

## Economic Development Attributes

### OVERVIEW

This summary provides a brief overview of the economic development attributes and their application in relation to the potential resource options considered in the 2011 Integrated Resource Plan (IRP). As with the environmental attributes, these attributes will be used to characterize the resource portfolios that are examined in the Integrated Resource Plan (IRP). For a description of how these attributes will be used refer to the *Comparing Policy Options* summary brief.

### OBJECTIVES

Two key objectives of the work presented in this summary brief document were to:

- Expand upon the previous social attributes that BC Hydro developed in 2005, and integrate new knowledge and information to create economic development attributes and indicators appropriate for provincially scaled portfolios as well recognizing the uncertainty associated with the various potential resource options and;
- Assign the economic development indicators to each potential resource option considered for the 2011 IRP.

### BACKGROUND

The Clean Energy Act (2010) establishes the encouragement of economic development and the creation and retention of jobs as one of sixteen energy objectives that BC Hydro is required to address in the IRP. To assist in understanding the economic development impacts of resource portfolios, BC Hydro is developing a dataset that identifies the direct, indirect and induced employment impacts, GDP and government revenue associated with the resource options. These resource options level employment impacts will be aggregated to characterize the resource portfolios.

### Previous Work

In the 2005 Resource Options Report BC Hydro tracked temporary and permanent jobs associated with construction and operations for each resource type. The jobs were reported in full time equivalents.

During engagement sessions in 2005, stakeholders agreed that temporary and permanent jobs could represent social impacts, since employment is related to economic growth and development. This was not a unanimous view; some stakeholders stated that this measure was a poor attempt at capturing economic benefits, which they indicated were better measured through financial attributes. Yet other stakeholders attached importance to employment numbers over and above that of the wages paid, and so requested that this measure be used to help differentiate among portfolios. Indirect job creation was also raised in discussion. Other social impacts were raised by stakeholders: aesthetic impacts, recreational impacts (e.g., access of kayakers to rivers), and noise pollution. These requests for impact measures tended to be site specific and difficult to develop into decision criteria. As a result, these were not tracked for the 2005 Integrated Electricity Plan (IEP).

### PURPOSE

To provide a brief overview of the development of the economic development attributes and their application in relation to the potential resource options considered in the 2011 Integrated Resource Plan.

### APPROACH

BC Hydro undertook the following steps in developing, preparing and presenting the economic development attributes and indicators:

- Reviewed economic and social attributes (for example from the 2006 IEP/LTAP) and their applicability to this project, provincially scoped data sources, and the BC Hydro databases for resource options (ROMAP);
- Developed a revised and expanded set of economic development attributes and indicators based on a literature review and a set of criteria for selecting indicators;
- Evaluated and selected attributes and indicators, based on internal review by BC Hydro, and external consultation (BC Hydro's consultation program is ongoing);
- Developed set of inputs to be forwarded to BC Stats to be run through the BC Stats Input Output model (BCIOM);
- Applied the indicators to the BC Hydro database for resource options (ROMAP) to populate economic indicators for each resource option; and
- Developed the economic indicators such that they can be summed across resource options in the portfolios that BC Hydro will develop as a part of the 2011 IRP in an effort to characterize the economic development attributes of the portfolios.

### CRITERIA

In determining how to approach the economic development attributes for the 2011 Integrated Resource Plan (IRP), key decision factors include but are not limited to:

- Available at a high level provincial scale
- Measurable in a quantity based approach that will facilitate comparisons across resource options
- Existing or easily acquired data
- Helping differentiate among portfolios across different resource types.
- Addressing the Government's Clean Energy Act objective with regards to economic development and the creation and retention of jobs.
- Easily understood by BC Hydro users, stakeholders and First Nations

### ATTRIBUTE OVERVIEW

Taking into consideration the objectives of the Clean Energy Act, input from stakeholders and the need to address both supply and demand side resource options, the following updated and expanded economic development attributes have been developed for the 2011 IRP:

- **Employment in B.C.** Employment opportunities in B.C. are created as a result of BC Hydro's activity and spending. BC Hydro's existing operations provide employment opportunities for many individuals. Potential energy projects throughout B.C. provide opportunities during both the construction and operating phases of a project. Employment opportunities are created in both metropolitan and regional areas given the remote locations of many potential renewable energy projects.<sup>1</sup>
- **Provincial Gross Domestic Product (GDP).** GDP refers to the additional value of goods and services added above the cost of inputs used to produce the good or provide the service. GDP is the additional value created through labour or mechanical processing. GDP is a better measure of economic impact than output since GDP avoids double counting impacts.<sup>2</sup>
- **Provincial Government Revenue.** Tax revenue is generated as a result of BC Hydro's operations. BC Hydro helps generate revenue to government through personal and corporate income taxes, grant-in-lieu of taxes payable by BC Hydro as well as resource revenues such as water rentals.<sup>3</sup>

### APPLICATION

The economic development attributes listed above attempt to capture the economic impacts of existing and potential B.C.-based power, transmission and DSM projects. In an effort to measure the economic development attributes of various power projects, the British Columbia Input Output Model (BCIOM) was chosen as the most suitable approach to estimate the economic development attributes for the 2011 IRP. Input-output analyses highlight the relationships among producers and consumers (businesses as well as individuals) of goods and services. An input-output analysis is based on first identifying a basket of goods

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<sup>1</sup> **Note:** Employment estimates generated by the BCIOM are derived from estimated wage costs using information on average annual earnings in an industry. The employment impacts are not full-time equivalent (FTE) measures. Instead, they reflect the wages paid and hours spent on the job by a typical worker in an industry. For an industry where most employees work full time, the numbers will be very similar to FTE counts. However, in an industry where part-time work is more common, the job counts will be quite different from FTEs. The latest version of the BCIOM estimates employment impacts based on average wages in 2009. Source: BC Input Output Model report. BC Stats 2010

<sup>2</sup> **Note:** Gross Domestic Product (GDP) is a measure of the value added (the unduplicated total value of goods and services) to the BC economy by current productive activities attributable to the project. It includes household income (wages, salaries and benefits, as well as income earned by proprietors of unincorporated businesses) from current productive activities as well as profits and other income earned by corporations. Only activities that occur within the province are included in GDP. Source: BC Input Output Model report. BC Stats 2010

<sup>3</sup> **Note:** Government tax revenue estimates generated by the model include income taxes as well as commodity taxes. *Provincial and federal tax revenues* include federal and provincial personal and corporation income taxes. Also included are PST, GST and other *commodity taxes* such as gas taxes, liquor and lottery taxes and profits, air transportation taxes, duties and excise taxes. Property tax revenues are not included in the estimates. *Municipal tax revenues* are primarily related to accommodation taxes. The latest iteration of the BCIOM takes into account the current tax structure (as of August 2010) as well as the prevailing tax rates. Provincial government revenues include the provincial portion of the Harmonized Sales Tax. Source: BC Input Output Model report. BC Stats 2010

and services used by a specific project<sup>4</sup> and then tracing through all of the steps involved in producing those goods and services to identify the total extent to which the British Columbia economy will be affected by project expenditures<sup>5</sup>.

### The Model

The economic development attributes listed above attempt to capture the economic impacts of existing and potential B.C.-based power projects. Economic impact modelling will be used in order to measure the economic development attributes previously listed. Economic impact modelling uses information contained in Input-Output accounts to estimate how an increase in demand for products or services in one industry will impact other industries and the economy as a whole. Input-Output accounts represent the basic structure and linkages between producers and consumers of good and services in an economy. An input-output analysis begins by identifying the spending on a basket of goods and services used by a specific project<sup>6</sup>. The analysis then traces all of the steps involved in producing those goods and services used by that specific project in order to identify the total extent to which the British Columbia economy will be affected by project expenditures<sup>7</sup>.

Statistics Canada produces input-output models, which are commonly used in such analysis. The Statistics Canada models are the most detailed and rigorous models available for estimating economic impacts resulting from a project's capital and operating expenditures. The input-output tables represent the most detailed account of the Canadian economy available and serve as a benchmark to the Canadian System of National Accounts. Input-Output tables cover all economic activities conducted. These tables are the most comprehensive and detailed statistics on transactions involving production activity, as well as intermediate and final consumption of goods.<sup>8</sup>

In an effort to measure the economic development attributes of various power, transmission and DSM projects, the BC Provincial Input Output Model (BCIOM) was chosen as the most suitable approach to estimate the economic development attributes for the 2011 IRP. The BCIOM is a sub-model of Statistics Canada's Interprovincial Input-Output Model. Based on 2006 economic data, the model encompasses 300 industries, 727 commodities and 170 final demand categories. The model is comprised of three parts:

- The *input* matrix displays the cost of goods and services, labour and capital used by industry during production.
- The *output* matrix shows the goods and services produced by each industry.
- The *final demand* matrix shows the goods and services available for consumption.

Together, these three matrices form a complete representation of the B.C. economy, including all intermediate transactions between industries, primary inputs (e.g., wages), and commodity and export proportions.<sup>9</sup>

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<sup>4</sup> Or, in the case of an industry analysis, the total value of production by one or more industries.

<sup>5</sup> BC Input Output Model report. BC Stats 2010

<sup>6</sup> Or, in the case of an industry analysis, the total value of production by one or more industries.

<sup>7</sup> BC Input Output Model report. BC Stats 2010

<sup>8</sup> British Columbia's Green Economy – Research Methodology – February 2010

<sup>9</sup> Power Smart Employment Impacts – BC Hydro 2010

### Multipliers

The results of input-output analysis can be used to calculate an economic “multiplier,” which expresses the total (direct, indirect and induced) economic impact as a scalar of the direct impact. A high multiplier means that a particular expenditure generates more business (supplier) activity within the economy than expenditures with lower multipliers. The size of the multiplier depends on several factors, the most important being the degree of upstream processing (prior to final use) in the economy and the extent of imported goods used in that processing. In general, the more self-sufficient the economy is in a particular good or service (i.e., the fewer the imports), the higher is the multiplier.<sup>10</sup>

### Direct, Indirect and Induced Impacts

Economic impacts are generally discussed in terms of direct, indirect and induced impacts. Input-Output multipliers are generally used in order to estimate the direct, indirect and induced impacts of the construction and operation of a facility. Total economic impacts are estimated as the sum of the various direct, indirect and induced impacts.

- Direct impacts refer to the economic impacts resulting from initial investment expenditures on a new facility or regular operational spending of an existing facility (e.g., on home retrofits). Direct impacts occur as a result of a facility’s or project’s spending on suppliers who initially receive expenditure from a facility or project.
- Indirect impacts refer to the additional economic activity that is generated as B.C. suppliers of the incremental materials (e.g., insulation manufacture) purchase intermediate goods and services. Induced impacts refer to the additional activity generated when the B.C. suppliers pay out wages to their employees, who in turn purchase more consumer goods and services.

### Assumptions

The BCIOM makes a number of explicit as well as implicit assumptions about the economy and the interactions between sectors of the economy. The major assumptions underlying the BCIOM are listed below.<sup>11</sup>

- The BCIOM can be considered to be a snapshot of the B.C. economy at some point in time. The current BCIOM reflects the B.C. economy in 2006. Some sectors in the model may have changed since then and may continue to do so.
- While the structure of the model is based on 2006 data, tax revenue and employment estimates are generated using more up-to-date data.
- The BCIOM assumes that relationships between industries remain constant over time.
- The model assumes that adjustments resulting from a change in demand occur immediately rather than over a period of time.
- The BCIOM does not, at present, distinguish between regional effects. For instance, the economic impacts of a change in demand are assumed to be the same regardless of whether the change occurred in a metropolitan area or in a rural area.

<sup>10</sup> Power Smart Employment Impacts – BC Hydro 2010

<sup>11</sup> BC Stats.

- The BCIOM assumes a linear relationship between a change in demand and the resulting impacts. That is, the model assumes that a change in demand for a commodity will translate into a proportional change in production.
- The BCIOM assumes that there are no capacity constraints to any increased production. The model assumes that no new capital investment is needed to increase production, which may not be true in the case of some sectors.
- The BCIOM assumes that industries are operating at full employment. Any increase in production by domestic industries will require new proportionate labour (employment). That is, an increase in demand for labour will cause an increase in employment as opposed to perhaps a deployment of existing workers.
- Income impacts; wages and salaries, rents and profits earned by the factors of production do not take into account opportunity costs (alternative use) of these factor inputs. The opportunity cost of a factor input is the value of its best alternative use.
- The BCIOM assumes that industries are operating at constant returns to scale. However, industries in some sectors may exhibit increasing returns to scale (e.g., early stages of development).
- The assumption of industry's fixed proportions of inputs does not permit any substitution among inputs due to technological invention (change), relative price changes, or shifts in demand patterns.