target through Customer-Based Generation, Green Energy, Resource Smart Programs and project proposals that meet or exceed environmental and social requirements. Achieving the Clean Energy target may raise electricity rates by 0.1 to 0.2 per cent per year over the next decade.

Utility planning is subject to risks and uncertainties related to supply, demand, price and other considerations. BC Hydro uses risk assessment analysis (in particular, sensitivity and scenario analysis) to guide the management of tensions between minimizing costs and risks.

Secure, reliable supply is a paramount objective for BC Hydro. This is particularly true given the nature of BC Hydro's supply source (primarily hydroelectric power) and hence reliance on weather patterns. BC Hydro's preference for reliable and secure electricity supply drives electricity plans to ensure domestic loads are served under low water conditions.

2004 IEP Report Elements

BC Hydro's 2004 IEP has nine components:

- Summary
- Part 1 Introduction and Planning Objectives
- Part 2 Demand-Supply Outlook
- Part 3 Resource Options
- Part 4 First Nations and Stakeholder Engagement
- Part 5 Portfolio Evaluation Process
- Part 6 Portfolio Evaluation Results
- Part 7 Action Plan
- Glossary

1 BC Hydro Overview

BC Hydro is a commercial Crown Corporation owned by the province of British Columbia. BC Hydro's board of directors is appointed by the provincial government and is accountable to the Minister of Energy and Mines. As a public utility, BC Hydro is subject to regulation by the British Columbia Utilities Commission (BCUC).

As one of the largest electric utilities in Canada, BC Hydro serves more than 1.6 million customers in an area containing over 94 per cent of British Columbia's population. BC Hydro provides least cost energy solutions to its customers in an environmentally and socially responsible way. With an efficient and reliable supply of electricity, BC Hydro has a world-class integrated electric system of over 10,000 megawatts of generating capacity, over 87 per cent of which is hydroelectric. Due to this efficient, reliable system, British Columbians enjoy high reliability at some of the lowest electricity rates in the world.

BC Hydro's vision is to be the leading sustainable energy company in North America. This means BC Hydro will find a balance among social, environmental and financial factors when making decisions.

BC Hydro's primary business activities are the generation and distribution of electricity. Approximately 47,000 gigawatt-hours of electricity are generated annually from 29 integrated hydroelectric facilities. BC Hydro also has one 913 MW gas-fired steam turbine power plant (Burrard) and one 46 MW gas-fired combustion turbine power plant (Prince Rupert)². Electricity is delivered safely and dependably to customers through an interconnected system of over 72,000 kilometres of publicly owned transmission (69 kV and above) and distribution (less than 69 kV) lines. The transmission assets continue to be owned by BC Hydro. However, the transmission system is now planned, operated and managed by the British Columbia Transmission Corporation (BCTC) on behalf of BC Hydro. BCTC is also a commercial Crown Corporation owned by the province of British Columbia, and is a public utility regulated by the BCUC.

Some of BC Hydro's customers live in areas too remote to be served by transmission lines; these non-integrated areas are served with electricity generated by local diesel engines and gas turbines or small hydroelectric stations. These generation plants are primarily BC Hydro-owned, although some electricity supply is provided under contract with independent power producers (IPPs). The planning and operation of BC Hydro's non-integrated areas are outside the scope of the 2004 Integrated Electricity Plan.

BC Hydro's wholly owned power marketing subsidiary, Powerex, trades energy outside the province. This includes selling any domestic surplus and, if cost-effective, purchasing power for domestic use. BC Hydro also uses its flexible hydroelectric storage reservoir system to buy energy when prices are low and to sell energy when prices are high. Powerex has become a leading marketer of wholesale energy products and services in western Canada and the western United States, and is a growing player in other markets in North America.

² BC Hydro also has a gas-fired combustion turbine in Fort Nelson, which is integrated with the Alberta system but not with the BC Hydro integrated system.

Since the late 1980s, BC Hydro has also been purchasing power from independent power producers (IPPs). IPPs currently contribute approximately 10 per cent of BC Hydro's total reliable energy capability.

2 Introduction to 2004 Integrated Electricity Plan

An integrated electricity plan (IEP) is an electric utility's long-term plan for acquiring the resources needed to meet anticipated customer needs. IEPs have been an integral part of BC Hydro's overall business planning process for many years. This, in turn ensures that BC Hydro meets its obligation to supply reliable electricity service to its customers at the least cost consistent with planning objectives.

Integrated electricity systems are complex and capital-intensive. In addition, most new resources require significant lead times to build. As a result, electric utilities plan ahead to be sure that the required resources will be in place when needed. IEPs are typically based on load forecasts and resource options that cover 15 to 20 years. Taking this long-term view does not mean that BC Hydro is locked into each of the resource options identified over the planning horizon. In fact, the IEP must be sufficiently flexible to respond to changing market conditions and future uncertainties. In other words, it must meet planning objectives against a range of possible futures.

BC Hydro periodically reviews and updates its IEP. BC Hydro's most recent IEP was issued in 2000 as an update to the 1995 IEP. A new IEP was to have been completed in 2001. However, the 2001 IEP planning process was put on hold in August 2001, pending the B.C. government's review of provincial energy policy. Following the release of the B.C. Energy Plan in November 2002, BC Hydro proceeded with the development of the 2004 IEP.

The primary purpose of BC Hydro's 2004 IEP is to project the nature and quantity of BC Hydro's resource needs over the next 20 years. This strategic direction guides the management of BC Hydro's owned and contracted energy resources, as well as future acquisition processes.

Specifically, the 2004 IEP:

- Provides the planning foundation for current and future demand-side management programs (Power Smart), private sector calls for electricity, and other resource acquisitions;
- Demonstrates to First Nations, stakeholders and the BCUC that BC Hydro has a plan to meet future customer demand for electricity that recognizes key risks and uncertainties;
- Considers and incorporates, where feasible, feedback from the First Nations' and stakeholder engagement process;
- Demonstrates how environmental, social and economic considerations are included in electricity planning; and
- Identifies an Action Plan that specifies initiatives to implement the IEP.

3 Business Environment and Planning Context

BC Hydro's electricity plans and planning processes are shaped by changing market structures and conditions, government policies and directives and electricity technology developments. The 2004 IEP is being developed during a period of transition for BC Hydro. In particular, a number of developments have occurred since the release of the 2000 IEP that needed to be considered in the 2004 IEP process. Key developments include:

- Continued evolution of North American electricity and gas markets;
- Development and implementation of a new Energy Plan for B.C.; and
- Various other government policy and legislative developments relevant to BC Hydro's demand-supply outlook and resource mix.

The following sections discuss key aspects of regional electricity and gas markets, implementation of the B.C. Energy Plan, and other developments.

3.1 North American Electricity and Gas Markets

The evolution of electricity and gas markets over the last several years, particularly in western North America, illustrates the reality of the new risks facing electric utilities. Beginning in 2000, the western North American electricity market experienced skyrocketing electricity prices and electricity supply shortages. The crisis was felt throughout western North America, but was most prevalent in California, in part, due to limitations in that state's electricity market design. The price increases and electricity supply shortages were exacerbated by a number of factors that prevailed across western North America at the time, including:

- New generation development had not kept up with demand growth;
- Drought conditions had caused a reduction in hydroelectric generation; and
- Increased demand for natural gas had raised fuel costs for gas-fired thermal generation.

The subsequent rush to build new "merchant" generation facilities, combined with regulatory intervention to cap electricity prices and conservation efforts by utilities and consumers, caused electricity prices to decline. Wholesale electricity prices fell further following a broad economic slowdown and relatively mild summers. These and other factors also eased the demand for natural gas.

However, because the resulting surplus situation discourages new generation development, it will potentially set up another cycle of shortage and surplus. The reality of these cycles emphasizes the need to address their associated risks through adequate planning and acquisition activities. The current utility planning trend is moving toward increasing the proportion of generation that is fixed in price or term in order to ensure there is sufficient supply to meet demand at stable prices.

Currently, the western North American wholesale electricity market is characterized by:

- Generation and trading sectors that have experienced a continued decline in total shareholder value;
- Reduced wholesale electricity trading as key players exited the market; and
- A lack of clear direction or rules regarding further electricity market reform (particularly in the U.S.).

Wholesale electricity market reform continues to progress, but slowly. In particular, the conjunction of energy market volatility and investor and regulatory uncertainty continue to call into question the future of the unregulated merchant generation business model in North America that supported the building of generation projects without secure contract purchase agreements in place. Most new independent power producers (IPPs) now require security in the form of long-term energy purchase contracts in order to acquire project financing. Energy trading is also returning to its traditional activities, which focus on balancing inter-regional supply and demand.

For long-term electricity planning purposes, a number of assumptions regarding the broader North American electricity and gas markets have been adopted for the development of the 2004 IEP. For example, gas-fired generators are the marginal resource generation most of the time, particularly in the western North American wholesale electricity market. Most industry experts believe that future wholesale electricity prices will continue to be positively correlated to natural gas prices and their attendant uncertainty and volatility. Over the long term, electricity prices are expected to converge to the unit cost of a combined cycle gas turbine (CCGT) plant.

3.1.1 Regional Transmission Organizations and RTO West

The U.S. Federal Energy Regulatory Commission (FERC) is continuing to promote the formation of regional transmission organizations (RTOs). FERC still seeks to ensure that RTOs and independent system operators (ISOs) have sound wholesale market rules and monitoring in place. However, FERC is working with the various regions in the U.S. to determine whether the benefits of RTO formation outweigh the costs and will allow phased-in implementation and sequencing of wholesale market rules tailored to each region.

BC Hydro has been involved in the ongoing development of RTO West, a proposed northwest regional transmission organization. With the creation of the BCTC, and the government designation of key agreements between BC Hydro and BCTC, the BCTC is now representing B.C.'s interests in the Filing Utilities group that is working on the formation of RTO West. The government has established a process whereby the interests of B.C. stakeholders, including BC Hydro, will be incorporated into any negotiating positions that BCTC will take on RTO formation. BC Hydro may also continue to participate in the design of RTO West through the various sub-committee processes.

Expected benefits of participating in RTO West are:

- Increasing market efficiencies (e.g. reducing transaction costs across multiple control areas);
- Increased economic opportunities for B.C. suppliers; and
- Electricity trade benefits for BC Hydro.

Because of the many stakeholders participating, the important issues to be resolved and the multiple regulatory jurisdictions, the development of RTO West has progressed very slowly. However, it is expected that RTO West will ultimately be formed and its continuing development may result in potential future challenges for ensuring continued adequate transmission and market access between B.C. and its neighbouring regions if BC does not continue to participate. Therefore, it is important that BC Hydro continue to participate in this process and ensure its trade and load serving interests are addressed.

3.1.2 Northeastern North American Power Blackout

In August 2003, much of Ontario and the northeastern U.S. suffered a massive electric system blackout that left millions of customers without power for days. This blackout has heightened public concern about the reliability of electricity supply. A joint U.S.-Canada investigation was undertaken to determine the causes of the blackout in order to prevent such a widespread failure from recurring. Problems with the operation of the transmission network were identified as the main cause of the blackout. BC Hydro will continue to follow the investigations of these events, but to date has not identified any aspects that would indicate a need to change its resource planning reliability criteria.

3.1.3 Natural Gas Supply

BC Hydro relies on hydroelectric production for over 87 per cent of its electricity supply, with a small amount of woodwaste and natural gas-fired generation facilities currently making up the remaining supply. BC Hydro is therefore exposed to some risk with regard to natural gas supply and prices. Although the proportion of BC Hydro's natural gas-fired generation is small, the cost of natural gas has a large impact on the cost of energy for gas-fired generation.

There is significant uncertainty and varying industry perspectives on how future natural gas markets (supply and demand) will unfold and what future prices will emerge. Many industry experts believe that North America's long-term natural gas supply markets will respond to price levels to meet future demand, and will adjust for declining traditional natural gas supplies through several major developments. These include development of coal bed methane, new natural gas areas (e.g. Arctic and offshore), and liquefied natural gas (LNG) facilities to import natural gas from other parts of the world. Nevertheless, given the uncertainties, BC Hydro does not rely on a single natural gas price forecast for longer-term electricity planning purposes. Rather, BC Hydro employs a scenario-based approach and develops a range of future natural gas prices.

3.2 B.C. Electricity Market

A major development in the B.C. energy sector in the past year was the release of the government's new energy policy, *Energy for our Future: A Plan for B.C.* (the Energy Plan) in late November 2002. A significant portion of the Energy Plan deals with electricity and BC Hydro. The four cornerstones of the Energy Plan which relate to the electricity section are:

- Low electricity rates and public ownership of BC Hydro;
- Secure, reliable supply;
- More private sector opportunities; and
- Environmental responsibility and no nuclear power sources.

Specific aspects of the B.C. Energy Plan, most of which have already been implemented or are in the process of being implemented, have significant implications for BC Hydro's electricity plans and planning processes. These include:

- Transferring the planning, operation and management of transmission system from BC Hydro to BCTC;
- Establishment of a Heritage Contract that preserves the benefits of historic investments in BC Hydro's flexible, low-cost generation resources;
- Establishment of stepped rates and increased retail transmission access whereby, under new rates, large electricity consumers will be able to choose a supplier other than the local distributor;
- Amendments to the *Utilities Commission Act* relating to utility plans and requirements to file energy supply contracts with the BCUC;
- BCUC review of BC Hydro's revenue requirement;
- BCUC review of BC Hydro's proposed Vancouver Island Generation Project (VIGP) to determine if it is still the most cost-effective means to reliably meet power needs on Vancouver Island;
- Developing new electricity generation through the private sector, with BC Hydro restricted to improvements at its existing facilities;³ and
- Establishing a voluntary goal for electricity distributors to acquire 50 per cent of new supply from BC Clean resources over the next 10 years.

These initiatives collectively represent substantial changes for BC Hydro. The following sections present the status of these initiatives and their implications for the 2004 IEP.

3.2.1 British Columbia Transmission Corporation

In accordance with the Energy Plan, British Columbia Transmission Corporation (BCTC) was incorporated in May 2003 as a wholly government-owned Crown corporation. The B.C. government passed the *Transmission Corporation Act* in May 2003, enabling BCTC to assume the planning, operation and management of BC Hydro's transmission assets. BCTC is independent from BC Hydro, with a separate board of directors. It is responsible for ensuring open and non-discriminatory access to the B.C. transmission system. Employees of BC Hydro's transmission line of business were transferred to BCTC in August 2003. In the first phase of operation, BCTC will operate under BC Hydro's Wholesale Transmission Service (WTS) tariff. By December 2004, BCTC must apply to the BCUC for approval of its own transmission tariff. By spring 2005, BCTC will provide transmission service under that tariff and will be directly regulated by the BCUC.

³ Any proposed new BC Hydro hydroelectric facility, such as Peace River Site C, must be brought to the provincial Cabinet for approval.

3.2.2 Heritage Contract, Stepped Rates and Retail Access

In March 2003, the province issued terms of reference for a BCUC inquiry related to a Heritage Contract for BC Hydro's existing generation resources and for stepped rates and transmission access. In April 2003, BC Hydro submitted its proposal for a Heritage Contract, Stepped Rates and Access Principles to the BCUC. The BCUC held a public inquiry in July and August 2003, which entailed significant stakeholder interest and participation. On October 17, 2003, the BCUC submitted its recommendations to the provincial government largely endorsing BC Hydro's proposal. On November 28, 2003, the government accepted the majority of the BCUC recommendations.

Key elements of the government direction are:

- Pursuant to the *BC Hydro Public Power Legacy and Heritage Contract Act*, a "Heritage Contract" is created to preserve the benefits of the existing hydroelectric and thermal resources for BC Hydro's customers. The Heritage Contract requires BC Hydro Generation to provide 49,000 GWh per year⁴ to BC Hydro Distribution. Of this, 48,845 GWh per year will be supplied to the integrated system.⁵ The IEP is based on the assumption that no termination notice would be given under the Heritage Contract; thus the contract would continue for at least the full 20-year planning horizon.
- Any net annual electricity income (i.e. trade income) benefits up to \$200 million will go to BC Hydro's customers to offset domestic revenue requirement (i.e. offset rate increases or incur rate decreases). Any negative trade income will be borne by the provincial government.
- New stepped rates and access principles for high voltage customers were proposed. High voltage customers are large industrial customers who take energy through a rate designed for heavy users. The intent of the new stepped rate structure is to provide pricing signals that will encourage large industrial customers to conserve energy (demand-side management) or generate energy from their own operations (self-generation). The new rate structure will also support opportunities for retail access for IPPs by allowing large customers to choose from suppliers other than BC Hydro for a portion of their load.

3.2.3 Utilities Commission Act Amendments and New Resource Planning Guidelines

The *Utilities Commission Act* (UCA) was amended in May 2003 pursuant to the B.C. Energy Plan. Changes were made to section 45, addressing the application process for a certificate of public convenience and necessity (CPCN). In addition, a new subsection, s. 45 (6.1), was added, requiring utilities to file, in the form and at the times required by the Commission, plans for capital expenditures and acquisition of supply-side and demand-side resources.⁶ Other planning-related amendments allow the Commission to permit utilities a return on investments made to reduce energy demand (s. 60 (1)) and make changes

⁴ Less Skagit River Treaty Obligations.

⁵ The remaining 155 GWh per year is from Fort Nelson Thermal Generating Station, which is in the non-integrated system.

⁶ The Commission has not yet issued an order under s. 45 (6.1).

to the nature and filing of energy supply contracts (ss. 68, 71). The Commission also issued its Resource Planning Guidelines on December 15, 2003, and BC Hydro has prepared the 2004 IEP in accordance with those Guidelines.

3.2.4 Private Sector Development and Clean Energy Target

In accordance with the B.C. Energy Plan, BC Hydro plans to acquire new electricity supply from the private sector. BC Hydro expects to meet its incremental electricity requirements by periodically issuing public calls for tenders. BC Hydro needs to monitor the energy markets in B.C. and to have a good sense of the types of projects (size, technology and location) that might be offered in response to a call for tenders. However, BC Hydro will not be able to maintain a shelf-ready suite of generating projects from which future resource requirements will be met, because responses to calls for tender cannot be expected to be shelf-ready for indefinite periods of time. This necessarily has an impact on the electricity planning process and the scope and details of the IEP.

The B.C. Energy Plan also creates a target for BC Hydro and other distribution utilities to voluntarily acquire 50 per cent of new supply through BC Clean energy sources, defined as technologies that result in a net environmental improvement relative to existing energy production. The B.C. Energy Plan contemplates that the Clean Energy target may raise electricity rates by 0.1 to 0.2 per cent per year over the next decade. BC Hydro intends to meet its obligation to provide electricity on a least cost basis while meeting the 50 per cent BC Clean target.

Purchasing power from IPPs has risks, including credit, siting and regulatory approval risks and technical implementation challenges (e.g. interconnections). BC Hydro must reflect these risks in its plans in order to ensure there is sufficient supply to meet its customers' needs.

3.2.5 Review of Vancouver Island Generation Project and BC Hydro's Vancouver Island Call for Tenders

In March 2003, BC Hydro's wholly owned subsidiary, Vancouver Island Energy Corporation, applied to the BCUC for a certificate of public convenience and necessity (CPCN) to develop the Vancouver Island Generation Project (VIGP), a 265-MW natural gas-fired electricity generation plant proposed for Duke Point in Nanaimo. This plant was planned to meet a shortfall in dependable capacity expected to arise from the retirement, for planning purposes, of the high-voltage direct current (HVDC) system between the Lower Mainland and Vancouver Island. The plant was also expected to operate as a baseload facility, contributing approximately 2,100 GWh per year to system energy.

On September 8, 2003, the BCUC issued a decision denying BC Hydro's application to build the VIGP. However, the BCUC accepted BC Hydro's evidence on the need and urgency for new generating capacity on Vancouver Island and encouraged BC Hydro to issue a call for tenders to determine whether a lower cost alternative exists to meet the Island's needs. Pursuant to provincial direction, BC Hydro will offer the VIGP for sale to an IPP as long as it makes economic and financial sense to do so.

On October 31, 2003, BC Hydro issued a Vancouver Island call for tenders. It is an open call for 150 to 300 MW of dependable capacity and associated energy with a commercial operation date set at May 2007. The process will proceed in two phases, a pre-qualification phase and a tender phase. An independent

reviewer has been retained to ensure process transparency and fairness. Announcement of the preferred option or options is expected to be in fall 2004.

3.3 Other Public Policy, Legislative, Regulatory and Stakeholder Issues

A variety of other public policy, legislative and regulatory developments also create potential risks and uncertainties for BC Hydro's electricity plans and planning processes. The areas discussed below are provided as illustrative examples rather than a comprehensive list:

- MLA review of Burrard Thermal
- Water use planning;
- Future greenhouse gas (GHG) emissions control;
- Other environmental regulatory developments;
- Electricity infrastructure siting constraints; and
- First Nations issues.

3.3.1 MLA Review of Burrard Thermal

The province is currently conducting a technical review of the gas-fired Burrard Thermal Generating Station. This review is being led by a group of members of the legislative assembly (MLAs). The range of options being considered include phasing it out, operating it as is, and repowering to 500 MW, 800 MW or 1,400 MW. Burrard is currently among BC Hydro's highest cost resources due to its reliance on natural gas fuel and its lower efficiency relative to newer gas-fired thermal generating plants. Consequently, BC Hydro currently expects to use Burrard only sparingly over the next few years.

Nevertheless, Burrard Thermal remains an important resource, as it is the only large central power station located in southwestern B.C., BC Hydro's major load centre. The plant, therefore, continues to have a role in BC Hydro's supply mix for security of supply and transmission support (i.e., for voltage stability). Burrard Thermal is part of the Heritage assets and may not be sold or disposed of, as provided by the *BC Hydro Public Power Legacy and Heritage Contract Act*, which received royal assent in November 2003.

3.3.2 Water Use Planning

In 1998, the province announced its policy on the water use planning (WUP) process. This multi-stakeholder review process is designed to address the competing interests for water use (e.g. fish, recreation and habitat management) associated with existing and new electricity generation facilities. Each water use plan, once authorized under the *Water Act*, will define the operating boundaries of each licensed facility. Water use plans are being developed through a collaborative process designed to consider economic, environmental and social values. Participants can include government agencies, First Nations, local citizens and other interested parties.

Under the program, 23 water use plans are being developed for BC Hydro's hydroelectric facilities. Most of these plans have been completed or are nearing completion. One outcome of the water use planning process is likely to be some reallocation of water from power production to non-power values. This will result in a reduction in the amount of hydroelectric energy available from BC Hydro

generation. However, uncertainty exists about the magnitude of this reduction, as the WUP program is not expected to be complete until the end of 2004.

3.3.3 Future Greenhouse Gas Emissions Control

Canada formally adopted the Kyoto Protocol in December 2002. Since then, all levels of government and industry have been involved in a process to design climate change policy that will reduce greenhouse gas (GHG) emissions in line with the targets agreed to in the protocol. The federal government's plan calls for the negotiation of sectoral covenants with large industrial emitters, including electricity generators, with access to an emission trading system to meet compliance at least cost to the Canadian economy. BC Hydro may be required to reduce emissions and/or purchase GHG credits in order to comply with domestic regulations. Emissions may be regulated as early as 2005.

How Canada implements GHG emission controls will determine whether BC Hydro faces significant costs related to its GHG emissions or is rewarded for its efforts on conservation, internal efficiency and green energy procurement. A favourable policy outcome for BC Hydro's ratepayers would mean minimal financial costs imposed on BC Hydro's thermal resources and the maximum credit possible granted to its emission-avoiding activities. Regulation of GHG emissions, if adopted in Canada, will have large and complex implications for future fuel and operating costs, energy supply options, siting issues, public expectations and concerns, environmental outcomes and the relative competitiveness of companies, regions and provinces. This issue is a significant source of uncertainty for BC Hydro's electricity planning process. Furthermore, divergent assessments of environmental and financial risks will continue to drive debate over future coal, gas, hydro, green energy or conservation supply choices and associated transmission constraints.

BC Hydro's current GHG management strategy incorporates a number of activities and policies, including risk management, policy input, regulatory compliance and voluntary public reporting. Examples include:

- Risk management such as investing in Power Smart, Resource Smart and Green energy to avoid emissions;
- Policy input such as proactive dialogue with government agencies and other stakeholders on the design of GHG policy options;
- Regulatory compliance as a requirement of BC Hydro's corporate environmental policy; and
- Voluntary reporting of emission levels on a regular basis.

3.3.4 Other Environmental Regulatory Developments

In June 2003, the *Species at Risk Act* was enacted, significantly expanding the federal scope of involvement in wildlife matters on public and private lands. As a result, B.C. is expected to enact wildlife legislation within the next year. The federal and provincial requirements protecting species at risk and critical habitat have the potential to affect how hydroelectric systems are operated and where they are built. Other environmental regulatory developments with electricity planning implications include:

- Evolving application and interpretation of the federal *Fisheries Act*;
- Water system operation and protection (*Drinking Water Protection Act*); and
- Potential application of the *Heritage Conservation Act* to reservoir shorelines.

3.3.5 Electricity Infrastructure Siting Issues

Environmental and social issues and increased regulatory requirements continue to challenge the siting of most new and existing electric generation and transmission infrastructure in B.C. For example, there are often conflicts tensions among reliability, cost and concerns over environmental impacts of locating power plants near urban load centres. There are also potential conflicts between development of projects in regions where impacts are local but most of the electricity consumers live elsewhere.

Green projects are also subject to siting and regulatory permitting hurdles. Local stakeholders have expressed concern about recreational and environmental impacts, as well as the need to provide additional local economic benefits above the applicable taxes.

Regional and municipal governments are asserting increasing interest in regulating infrastructure development in their region, particularly regarding environmental impacts. This was supported by a recent Supreme Court of Canada judgment upholding municipal authority to regulate cosmetic pesticide use, and by increased regulatory powers in the B.C. *Municipal Charter*. For example, in April 2003, the Squamish-Lillooet Regional District established rezoning requirements for all new energy developments, including a policy opposing new transmission corridors, as a result of community concern over the cumulative visual impact of power lines. With one regional district having established an approval process for new power developments, other districts or municipalities may consider implementing their own approval processes.

3.3.6 First Nations Issues

Key First Nations issues are emerging in relation to consultation, economic development and treaties. Aboriginal law is continuing to define the scope of the consultation required; however, the courts have confirmed that consultation includes accommodation. First Nations need not have established their aboriginal rights in court or concluded treaties in order to establish their right to be consulted. Inadequate consultation by the Crown can result in the courts setting aside ministerial approvals to third parties. Economic development for First Nations is a key priority for both the federal and provincial governments.

BC Hydro's approach to First Nations issues focuses on a commitment to building mutually beneficial relationships respecting BC Hydro's existing and proposed facilities. BC Hydro has developed a specific governing *Statement of Principles for Relations with Aboriginal Peoples*, which guides all employees in their interactions with Aboriginal peoples. These 15 principles relate to cooperation, communication, impact of operations, resolution of disputes, community and economic development, and employment.

3.4 Aging Generation and Transmission Facilities

BC Hydro's electricity planning process must consider not only the need for new resources to meet future load growth, but also new resources to replace existing assets that have reached the end of their useful lives. As a physical system ages, the probability of equipment failures increases. BC Hydro's assets are aging and will present increasing safety, reliability and financial risks. Adding to the risk is the fact that the life expectancy of the equipment is difficult to assess, creating a challenge in managing the tension between rising risk levels and the significantly higher cost of equipment replacement compared to maintenance. In addition, maintenance costs rise with aging equipment so that it costs more to maintain the system at the same level of risk.

As discussed in Section 3.2.5, the planned retirement in F2008⁷ of the high-voltage direct current (HVDC) transmission system serving Vancouver Island illustrates the additional planning challenges associated with replacing aging infrastructure. The exact timing of the retirement of the HVDC system is impossible to predict with certainty. However, its eventual failure is likely to be sudden. It is increasingly risky to rely on such a system without introducing a new supply alternative.

3.5 Technology

Utilities will likely face considerably change in the next twenty years, and technological innovation is poised to play a central role in that change both in impacting customer demand and in how power is generated. With respect to customer demand, technological innovation can decrease customer demand through energy efficiency, e.g., light emitting diodes are very efficient light sources. On the other hand, innovation tends to increase the diversity and number of electricity devices that people use.

With respect to power generation, condition assessment technologies and information technologies are increasingly used to optimize all assets and to manage aging assets that are being taxed by increasing trade and demand growth. The implications of changing technology for electricity planning are that resource evaluations may need to reflect anticipated efficiency improvements and cost reductions associated with future technological changes. For example, wind power costs have declined significantly since the technology was first commercialized and is expected to continue to decline with continued technological improvements.

For 2004 IEP, technological innovation are reflected in the following ways:

- Assumptions regarding the future end-use load forecast, and
- Sensitivity analyses around the cost of new resources.

3.6 Business Environment Implications for BC Hydro's Planning

BC Hydro's business environment is characterized by continuing market, regulatory and structural changes in the electricity sector and other related energy sectors (e.g., natural gas). These changes include changing economic conditions, electricity demands, fuel prices, technologies, government regulations, stakeholder expectations and other market forces. Meeting the

⁷ Dates marked with an F refer to BC Hydro's fiscal year, which ends March 31.

future electricity needs of BC Hydro's customers in this continuously evolving business environment and its attendant risks requires an electricity planning process that is flexible and dynamic.

Nevertheless, the planning process must still culminate in a documented plan for decision-making, namely, the IEP. As such, while the IEP is based on the best information available at the time it is issued, it is also limited to the extent that information is subject to change in the future. For IEP to be an effective decision-making tool, it must achieve a balance between decision-making under uncertainty and over-analysis. The 2004 IEP strives to find this balance in two ways.

First, the 2004 IEP is grounded in current business realities, thus representing a snapshot in time. For the 2004 IEP, the planning assumptions are linked to the Energy Plan, which explicitly defines BC Hydro's role within the provincial electricity sector. The IEP is also based on best available information and analysis with respect to anticipated electricity demand, resource options, commodity prices (e.g., gas and electricity) and other planning considerations.

Second, the 2004 IEP identifies and evaluates key planning risks and uncertainties. Electricity planning is not an exact science. For example, BC Hydro's predominant energy supply, hydroelectricity (i.e., water), is subject to the vagaries of weather. Consequently, energy supply is BC Hydro's single largest source of variability and uncertainty. Other important planning risks, such as changing natural gas prices and environmental regulations, must also be evaluated as part of the planning process. To evaluate key planning risks, BC Hydro's 2004 IEP incorporates two broadly accepted risk assessment tools, sensitivity analysis and scenario analysis. Further discussion of the key planning risks that are evaluated as part of the 2004 IEP and the analytical techniques used to evaluate them are discussed in Part 5 of the IEP.

4 Status of Action Plan from 2000 IEP Update & Resource Acquisition Plan

4.1 Status of the 2000 IEP Update Action Plan

In 2001, BC Hydro reviewed the 2000 IEP Update and took a number of initiatives to meet future requirements in light of rapidly changing circumstances in the volatile market conditions at that time. In particular, BC Hydro added Power Smart and energy calls from the private sector to complement and defer the need for future larger gas-fired generators identified in the IEP Update.

The revised resource strategy resulted in a more diversified portfolio incorporating a mix of supply-side and demand-side options with both public and private sector participation. The shift permits a more robust approach to managing emerging price and reliability risks, and supported diversification opportunities. Implementation of this revised strategy has resulted in a revitalized Power Smart program expected to save 3,618 GWh annually by F2012, and in three energy calls resulting in 39 signed energy purchase agreements. Table 4.1 shows how BC Hydro targeted its diversified resource acquisition strategy based on load growth expectations of the time.

Table 4.1. 2000 IEP Targets for Resource Acquisition Strategy

Component	Target (Cumulative GWh/Year)
10-Year Cumulative Forecast Load Growth (From F2001)	10,000
Power Smart	3,500
Resource Smart	1,100
Vancouver Island Generation Project (VIGP)	2,100
Energy Calls	3,300
Total Resources	10,000

BC Hydro's 2000 IEP Update also included a four-year Action Plan to acquire or maintain new projects and programs identified in the 20-year outlook. Table 4.2 summarizes the status of the initiatives identified in the 2000 IEP Update.

Table 4.2. 2000 IEP Action Plan – Current Status

Item	Action	Current Status
Combined Cycle Gas Turbines	Identify and examine Vancouver Island and Mainland sites	In 2001, BC Hydro conducted site selection studies in the Interior and on Vancouver Island. A site selection process identified Duke Point as the preferred site for the Vancouver Island Generation Project resulting in a CPCN Application to the BCUC, and a subsequent Vancouver Island call for tenders, currently underway.
New Green Resources	Acquire cost-effective new Green resources	In April 2000, BC Hydro announced an initiative to meet 10 per cent of new load growth over a 10-year period with Green resources. Under the Energy Plan, BC Hydro will pursue a voluntary goal to acquire 50 per cent of new supply from BC Clean electricity over the next 10 years.
Seven Mile Unit 4	Examine merits of advancement	Seven Mile Unit 4 was approved by the BC Hydro board of directors in January 2001 and the new unit was on line in April 2003 on an accelerated schedule, 10 months ahead of the approved schedule and \$8 million under budget.
Revelstoke Unit 5	Maintain as an option for future consideration	Revelstoke Unit 5 continues to be an option for adding additional dependable capacity.
Resource Smart	Continue with efficiency and operational improvements at existing facilities	A number of Resource Smart projects completed since January 2000, including Seven Mile 4, have added 623 GWh of energy capability to the BC Hydro system and 210 MW of dependable capacity. The Resource Smart Program is ongoing.
Burrard Thermal Generating Station	Defer Burrard repowering decision	In April 2001, the B.C. government released a study that reviewed a range of options for the Burrard plant. The study concluded that constraining the operation of Burrard or shutting it down was not in the best interest of the Province and that repowering warranted further investigation. The Energy Plan called for a further government review of the options for Burrard. This study is currently in progress.
HVDC Transmission to Vancouver Island	Continue to monitor performance and retirement schedule and evaluate Vancouver Island system reliability requirements	Pole I continues to be available on “hot-standby” basis only to extend the service life of that equipment as non-firm or backup supply to Vancouver Island. Two cable repairs have been required to maintain the firm capability rating of the HVDC system at 240 MW until F2008 (fall 2007). The planned retirement date for the HVDC system continues to be fall 2007. The BCUC accepted this planning assumption in the VIGP decision.

Item	Action	Current Status
Demand-Side Management	Continue with current approach with respect to demand-side management activities	In 2001, BC Hydro relaunched the Power Smart programs with a target of acquiring 3,500 GWh per year of savings (measured at the customer's meter) over 10 years.
Community Energy Planning	Continue to work with community planners on energy-related issues	BC Hydro's current focus has been in assisting smaller communities, including non-integrated communities that have shown an interest in community energy planning.
Planning Activities	<p>Continue to monitor and develop strategies to meet changes from forecast load growth, including potential large new loads</p> <p>Continue to monitor the outlook for long-term gas and electricity market prices</p>	<p>A number of load forecast initiatives have been completed or are currently underway.</p> <p>BC Hydro continues to monitor the status of proposed new large industrial loads to assess their impact on generation and transmission system requirements. Required acquisitions would not be made until a new large customer made application for service under BC Hydro's tariff.</p> <p>The residential end use model (REEPS) has been updated to incorporate recent customer survey information on appliance saturations and current end use energy consumption information for new major appliances.</p> <p>Commercial floor stock, a key driver of commercial energy consumption, has been revised along the lines of information provided in the Conservation Potential Review to increase consistency among data sources.</p> <p>The industrial forecast process has been modified to ensure that forecasts of major customer consumption are consistent with forecast economic trends in the key sectors: pulp and paper, chemicals, forestry and mining.</p> <p>Weather normalization procedures for energy consumption have been modified to use a 10-year rolling heating degree-day average instead of the former 30-year typical meteorological year, which does not adequately capture recent warming trends.</p> <p>The peak demand has been disaggregated to 12 distribution areas and eight transmission regions to provide more value to users of the peak forecast.</p> <p>The Load Forecast Renewal Project was started in July 2003 to improve the forecast process and products.</p> <p>Market prices and market fundamentals are monitored on an on-going basis. Forecasts of gas and electricity prices are updated on a regular basis. Forecasting processes and analytics are regularly reviewed and improved.</p>

Item	Action	Current Status
Planning Activities (continued)	<p>Retain future provincial resource options such as Peace Site C through continued support for the retention of flood reserves</p> <p>Continue to monitor and incorporate the impacts of water use planning</p> <p>Continue to monitor technological advancements in energy supply resources and incorporate into on-going planning process</p>	<p>BC Hydro continues to maintain the flood reserves for the Peace Site C project. The Energy Plan indicated that development of this project would require Cabinet approval. In 2002, BC Hydro returned to the province the Hat Creek coal reserves it held.</p> <p>As draft water use plans for each of BC Hydro's hydroelectric facilities are submitted and approved by the Water Controller, adjustments are made to project and system capability.</p> <p>Between 2001 and 2002, BC Hydro conducted Green Energy inventory studies for Vancouver Island and Mainland B.C. BC Hydro continues to support a wind monitoring program of 15 monitoring installations located in nine areas of the province. Wind and wave demonstration programs were initiated in 2001, which involved public-private partnerships. BC Hydro subsequently exited the demonstration projects when private sector companies began submitting wind project applications showing the advancement of wind energy development in B.C.</p>
Greenhouse Gas Issue Developments	Continue to develop and implement management plan and continue to monitor GHG policy developments provincially, nationally and internationally	BC Hydro has committed to offsetting 50 per cent of the GHG emissions associated with the Island Cogeneration Plant (ICP) and the VIGP (if developed) through 2010. BC Hydro's actions to manage GHG emissions include reducing demand through Power Smart, meeting electricity needs through low GHG-emitting resources and investing in direct emission reductions in other sectors.
North Coast Supply	Continue to monitor reliability of service in the area	BC Hydro continues to monitor the demand-supply outlook and the reliability of service in the North Coast region between Prince George and Prince Rupert, which is supplied by one radial transmission line.
Keogh Generating Station	Develop a decommissioning strategy	In July 2000, BC Hydro applied to the BCUC for approval to decommission the Keogh generating station on Vancouver Island. The Commission approved the decommissioning by Order No. G-80-00 on August 31, 2000.

4.2 Resource Acquisition Initiatives: 2000 to 2003

This section provides a more detailed summary of key resource acquisition programs that BC Hydro initiated since the release of the 2000 IEP, namely:

- 10-Year Power Smart Plan;
- 2000 Request for Expressions of Interest for Green Energy
- 2001 Green Energy Call;
- 2002 Customer-Based Generation Call; and
- 2002 Green Energy Call.

The expected energy and capacity contributions from these resource acquisition initiatives are summarized in Part 2, Demand-Supply Outlook.

4.2.1 10-Year Power Smart Plan

Based on the results of the *Conservation Potential Review 2002*, BC Hydro has set a 10-year target to achieve 3,618 GWh per year in energy savings (measured at the customer's meter) from its Power Smart program. Power Smart met its F2003 target, achieving 361 GWh per year in energy savings.

By F2012, Power Smart is also expected to reduce system peak demand by about 500 MW and Vancouver Island peak demand by about 100 MW.

A program example is the Power Smart traffic light program, which helps municipalities upgrade incandescent traffic signals to energy-efficient light-emitting diode (LED) traffic signals. BC Hydro purchases red, green and pedestrian "Don't Walk" LED signal lights over a five-year period, recovering half the cost from program participants. Currently, over 40 communities are participating in the program.

4.2.2 2000 Request for Expression of Interest for Green Energy

In April 2000, BC Hydro issued a request for expressions of interest to the private sector that focused on acquiring Green Energy. As mentioned above, the IEP Update specified an energy portfolio in which Green resources would eventually comprise 10 per cent of cumulative load growth. At the end of the IEP Update's 10-year planning horizon, this equates to approximately 1,000 GWh per year. BC Hydro received more than 80 project proposals. Of these, three resulted in signed agreements. All three projects either have or are expected to attain their commercial operation date in F2004. They represent a total 40 MW of installed capacity and 149 GWh per year of new energy capability.

4.2.3 2001 Green Energy Call

In August 2001, BC Hydro issued a request for proposals (RFP) to all other respondents to the 2000 request for expressions of interest. This call sought Green Energy to help meet the target portfolio. The target volume was set at 800 GWh per year to meet the cumulative 1,000 GWh per year Green Energy portfolio target for the 10-year planning horizon.

This RFP replaced the individual contract negotiation process with a standard selection process, common contract terms and conditions, a standard price framework, and a set of criteria that required eligible projects to have low net

environmental impacts, be licensable, renewable, and socially responsible. Recognizing the projects' varying potential for environmental impacts, complexity and transaction costs, BC Hydro divided projects into two categories: those expected to deliver less than 40 GWh per year, and those expected to deliver more than 40 GWh per year ("small" and "large" projects). The small projects had a simpler evaluation process and a simpler form of contract. BC Hydro received 32 small project proposals and 24 large ones. Of these, 18 small projects and three large projects entered into agreements totalling 180 MW of installed capacity and 855 GWh per year of energy capability.

4.2.4 2002 Customer-Based Generation Call

In May 2002, BC Hydro issued a call for tenders to acquire firm energy from commercial and industrial customers. Eligible projects had to achieve a commercial operation date no later than September 30, 2006. The target volume was set at 800 GWh per year, roughly one year's annual load growth. This customer-based generation (CBG) call was a two-stage competitive process with a reverse price auction based on a ceiling price. The first stage, a request for qualifications, was developed to ensure credible bids in the second stage, the tender call.

A total of 37 proposals were submitted, 22 of which were pre-qualified and invited to tender a bid in the second stage in September 2002. Seven bids were ultimately received. Five bidders signed agreements totalling 60 MW of installed capacity and 500 GWh per year of energy capability. Two projects, with combined energy capability of 164 GWh, have since withdrawn. Two projects have declared commercial operation and one is being constructed with commercial operation expected on or before September 2006.

4.2.5 2002 Green Power Generation Call

In October 2002, BC Hydro issued a Green Power generation call to help continue to meet the Green portfolio target. The target for the call was 800 GWh per year. A two-stage call for tenders process was used, as in the customer-based generation call: a ceiling price, reverse auction and commercial operation date of September 30, 2006.

A total of 70 projects were submitted, including Columbia Power Corporation's Brilliant Expansion project. BC Hydro subsequently short-listed 30 eligible bidders and increased the target to include the amount of the Brilliant Expansion project. Sixteen bids totalling 500 MW of installed capacity and 1,760 GWh per year of energy capability were submitted. All bids met the mandatory criteria, had ceiling prices below the adjusted ceiling price, and entered into agreements, which have now been signed and executed.

5 Overall Approach to the 2004 IEP

In general, electricity planning entails trade-offs between cost minimization and risk minimization. BC Hydro's approach to resource acquisitions has focused on securing medium- to long-term needs rather than year-to-year needs. Thus, within the 20-year IEP planning horizon, BC Hydro has determined that it should manage its acquisitions in the context of:

- System reliability requirements;
- Market prices for gas and electricity;
- Price volatility and correlation of electricity prices, fuel prices and demand;
- Market liquidity, market information and credit issues relating to the other parties to the contracts;
- Load forecast uncertainty;
- Reservoir conditions;
- Transmission availability;
- "Clean" and "Green" energy targets; and
- Other relevant parameters.

BC Hydro strives to achieve an appropriate balance and to address risk through its various short- to long-term planning and acquisition processes. This management approach is an integrated risk perspective that addresses current risks and conditions and bridges traditionally distinct longer-term electricity planning horizons and shorter-term operational planning horizons.

The current approach to energy portfolio management continues to be significantly influenced by BC Hydro's predominantly hydroelectric generating assets and water supply variability associated with them. The risks associated with a low hydro season are more significant than the benefits of a high hydro season. The market price of electricity usually is higher than normal in low water years and lower in high water years. Therefore, in low water years BC Hydro may rely more on thermal plants or import electricity at high prices. Conversely, in high water years when there may be a surplus of electricity to sell, the market price will be low. To some extent, BC Hydro can also use the flexibility of its reservoir system to limit required purchases during high price periods. However, BC Hydro remains exposed to the price and availability of imported power, which may also be influenced by regional hydroelectric shortages.

On the other hand, in years when streamflow conditions are average or better, BC Hydro is able to refill its reservoirs, reduce thermal generation or market purchases. Profits from the sale of surplus energy from Heritage resources flows to the Heritage Contract Deferral Account, which benefits ratepayers.

BC Hydro's preference for reliable and secure electricity supply drives electricity plans to ensure domestic loads are served even under low water conditions. This results in potential energy surpluses in average water conditions. As noted previously, BC Hydro must also consider other important planning variables, such as natural gas prices and environmental regulations, which are also subject to change.

In summary, BC Hydro's resource planning approach is rooted in the following management perspectives:

- BC Hydro cannot anticipate every contingency with respect to water inflows, natural gas fuel consumption and electricity demand changes; nor can it perfectly time the in-service schedules of new resources to meet anticipated demand growth.
- The experience in the western North American gas and electricity markets has illustrated that spot prices have been very volatile since the markets were liberalized. High price volatility adds risks and uncertainty to pricing and availability. Given these market characteristics, and considering other factors such as transmission intertie issues and the cyclical nature of new generation investments, BC Hydro has concluded that over-reliance on the short-term or spot market does not offer the same domestic supply reliability or price stability as long-term fixed price contracts. Accordingly, BC Hydro does not currently consider non-firm market purchases under average hydro conditions (i.e., a net domestic supply deficit) to be an appropriate long-term planning option.
- BC Hydro's energy supply management strategy is to have a diversified energy supply portfolio that will be robust within an environment of high gas and electricity price volatility. The portfolio design is intended to strike an appropriate balance between maintaining a low-cost supply base and avoiding energy-related earnings and rate shocks caused by fluctuating energy supply costs.
- The provincial government has consistently supported the participation of B.C.'s private sector (e.g. IPPs and customer-based generation) in new electricity generation. This support is reaffirmed in the Energy Plan. Provincial energy policy direction with respect to development of private sector generation accords with BC Hydro's current energy management approach of acquiring domestic long-term fixed-price contracts to meet domestic demand, rather than relying on non-firm imports.

The management perspectives summarized above have underpinned BC Hydro's resource acquisition initiatives in recent years, including the relaunch of Power Smart in 2001 and the subsequent energy calls. The portfolio approach also provides the basis for BC Hydro's resource acquisition initiatives between 2000 and 2003. The 2004 IEP presents BC Hydro's long-term plan for acquiring new resources to supply BC Hydro's existing and new domestic electricity requirements. The following sections summarize the 2004 IEP planning objectives, principles and process including the 2004 IEP report elements.

5.1 2004 IEP Objectives

Electricity planning objectives provide the basis on which to identify and compare resource plans. The 2004 IEP objectives were developed within the BC Hydro corporate policy framework (incorporating, for example, aboriginal relations principles and environmental management policies) as well as within the framework of provincial government policies (i.e., Energy Plan). The objectives are intended to reflect the values important to the provincial government, BC Hydro and by extension the people of B.C. They provide a foundation for the 2004 IEP planning process and the resulting IEP. Table 5.1

summarizes the 2004 IEP planning objectives and how they are aligned to the B.C. Energy Plan. The table lists B.C. Energy Plan objectives in the left column and the 2004 IEP objectives in the right column, illustrating their link to the provincial objectives.

Secure, reliable supply is a paramount objective for BC Hydro. This is particularly true given the nature of BC Hydro's supply source (primarily water) and hence reliance on weather patterns. In other words, BC Hydro's preference for reliable and secure electricity supply drives electricity plans to ensure domestic loads are served even under low water conditions.

Table 5.1. B.C. Energy Plan Objectives and 2004 IEP Objectives

B.C. Energy Plan Objectives	2004 Integrated Electricity Plan Objectives
Low electricity rates and public ownership of BC Hydro	Minimize long-term ratepayer costs by establishing the least cost sequence of resources on a risk-adjusted basis that meets customers' needs as well as other BC Hydro and provincial government policy objectives.
Secure, reliable supply	Maintain adequate dependable capacity and energy capability to meet customer needs through the application of relevant electricity industry and BC Hydro reliability planning criteria.
Private sector development of new electricity generation	Seek proposals from the private sector to supply power to BC Hydro.
Environmental responsibility and no nuclear power sources	Enhance environmental and social responsibility with a voluntary 50 per cent Clean Energy ⁸ target through Customer-Based Generation, Green Energy, Resource Smart Programs and project proposals that meet or exceed environmental and social requirements. Achieving the Clean Energy target may raise electricity rates by 0.1 to 0.2 per cent per year over the next decade ⁹ .

5.2 2004 IEP Planning Principles

In serving the 2004 IEP planning objectives, BC Hydro adopted the principles that the IEP should be:

- Transparent;
- Robust;
- Dynamic and flexible; and
- Market-driven.

⁸ As outlined in the Energy Plan, BC Clean electricity refers to alternative energy technologies that result in a net environmental improvement relative to existing energy production. The scope of the "BC Clean" definition is subject to refinement and approval by the Minister of Energy and Mines.

⁹ BC Hydro interprets this as a cap on the maximum rate impact of the Clean Energy target.

5.2.1 Transparent

A transparent IEP means that it includes clear presentation of data, assumption, analytical methods and results.

5.2.2 Robust

A robust IEP means that it will allow BC Hydro to meet its requirements, reliably under various scenarios and uncertainties. It recognizes that the load forecast is uncertain with regard to growth, stepped rates, rate impacts and retail access. It also recognizes that long lead times are required for many of the new resource additions.

5.2.3 Dynamic and Flexible

A dynamic and flexible IEP means it addresses the rapidly changing energy markets in North America. BC Hydro must adapt its planning process to respond to the changes in the market. The planning process includes scenario analysis, sensitivity and multiple portfolio analysis to study many possible situations. This allows BC Hydro to adapt to changing circumstances.

BC Hydro expects to acquire future electricity resources mainly through competitive calls to the private sector. Therefore, the 2004 IEP is a directional plan that identifies province-wide and regional needs, it addresses key objectives and policy issues, and indicated the expected timing of future private sector calls. The IEP also addresses the management of risks such as fuel price, potential GHG liability, and over- and under-supply. In the case of DSM and transmission, the IEP describes the programs and projects to pursue.

5.2.4 Market-Driven

A market-driven IEP reflects the fact that North American energy markets are strongly influenced by market fundamentals. Key aspects of the IEP designed to address this are as follows:

- Load forecasts will respond to a range of economic conditions;
- Gas and electricity price forecasts will be based on market information; and
- Resource options will be characterized mainly on the basis of development by IPPs, as BC Hydro expects to acquire electricity mainly through competitive bids by the private sector.

5.3 2004 IEP Planning Process and Report Elements

The 2004 IEP shows how BC Hydro plans to meet its future domestic customers' demand for electricity.

Figure 5.1 illustrates the 2004 IEP development process. It highlights in which Parts of the 2004 IEP the key process elements are reflected and their relationship to each other. As shown, the planning objectives and principles are established up front. The demand-supply outlook, resource options, key input assumptions and First Nation and stakeholder engagement the development, evaluation and comparison of portfolios. All of this culminates in an Action Plan to implement the IEP. BC Hydro's 2004 IEP has nine components:

The **Summary** presents an overview of Parts 1 through 7.

Part 1 – **Introduction and Planning Objectives**, presented here, summarizes BC Hydro’s business as a regulated utility, and describes aspects of the B.C. and North American markets that have implications for BC Hydro’s electricity planning process.

Part 2 – **Demand-Supply Outlook** outlines BC Hydro’s planning criteria, presents BC Hydro’s load forecast over the next 20 years, and compares it against existing and currently planned resources. The resulting demand-supply balance is shown for the Reference Forecast, along with a high and a low load growth scenario.

Part 3 – **Resource Options** inventories and characterizes the demand-side and supply-side options that are available to BC Hydro for meeting future electricity requirements.

Part 4 – **First Nations and Stakeholder Engagement** details the discussions BC Hydro had with First Nations and stakeholders in the IEP planning process.

Part 5 – **Portfolio Evaluation Process** describes BC Hydro builds and evaluates portfolios, outlines the key areas of risk and uncertainty, and identifies how these are being addressed in the planning and evaluation process.

Part 6 – **Portfolio Evaluation Results** describes the portfolios, presents the results of the multi-attribute portfolio analysis (MAPA), compares these results among portfolios and presents conclusions.

Part 7 – The **Action Plan** outlines specific follow up actions to meet the needs identified in the IEP.

The **Glossary** defines terms used in the IEP.

Figure 5.1. 2004 IEP Development Process

