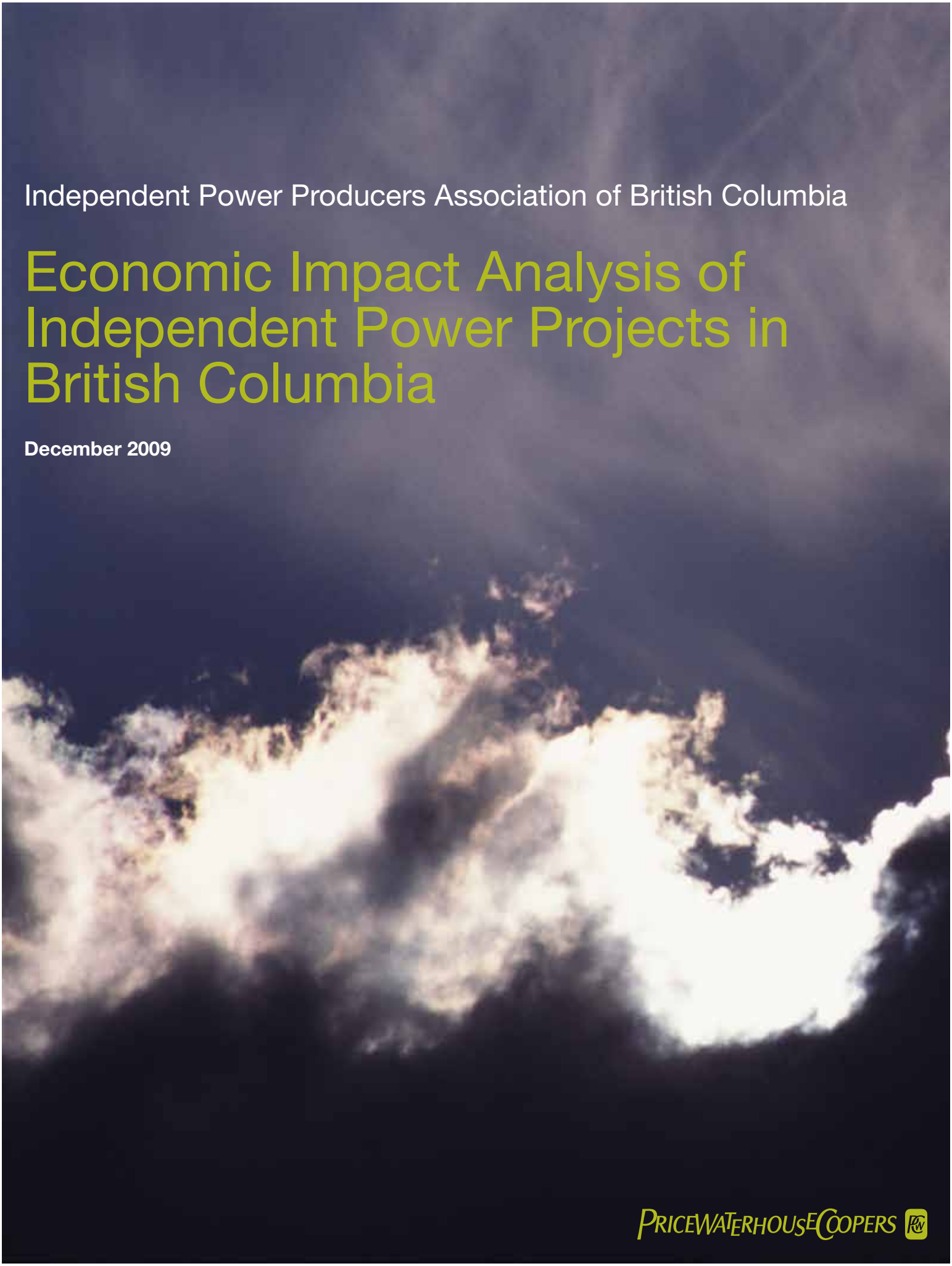


Independent Power Producers Association of British Columbia

Economic Impact Analysis of Independent Power Projects in British Columbia

December 2009

PricewaterhouseCoopers

Table of Contents

1 Executive Summary

The Independent Power Industry in British Columbia

Independent power producer (IPP) projects that supply electricity to British Columbia's regulated electricity market have been active in the province since the late 1980s. From that time and up to the present, independent power producers have developed 49 projects that currently account for approximately 10% of British Columbia's electricity generation. IPP development continues to expand with construction and operation of IPP projects in nearly every region of the province.

Existing IPP Projects

In this study, we have separated the analysis of the economic impacts of IPP projects into two categories: existing IPP projects, and potential IPP projects.

Existing IPP projects are defined as run-of-river, wind and thermal projects that are currently operating and generating power in BC, excluding self-generation projects and non-BC Hydro large-scale hydro projects. Existing IPP projects generate roughly 5,940 annual GWh of electricity in British Columbia.

Potential IPP Projects

Potential IPP projects are defined as run-of-river, wind, and thermal projects that may arise from electricity purchase agreements (EPAs) signed through previous BC Hydro power calls, projected future EPA from current BC Hydro power calls and projects assumed to be developed as a result of the Independent Power Producers Association of British Columbia's (IPPBC) long-run demand forecast. These categories are outlined below:

1. **Projects arising from previous BC Hydro Power Calls:** this category includes IPP projects that have been granted EPAs through BC Hydro power calls occurring prior to or through the 2006 call but are not yet operational and are projected to be approximately 3,030 GWh of electricity.
2. **Projects arising from current BC Hydro Power Calls:** this category includes IPP projects that may become operational as a result of the 2008 Clean Power Call, the 2008 Bioenergy Call, and BC Hydro's Standing Offer Program. These power calls are projected to lead to EPAs for approximately 5,179 annual GWh of electricity.

3. **Additional IPP projects arising from IPPBC's forecast of future electricity demand:** In addition to IPP projects defined in categories (1) and (2) above, our understanding is that the IPPBC has projected demand for future power generation equalling 21,321 annual GWh by 2020. This consists of additional 9,321 GWh from future BC Hydro calls and 12,000 GWh through exports of power to the United States.

Summary of Existing and Potential IPP Projects

If IPP projects from previous and current BC Hydro calls for power reach the operational stage, the total power supplied by BC IPP projects would increase from a current level of about 5,940 annual GWh to approximately 14,149 annual GWh.

Additionally, if IPPBC forecasts for domestic and export demand are realized, by the year 2020 IPP projects in BC could be generating a further 21,321 GWh of annual output to service demand domestically and for export to the United States.

Table 1.1 summarizes the output (GWh) and capacity (MW) of existing IPP projects and potential IPP projects that provides the basis for the economic impacts presented in this study.

Capital Expenditures

The value of capital investment in existing IPPs across BC, at 2009 replacement cost, is estimated at $2.8 billion. Capital investment in potential IPPs is estimated at $26.1 billion in 2009 constant dollars. It should be noted that these impacts are projected to occur over at least a 10-year time period. Also, while a significant portion of the projected capital expenditure is expected to flow outside of the province due to the specialized nature of capital equipment needed for these projects, a sizeable portion could be expected to occur within BC.

Table 1.2 below summarizes the estimated capital expenditures from all types of existing and potential IPP projects in British Columbia.

Table 1.1 Summary of Output and Capacity from Existing and Potential IPP Projects

Existing and Potential IPP Projects	Category	GWh	MW
Projects from previous BC Hydro Power Calls	2006 and Prior Calls	3,030	775
Projects from current BC Hydro Power Calls	2008 Clean Power Call	3,500	968
	2008 Bioenergy Call	1,279	144
	Standing Offer Program	400	50
Total demand from current BC Hydro Power Calls		5,179	1,162
IPPBC forecast of future electricity demand	2020 Domestic Demand	9,321	2,611
	2020 Export Demand	12,000	3,361
Total future demand		21,321	5,972
Total potential projects		**29,530**	**7,909**
Total existing IPP projects		**5,940**	**1,014**
Total existing and potential projects		**35,470**	**8,923**

Note: GWh's noted from BC Hydro Power Calls are estimated net of attrition.

Table 1.2 Capital Expenditures, Existing and Potential IPP projects in BC
($2009 replacement cost, millions)

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Estimated Existing Operations ($2009 millions)	$1,575	$240	$963	$2,778
Projected Potential Operations ($2009 millions)	$11,900	$11,373	$2,871	$26,144

Economic Impacts of Existing and Potential IPP Projects

Construction Phase

Existing Independent Power Projects – Construction Phase

The construction of existing independent power operations is estimated to have created approximately $1.2 billion in provincial GDP, or $1.1 million per MW (at 2009 replacement cost). Most of the impact is estimated to have been generated by existing run-of-river and thermal projects and material contribution of a soon-to-be operating wind project.

The majority of employment created by IPP projects occurs during the construction phase, and should therefore be considered as person year impacts rather than full-time jobs. The employment impacts from the construction of existing independent power operations is estimated to have been 11,136 person years of employment, or about 11 person years of employment per MW.

Government revenues generated through the construction phase of existing IPP projects are estimated to have been approximately $236 million. Government revenues include corporate income taxes, personal income taxes, property taxes and special taxes such as water rentals paid by run-of-river operations.

Table 1.3 below summarizes the estimated impacts from all types of existing IPP projects.

Table 1.3 Estimated Economic Impacts of Existing IPP Projects – Construction Phase ($2009 millions)

	Direct	Indirect & Induced	Total Impacts	Total Impact per MW
GDP Impact ($2009 millions, replacement cost)	$657	$519	$1,176	$1.1
Employment (person years)	3,159	7,977	11,136	11.0
Government Revenue ($2009 millions)	$130	$106	$236	$0.23

Potential IPP Projects – Construction Phase

The projected impact on GDP of potential IPP projects is estimated at $8.8 billion or $1.1 million per MW. The impacts are projected to be largely generated by run-of-river and wind projects, reflecting the composition of recent BC Hydro clean power calls and BC's renewable energy resource potential. The impacts also include material impacts from investments in biomass and other thermal energy.

Total employment impacts from potential IPP projects are estimated at 86,991 person years of employment, or 11 person years of employment per MW. While the majority of employment is expected to come from run-of-river projects, thermal projects such as biomass are estimated to have higher indirect and induced employment impacts.

Government revenues generated through the construction phase of potential IPP projects are estimated at $1.6 billion.

Table 1.4 below illustrates the estimated impacts from all types of potential projects.

Table 1.4 Estimated Economic Impacts of Potential IPP Projects – Construction Phase ($2009 millions)

	Direct	Indirect & Induced	Total Impacts	Total Impact per MW
GDP Impact ($2009 millions, replacement cost)	$4,854	$3,947	$8,801	$1.1
Employment (person years)	26,081	60,910	86,991	11
Government Revenue ($2009 millions)	$907	$736	$1,643	$0.21

Operations Phase

Existing and Potential IPP Projects – Operations Phase

IPP projects continue to contribute to the provincial and local economies once operational. The estimated and projected annual GDP impacts from existing and potential IPP projects are shown in Table 1.5.

In addition to generating impacts during construction, IPP projects also generate ongoing employment through operations. Employment impacts of ongoing operations are considered to be full-time jobs annually. Table 1.6 illustrates the estimated and projected annual employment impacts from existing and potential IPP projects.

Community and Other Benefits from IPP Projects

Benefits to Communities

Employment from IPP projects is spread throughout BC and includes remote and rural communities and communities affected by recent declines in traditional industries such as the forestry industry. Employment is greater during project construction however, there is also an ongoing need for operations employment, maintenance of project facilities, road maintenance on private roads and vegetation maintenance along transmission corridors.

Benefits to First Nations

IPP projects can have a significant impact on First Nations as many IPP projects are constructed on traditional First Nation's territories. In many instances, First Nations benefit economically from IPP projects through negotiation of Impact and Benefit Agreements with the IPP. These agreements can contain a wide range of provisions including education and training, employment, contracting, revenue sharing, business development and social/ cultural measures.

Other Benefits from IPP Projects

IPP projects also contribute to provincial energy self-sufficiency, have zero or reduced greenhouse gas emissions compared to coal-fired or other fossil fuel electricity generation and use renewable energy technologies to generate electricity.

Table 1.5 Annual GDP Impact from Spending by IPP Projects – Operations Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Estimated Existing Operations ($2009 millions)	$48.3	$1.4	$75.0	$124.7
Projected Potential Operations ($2009 millions)	$62.2	$43.4	$324.3	$429.9

Table 1.6 Annual Employment Impacts from IPP – Operations Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Estimated Existing Operations (FTE)	140	52	983	1,175
Projected Potential Operations (FTE)	1,149	1,654	5,127	8,020

2 Introduction

2.1 Introduction

IPP projects in BC generate electricity from clean energy sources using a variety of technologies, including run-of-river (small hydro), wind power, thermal power (including gas, biogas, and biomass). At present, most of the existing independent power production comes from run-of-river projects, followed by biomass generated power. More recently, several wind power projects are nearing operational status, and are planned to soon start contributing to BC's electricity market. These sources of electricity generation contribute towards achieving the Provincial Government's policy objectives of energy self-sufficiency, reduction of greenhouse gases and generation of power from renewable sources.

2.2 Background and Study Purpose

The Independent Power Producers Association of BC (IPPBC) has requested PricewaterhouseCoopers LLP to update and expand upon a preliminary economic impact report produced by D.E. Park and Associates (the Park Report).[1] In this report, we have built upon the initial findings of the Park Report including the verification and assessment of baseline data used to produce economic impact estimates. In addition, this report provides a discussion of how the development of IPP projects impact communities throughout British Columbia.

2.3 Project Scope

The project scope included:

Verification of Baseline Data

Reviewed baseline data used in the Park Report. Data used as inputs to the economic impact analysis was reviewed for its reliability, consistency, and timeliness. Where available, data was updated from that used in the original analysis to describe current conditions.

Modelling Economic Impacts

Reviewed the methodology and results of the economic impact calculations from the Park Report and ran a separate economic impact model with updated and new data to produce revised estimates of the contributions towards GDP, employment and taxes for existing and potential IPP projects.

Review and Discussion of Benefits and Industry Outlook

Described how the independent power industry contributes to economic development throughout the province, and how the industry provides benefits and opportunities for BC and First Nations communities.

Reviewed published material to determine the most recent policy initiatives that may impact the independent power industry. In addition, expanded the description to consider the future industry by identifying industry trends and issues that may affect future growth.

1. D.E. Park and Associates: 2009, *Economic Impact of Independent Power Projects in British Columbia, unpublished.*

2.4 Report Outline

The report is structured as follows:

Section 3 provides an overview of the independent power industry in British Columbia.

Section 4 presents the estimated economic impact of expenditures by IPP projects in BC for existing and potential projects.

Section 5 outlines the benefits and opportunities of IPP projects to BC and First Nations communities.

2.5 Report Limitations

PwC has relied upon the completeness, accuracy and fair presentation of all the information, data, advice, opinions or representations obtained from public sources and the Client (collectively, the "Information"). The findings in the Report are conditional upon such completeness, accuracy and fair presentation of the Information. PwC has not verified independently the completeness, accuracy and fair presentation of the Information. We are providing no opinion, attestation or other form of assurance with respect to our work and we did not verify or audit any information provided to us.

PwC reserves the right at its discretion to withdraw or make revisions to the Report should PwC be made aware of facts existing at the date of the report that were not known to PwC when it prepared the Report. The conclusions and recommendations are given as of the date hereof and PwC is under no obligation to advise any person of any change or matter brought to its attention after such date, which would affect the findings and conclusions and PwC reserves the right to change or withdraw the Report.

This document in its entirety can never be entered as evidence in any British Columbia Utilities Commission or other regulatory proceedings.

We understand this report may be provided to Government representatives, members of the Independent Power Producers Association of British Columbia and to organizations and individuals involved with the electricity industry in British Columbia. This report uses information from public and private sources that was known and available as of October 31, 2009.

3 Industry Overview

Profile of the Independent Power Industry in British Columbia as of October 2009

49 operating IPP projects spread across British Columbia

38 small hydro projects @ 10 MW (average size)

4 biomass projects @ 4 MW (average size)

3 biogas projects @ 3 MW (average size)

2 biogas projects @ 175 MW (average size)

2 energy recovery generators @ 5 MW (average size)

IPPs supply 10% of British Columbia's electricity generation

Oldest IPP started supplying electricity 20 years ago

3.1 The Electricity Industry in British Columbia

The BC Ministry of Energy Mines and Petroleum Resources (MEMPR) oversees the electricity industry in British Columbia. As part of its mandate, MEMPR is responsible for BC Hydro and British Columbia Transmission Corporation (BCTC), the two crown corporations that generate, distribute and transmit electricity to residents and businesses in British Columbia. MEMPR also contributes to the development and implementation of provincial energy policy. (Appendix A provides an overview of Provincial Government policy as it relates to the independent power industry and the electricity market).

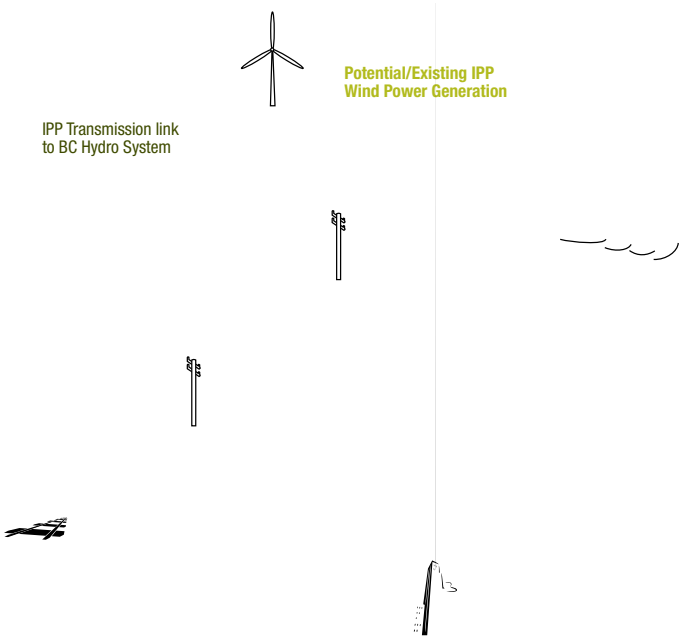
BC Hydro generates, distributes and sells electricity to its residential, commercial and industrial customers. BC Hydro is a provincial Crown corporation that is governed by the Hydro and Power Authority Act. Powerex is a wholly-owned subsidiary of BC Hydro that buys and sells power across North America. The British Columbia Utilities Commission (BCUC) through the provisions of the Utilities Commission Act is the provincial agency that regulates BC Hydro and the British Columbia Transmission Corporation (BCTC). BCTC is the crown corporation responsible for planning, developing and operating transmission lines throughout the province.

Fortis BC is an investor-owned utility regulated by the BCUC. Fortis BC generates and distributes electricity to customers located in the south central region of British Columbia. The company operates four hydro plants with an installed capacity of 235 MW.

Columbia Power Corporation (CPC) is a provincial crown corporation that develops and operates hydroelectric power projects in the Columbia Basin, on a joint venture basis with the Columbia Basin Trust (CBT). CPC operates three hydro facilities with an installed capacity of 450 MW.

In addition to the BCUC, there are federal and provincial entities that regulate the development of new generation and transmission in BC. A limited list of entities includes the BC Ministry of Forest and Range's Integrated Land Management Bureau, BC Ministry of Environment/Water Comptroller's office, BC Environmental Assessment Office, federal department of Fisheries and Oceans and the Coast Guard. First Nations consultation is also undertaken before a project can proceed. Any exports to the United States require the approval of the National Energy Board.

Figure 3.1 Electricity Market Structure



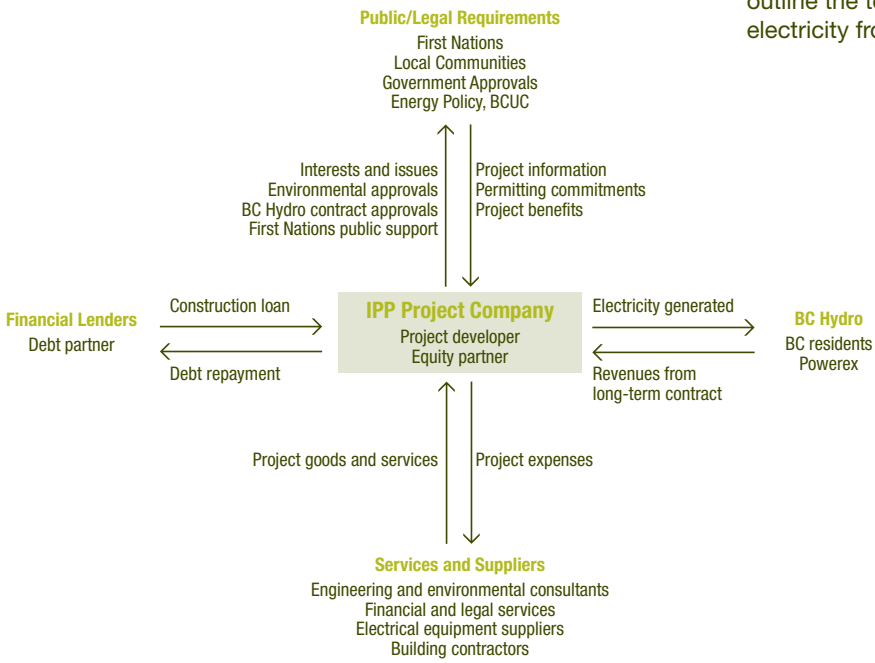
3.3 Typical IPP Development Process

The development of an IPP project requires the project developer to undergo a complex process that requires building relationships with diverse stakeholder groups. As illustrated in Figure 3.2 throughout the project development process and into operation phase, key relationships for IPPs include public/legal, BC Hydro, financial lenders, and services and suppliers.

IPPs typically follow eight steps as they develop, finance, build and operate electricity generating plants:

1. Search for sites with good hydro, wind, or thermal fuel supply that is close to the electricity grid and that are accessible and buildable.
2. Prepare and submit a competitive bid for proposed projects to BC Hydro when competitions under the call for power programs for electricity suppliers are held every two years.
3. Sign an EPA with BC Hydro (if awarded a contract) to supply electricity for up to 40 years at a fixed price.
4. Obtain licenses and approvals to build, there may be upwards of 50 such permits.
5. Raise financing for construction.
6. Construct the generating plant, generally over a two-year period.
7. Commission and operate the project for up to 40 years.
8. Apply revenue from electricity sales to repay financiers, pay water rentals, taxes, First Nations benefit agreements, local government levies and plant operators with the balance of earnings as return on equity.

Figure 3.2 Key Relationships for IPP Projects



3.4 Current Industry Profile

The independent power industry has contributed to BC's electricity supply for many years. As the electricity needs of the province increase, and as environmental policy shifts towards sustainable and clean energy technologies, the role of IPPs in supplying electricity is expected to grow.

IPPBC reports there are currently 49 IPP projects operating in British Columbia, with total installed generating capacity of just over 1,000 MW and total annual firm energy output of close to 5,940 GWh.[6] Power supplied by IPPs amounts to 10% of BC's electricity requirements.

IPPs are able to supply electricity to British Columbia through Electricity Purchase Agreements (EPA) with BC Hydro. EPAs outline the terms and conditions by which BC Hydro purchases electricity from IPPs.

5. Energy Plan for our Future: A Plan for BC Ministry of Energy and Mines, 2002.
6. As of April 1, 2009 and excluding the Alcan Long-Term Electricity Purchase, Arrow Lakes Hydro and the Brilliant Expansion.

Calls for power

BC Hydro has implemented a series of calls for power in order to attract future electricity capacity from IPPs. Under a call for power, IPPs are encouraged to submit a proposal outlining a potential energy project as well as the amount of electricity and source of power to be produced. BC Hydro assesses each proposal and offers EPAs to successful bidders.

In addition to the IPPs currently operating in BC, BC Hydro awarded thirty-eight projects with purchase contracts from the 2006 Open Call for Power although these projects are not yet operating. There are also four projects approved for EPAs for forestry based biomass projects under Phase 1 of the Bioenergy Call.

Results of Phase II of the Bioenergy Call and the 2008 Clean Power Call have not yet been released. BC Hydro states that it expects to award electricity purchase agreements for 5,000 GWh of power from the 2008 Clean Power Call and 1,000 Gwh from Phase II of the Bioenergy Call. BC Hydro anticipates attrition — that is projects receiving EPAs that do not pursue development due to permitting issues, financing problems, transmission and interconnection issues or other reasons – of about 30%.[7] Therefore, energy supply, net of attrition, from the 2008 Clean Power Call and Phase II of the Bioenergy Call is anticipated to equal roughly 3,500 GWh per year and 700 GWh per year respectively.

BC Hydro has also initiated a Standing Offer Program targeted at small clean energy projects, with capacity of no more than 10 MW. BC Hydro is planning for 50 MW of installed capacity and 400 GWh per year from this program.[8] As of October 2009, four projects with approximately 17 MW of capacity have been offered EPAs.[9]

Figure 3.3 illustrates BC Hydro's expectation for the timing of new supply purchased through current and prior calls. Further description of BC Hydro Calls is provided in Appendix A.

3.5 IPPBC Demand Forecast

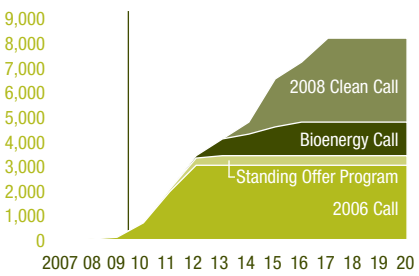
We understand that in addition to the new power supply discussed above, the IPPBC has forecasted that by 2020 electricity demand that could potentially be serviced by IPP projects will expand by a further 21,321 GWh through a combination of increased domestic demand and power exports. The IPPBC assumptions underlying this forecast are outlined below.

Domestic Demand

IPPBC domestic demand and supply forecasts

IPPBC has developed their own domestic demand and supply forecasts based on those provided by BC Hydro in the evidentiary update for the 2008 LTAP[10]. Based on BC Hydro's forecasts for future demand and supply, and assuming no further power purchases, it is estimated that a supply deficit of 4,200 GWh per year could emerge in 2020 (see Table 3.1).

Figure 3.3 New Supply from BC Hydro Calls



7. BC Hydro, 2008 Long Term Acquisition Plan (LTAP), page 6-29.
8. BC Hydro, 2008 Long Term Acquisition Plan (LTAP), page 6-54.
9. BC Hydro, Current Applications & Offered EPAs, www.bchydro.com
10. BC Hydro Long-Term Acquisition Plan Application, Evidentiary Update December 22, 2008, Table 2–10, pg 29.

BC Hydro's mid-load demand forecast for 2009 is 58,000 annual GWh. In 2020, BC Hydro forecasts that demand for electricity could increase to 68,200 GWh, representing a compound growth rate of about 1.5% per year. BC Hydro's 2020 demand forecast represents an increase of 10,200 GWh per year above the 2009 level. BC Hydro forecasts that DSM initiatives could reduce the future demand by 9,600 GWh by 2020 taking forecast future demand to 58,600 GWh by 2020.

On the supply side, BC Hydro forecasts that the supply of electricity from existing sources will amount to 54,400 GWh in 2020 compared to forecast 2009 levels of 52,500 GWh. After taking into account DSM initiatives, a potential supply deficit in 2020 of 4,200 GWh could emerge if only existing power sources are allowed to operate (see Table 3.1).[11]

IPPBC has used the above BC Hydro forecasts as a base from which to estimate future electricity demand and supply taking into account a number of adjustments.

Demand forecasts have been adjusted to take into account the potentially higher demand from several sources including the electrification of oil and gas projects in the North East. In addition, the evidentiary update to BC Hydro's 2008 LTAP indicates that if all residential buildings were to use electric water and space heating by 2020, demand could increase by 26,000 GWh. BC Hydro demand forecasts assume that 20% of residential building use electric space heating while 35% use electric water heating. IPPBC has assumed an increase in electricity demand equal to 10% of the 26,000 figure to take into account potential increased demand for residential heating requirements.

IPPBC has also made an allowance for the potential increased use of electric vehicles by 2020. BC Hydro estimates that if all vehicles were switched to electric vehicles, demand would increase by 9,000 GWh[12]. IPPBC has assumed that 15% of all vehicles will be electric vehicles by 2020, which could lift demand by 1,400 GWh. Lastly, IPPBC has assumed a lower than forecast impact from DSM measures. IPPBC has assumed that 65% of the forecast 10,200 GWh growth in demand calculated previously will be met by DSM measures, based on the BC Energy Plan which states that 50% of future demand will be met with conservation methods[13]. IPPBC forecasts that demand in 2020 could increase to 68,600 GWh after taking into account the above adjustments (compared to BC Hydro forecast after DSM of 58,600 GWh).

On the supply side, IPPBC has assumed that the heritage Burrard thermal power plant will be phased out over time in line with the BC Energy Plan[14] and the recent Throne speech delivered in August 2009. IPPBC has also adjusted forecast supply by 3,000 GWh to take into account the required 2020 electricity

Table 3.1 BC Hydro's forecast demand and supply from existing sources

(GWh per year)	F2009	F2020
BC Hydro's mid load forecast demand	**58,000**	**68,200**
BC Hydro's forecast contribution from DSM		(9,600)
Forecast demand post DSM (a)	**58,000**	**58,600**
BC Hydro's forecasts supply from existing and committed sources (excluding SOP)		
Heritage hydroelectric (assuming critical water)	42,600	42,600
Heritage (Burrard) thermal/market purchases	1,900	3,200
Resource Smart	200	500
Revelstoke Unit 5	0	100
Existing EPAs (including Alcan)	7,800	6,100
F2006 Call	0	1,900
Total existing & committed supply (b)	**52,500**	**54,400**
Post-DSM supply deficit (c=b-a)	(5,500)	(4,200)

Source: BC Hydro 2008 LTAP, Evidentiary Update December 2008, Table 2–10

11. An overview of electricity demand and forecast supply for British Columbia prepared by BC Hydro is provided as Appendix B.
12. 2008 Long-term Acquisition Plan, Evidentiary Update, December 2008, pg 11–12.
13. The BC Energy Plan point 1.
14. The BC Energy Plan point 22.

buffer outlined in the BC Energy Plan[15]. New supply from Waneta (estimated at a third of the project output) and Site C (estimated at 4,600 GWh by BC Hydro) have also been factored into future supply figures. Lastly, IPPBC has adjusted supply for potential electricity to be acquired from the Standing Offer Program (estimated by BC Hydro at 400 GWh), Bioenergy calls (estimated by BC Hydro at 1,279 GWh[16]) and the Clean Power Call (estimates by BC Hydro at 3,500 GWh based on original 5,000 GWh target taking into account 30% attrition). IPPBC forecasts that electricity supply in 2020 could reach 59,279 GWh by 2020 after taking into account the above adjustments.

Overall then, IPPBC forecasts a supply deficit of 9,321 GWh by 2020, which could be filled by future IPP projects.

Table 3.2 IPPBC forecast 2020 demand and supply

(GWh per year)	F2020
BC Hydro forecast demand after DSM	**58,600**
IPPBC adjustments to BC Hydro demand forecasts	
Allowance for electrification of North East oil and gas facilities	3,000
Allowance for residential heat and hot water	2,600
Alowance for electric vehicles	1,400
Reduced reliance on DSM	3,000
Total adjustments to future demand	**10,000**
Future demand after adjustments	68,600
BC Hydro forecast supply from existing sources	**54,400**
IPPBC adjustments to BC Hydro supply forecasts	
Reduce Burrard to minimum energy[1]	(2,800)
Insurance energy required by 2020	(3,000)
New BC Hydro supply from Waneta	900
New BC Hydro supply from Site C	4,600
New supply from Standing Offer Program	400
New supply from Bioenergy calls[2]	1,000
New supply from Clean Power Call	3,500
Total adjustment to future supply	**4,600**
Future supply after adjustments	59,000
Forecast supply deficit	**(9,600)**

1. On October 28, 2009, the Provincial Government issued a directive to the British Columbia Utilities Commission that Burrard Thermal would no longer be available to supply firm energy and could only be relied upon for no more than 900 MW of capacity.
2. Construction of 1,279 GWh will be built from projects under the Bioenergy call but only 1,000 GWh of power are expected to be available in 2020.

Export Demand Assumptions

The IPPBC is also forecasting that, as a result of demand arising from accessible export regions in the Western Interconnection,[17] IPP projects in BC will be able to export 12,000 GWh of electricity to the United States.

This forecast is predicated on the following IPPBC assumptions:

- BC IPPs will capture 10% of the 120,000 GWh total legislated renewable portfolio standards requirement across the Western Electricity Coordinating Council (WECC) area[18]
- Construction of transmission capacity will occur to enable greater flow of renewable energy between BC/Alberta, the Pacific Northwest and California
- Canada will establish comparable fiscal incentives for renewables comparable to U.S. levels
- BC renewables will be able to shape and firm their typically intermittent and seasonal energy to meet export buyers needs
- The cost of transmission to deliver electricity to export buyers will not be so high as to make BC renewables uncompetitive

Appendix C provides an overview of the electricity export/import market in British Columbia and discusses factors affecting export capability.

15. The BC Energy Plan point 10.
16. Total capacity built by 2020 from the Bioenergy call is estimated to be 1,279 GWh, however projects generating only 1,000 GWh are expected by IPPBC.
17. Participants of the Western Interconnection include 14 western states, Alberta, British Columbia and northern Baja California, Mexico.
18. Base Case RPS Targets by Region, Terms of Reference, Overview of Export Study, Energy and Environmental Economics Inc., Long-Term Electricity Transmission Inquiry, page 39, August 5, 2009.

3.6 Summary

Based on the information and projections discussed in previous sections, we have grouped IPP projects into two broad categories: existing IPP projects, and potential IPP projects. These categories are defined below.

Existing IPP Projects

Existing IPP projects are defined as run-of-river, wind and thermal projects that are currently operating and generating power in BC, excluding self-generation projects and non-BC Hydro large-scale hydro projects. Existing IPP projects generate roughly 5,940 annual GWh of electricity in British Columbia.

Potential IPP Projects

Potential IPP projects are defined as run-of-river, wind, and thermal projects that may arise from electricity purchase agreements (EPAs) signed through previous BC Hydro power calls, projected future EPAs from current BC Hydro power calls and projects assumed to be developed as a result of IPPBC's long-run demand forecast. These categories are outlined below:

1. **Projects arising from previous BC Hydro Power Calls:** this category includes IPP projects that have been granted EPAs through BC Hydro power calls occurring prior to or through the 2006 call but are not yet operational and is approximately 3,030 GWh of electricity.
2. **Projects arising from current BC Hydro Power Calls:** this category includes IPP projects that may become operational as a result of the 2008 Clean Power Call, the 2008 Bioenergy Call, and BC Hydro's Standing Offer Program. These power calls are projected to lead to EPAs for approximately 5,179 annual GWh of electricity.
3. **Additional IPP projects arising from IPPBC's forecast of future electricity demand:** In addition to IPP projects defined in categories (1) and (2) above, our understanding is that the IPPBC has projected demand for future power generation equalling 21,321 annual GWh by 2020. This consists of additional 9,321 GWh from future BC Hydro calls and 12,000 GWh through exports of power to the United States.

Table 3.3 summarizes the output (GWh) and capacity (MW) of existing IPP projects and potential IPP projects.

The data in Table 3.3 provides the basis for the economic impacts presented in Section 4.

Table 3.3 Summary of Output and Capacity from Existing and Potential IPP Project

Existing and Potential IPP Projects	Category	GWh	MW
Projects from previous BC Hydro Power Calls	2006 and Prior Calls	3,030	775
Projects from current BC Hydro Power Calls	2008 Clean Power Call	3,500	968
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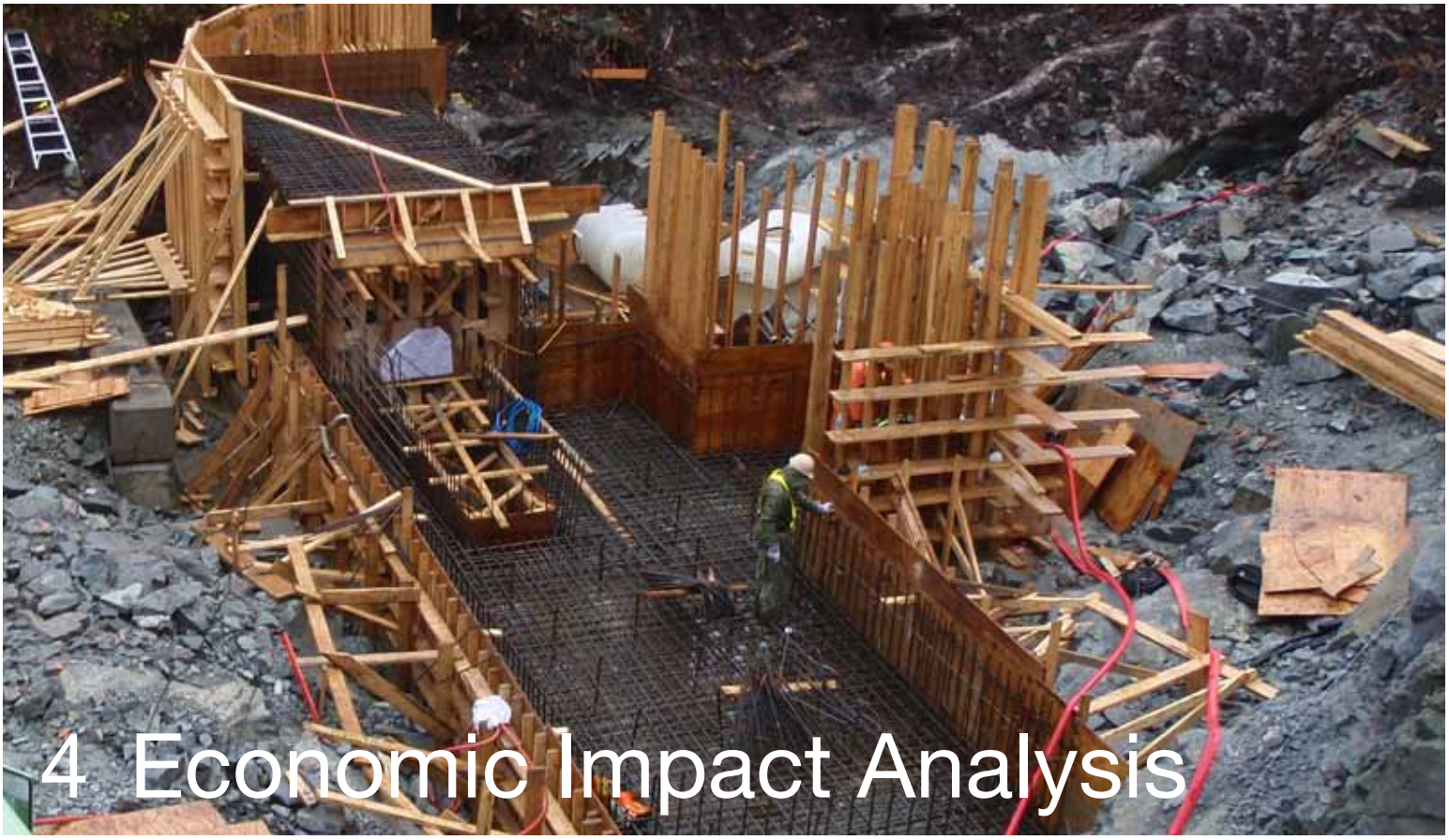
Total existing IPP projects		**5,940**	**1,014**
Total existing and potential projects		**35,470**	**8,923**



4 Economic Impact Analysis

In our study economic impacts were estimated using economic multipliers for BC published by BC Stats. These multipliers represent the effects of a one-time shock to the economy. Impacts arise from direct spending by an industry, as well as through indirect spending via backward linkages (e.g. supply-chains) throughout the BC economy.

This analysis attempts to capture the existing and potential economic impacts derived from investment in existing and potential BC based IPP projects. While IPP projects may produce many qualitative benefits for an economy, the measurement of economic impacts is generally viewed as being restricted to quantitative, well-established measures of economic activity. The most commonly used of these measures are value added (or gross domestic product (GDP)), government tax revenues and employment:

Value added (GDP) – the "value added" to the economy is the unduplicated total value of goods and services. It includes only final goods to avoid double counting of products sold during an accounting period.

Government tax revenue – the total amount of tax revenues generated for different levels of government.

Wages and salaries – the total value of wages and salaries associated with employment impacts.

Employment – the number of additional jobs created. It represents the number of full-time jobs and is expressed in equivalent person years.

By convention, economic impacts are reported at the direct, indirect, and induced levels. These levels are defined below:

Direct impacts are changes that occur in "front-end" businesses that would initially receive expenditures and operating revenue as a direct consequence of the operations and activities of a project (e.g., the purchase of construction materials or equipment from a local supplier).

Indirect impacts arise from changes in activity by suppliers of the "front-end" businesses (e.g., purchase of merchandise from factory by local business supplying the project).

Induced impacts arise from shifts in spending on goods and services as a consequence of changes to the wages and salaries of the directly and indirectly affected businesses.

The total impact of any given initial expenditure by a project is calculated by adding the direct, indirect and induced impacts.

4.1.1 Regional Impacts

An element of the IPP industry is that it impacts a diversity of geographic areas. In many cases, IPP projects are constructed in economically disadvantaged areas of the province, or in areas that have been hit hard by the downturn in the forestry industry. We have estimated economic impacts from IPP projects within the following BC transmission regions.

- Vancouver Island
- Lower Mainland (includes: Sunshine Coast, Squamish to Pemberton Corridor, Harrison and Lillouet Lake area)
- Kelly/Nicola
- South Interior
- East Kootenay
- Central Interior
- Peace River
- North Coast

Although an IPP project may be located within a specific region, it would be incorrect to assume that all economic impacts arising from the project occur within that region. Some project spending will occur outside of the region in which the IPP project is located and some spending, particularly on specialized equipment such as wind turbines, will occur outside of the province. We have assumed that BC based project spending will occur in regions that have an optimal combination of economies of scale (measured by industry share of labour) and transportation cost. For example, spending for professional or technical services is more likely to occur in the Lower Mainland where such services are concentrated. Spending that occurs outside of the province has been excluded from the economic impact calculations.

4.1.2 Data Sources

Data regarding the characteristics of IPP projects in BC were sourced from BC Hydro and IPPBC. Estimates of future IPP investments were made by combining information obtained from IPPBC and BC Hydro's 2008 Long-Term Acquisition Plan. These estimates also build from previous work completed by D.E. Park & Associates, and Steve Davis & Associates Consulting Ltd.

Economic impacts were estimated using BC Stats input-output multipliers. The composition of capital and operating expenditures used to generate these impacts were based on information for typical projects for each energy type. This information was supplied by IPPBC which was obtained from independent power company sources.

4.2 Capital Spending on IPP Projects

The economic impacts in this study are estimated in 2009 dollars. For current IPP projects, this means that economic impacts reflect the impact of the project at 2009 replacement cost. Key assumptions regarding capital costs used to estimate economic impacts were scaled by installed capacity (Megawatts, MW) for each IPP energy type. These assumptions are presented in Table 4.1 and have been reviewed and agreed to by independent power industry experts.[19]

19. D.E. Park & Associates, April 2009

From Table 4.1 the estimated value of capital investment in existing IPPs across BC, at 2009 replacement cost, is estimated to equal $2.8 billion. Capital investment in potential IPPs is estimated to equal $26.1 billion in 2009 constant dollars. It should be noted that capital investments are projected to occur over at least a 10-year time period. Also, much of the projected capital expenditure is expected to flow outside of the province due to the specialized nature of capital equipment needed for these projects.

4.3 Impact on the Provincial Economy

IPP projects contribute to provincial GDP during both the construction phase of a project and through ongoing operations.

The construction phase impacts for existing IPP operations at 2009 replacement cost are presented at the provincial level, by energy type, in Table 4.2.

The estimated GDP impact from the construction of existing IPP operations is estimated to have been $1.2 billion or $1.1 million per MW at 2009 replacement cost. Most of the impact is estimated to have been generated by run-of-river and thermal projects, though we have estimated a material contribution from the one (soon to be) operating wind power project.

Table 4.3 presents the projected IPP impacts from potential IPP projects. It is important to note that these impacts are projections of the future and therefore contain an inherent degree of uncertainty. It should also be noted that these impacts are expected to occur over at least a 10-year period.

The projected GDP impact from the construction of potential IPP projects is equal to $8.8 billion or $1.1 million per MW. The impacts are projected to be largely generated by run-of-river and wind projects, reflecting the composition of recent BC Hydro clean power calls and BC's renewable energy resource potential. Material impacts arising from investments in biomass and other thermal energy are also reflected in the projections and the estimated GDP per MW for thermal energy is particularly high compared with other energy types because of the higher proportion of in-province capital spending for biomass projects.

Table 4.1 Capital Spending and Installed Capacity by Energy Type

			Thermal	
	Small Hydro/ Run-of-River	Wind	Biomass/ Energy Recovery	Gas/BioGas
Capital Expenditures/MW during Construction Phase ($2009 million)	$3.5	$3.0	$4.0	$1.5
Existing Operations (MW)	450	102[2]	108	354
Estimated Capital Expenditures at 2009 Replacement Cost (millions)	$1,575	$240[3]	$432	$531
Total Anticipated Supply from Potential IPP Projects (MW) – net of attrition				
EPAs from 2006 & Prior Calls (MW)	581	178	16	–
2008 Clean Power Call (MW)	506	430	32	–
2008 Bioenergy Call (MW)	–		144	–
Standing Offer Program (MW)	39[1]	1.5	7.5	2
Future Calls & Export Demand[4] (MW)	2,274	3,181	517	–
Total Potential (MW)	3,400	3,791	717	2
Estimated Capital Expenditures during Construction Phase ($2009 billion)	$11,900	$11,373	$2,868	$3

Notes:
1. Energy composition of the planned 50 MW under the Standing Offer Program is assumed to follow the composition of applications as of April 2009.
2. Assumes the Bear Mountain wind project will be operating by November 2009.
3. Estimated Capital Cost of Bear Mountain wind project
4. Capacity (MW) from future calls is based on IPPBC long-term forecast assumptions. The energy composition of these future calls is based on a Pacific Gas and Electric Company 2008 feasibility study for potential renewable energy generation in BC. (See: PG&E's Renewable Energy Feasibility Study – Phase One Results, PG&E Media Backgrounder, June 20, 2008

Source: D.E. Park & Associates; IPPBC

Table 4.2 Estimated GDP Impact of Existing IPP Projects – Construction Phase (at $2009 Replacement Cost)

	Small Hydro/ Run-of-River	Wind	Thermal	Total
GDP Impact ($2009 million)	$531	$75	$570	$1,176
Direct ($2009 million)	$299	$41	$318	$657
Indirect and Induced ($2009 million)	$232	$34	$253	$519
GDP Impact per MW ($2009 million)	$1.2	$0.8	$1.2	$1.1

Table 4.3 Projected GDP Impact of Potential IPP Projects – Construction Phase ($2009)

	Small Hydro/ Run-of-River	Wind	Thermal	Total
GDP Impact ($2009 million)	$3,998	$3,108	$1,695	$8,801
Direct ($2009 million)	$2,249	$1,661	$944	$4,854
Indirect and Induced ($2009 million)	$1,749	$1,447	$751	$3,947
GDP Impact per MW ($2009 million)	$1.2	$0.8	$2.3	$1.2

4.3.1 Regional GDP Impacts – Construction Phase

Because IPP projects occur in a diverse array of BC communities, the development of these projects presents a significant opportunity for many regions of the province to magnify and diversify their economic base. Figure 4.1 illustrates how the estimated GDP impacts are distributed across BC.

As Figure 4.1 illustrates, the geographic diversity of IPP projects translates to significant contributions to regional economies across the province. A large portion of the GDP impact is estimated to occur in the Lower Mainland (Sunshine Coast, Squamish to Pemberton Corridor, Harrison and Lillooet Lake area) because of the large number of run-of-river projects proposed for that region, and because a significant amount of overall IPP project spending on required goods and services occurs within that region.

4.4 Operating Phase GDP Impacts

Upon completion of the construction phase, IPP projects continue to contribute to the local economy through ongoing operations. The annual GDP impacts of existing and potential IPP projects are presented in Table 4.4.

The impacts in Table 4.4 present the total direct, indirect and induced annual GDP impacts created by the operations expenditures of IPP projects. Thermal projects are estimated to have the largest annual impact during the operating phase due to a high magnitude of spending within BC, particularly for biomass fuel from the BC forestry sector.

Figure 4.1 GDP Impact of IPP Construction Phase by Region

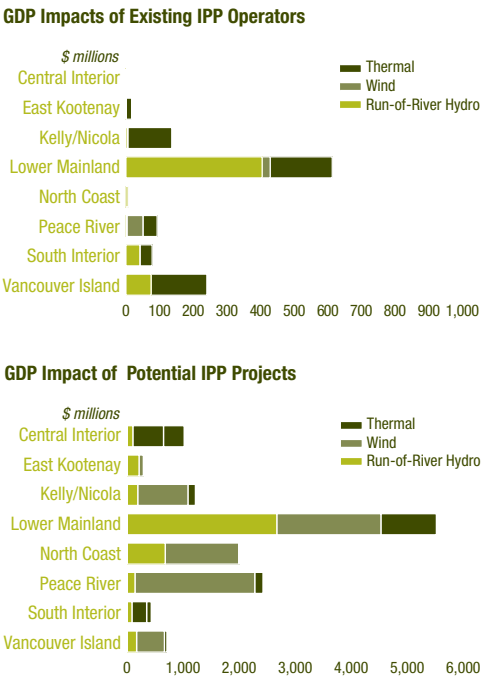


Table 4.4 Total Annual GDP Impact from Spending by IPP Projects – Operations Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Existing Operations ($2009 million)	$8.3	$1.4	$75.0	$84.7
Potential Operations ($2009 million)	$62.2	$43.4	$324.3	$429.9

4.4.1 Regional GDP Impacts – Operating Phase

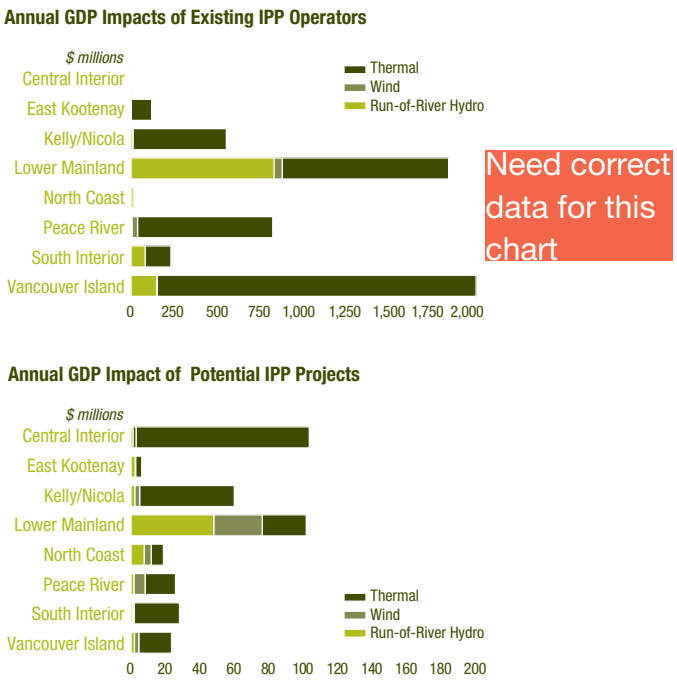
Annual GDP impacts from spending by IPP operations are illustrated by region in Figure 4.2. Much of the spending on operations is assumed to occur locally, creating a more balanced dispersion of GDP impacts compared with the construction phase.

4.5 Employment Impacts

The majority of employment created by IPP projects occurs during the construction phase of a project and should therefore be considered person year impacts rather than full-time jobs. However, IPP projects also create ongoing employment from operations. The direct employment impacts, per MW, are presented in Table 4.5, and are estimated using a conservative employment factor that is based on industry averages.[20] All indirect and induced impacts were estimated using BC Stats input-output model multipliers.

Table 4.6 presents estimates of employment generated during the construction phase of existing IPP projects and represents estimates of the person years of employment generated.

Figure 4.2 Annual GDP Impact of IPP Spending During Operations Phase by Region



The total employment impact from the construction phase of existing IPP projects is estimated to have been just over 11,000 person years of employment. Each of the three energy types involves labour intensive construction phases for each project and therefore, are estimated to generate significant direct employment.

Table 4.7 presents the projected employment from potential IPP projects arising from BC Hydro energy calls up to 2008 and IPPBC forecasts of future long-run electricity demand.

Total employment impacts from potential IPP developments are projected to equal 86,991 person years of employment or about 11 person years of employment per MW. The majority of employment is projected to be generated by run-of-river hydro projects and wind projects. However, based on information we have collected, thermal projects (particularly biomass) have a higher portion of BC content in capital expenditures and, therefore, are estimated to have higher indirect and induced employment impacts.

Table 4.5 Direct Employment Impacts by Energy Type, per MW

	Small Hydro/Run-of-River	Thermal		
		Wind	Biomass	Gas
Jobs/MW (person years) During Construction Phase	4.0	2.5	4.2	1.7
Jobs/MW (FTEs) During Operating Phase	0.06	0.26	0.5	0.2

Table 4.6 Estimated Employment Impact of Existing IPP Projects – Construction Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Employment (person years)	5,430	768	4,863	11,136
Direct (person years)	1,804	225	1,055	3,159
Indirect and Induced (person years)	3,626	543	3,808	7,977
Employment per MW	12	8	10.5	11

Table 4.7 Projected Employment Impact of Potential IPP Projects – Construction Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Employment Impact (person years)	40,916	31,723	14,352	86,991
Direct (person years)	13,595	9,479	3,007	26,081
Indirect and Induced (person years)	27,320	22,245	11,345	60,910
Employment per MW	12	8	20	11

20. D.E. Park & Associates Report, April 2009. The employment factor used is conservative in that it produces lower impacts than do BC Stats input-output multipliers.

4.5.1 Regional Employent Impacts – Construction Phase

In assessing employment impacts across regions, we have made the key assumption that construction employment is largely drawn from the local region. It may be the case that workers live outside of the region most of the year, however, we have assumed that these individuals stay within the region for the duration of their employment on the project and spend a portion of their wages locally. Therefore, they are treated as temporary residents of the region. Regional employment impacts are illustrated in Figure 4.3.

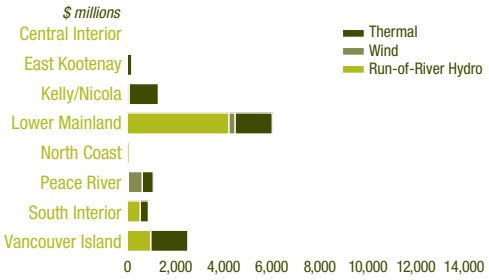
4.5.2 Operating Phase Impacts

In addition to the construction phase impacts presented in Tables 4.6 and 4.7, IPP operations are estimated to generate ongoing employment impacts. The employment impacts of ongoing operations are considered to be permanent full-time jobs. In addition to jobs that relate directly to operating the facility, other employment arises from direct spending by IPP projects for things such as road maintenance and vegetation maintenance on transmission lines.

As shown in Table 4.8, the operations of existing IPP projects support a significant amount of employment in the province while potential IPP projects would generate even larger employment impacts.

Figure 4.3 Regional Employment Impact of IPP Projects during Construction Phase

Employment Impacts of Existing IPP Operators



Employment Impact of Potential IPP Projects

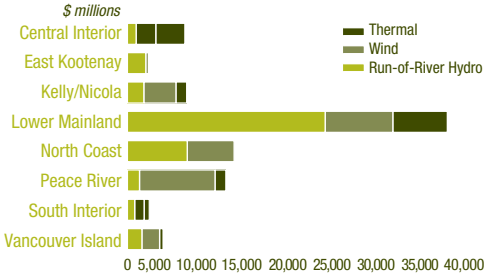


Table 4.8 Annual Employment Impacts from IPP – Operations Phase

	Small Hydro/ Run-of-River	Wind[21]	Thermal	Total
Existing Operations (FTE)	**140**	**52**	**983**	**1,175**
Direct Employment	27	31	125	183
Employment Supported by Operating Expenditures	113	21	858	992
Potential Operations (FTE)	**1,148**	**1,654**	**5,128**	**7,930**
Direct Employment	171	986	358	1,515
Employment Supported by Operating Expenditures	977	668	4,770	6,415

21. Direct impacts for Wind projects during operations phase are estimated to be higher than indirect impacts due to assumed out-of-province spending for operations, maintenance and financing costs.

4.5.3 Regional Employent Impacts – Operating Phase

Regional employment impacts generated or supported by the operating expenditures of IPPs are shown in Figure 4.4.

We have assumed that much of the employment during the operating phase of an IPP project will be sourced locally. Therefore, employment impacts generated by IPP projects are assumed to be spread throughout BC. The regional diversity of the demand for labour from potential IPP projects could translate to enhanced employment and training opportunities for individuals living in remote communities and for First Nations communities.

4.6 Government Taxation Revenue Impacts

IPP projects generate tax revenues for all levels of government both during the construction phase and through ongoing operations. These tax revenues include corporate income taxes, personal income taxes, property taxes and special taxes such as water rentals paid by run-of-river operations.

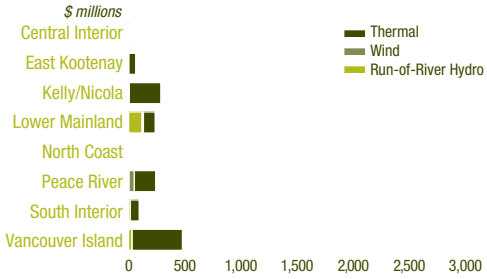
Table 4.9 presents estimated government tax revenues generated during the construction phase of existing IPP projects.

Government tax revenues, accruing to all levels of government, attributable to expenditures during the construction phase of existing IPP projects are estimated to have been $235 million. Payments to the federal government are estimated to have been just over $112 million, $102 million is estimated to have gone to the Province, and $22 million is estimated to have accrued to municipal governments across BC.

Table 4.10 outlines government taxation revenue projected to result from investment in potential IPP projects.

Figure 4.4 Regional Employment Impacts of IPP Projects during Operating Phase

Annual Employment Impacts of Existing IPP Projects



Annual Employment Impact of Potential IPP Projects

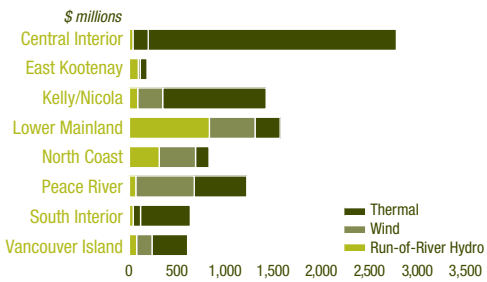


Table 4.9 Estimated Government Tax Revenues from Existing IPP Projects – Construction Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Government Tax Revenues ($2009 million)	$97	$15	$123	$235
Federal ($2009 million)	$43	$6	$63	$112
Provincial ($2009 million)	$44	$7	$51	$102
Municipal ($2009 million)	$11	$2	$9	$22

Table 4.10 Projected Government Taxation Revenues from Potential IPP Projects – Construction Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Government Tax Revenues ($2009 million)	$734	$645	$265	$1,644
Federal ($2009 million)	$323	$263	$136	$722
Provincial ($2009 million)	$332	$320	$110	$762
Municipal ($2009 million)	$79	$62	$19	$160

Tax revenues generated from the construction of potential IPP projects are projected at $1.6 billion. Approximately $722 million in government revenues are projected to accrue to the Federal government, $762 million is projected to flow to the Province, and $160 million is projected to be paid to municipal governments across BC.

4.6.1 Operating Phase Impacts

Tax revenues generated by expenditures from ongoing operations of IPP projects include commodity taxes, corporate and personal income taxes, and various municipal taxes. Estimates of these annual tax revenues are shown in Table 4.11. These tax revenue impacts represent only those government tax revenues generated by the annual operational spending of IPP projects.

IPPs also pay taxes directly to all levels of government and include corporate income taxes, personal income taxes paid by employees, property taxes and energy specific taxes such as water rentals.

Estimating the corporate and personal income taxes for IPP firms is challenging since some of the technology applications are relatively new in British Columbia and, therefore, there is little historical data from which to calculate reliable measures of income taxes generated by the industry. To estimate direct annual corporate and personal income tax payments from IPP projects, we have made some necessary simplifying assumptions. For example, to estimate personal income taxes paid by direct employees of IPP projects, we have assumed that the average wage in the IPP industry will be competitive with average wages for the utility industry in BC. Furthermore, estimates of corporate income taxes assume that the IPP operations are profitable, though in practice these operations may take several years to generate positive earnings. Other taxes such as property taxes and water rentals have been estimated based on data collected from individual IPP projects.

Estimates of direct tax payments to all levels of governments are presented in Table 4.12. It should be noted that these are estimates based on simplifying assumptions and may differ from actual results.

Table 4.11 Annual Government Taxation Revenues from Spending by IPP Projects – Operations Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Existing IPP Operations	**$1.15**	**$0.17**	**$10.1**	**$11.4**
Federal ($2009 million)	$0.47	$0.08	$4.6	$5.1
Provincial ($2009 million)	$0.47	$0.07	$4.3	$4.8
Municipal ($2009 million)	$0.21	$0.02	$1.2	$1.4
Potential IPP Operations	**$8.7**	**$6.3**	**$31.9**	**$46.9**
Federal ($2009 million)	$3.5	$3.2	$16.0	$22.5
Provincial ($2009 million)	$3.6	$2.6	$12.7	$18.9
Municipal ($2009 million)	$1.6	$0.7	$3.2	$5.5

Table 4.12 Annual Direct Tax Payments by IPP Projects – Operations Phase

	Small Hydro/ Run-of-River	Wind	Thermal	Total
Existing IPP Operations	**$35.2**	**$5.4**	**$31.5**	**$72.1**
Federal ($2009 millions)	$16.3	$3.2	$17.3	$36.8
Provincial ($2009 millions)	$15.6*	$2.1	$11.3	$29.0
Municipal (property taxes)	$3.3	$0.11	$2.9	$6.3
Potential IPP Operations	**$215.0**	**$200.5**	**$118.6**	**$534.1**
Federal ($2009 millions)	$103.3	$118.9	$60.1	$282.3
Provincial ($2009 millions)	$91.3	$77.5	$39.4	$208.2
Municipal (property taxes, $2009 millions)	$20.4	$4.1	$19.1	$43.6

* Includes water rentals

4.7 Other Economic Benefits

Pre-construction spending

IPP operators spend capital not only building a new IPP project but also in exploring and developing new project opportunities. As a result, an IPP may spend several million dollars prior to constructing a power plant. For example, information obtained from several wind projects indicated estimated pre-construction spending from $2.8 million to $4.6 million for projects ranging in size from 120 MW to 370 MW. Estimated costs for the environmental assessment process ranged from $0.75 million to $1.3 million. It is important to note that the previous economic analysis only considers economic impacts from construction of a new power generating facility and does not take into account the potential impacts of exploration and development spending.

A breakdown of exploration and development spending includes the following categories:

- Resource Assessment and securing tenures
- Environmental studies
- Engineering (including feasibility studies)
- First Nations and stakeholder consultation
- Other costs

The IPPBC estimated that IPPs bidding on the Clean Power Call spent $50 million preparing their bids before the deadline.[22] It is worth noting that the development capital invested by IPPs in the lead up to bidding on a power call represents at-risk capital of private companies. Not all of pre-construction efforts result in successful projects but any projects that are not approved do not represent a loss of development spending to ratepayers or tax payers. BC Hydro estimates that around 30%[23] of potential IPP projects selected from calls for power will not be completed as a result of permitting issues, lack of financing opportunities, the cost of capital as well as difficulties around potential transmission and interconnection issues.

IPP projects can experience different types of risks and challenges that add to the cost of project construction. The following factors outline some of the challenges encountered in the development of an IPP project:

- IPP projects can take a number of years to develop such that the delay could result in construction cost overruns and other impacts from unplanned delays.
- Financial risks also includes possible cost increases from rising inflation and changes in interest rate movements during construction.
- Project risks could also be related to the topology where the project is situated, environmental impacts, and/or possible land-use conflicts that could delay and result in increased construction costs.
- Projects such as wind farms may be located in remote areas, which may lessen the attractiveness of the electricity opportunity such that the remoteness results in escalated costs to construct the facility and connect to the grid.

4.7.1 Benefits of Risk Transfer from Public to Private Sector

Investment in IPP projects by private investors provides a benefit to ratepayers in BC. Private investors assume the project risk by taking on the exploration and development costs of new electricity projects as investment in new electricity projects is considered to carry significant risk. Risk stems from uncertainty around the public acceptance of new power projects or potential cost volatility associated with certain fuel sources. By taking on this risk, IPPs have been noted as responding to the gap in electricity generation investment and in this role have reduced the financial risk to ratepayers and tax payers.[24]

22. IPPBC, conference welcome speech, 6th Annual Conference of the Association, October 2008.
23. BC Hydro 2008 Long Term Acquisition Plan, Revision of February 27, 2009.
24. Mark Jaccard, Assessing BC Electricity Policy, Peer Review of Two Controversial 2007 Documents, September 2008.

5 Community Economic Benefits

5.1 BC Communitites

In addition to economic impacts IPP projects may generate broader economic benefits. In this section we describe some of these benefits.

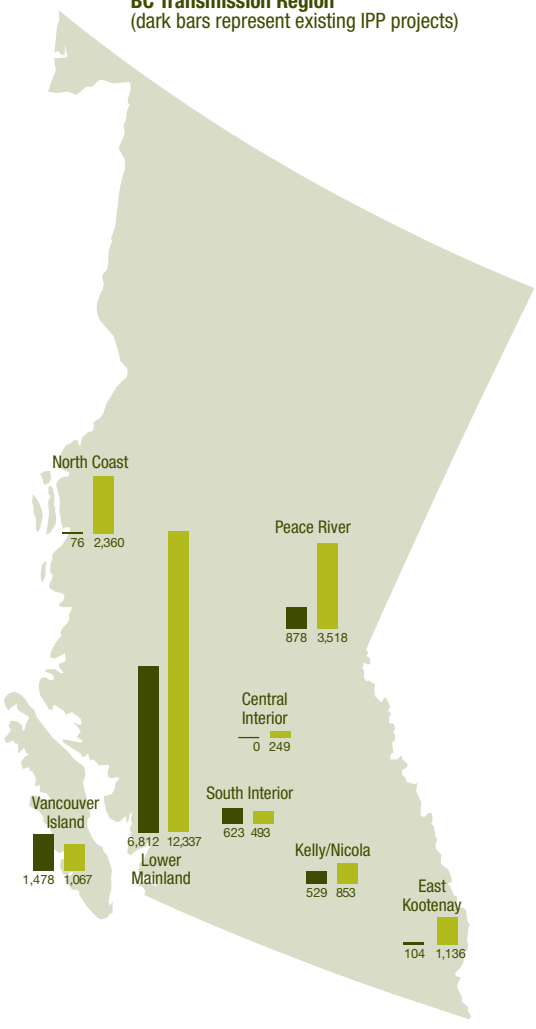
5.1.1 Employment Benefits

Many IPP projects are located in remote locations of BC that are at present economically disadvantaged. This is especially true for communities that have historically relied on the forestry industry as a significant employer. Figure 5.1 illustrates the geographic distribution of estimated IPP employment impacts for existing and potential projects.

Because many of the skills required in the forestry industry are transferrable to the independent power industry, IPP projects may provide an employment stimulus to economically depressed regions of BC. Examples of roles and jobs that cross over from existing BC industries to work on IPP Projects include:

- Crews that build roads for logging operations are both local and trained to build roads and other related works on IPP projects, and maintain the roads during plant operations
- Crews that build large industrial projects in nearby towns (industrial towns, etc) can build the foundations, concrete, and other comparable types of construction on IPP projects
- Crews that carry out cable logging operations can work on the cable stringing operations for transmission line construction
- Crews that carry out hard rock mining operations can work on tunnels for IPP projects
- Environmental consultants that assess the fisheries, wildlife, and vegetation aspects of proposed infrastructure, mining, and forestry projects to meet Provincial and Federal environmental requirements are well suited to assess the potential impacts of IPP Projects
- Engineering consultants that assess the technical viability of proposed road, bridge, pipeline, and transmission line projects use those same skills and expertise on IPP Projects

Figure 5.1. Employment Impacts by BC Transmission Region
(dark bars represent existing IPP projects)



5.1.2 Local Government Revenues

Construction and ongoing operations expenditures by IPP projects are estimated to generate significant municipal taxes across BC (see Tables 4.9 – 4.11). The direct property taxes paid by IPP projects help to enhance and diversify the municipal tax base and represent a substantial benefit for the communities in which they are located.

The estimated direct contribution by potential IPP projects to municipal taxes shown in Table 4.12 illustrates the impact that potential IPP projects would have on the economic development of local communities in BC. These projects also represent an opportunity to diversify the current tax base of communities without a large industrial presence or to replace taxes lost due to the decline in traditional industries.

Moreover, potential IPP projects could be significant employers in their regions which would in turn support a higher residential tax base and encourage community development.

5.1.3 Local Purchasing

During the construction of an IPP project, the IPP operator usually works with local builders and contractors. In many cases, IPP projects also offer local communities a variety of training and employment opportunities in both the construction and operating phases of the project. Local businesses may also be employed to maintain equipment such as transmission lines even if the actual power generator is not located nearby. As a result, more than one community may benefit from a single IPP project.

5.1.4 Enhancement of Services

IPP projects are often located in remote areas with few facilities and infrastructure. The construction of an IPP project can provide a remote community with the opportunity to upgrade existing infrastructure or to obtain previously unavailable services. In a number of cases, it is necessary for IPP operators to construct roads in order to obtain access to their remote projects and in order to assist in bringing construction equipment to the building site. As a result, an IPP projects may create new access to areas that are remote in addition to improving existing access.

In addition, IPP projects may leave a community communications equipment as well as camp accommodation used in the construction of the power plant. Such equipment and accommodation may provide a local community with better communication infrastructure as well as additional buildings, which may be converted into community centres or town halls. IPP operators may provide local communities with financial support for community and cultural events, as well as for conservation efforts of streams and wildlife.

5.2 First Nations Partnering

5.2.1 First Nations Consultation

A number of landmark court cases have established and continue to define Aboriginal rights and land title. Previous court decisions have clarified the Crown's responsibility to negotiate with First Nations communities with respect to potential developments on traditional territories. In particular, two cases (*Rinstad* vs. *Taku River Tlingit* and *Haida* vs. *BC* and *Weyerhauser*) have confirmed the Crown's legal duty to consult with First Nations and to potentially accommodate First Nations interests as they relate to developments on traditional territories. The duty for the Crown to consult and potentially accommodate First Nations arises under Section 35 of the Constitution Act (1982) and may be triggered by any federal activity (licence, disposition of Crown land, etc.) that could impact Aboriginal rights. The obligation to consult and accommodate First Nations with respect to potential developments does not extend to the private sector. However, the Crown can make certain demands on private sector proponents seeking licenses or other approvals. In 2008, the Government of Canada released Interim Guidelines on Aboriginal Consultation and Accommodation, in order to provide a framework for consultations with Aboriginal communities.

Power projects can impact First Nations communities to the extent that they are built on traditional territories which could trigger the Crown's duty to consult and potentially accommodate the duty to consult. Such projects can also have socio-economic, cultural and environmental impacts on First Nations communities and traditional lands. A number of IPP operators have recognized the benefits of negotiating partnership agreements with affected First Nations communities.

5.2.2 Benefits of Partnerships

Both IPPs and First Nations can benefit from partnership agreements. For IPPs, the project gains access to a local work force with local knowledge of the surroundings. Partnering with local communities can also facilitate the cooperation of First Nations, allowing permitting and construction of the project to proceed with minimal interruptions or disturbances.

Partnership agreements outline how the IPP and the First Nations community will work together to construct and operate a potential power project. Such partnership agreements also typically outline a number of financial and economic benefits that will flow to affected First Nations communities. Partnership agreements are described in section 5.2.3.

First Nations communities benefit from partnership agreements as a result of social and cultural support, financial payments from the project and economic benefits. Key features of partnership agreements include:

Training, employment and procurement. First Nations people and businesses are engaged in the construction, management and maintenance of the power project. The partnership agreement typically contains a provision for contracting First Nations businesses in the development and maintenance of the facility. Such efforts provide First Nations with additional employment and training opportunities.

Revenue sharing agreements or profit sharing agreements are commonly negotiated between First Nations and IPPs providing financial benefits for the local community. First Nations sometimes also take an equity stake in the project allowing further financial benefits. Equity stakes also allow for First Nations representation on the project's board or management positions to further enhance the communities influence in the project.

Cultural and environmental contributions aimed at promoting and preserving First Nations culture and environmental stewardship are also negotiated in partnership agreements.

Additional infrastructure (e.g. roads, communication stations, additional housing for workers) gained as part of an IPP project partnership agreement. In addition, a number of remote First Nations communities can gain access to cleaner and more reliable energy after being connected to the grid as opposed to operating diesel generators.

5.2.3 Types of Partnerships

The types of partnerships between IPP owners and First Nations can take a number of forms including Impact Benefit Agreements (IBAs), Memorandums of Understanding (MoUs), revenue sharing or profit sharing agreements as well as potential equity stakes in a project.

Partnership agreements may need to be negotiated with a number of First Nations communities, depending on the scale and location of an IPP project. For instance, if transmission lines need to be constructed for connection to the main grid, it is possible that these lines may cross a number of traditional First Nations territories. As a result, IPPs may need to negotiate agreements with all communities affected by the project. In such a case, a number of First Nations communities could negotiate benefits, to varying degrees, from a single IPP project.

Impact Benefit Agreements (IBAs) are commonly used in outlining and defining the relationship between IPP operators and First Nations communities. IBAs define how First Nations and IPPs will work together as well as the potential financial and economic benefits. A typical IBA will define how revenue, royalties or profits will be shared with First Nations communities. In addition, IBAs may provide for the provision of funds for cultural preservation or environmental stewardship. The IBA may also outline training, employment and contracting arrangements. IBAs may also contain procedures for dispute resolution between the two parties.

Revenue sharing and profit sharing agreements are negotiated with First Nations communities to provide financial benefits from a project established on their traditional territories. Such agreements outline the percentage of revenue or profit generated by the IPP project that will be transferred to the First Nations each year. IBAs typically include some form of either revenue or profit sharing.

Equity interest in the project occurs in some instances. In such cases, First Nations may participate in the management and operation of a project in addition to benefiting from a share of the profit. In other circumstances First Nations may have the option of acquiring the project at the end of an electricity purchase agreement with BC Hydro.

First Nations ownership such as the China Creek Small Hydro Project, have been driven and developed by First Nations communities and provide opportunities to non-First Nations businesses and communities. In the case of the China Creek project, the First Nations communities created an investment opportunity for private investors as well as creating employment opportunities for First Nations people. In this case, the local municipality was also given a small equity stake in the project providing a partnership between First Nations, private business and local government.

The type of partnership between First Nations and IPPs may depend on the infrastructure built on traditional territory. First Nations are typically more involved in the running of a project if the generating infrastructure is located on their traditional land. Where transmission lines cross through traditional lands, in some cases First Nations people have been employed to maintain project infrastructure rather than operate.

5.2.4 Current IPP-First Nations Partnerships

A number of IPP operators have negotiated partnership agreements with First Nations communities impacted by IPP operations. This section lists a few agreements reached between First Nations and IPPs and is not a complete list.

- In 2007 Plutonic Power signed an IBA with the Klahoose First Nation regarding the building and operation of the East Toba River/Montrose Creek run-of-river facility. This agreement provides for the employment of Klahoose members as well as Klahoose businesses. The IBA also sets out royalty payments to be made to the Klahoose First Nations for the next 50 years.[25]

25. Plutonic Power Corporation press release, Feb 20, 2007.
26. Plutonic Power Corporation press release, Apr 19, 2007.
27. Plutonic Power Corporation press release, Mar 3, 2008.

- In 2007 Plutonic Power signed an IBA with the Sliammon First Nation regarding the construction of a transmission line on Sliammon traditional territory. The IBA describes the annual payments to be made to the Sliammon First Nation as well as employment opportunities for Sliammon members and businesses.[26]
- In 2008 Plutonic Power signed an IBA with the Sechelt First Nation to enable for the development of transmission infrastructure at Saltery Bay. The IBA outlines annual payments to be made to the Sechelt First Nation for the life of the project as well as employment opportunities for Sechelt members and businesses.[27]
- In 2001 Cloudworks and the Mount Currie First Nation negotiated a Participation Agreement regarding the development of the Rutherford Creek hydro project. The agreement outlined that Mount Currie members would be employed in the construction of the project and that the Mount Currie First Nation would also share in the profits of the project.[28]
- In 2005, ENMAX and the Squamish First Nation announced that ENMAX would acquire 99% of the Furry Creek hydro project with the Squamish First Nation retaining 1% ownership. The Squamish First Nation also benefited from employment opportunities during the construction of the project. The Squamish Nation is also involved in the Ashlu Creek Green Power Project.[29]
- The Upnit Power Corporation was formed in 2004 with shareholders from First Nations, private companies and public municipalities. The Upnit Power Corporation is owned 72.5% by the Hupacasath First Nation, 10% by the Ucluelet First Nation, 12.5% by Synex Energy and 5% by the City of Port Alberni. The Upnit Power Corporation is responsible for running the China Creek hydro project. The China Creek project was initiated and developed by the Hupacasath Nation who also brought in other equity partners.[30]
- The Lil'wat and Squamish First Nations benefit from the Brandywine Creek project through employment and economic opportunities.[31]
- The Tahltan First Nation is entitled to 33% of net profits generated by the Hluey Lake Project electricity sales to industrial customer other than BC Hydro. In addition, the Tahltan First Nation will be able to purchase the facility from the Clean Power Income Fund at the end of the 20-year purchase agreement with BC Hydro.[32]
- NaiKun Wind Energy has entered in to a number of agreements with a number of First Nation communities around its proposed offshore wind farm in the Hecate Strait. NaiKun has signed a Limited Partnership Agreement with the Haida First Nation in 2009 under which the Haida Nation will share in revenues and benefit from employment and environmental stewardship opportunities. The Haida First Nation also recently agreed to purchase a 40% stake in the project. NaiKun has also signed a Commercial Agreement with the Lax Kw'alaams and Metlakatla First Nations regarding the transmission of electricity across traditional areas.[33]
- The Halfway River First Nation and Aeolis Wind Power Corporation signed a Memorandum of Understanding (MoU) regarding the proposed Hackney Hills and Thunder Mountain wind projects. The MoU outlines a framework for developing an IBA between the two parties. The Halfway River First Nation is participating in the environmental assessment of the two projects.[34]
- Western Biomass Power Corporation (a subsidiary of Run of River Power) and the Tsilhqot'in National Government have applied for approval of their 50-50 joint venture biomass project, as part of Phase II of the Bioenergy call.[35] The facility would use pine beetle infested wood to produce 60 MW and would be located in Hanceville.
- Western Biomass Power Corporation has a joint venture agreement with Gitxsan First Nation for operation of the proposed Suskwa biomass project. Under the agreement there would be 40% Gitxsan participation.[36]

28. http://www.cloudworksenergy.com
29. ENMAX press release, Apr 11, 2005.
30. http://www.hupacasath.ca/upnit-power-corporation
31. http://www.runofriverpower.com
32. Macquarie Power and Infrastructure Income Fund, Annual Information Form, Mar 21, 2008.
33. http://www.naikun.ca/the_project/index.php
34. http://www.aeoliswind.ca/
35. http://runofriverpower-com.shoutcms.com/
36. http://runofriverpower-com.shoutcms.com/

Appendix A – British Columbia Policy Framework

Both BC Hydro and the Government of British Columbia have outlined initiatives aimed at meeting British Columbia's future electricity demands. This section highlights the policies and initiatives being used to meet future electricity demand.

British Columbia initiatives to meet future electricity demand

The Government of British Columbia has released a number of plans and strategies which could support the development of IPP projects. This section highlights key policies.

BC Energy Plan

The Government of British Columbia has outlined its plans to meet future electricity demand in its 2002 Energy Plan and 2007 BC Energy Plan. The 2007 BC Energy Plan aims to guarantee that 90% of British Columbia's electricity is generated by clean or renewable energy sources. The 2007 BC Energy Plan also indicates that all new natural gas or oil-fired electricity projects in British Columbia will have zero net greenhouse gas (GHG) emissions. As a result, operators of such facilities will need to invest in mechanisms to offset the GHG emissions from their generators.

In addition, the 2007 BC Energy Plan intends for British Columbia to become self-sufficient in electricity generation by 2016. The Energy Plan indicates that the Government of British Columbia will utilize both supply-side and demand-side means in order to meet the future electricity requirements of the province. The 2007 BC Energy Plan also details other methods the Government will use in order to meet future demand for electricity.

Supply-side measures: BC Hydro acquires additional electricity capacity from IPP operators. The means by which BC Hydro aims to acquire additional electricity are discussed in the next section.

Demand-side measures: The BC Government aims to reduce the demand for electricity over time through greater energy efficiency and conservation through Demand Side Management (DSM) measures. The Energy Plan intends for 50% of the forecast electricity gap[37] to be filled through energy conservation methods. BC Hydro indicated in its latest Service Plan that as much as 73% of the forecast energy gap could be met through DSM methods. Such demand reduction measures include using more energy efficient appliances, new rate structures to encourage energy efficiency and conservation, load displacement[38], fuel switching (e.g. using solar power to heat water) and using small distributed generation (e.g. net metering[39]). Under the BC Energy Plan, utilities are required to specifically consider demand reduction measures as part of their long term planning.

New building efficiency standards: The BC Government also plans to implement energy efficiency standards for buildings by 2010. In addition, new public sector buildings will be required to make use of environmental designs to reduce greenhouse gas emissions. The 2007 BC Energy Plan also indicates that energy efficiency labeling for buildings could support its energy conservation goals.

Innovative Clean Energy Fund: The Innovative Clean Energy (ICE) Fund was established to encourage the development of clean and efficient energy technologies. The fund is intended to help advance energy projects through to commercialization and to promote the use of renewable technologies. To date, the ICE Fund has contributed $47 million towards developing and commercializing 34 projects involving tidal, solar, wind, biomass and geothermal technologies.

BC Bioenergy Strategy

In addition to the 2007 BC Energy Plan, the BC Government has a number of other strategies regarding electricity production. The Bioenergy Strategy, released in 2008, identifies a number of biomass resources that could be used to generate electricity to meet the province's future electricity requirements. The Bioenergy Strategy aims to create at least 10 community biomass electricity projects by 2020 and to use waste wood to generate energy. In addition, the Bioenergy Strategy requires the capture of methane gas from large landfills and aims to support wood gasification research. In addition, the Bioenergy Strategy aims for biofuel projects to contribute 50% of BC's renewable fuel requirements. The Bioenergy Strategy has the potential to support and encourage biomass and biogas IPP projects in the future.

37. The energy gap is the difference between forecast demand for electricity and the forecast supply of electricity in British Columbia. See Figure 7.
38. Load displacement involves customers generating their own electricity.
39. Net metering allows customers who generate their own electricity to offset the amount of electricity drawn from BC Hydro with the amount of surplus electricity generated by the customer.

BC Climate Action Plan

The British Columbia Climate Action Plan outlines the means by which the Government of British Columbia aims to meet its greenhouse gas reduction targets. In 2007 the Greenhouse Gas Reduction Targets Act mandated a 33% reduction in greenhouse gas emissions, from 2007 levels, by 2020. In the near term, the BC Government is aiming to reduce greenhouse gas emissions by 6% by 2012 and 16% by 2018, from 2007 levels. The Greenhouse Gas Reduction Targets Act also mandated a reduction in greenhouse gas emissions of 80% from 2007 levels by 2050. As a result, the BC Climate Action Plan attempts to highlight how such targets will be met.

BC Hydro initiatives to meet future electricity demand

Under the BC Energy Plan, BC Hydro will be required to obtain 3,000 GWh of supply as insurance above its requirements needed to meet customer demand by 2026. In addition, the BC Energy Plan aims to acquire additional electricity supply from British Columbia producers so that by 2016 BC Hydro will be able to meet customer demand even under critical water conditions.

BC Hydro has implemented a series of calls for power in order to attract future electricity capacity. Under a call for power, IPPs are encouraged to submit a proposal outlining a potential energy project as well as the amount of electricity and source of power to be produced. BC Hydro assesses each proposal and offers Electricity Purchase Agreements (EPAs) to successful projects.

- **2006 Open Call for Power:** BC Hydro initiated the 2006 Open Call for Power in December 2005. The Call for Power was aimed at purchasing electricity from projects, operated by IPPs. The Call for Power aimed to acquire 2,500 GWh per year of electricity from large projects (capacity of 10 MW or greater) and 200 GWh per year from small projects (capacity of less than 10 MW). By July 2006, 38 EPAs had been signed with IPPs. Approved larger projects would contribute 5,725 GWh per year, while smaller projects would contribute 654 GWh per year. The target volume of 2,500 GWh per year was increased as a result of a greater load-resource gap, an allowance for attrition and outages, and increased technological diversity.
- **Clean Power Call:** The Clean Power Call was launched in June 2008 and aims to purchase 3,000 GWh per year. Power will be purchased from large IPP projects where clean and renewable energy production methods are used. The projects are expected to come online between 2010 and 2016. BC Hydro had received 68 proposals by November 2008 under the call representing over 17,000 GWh per year.
- **Standing Offer Program:** In April 2008, BC Hydro launched a Standing Offer Program aimed at encouraging the development of smaller, clean energy projects to supply electricity to the British Columbia grid. The program aims to purchase electricity from small projects, operated by IPPs, which have a capacity to produce 10 MW or less. As of September 2009, 10 applications for EPAs were under review plus four EPA's for approximately 17 MWs on offer. The total applications could add as much as 53 MW of capacity should they all be approved.
- **Bioenergy Call for Power:** The Bioenergy Call for Power is a two-phased call aimed at utilizing timber infected by the mountain pine beetle as well as biomass and wood fibre to produce clean energy in British Columbia. Phase I was launched in February 2008 and was aimed at projects that were immediately viable (i.e. did not need any new allocation of tenures from the Ministry of Forests and Range). Under Phase I, four EPAs were granted out of 20 proposed projects, which will generate 579 GWh per year. Phase II was launched in March 2009 aimed at attracting both large and small scale biomass projects.[40] Phase II aims to purchase 1,000 GWh per year from large-scale projects. Small-scale projects are defined as community-based generators with a capacity under 5 MW. BC Hydro expects to announce successful applicants under Phase II in early 2010. BC Hydro will issue the Phase II Biomass Projects RFP after several key issues have been resolved.[41]

40. BC Hydro Press Release, March 5, 2009
41. BC Hydro 2009 Phase II Biomass Projects RFP, October 9, 2009 Update, www.bchydro.com

Appendix B – BC Hydro Electricity Demand & Forecast

Trends and Drivers

The main trends and drivers of the electricity industry in British Columbia are discussed in this section. First though, a brief discussion on BC Hydro's operating statistics is provided. Table 1 provides a few summary operating statistics for BC Hydro as the dominant electricity provider in British Columbia. Over time, BC Hydro's own generating capacity has remained fairly constant. Since 2005, BC Hydro's generating capacity has grown by 0.2%. Over the same period the peak one-hour demand has grown by 6.1%. While there are many factors at play, such a disconnect between generating growth and peak hour demand growth suggests that demand for electricity has increased over the past four years while BC Hydro's own ability to generate electricity has remained static. Clearly then, the previous calls for power have been an attempt to partly meet a rising demand for electricity.

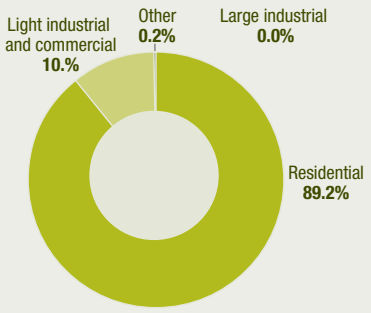
Examining the supply statistics presented in Table 1 indicates that BC Hydro obtains a large proportion of total electricity supply from external parties. In 2009, 14% of electricity was supplied through long-term purchase agreements, while 37% was obtained through short-term contracts.

Table 1: BC Hydro statistics

	2005	2006	2007	2008	2009
Number of customers	1,675,258	1,704,892	1,736,987	1,767,194	1,801,328
Generating capacity (MW)					
Hydroelectric	10,218	10,219	10,232	10,237	10,242
Thermal (Burrard and others)	1,093	1,094	1,091	1,089	1,088
Total capacity (MW)	**11,311**	**11,313**	**11,323**	**11,326**	**11,330**
Peak one-hour demand (MW)	9,437	9,317	10,113	9,548	10,011
Sources of supply (GWh)					
Hydroelectric	41,601	46,850	44,476	52,140	43,812
Thermal – Burrard	456	39	727	260	116
Thermal – Other	325	336	333	163	196
Purchases under long-term commitments	10,992	11,275	10,306	11,878	12,359
Purchases under short-term commitments	32,637	29,831	35,360	32,281	33,237
Exchange net	(440)	(629)	410	(485)	536
Total supply (GWh)	**85,571**	**87,702**	**91,612**	**96,237**	**90,256**

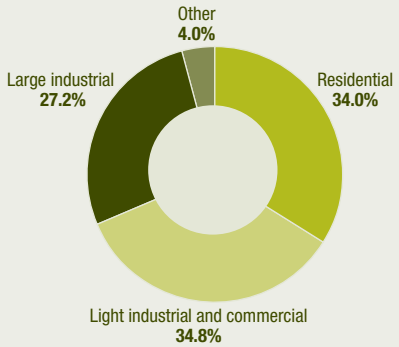
Source: BC Hydro 2009 annual report

Figure 1: Profile of BC Hydro domestic customer numbers by customer groups



Source: BC Hydro annual report 2009

Figure 2: Proportion of BC Hydro total domestic electricity sold to customer groups



Source: BC Hydro annual report 2009

There are a number of drivers in the electricity industry not least of which is demand for electricity. Demand in turn is driven by a number of other factors including energy prices and population growth. Improvements in technology are also important factors to consider when discussing future trends in the electricity industry. Any technology that can more efficiently produce electricity or that can reduce carbon emissions is likely to gain support in the future but only to the extent that it is cost effective. These factors are discussed in more detail here.

Electricity Demand

BC Hydro provides electricity to 95% of the Province's population, or 1.8 million customers. Residential customers represent 89% of BC Hydro's customers with commercial and industrial customers making up the remaining users. However, while the number of customers is heavily skewed towards residential customers, the use of electricity is split almost evenly between the three customer groups (i.e., residential commercial, industrial).

As a result, the future demand for electricity depends not only on demographic trends amongst residential customers, but also on the economic factors influencing commercial and industrial electricity users. It is also important to consider government initiatives aimed at reducing electricity demand over time and initiatives aimed at increasing electricity supply.

Residential customers

Residential customers increase their demand for electricity as the population grows. A larger population is likely to purchase more electrical appliances and additional houses. Income growth can also impact demand for electricity as higher levels of wealth support the purchase of more electrical appliances and houses.

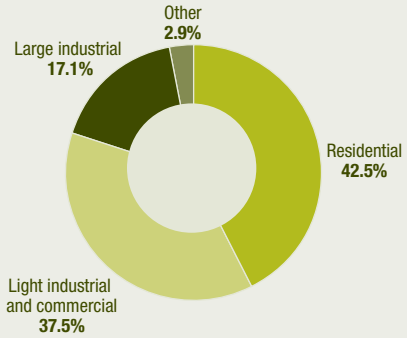
As a result, the demand for electricity in the near term is likely to fall given global economic uncertainty. Residential customers are likely to be more conservative with their spending in the near to medium term given that unemployment levels have risen to five-year highs (Figure 4).

Industrial customers

Large industrial customers can have fairly volatile energy demands depending on economic conditions. Mining companies for instance are likely to alter their electricity demands depending on export markets and commodity prices. During periods where metal and mineral prices are increasing, it is likely that mines will increase production and hence increase their demand for electricity. The price of metals, in turn, is contingent on global economic conditions and industrial production. As a result, industrial and commercial demand for electricity can be heavily influenced by global economic conditions.

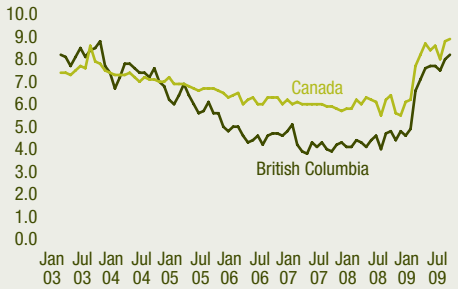
Commodity prices have fallen dramatically recently, prompting many metals producers to scale back their production levels. In addition, weaker commodity prices and tighter credit markets have delayed new projects and further exploration. As a result, production levels, and consequently electricity demand, are likely to be lower in the near term compared to historical levels.

Figure 3: Proportion of BC Hydro total revenue from domestic customers



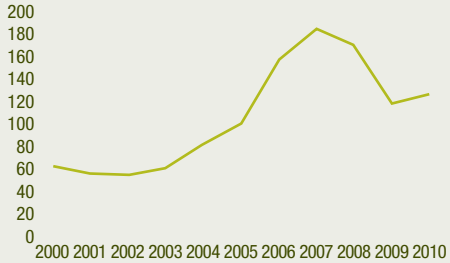
Source: BC Hydro annual report 2009

Figure 4: Unemployment rate for British Columbia and Canada (%)



Source: BC Statistics

Figure 5: Metals price index (2005=100)



Source: International Monetary Fund, World Economic Outlook Database, October 2009

However, there are signs that global economic conditions are improving. The International Monetary Fund (IMF) is forecasting a modest recovery in global growth in 2010. It is important to note, however, that forecast growth in 2010 is still well below historical levels but is nonetheless encouraging. As global economies recover, demand for commodities should increase as industrialization in developing economies continues, lifting commodity prices and production levels and electricity demand from British Columbia commodity producers.

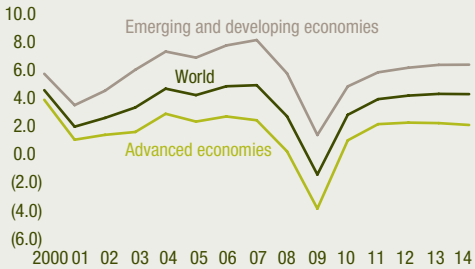
BC Hydro forecast demand for electricity

Overall, electricity demand is expected to fall in the near term given current difficult economic conditions. BC Hydro expects electricity demand to increase by 20% to 35% over the next 20 years if no energy conservation methods are put in place. BC Hydro intends to meet future electricity demand through a number of measures including purchasing power from IPPs as well as through energy conservation methods. BC Hydro's forecast electricity demands are displayed in Figure 7.

In the near term though, demand is expected to fall from F2009 (year to March 2009) levels in F2010 before starting to increase again. BC Hydro's forecast demand growth by customer group is provided in Table 2.

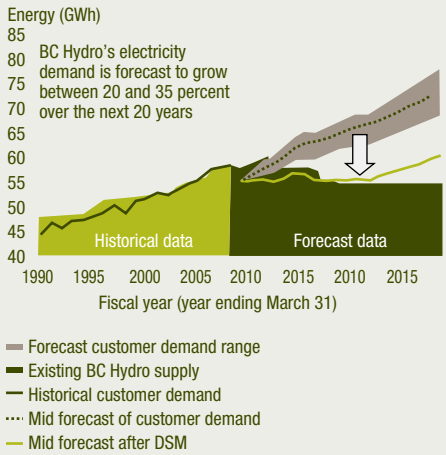
BC Hydro forecasts suggest that future demand for electricity is likely to be greater than current supply (see Figure 7). As a result, BC Hydro will likely need to purchase additional electricity from new IPP projects. BC Hydro has implemented a number of calls for power from both large and small IPP projects in order to meet future demand.

Figure 6: IMF forecast GDP growth



Source: International Monetary Fund, World Economic Outlook Database

Figure 7: BC Hydro's supply and demand outlook



Source: BC Hydro Service Plan 2009/10-2011/12

Table 2: Forecast growth rate of electricity demand by customer group

GWh	Actual F2008	Actual F2009	Forecast F2010	Forecast F2011	Forecast F2012
Residential sales load growth	5.4%	1.8%	-2.6%	0.2%	-1.1%
Light industrial sales load growth	0.8%	-0.8%	-0.3%	2.2%	0.4%
Large industrial sales load growth	-3.7%	-7.0%	-8.0%	11.1%	1.9%
Domestic sales load growth	0.7%	-1.8%	-3.1%	4.0%	0.4%

Source: BC Hydro (for years ending in March)

Appendix C – Export/Import Trends

Electricity Export and Importing Trends in British Columbia

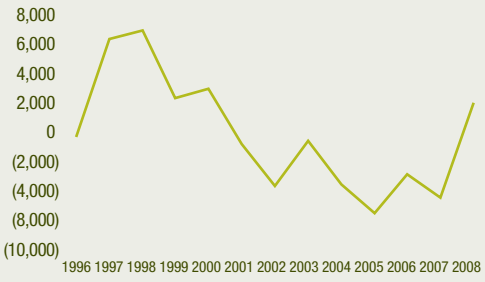
BC Hydro trades electricity through its subsidiary Powerex. Energy trading is regulated by provincial governments as well as the federal government, which oversees export from Canada. Powerex has obtained the necessary permits from the National Energy Board, which outline the terms under which electricity trading will occur. In addition, Powerex received authorization from the US Federal Energy Regulatory Commission in 1997 to trade electricity with the United States.

BC Hydro has traded electricity with the United States over two decades and continues to do so. Since BC Hydro facilities can store water in dams, it can in effect store electricity. The water can be released and electricity can be produced in order to meet demand when required.

When the United States requires electricity during daylight hours or to power air-conditioners in summer, BC Hydro is able to export electricity as required. BC Hydro then imports electricity in the load hours from the thermal plants in the United States, which cannot be shut down.

BC Hydro figures indicate that the Company has been a net importer of electricity for seven out of the last eight years (see Figure 8), negative numbers indicate BC Hydro was a net importer). BC Hydro has indicated that in 2008 water inflows to its hydroelectric facilities were well above normal, allowing the Company to sell excess energy. The result of abnormally high inflows resulted in BC Hydro being a net exporter of electricity in 2008. A return to more regular inflow levels could see BC Hydro become a net importer once more in future years. As a result, further purchases from IPPs could help to reduce imports of electricity and assist British Columbia's goal of becoming self-sufficient.

Figure 8: BC Hydro net GWh traded
(Exports less imports, GWh)



Factors Influencing Electricity Exports

- **Political considerations in the United States**. In California there is a clear drive to reduce greenhouse gas emissions and to increase the use of renewable energy sources. In September 2009, Governor Schwarzenegger signed an Executive Order to increase California's use of renewable energy to 33% of energy consumption by 2020. The Executive Order is part of an attempt to reduce California's greenhouse gas emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050. The Governor has also vetoed legislation limiting the amount of electricity that could be purchased outside of California.

  In Washington, there is a similar push to reduce greenhouse gas emissions. In 2008, Engrossed Second Substitute House Bill 2815 was passed to reduce Washington's greenhouse gas emissions to 1990 levels by 2020. In addition, the bill aims to further reduce greenhouse gas emissions by 25% below 1990 levels by 2035 and to 50% below 1990 levels by 2050.

  Such measures in British Columbia's biggest electricity export markets could lift exports of electricity produced by IPPs.

- **Requirements for Renewable Portfolio Standards (RPS) and Greenhouse Gas Emissions**. The majority of member jursidictions in the Western Electricity Coordinating Council (WECC) area have legislated RPS and Greenhouse Gas reduction requirements. Exports of electricity generated from BC IPP projects could satisfy some of this demand.
- **Future electricity insurance**. The 2007 BC Energy Plan states that it is the aim of the Government to be able to have a 3,000 GWh per year insurance over and above the demands of consumers by 2026. In addition, the Government aims to be self-sufficient and able to meet consumer demands even during periods of low water conditions. In 2007, with the 3,000 GWh insurance in mind, the Premier's Technology Council[42] recommended that British Columbia should aim to become a net exporter of clean energy by 2020. To the extent that such insurance is not required in any particular year, there is the potential for any additional electricity produced by IPPs to be traded across borders or with other Canadian provinces
- **Potential generating capacity**. A study published by the Western Governors Association and the US Department of Energy[43] attempted to identify and quantify the potential amount of renewable energy that could be supplied into the Western Interconnection. The paper estimates that British Columbia could eventually supply as much as 34,000 GWh from wind farms, 2,500 GWh from geothermal plants, 22,000 GWh from hydro plants and 7,000 GWh from biomass facilities. Should these estimates prove accurate, the export potential from British Columbia could be large but at the same time could be limited by transmission infrastructure.
- **Current transmission infrastructure**. The British Columbia Transmission Corporation has in place its Transmission Expansion Policy (TEP) which is used to examine potential proposals for expanding the transmission system which includes the following
  - The desire by the British Columbia Government to have a 3,000 GWh per year insurance in place by 2026
  - The high future demand for clean energy from California
  - It is likely that existing transmission infrastructure and interties will need to be upgraded or expanded to better allow for the trade of surplus energy during periods when it is not needed
  - A number of potential IPP projects are located in remote areas. As a result, the transmission network will need to be expanded in order for some IPP projects to contribute to the grid
  - Exports of electricity to other provinces within Canada are likely limited in the near to medium term. British Columbia's location on the far west of Canada means that transmission of electricity to provinces further east than Alberta is problematic. As a result, trade between British Columbia and other provinces will likely remain modest in the medium term

42. Premier's Technology Council, 10th Report, September 2007.
43. Western Renewable Energy Zones – Phase 1 Report, June 2009

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