RESPONSE TO WORKING GROUP AND PUBLIC COMMENTS ON THE SITE C CLEAN ENERGY PROJECT ENVIRONMENTAL IMPACT STATEMENT

Technical Memo

WORKFORCE AND POPULATION ESTIMATES DURING CONSTRUCTION

MAY 8, 2013

Subject: Workforce and Population Estimates During Construction

Purpose of Technical Memo

To purpose of this technical memo is to clarify the methodologies used to determine the Jobs estimates described in the Project Benefits and the Labour Market sections of the EIS (Sections 7 and 17 respectively), and how the Jobs estimate was used to forecast the population described in the Population and Demographics (Section 28). Specifically, the memo describes how the following estimates were developed:

- Total construction phase employment of 10,000 person years of direct construction jobs, and 33,000 person years total estimated employment (direct, indirect and induced employment) generated by the Project prior to the operations phase.[1]
- Peak construction year workforce of 1,864, estimated to comprise 1,372 camp residents and 492 local residents (EIS Section 28)
- Peak construction year regional population change, estimated at 1,614 new residents comprised of direct (non-camp), indirect, induced and displaced (vacancy backfills) workers plus dependents[2]

The construction phase of the Project would extend from 2014 to 2020[3].

Introduction

The Project cost estimate provides information on the labour expected to be required for the construction of the Project and is based on the project design as proposed in the EIS.

The B.C. Input-Output Model[4] used the Project cost estimate to determine what economic activity would be generated due to the Project. This included an estimate of the number of "jobs", or person-years of employment that would be created during the construction of the Project as a whole and in the LAA (Northeast Development Region). The LAA is comprised of the Peace River Regional District and the Northern Rockies Regional Municipality. The B.C. Input-Output model also produced other results used in the assessment of the Project, such as regional economic activity.

The 33,000 jobs in total estimated employment prior to Project in-service date includes the results of the following:

- 19,100 indirect and induced jobs based on the results of the B.C. Input-Output model
- 10,200 direct Project jobs based on the cost estimate for the construction phase
- 3,700 direct, indirect and induced jobs provided prior to and during the Environmental Assessment as shown in the table below (EIS, Table 7.11).

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1 EIS, Section 7.3.2.1, page 7-15, Table 7.11.

2 EIS, Section 28.4.1.2, page 28-12, lines 16-20.

3 EIS, Section 3, Figure 3.1.

4 EIS, Volume 3, Appendix A2 Economic Assessment Supporting Documentation – Project Economic Impacts – B.C. Input-Output Model, B.C. Stats.

EIS Table 7.11 Estimated Employment Provided by the Project Prior to Project In Service Date[5]

	Direct Jobs	Indirect and Induced Jobs	Total Employment
Prior to and during the Environmental Assessment	2,200	1,500	3,700
Construction Phase	10,200	19,100	29,300
Total Jobs to Project ISD	12,400	20,600	33,000

NOTES:
All values in person-years of employment
Source: Modified from Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: B.C. Stats

Regional population changes during construction, as a result of the Project, are estimated using a population model that used the projected total person-years of employment, as well as documented assumptions about the regional labour market, allocations of workers to camp or local housing, and household demographics. The population model methodology and results are presented in full in Volume 4 Appendix A Part 3 Population Effects Model for the following population groups:

- In-camp Project Workers: this includes those working directly for the Project, who reside in the Project workforce camp, and whose dependents remain in their home communities (assumed to be outside the region)
- In-community direct Project workers and dependents: this includes new residents, who work directly for the Project, and who reside in the community (not in camp), and includes their dependents (spouse and children)
- In-community indirect, induced and displaced workers and dependents, comprised of:
  - Indirect and induced workers and dependents: this includes new residents, who do not work directly for the Project but work for supplier or service industries with new Project related labour demand, and who reside in the community (not in camp), and includes their dependents (spouse and children)
  - Displacement workers and dependents: this includes persons drawn to the region to fill positions vacated by existing local residents that take direct Project positions, based on the assumption that there are not enough unemployed regional residents to backfill these positions[6]

Definition of Jobs, and Person-Years of Employment

"Person-years of employment" and "jobs" are interchangable terms. Person-years are useful for describing the total employment of the Project using a common unit of measurement. A person-year is the unit of measurement used to estimate jobs (referred to generally as "jobs" in the B.C. Stats report and in the EIS), and it is the total number of hours worked in a year by an average worker in a specific job classification. The average number of hours per year varies among job categories, and by region. For most trade categories, the average number of hours worked per year is higher in the Peace Region than in the Province as a whole. As an example, a person-year of employment for a boilermaker was estimated to be 3,120 hours per year (or 260 hours per month) in the Peace Region. Person-years of employment are generally provided in the EIS on an aggregate level – i.e. as a total across the

[5] EIS, Section 7.3.2.1, Table 7.11, page 7-15.
[6] EIS Volume 4 Appendix A Part 3, Section 2, page A-2.

construction period – although in some cases employment is described on an annual basis, for example to describe the average or peak workforce expected in a given year of construction. The estimate of person-years of employment will not equal the number of individuals employed on the project . For example, 5 person-years could correspond to a number of different scenarios, including:

- One person working full-time for a five year period, or
- Five different people working full-time for a one year period, or
- Ten different people working half-time for a one year period

Where relevant, BC Hydro has used a monthly construction schedule to project the number of individual workers that are expected to be working in a given period, for example when planning the potential size of camp accommodation needed.

Cost Estimate - Estimating Methodology for Direct Employment

The estimate of the labour required for the construction of the Project is based on the cost estimate, described in Volume 1 Appendix F Part 1 (Project Cost Estimate). Cost estimators used the project design along with current market information to prepare "…detailed quantity estimates, and assumptions for construction scheduling and sequencing, work crews and productivity, equipment and cycle times, production rates, access and craneage." This information is a key input to the estimate of direct labour required for the construction of the Project.

Direct jobs refer to employment created in industries (including BC Hydro itself) that supply goods and services directly used by the project, for example the contractors directly engaged in construction activities. Direct jobs were estimated using the total number of hours of direct labour required to construct the project generated as part of the cost estimating process. These hours were provided from the Project cost estimate by job classification (e.g. boilermakers, carpenters, construction management, etc.), and were then converted to person-years of employment (jobs) by dividing by the average number of hours of work in a year (suitable for the Peace Region) for each job classification.[7]

Based on the detailed estimation, the number of direct person-years of employment required for construction of the Project is expected to be 10,200 jobs (EIS Section 7.3.2.1, Table 7.11).

B.C. Input-Output Model – Estimating Methodology for Indirect and Induced Employment

As required by the EIS Guidelines, BC Hydro has also provided an estimate of indirect and induced labour generated by the Project, including estimates of regional employment.

Indirect jobs refer to employment created in supplier industries for the Project (e.g. jobs involved in the production of concrete), and go "all the way back to the beginning of the supply chain"[8]. Induced jobs refer to employment created by consumer spending by workers employed in direct or indirect jobs on the Project (e.g. jobs in service industries, such as restaurants or retailers).

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[7] The results are sensitive to the number of hours assumed for each labour classification, for example assuming a lower number of hours worked by carpenters would increase the total number of carpenters required to complete the amount of work required at the time required in the schedule. It would not increase the total number of hours of direct labour required.

[8] EIS, Volume 3, Appendix A2 Economic Assessment Supporting Documentation – Project Economic Impacts – B.C. Input-Output Model, B.C. Stats.

Both indirect and induced jobs were estimated by B.C. Stats, using the B.C. Stats B.C. Input-Output model, as presented in Volume 3 Appendix A Part 2 (Project Economic Impacts: B.C. Stats). B.C. Stats took input information from the project cost estimate, including "Detailed expenditure estimates for each of the major stages of the project…" as well as the direct employment from the cost estimate as discussed above. The B.C. Input-Output Model then applies economic multipliers on these input factors to calculate the indirect and induced jobs. These economic multipliers are based on the information B.C. Stats has on the structure of the Provincial economy. The number of indirect and induced jobs created by the construction of the Project is expected to be approximately 19,100 jobs.

B.C. Input-Output Model - Regional Results

The B.C. Stats Input-Output model provides provincial and regional results. The regional results reflect an improvement in modeling methodology, as other available analytical tools, such as econometric models are provincial in scale, and previous methods did not include the level of detail used in the B.C. Input-Output model. In Volume 3 Appendix A Part 2: Project Economic Impacts: B.C. Stats Report, the term "experimental" is used as a modifier by B.C. Stats to highlight the fact that the approach or methodology is in development and could be subject to revisions before being finalized. For example, when the provincial economic accounts were first produced, they were labelled as experimental for a number of years, because the methodology on which they are based was new, as were the estimates. The term does not imply that the results are unreliable, or that better methodologies are available.

Population Model to estimate Camp Population, and Forecast New Regional Population

The population model estimates the regional population expected during each year of construction, based on the regional employment estimates for the Project. Using the direct job estimates from the Project cost estimate and the indirect and induced jobs estimate from the B.C. Input-Output Model, the population model applies demographic characteristics, allocations of workers to camp or local housing, and labour market factors to produce a population projection for the region.

The population model takes into account current and forecast labour market conditions, such as proportion of different types of workers in the region and unemployment rates, to estimate the following:

- The number of Project jobs likely to be taken by existing residents of the LAA[9]
- How many new workers would be required to fill jobs vacated by existing residents moving to Project jobs (displacement)
- How many spouses of workers would be available to take employment in the region

The allocation of direct Project workers to camp or local housing took into account the anticipated housing preferences by type of worker. Based on industry research, different types of workers were assigned different housing preferences. Workers with longer employment (construction management) were assumed to be more likely to prefer local housing in the community (non-camp) which would result in them bringing their dependents to the region. Workers with shorter term or seasonal work (crafts or contractor supervisors) were assumed to be more likely to live in the Project workforce camps, and therefore would not bring their dependents to the region. These assumptions were used to allocate the workforce between Project workforce camp and local in-community housing.[10] The

[9] Total yearly estimated local hire of crafts positions is found in EIS, Volume 4 Appendix A Part 3, Table 1.

[10] EIS, Volume 4 Appendix A Part 3, Section 3.3 and 3.4, page A-6 and A-7.

workforce allocated to local in-community housing, and their dependents, was included in the forecast new regional population estimate.

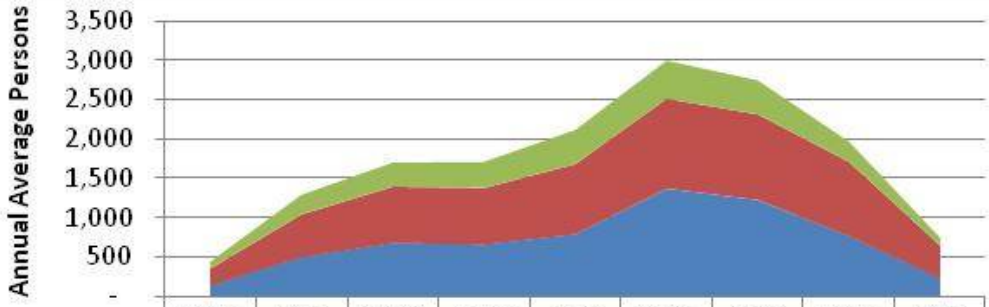
The forecast demographic profile of the estimated new regional population was informed by demographic assumptions, including gender, median age, marital status and number of children per census family. Demographic assumptions for the forecast new regional population was based on the current demographics of the LAA, based on the similarities between the current LAA workforce and the types of workers required by the Project.

Based on these methods, estimates of new regional population were made for the Project construction phase. The full results for all years of the Project are available in Table 5 of Volume 4, Appendix A, Part 3, Section 4, page A-9 and A-10. During the peak year of construction (estimated as Year 5) , it is expected that there will be approximately:

- 1,372 in-camp Project workers
- 1,614 new local residents (comprised of 1,135 direct workers and their dependents, and 479 indirect / induced and displaced / backfill workers and their dependents)[11]

[11] EIS, Section 28.4.1.2, page 28-12, lines 16-20.

Figure 28.5 Construction Phase Population Effects[12]



	year 0	year 1	Year 2	year 3	year 4	year 5	year 6	year 7	year 8
In-Community Indirect and Induced, Displaced (and dependents)	84	246	301	327	430	479	427	251	97
In-Community Direct Workers (and dependents)	216	542	712	717	887	1,135	1,081	941	416
In-Camp Project Workers (no dependents)	145	502	683	661	792	1,372	1,227	768	233

In-Camp Project Workers (no dependents)
In-Community Direct Workers (and dependents)
In-Community Indirect and Induced, Displaced (and dependents)

Notes: The values for community direct and community indirect/induced workers includes dependents.

Population Model Sensitivity

The population forecast is sensitive to the assumptions that allocate the in-migrant labour force to local in-community housing, or to the Project workforce camp. The number of direct Project workers residing in local community housing is positively correlated with higher total new regional population, including the worker and the dependents assumed to accompany the worker.[13] The population model assumed 15% of crafts positions with the Project would be filled by existing residents of the region.[14] Since non-resident crafts workers are assumed to prefer in-camp housing due to typical employment terms, a lower than assumed local hire rate (below 15%) would result in a lower new regional population than estimated by the model for two reasons: first, in-migrant crafts workers would be likely to live in camp, and second, the in-migration required to fill the displacement positions would be reduced, both of which would reduce the population increase by the worker and their dependents

[12] EIS Section 28, Figure 28.5.
[13] EIS Volume 4 Appendix A Part 3, Section 4, page A-8.
[14] EIS Volume 4 Appendix A Part 3, Section 3.1, page A-3.

Related Comments / Information Requests:

This technical memo provides information related to the following Information Requests:

gov_0001-005	gov_0004-012	gov_0004-026	gov_0013-007	pub_0241-006
pub_0438-018	pub_0509-001	pub_0563-001	ab_0002-010	