



LETTER NO. L-76-06

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VIA E-MAIL

November 27, 2006

BC HYDRO – SECTION 71 FILING
LTEPA/ALCAN ESC EXHIBIT A-7

TO: British Columbia Hydro and Power Authority
Registered Intervenor (BCH-ALCAN-RI)
Interested Parties (BCH-ALCAN-IP)

Re: British Columbia Hydro and Power Authority ("BC Hydro")
BCUC Order No. G-142-06/Project No. 3698446
Filing of Energy Supply Contract with Alcan Inc.
LTEPA Amending Agreement, Amended and Restated
Long-Term Electricity Purchase Agreement

The Commission has received the enclosed request dated November 24, 2006 from counsel for the District of Kitimat (the "District") for leave to file additional evidence in the subject proceeding. The District intends to convene a witness panel to defend its evidence in the hearing.

The District proposes to file any Documentary Evidence by November 29, 2006, and to file its Direct Evidence and any further materials by December 1, 2006. The District's November 24th letter also enclosed a copy of a report dated July 2003 from Dr. Roslyn Kunin. The District requests leave to file Dr. Kunin's report as evidence, on the condition that she will be made available for cross-examination on or after December 18, 2006.

Further to the Regulatory Timetable that was Appendix A to Order No. G-142-06, the Commission hereby establishes a Procedural Conference to hear the District's leave application. The Procedural Conference will commence at 1:30 p.m. on Wednesday, November 29, 2006 in the Commission Hearing Room on the Twelfth Floor, 1125 Howe Street, Vancouver, B.C. The 2006 Integrated Electricity Plan and Long-Term Acquisition Plan proceeding will be adjourned while the District's leave application is heard.

Yours truly,

Original signed by:

Robert J. Pellatt

JBW/rt
Enclosure



Hunter Litigation Chambers

HUNTER/VOITH/BERARDINO/HARRIS

November 24, 2006

File no: 1160.003

Via E-Mail**commission.secretary@bcuc.com**

Robert Pellatt,
Commission Secretary
British Columbia Utilities Commission
P.O. Box 250
6th Floor, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Mr. Pellatt:

Re: British Columbia Hydro and Power Authority - BCUC Order No. G-142-06/Project No. 3698446 - Filing of Energy Supply Contract with Alcan Inc. - LTEPA Amending Agreement, Amended and Restated Long-Term Electricity Purchase Agreement

As you are aware, we are counsel for the Intervenor District of Kitimat (the "District") in this matter.

We are writing with respect to the evidentiary record for the upcoming hearing. BCUC Order No. G-142-06 (the "Order") provides that certain materials from the IEP/LTAP proceeding (Project 3698419) will be included in the evidentiary record for this proceeding. The District would like to file additional evidence to address the question of whether the Amended and Restated LTEPA and the LTEPA Amending Agreement are in the public interest. The District also wishes to convene a panel at the hearing to defend its evidence in this regard. However, the Order is silent regarding the deadline for filing intervenor evidence.

We have spoken with Mr. Williston at the Commission. He, in turn, has spoken with Mr. Fulton and suggested that we write to you advising of our intention to file evidence and seeking leave to do the same. As such, we hereby request leave, on behalf of the District, to file evidence and to convene a panel to defend the same at the hearing of this matter. We propose the following schedule for the filing of this evidence:

Wednesday, November 29, 2006 – Filing of any Documentary Evidence to be relied upon by the District

Friday, December 1, 2006 – Filing of Direct Evidence and any further materials to be relied upon by the District

**An Economic Study
on the Use of Hydro Power in Kitimat
for Aluminum Production
as Opposed to Export**

Presented to:

The District of Kitimat

Roslyn Kunin & Associates, Inc. (RKA, Inc.)

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July 2003

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Roslyn Kunin and Associates, Inc.

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Executive Summary

The District of Kitimat has contracted with Roslyn Kunin and Associates, Inc. (RKA) to conduct a study on the economic impact of using hydro power from the Kemano generating station for the production of aluminum in Kitimat compared with selling the power as a commodity in its own right. RKA, in turn, undertook research and produced an assessment of the economic impact of changes in employment in aluminum production on the local community, as well as on the province. The analysis and findings are presented in this study.

Our research shows that the impact of significant job losses because of curtailment in aluminum production at Kitimat has major implications for workers, government revenue and general economic activity in B.C.

Based on our research, it is reasonable to assume that for each loss of 100 jobs at the Kitimat smelter, the Province of British Columbia would lose \$56.5 million in gross industrial output a year and between \$1.8 million and \$2.4 million in provincial tax revenue.

A total shutdown of the Kitimat plant, according to our research, would reduce B.C.'s gross industrial output by \$1.1 billion a year compared with 2001 when the smelter employed 1,865 people. More than \$33 million in provincial tax revenues would also be lost each year. This would occur if a decision were taken to entirely phase out aluminum production in favour of selling electricity from the Kemano power station into the grid.

The District of Kitimat on B.C.'s northwest coast exists because of the decision of the Aluminum Company of Canada (Alcan) to build its aluminum smelter at that location, a decision which in turn rests on the B.C. Government's 1949 decision to create the aluminum industry by giving Alcan rights to the headwaters of the Nechako River in order to generate hydroelectric power at its Kemano power generation facility and other benefits.

We recognize that secondary economic impacts of hydro power generated from the Kemano power plant, such as additional jobs, industrial output, and government revenue created, can only be realized by aluminum production or other industrial utilization, and not through the sale of power. This is equally true at the local community level and the provincial level. We argue that these benefits are additive to the benefits of hydro power generation through the Kemano plant.

In estimating the economic impact of aluminum production on the local community, as well as on the province, we have:

Described the populations and economic structure of the area, including indicators such as migration patterns and labour force composition, showing the historic and general significance of aluminum production.

Applied the base method (drawing information from local area economic dependencies) to arrive at income dependencies in the areas concerned.

Used impact ratios to estimate the total employment impact on the local area brought by changes in the employment level of aluminum production, direct, indirect, and induced.

Derived the economic impacts on B.C. from the primary metal industry using industry multipliers generated from the B.C. Input Output Model.

Extrapolated the impact on employment, output and government revenues of changes in aluminum production.

The impact of changes in employment at the Kitimat aluminum smelter in increments of 100 workers can be summarized as follows.

Summary Table 1: Total Employment Impact of Aluminum Production per 100 Direct Jobs at the Kitimat Smelter

Kitimat	Kitimat-Terrace	BC
125	144	234

Summary Table 2: Total Economic Impacts of Aluminum Production in B.C. per 100 Direct Jobs at the Kitimat Smelter

Gross Industrial Output	Provincial Government Revenue	Municipal Government Revenue
\$56.5 million	\$2.06 million	\$350,000

In the main part of the report, we will describe our analytical framework and our application of economic models to derive the estimates summarized above.

Chapter 1 Introduction

Background

The District of Kitimat on BC's northwest coast exists because of the decision of the Aluminum Company of Canada (Alcan) to build its aluminum smelter at that location, a decision which in turn rests on the BC Government's 1949 decision to create the aluminum industry by giving Alcan rights to the headwaters of the Nechako River in order to generate hydroelectric power at its Kemano power generation facility and other benefits.

Over the last 50 years, Kitimat's fortunes have risen and fallen under the direct influence of the aluminum industry's fortunes. In recent years the aluminum industry has had unforeseen difficulties worldwide, with declines in demand and price, and competition from new regions such as China and Russia. At the same time, the market for electric power became suddenly very volatile.

Kitimat District has asked Roslyn Kunin & Associates to determine if the historic importance of the production of aluminum persists. It has sought reassurance from Alcan that it intends to continue producing aluminum from Kemano power, and that it intends to keep its commitment, part of a 1997 Agreement with the Government, to expand the Kitimat smelter operations. Kitimat has sought reassurance from the BC Government that it intends to hold Alcan to the terms of the 1949 Act and subsequent agreements—to use the power for a provincial aluminum industry, or at least for industrial purposes in the local “vicinity” (the terms of the 1950 Agreement¹) rather than selling it on world markets. The access to the public resource water—hence hydroelectricity—was a benefit of immense value bestowed by BC on Alcan in 1949, and made perpetual in 1997. This benefit was not given away by the Government, but granted in exchange for the benefits to the province of the value-added aluminum exporting industry. In the words of Premier Gordon Campbell, “There are resources that have been made available, and we expect that these resources are going to be used for job creation.”²

Kitimat has seen that basic *quid pro quo* as in danger of erosion in the volatile markets of recent years. Kitimat also considers its economy as being at stake, along with the economic benefits to the province of aluminum production.

¹ “In order that the promotion and development of the district and of other industries in the vicinity of the Works may be encouraged, ALCAN may sell to others electric energy generated at the WORKS...” – Section 9, “Sale of Power by ALCAN”, the 1950 Agreement between the Government of BC and Alcan.

² “Campbell Sees Alcan Partnership as Benefit,” *The Northern Sentinel*, May 15, 2002.

Concerned by indicators that while aluminum is profitable, power sales may be more profitable for Alcan, the District of Kitimat has been in constant dialogue with both the company and the government concerning the intended uses of Kemano power. It has undertaken its own analyses and reviewed power and aluminum markets, and also invited public scrutiny of its assumptions, observations, premises and logic regarding predictions about a trend to power sales.

In undertaking its research, Kitimat also sought to test the historic premise that the aluminum industry is of crucial importance to the District and to the northwest area of the province's economy.

The Economic Impact Study

In January 2003, the District Municipality of Kitimat contracted with RKA to conduct an economic study on the use of hydro power for the production of aluminum in Kitimat as opposed to power sales. RKA is an economic consulting firm specializing in analyzing the state of the economy and its impact on people.

This study will answer these questions:

In Kitimat and in the local geographic area surrounding Kitimat, how important is aluminum production in providing income to the local economy? How many jobs, both directly and indirectly, are dependent upon aluminum production? If hydro power is exported, what is the economic impact on the local economy?

To the province of British Columbia, what is the impact on the economy if an increase or decrease aluminum production induces an increase or reduction of employment at the Kitimat smelter? How does it affect provincial and municipal revenue? Again, will sale of hydro power to a foreign country generate similar impacts?

To answer these questions, RKA has conducted an economic impact analysis of Kitimat's aluminum production on both the local economy and the provincial economy. We recognize the fact that the additive economic impact of hydro power can only be realized through aluminum production or other industrial applications.

The function of economic impact analysis is to measure the changes in spending and employment associated with new developments and/or changes. Economic impact can be measured as:

- ◆ the dollar value of industrial output produced;
- ◆ the person years of employment generated; or
- ◆ value of capital used and/or created.

Any of these measures describes the gross level of activity, or expenditure, or employment in a sector of the economy arising from a specific project or change.

This measures the overall impact; it is not a cost benefit analysis. This study will use changes in employment as a base to measure economic impact.

There are three components in any economic impact analysis: direct, indirect, and induced impacts. Total economic impact is the sum of these three components.

Direct impact – this measures the direct change in output/employment/value-added/value of capital used, as a result of the change of external factors (e.g., an increase of demand for the product, or an effect of a change of government regulation on an industry).

Indirect impact – this measures the change in output/employment/value-added/value of capital used in sectors of the economy that provide goods and services to the industry directly affected.

Induced impact – this measures the additional economic activity as a result of the change in household income of those families directly and indirectly impacted.

The general layout of this report is as follows. In Chapter 2, we outline the methodology with which we provide analysis of economic impacts for the local area of Kitimat and for the province. Chapter 3 provides a background description of the population and economic structure of the District of Kitimat and its surrounding area. Chapter 4 provides the economic impacts of aluminum production on Kitimat and its surrounding area, and Chapter 5 extends this analysis to the province as a whole. In Chapter 6 we deal with government revenue generated. In Chapter 7 we consider the question of power sales vs. aluminum production, and the market conditions that influence it. Finally, in Chapter 8, we present the conclusions of this study.

Chapter 2 Methodology

We have conducted an extensive literature review on economic impact analysis both at the community level and at the provincial level. Two types of models are in use, each serving a different level of aggregation. At the macro level, it is the input-output model. At the micro level, it is the economic base model. In this Chapter, we provide a brief description of these models and how they are applied.

Input-Output Model

The starting point for an input-output analysis is the observation that the production of any one good not only creates a supply of that product, but also a demand for all the other goods that go into its production. The latter are called intermediate goods. An input-output model in economics is a way of structuring the whole economy in terms of who makes what and who uses what, and analyzing the flow of commodities due to the interdependence of industries.

Such a model is very useful in predicting how an increase in demand for the products of one industry will have an impact on other industries and therefore the entire economy. In other words, if we know the *direct* impact in industrial output of industry X (due to an increase of world demand for its products, for example), we can estimate the *indirect* impact (those industries that supply intermediate goods and services to industry X) and the *induced* impact (further increase in demand for goods and services as a result of the increase of household income). Total economic impact is the sum of *direct*, *indirect*, and *induced* impacts.

Canada has had a national input-output model since 1949 and Statistics Canada has collected the data and produced tables for each province at five-year intervals since 1974. In BC, BC Stats has maintained and operated the BC Input-Output Model since the early 1980's. The most recently available model uses data for 1996.

In this study, we will utilize the information available from the 1996 BC Input-Output Model to produce an estimate of the economic impact on the provincial economy from an increase (or decrease) of direct employment at the Kitimat Aluminum Works.

Economic Base Model

When it comes to regional economic analysis, it would be ideal if that kind of input-output analysis were readily available for sub-provincial levels. In reality

though, such models are not available due to data limitations. Instead, the economic base model was developed.

The economic base concept originated with the need to predict the effects of new economic activity on cities or regions. For instance if a new plant or industry is located in a community, a question which city planners and economists need to answer is “what are the indirect effects of this new activity on employment and income in the community?” With these estimates in hand, they can work toward planning the social infrastructure needed to support all of these people.³

The fundamental premise of the economic base model is that the economy of a community can be represented by income flows that can be grouped into either a “basic” or “non-basic” category, depending on the source of income. If the source of the income is from outside the community (i.e., it is earned elsewhere, but spent in the community being examined, usually in response to exported goods and services produced within the community), it is categorized as basic income. On the other hand, income that is paid to individuals in the community for goods and services provided to, and paid for by, other members of the community, is considered non-basic.

Another term for the “basic” category is the “export” sector, while the “non-basic” sector is also termed the “service” sector or the “local” sector. To summarize, an economic activity whose output or employment depends on the local market is regarded as a “service” sector, and the economic activities directly depending on activity outside the region are called “base” sector activities.

The economic base model suggests that the economic sustainability of a region depends on the ability of its inhabitants to export some or all of at least one of the outputs produced in the region. Income earned through exports, and spent in the community, enables the local “service” sector’s economic activity to grow via the chain or link between the two sectors. Therefore, total economic activity is a function of base activity and it changes as a multiple of change in the base activity. In this respect, the economic base model is an extension of input-output analysis. (We discuss the economic base model at greater length in Chapter 4.)

Application of this model to a particular region requires a measurement of economic activity and identification of the “base” and “service” sectors’ economic activities. To measure economic activity, researchers use employment, physical output, personal income, sales, value added, or income of the region or a sector. However, division of economic activity between the “base” and “service” sectors is a difficult task.

In this study, we will make use of BC Stats’ published research built on the economic base model. It will help us to provide an estimate of aluminum

³ See, for example, William Schaffer, *Regional Impact Models*, Chapter 2: Regional Models of Income Determination: Simple Economic-Base Theory.

production's significance in income creation, as well as its employment impacts, on Kitimat and its surrounding area.

Application of the Models

The steps we will take include:

- ◆ a survey of the populations and economic structure of the area, including such indicators as migration patterns and labour force data, showing the historic and general significance of aluminum production
- ◆ application of the base method (drawing information from local area economic dependencies) to arrive at income dependencies in the areas
- ◆ use of the ratios to estimate total employment impact on the local area brought by changes in the employment level in aluminum production, direct, indirect, and induced
- ◆ derivation of the economic impact for BC of this primary metal industry using the BC Input Output Model to generate industry multipliers
- ◆ derivation of the employment impact, the output impact in dollars, and the impacts on government revenues.

Chapter 3 Population and Economic Structure of Kitimat and Kitimat-Terrace Local Area

This study focuses on the economic impact of Alcan's aluminum smelter in Kitimat. As background leading up to the current critical importance of the smelter in the area, we will describe in this section Kitimat's population change over the years. For the purposes of this study, we will also consider the population in Terrace, as Kitimat-Terrace is the geographic area on which our impact analysis will concentrate in Chapter 4.

In addition, we will present some facts on interprovincial and intraprovincial migration within the Kitimat-Stikine Regional District, which may also be representative of the Kitimat-Terrace local area. That local area accounts for 54.6 per cent of the regional district's overall population.

In this Chapter, we will also examine the economic structure of Kitimat and Terrace respectively, in order to lay the foundation for analysis of income dependencies and employment impact ratio which will follow in Chapter 4.

Population of Kitimat

Kitimat lies on the north coast of BC about 650 km northwest of Vancouver, 56 km south of Terrace and 110 km east of Prince Rupert. Kitimat sits at the head of Kitimat Arm which is a waterbody extending northeast from Douglas Channel. A generally flat valley more than 5 km wide extends between Kitimat and Terrace. The surrounding Coast Mountains create a sheltered harbour, 96 km from open water, which is well suited to deep sea transport.

It was due to these natural advantages that the modern city of Kitimat was created in 1953. Prior to this time, there was no town. There were a few First Nations people inhabiting this area, whose economy was based primarily on fishing. In 1949 the Provincial Government passed the "Industrial Development Act" which gave the Lieutenant Governor-in-Council authority to sell or lease Crown land and grant water licenses to any person proposing to establish an aluminum industry in B.C. That directly led to the existence of Kitimat.

In 1950, Alcan chose a site at the head of Kitimat Arm for an aluminum smelter. The potential availability of hydro power was a major factor in selecting this site. Alcan stopped the Nechako River by means of a large rock-filled dam, and tunnels were drilled through the Coast Mountains to transport water from the Nechako watershed to the powerhouse. The water falls 792 m inside Mount Tahtsa to the Kemano powerhouse at sea level. Power generated at Kemano is then transmitted 82 km overland to the Kitimat smelter.

From the outset, Kitimat was designed to anticipate and encourage industrial development. Population grew first mainly because of the Alcan smelter, and later because of the establishment of other manufacturing facilities. Figure 1 depicts the rise in population of Kitimat between 1941 and 1975. This chart draws from research we have conducted, from a variety of sources.⁴ It shows the rapid growth of the town resulting from the Agreement, as the population grew from near zero prior to 1951 to approximately 4,000 in 1954. This growth spurt led to the incorporation of The District of Kitimat in 1953.

Population in Kitimat, 1941 to 1975

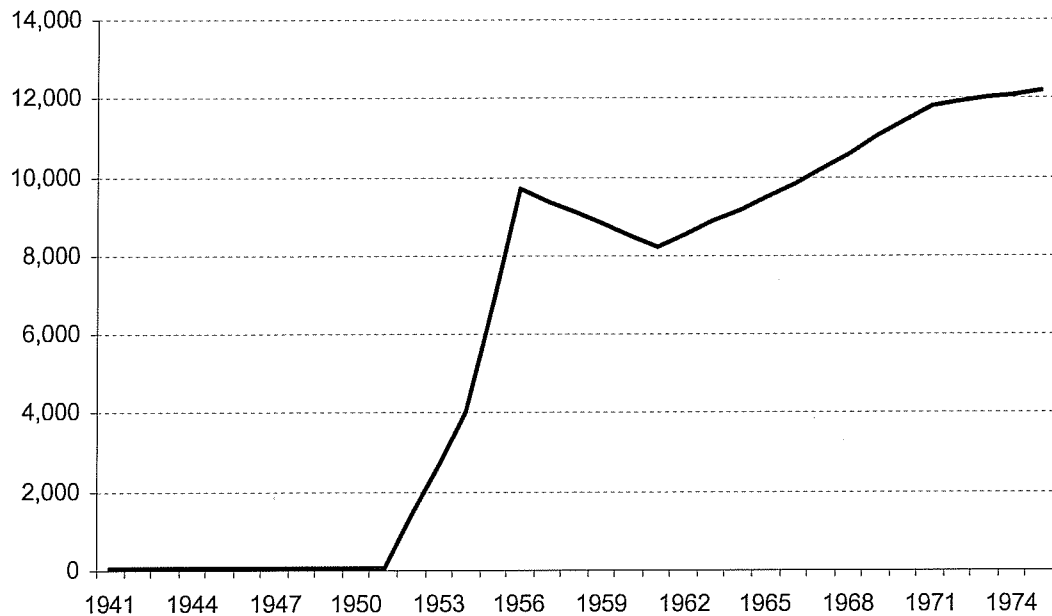


Figure 1 Population in Kitimat, 1941 to 1975

Source: See Footnote 4

⁴ The *Regional Industrial Index of British Columbia*, 1948 Edition indicates that the town of Kitimat did not exist and it can be inferred that the population of the site was minimal, a fraction of the population of "Prince Rupert District" outside the City proper (2,125). Other sources indicate that probably only one or a few farm families lived on the present site of Kitimat. Likewise, from the *Regional Industrial Index of British Columbia*, 1952 Edition, it can be inferred that Kitimat was part of the "Prince Rupert-Kitimat Area", with a population still a fraction of (estimated) total 2,576. Other sources indicate that probably only a camp (with surveyors, etc.) was present at the time. Estimates of population are available after the Kitimat Regional District was incorporated March 31st, 1953. In 1954 the population was estimated at 4,000 (*Regional Industrial Index of British Columbia*, 1954 Edition), with estimates of 9,676 in 1956, 8,217 in 1961, 9,792 in 1966, and 11,803 in 1971 (these 3 estimates are attributed to "Statistics Canada, BC Stats" in "Population", Terrace Economic Development Authority website, www.investinterrace.com). Values in those years where direct estimates are not available have been derived by mathematical interpolation.

Thus, Figure 1 makes clear how at the start, Kitimat owed its very existence to the establishment of the Alcan aluminum works, and its growth was tied to the growth in aluminum production. The current series of Census data begins in 1976.

Figure 2 shows the level of population, as well as the year-to-year percentage changes, for Kitimat from 1976 to 2002. These two charts indicate that, throughout the fifty years of the District of Kitimat's history, there were periods of positive population growth, notably from 1962 through 1976, from 1978 to 1982, and between 1989 and 1991. At other times, there were contractions of the population base, notably:

- -15.1 per cent between 1957 and 1961,
- -15.9 per cent between 1983 and 1988,
- -1.4 per cent between 1992 and 1995, and
- -7.0 per cent between 1996 and 2001.

Population in Kitimat, Year-to-Year Change, 1976 to 2002

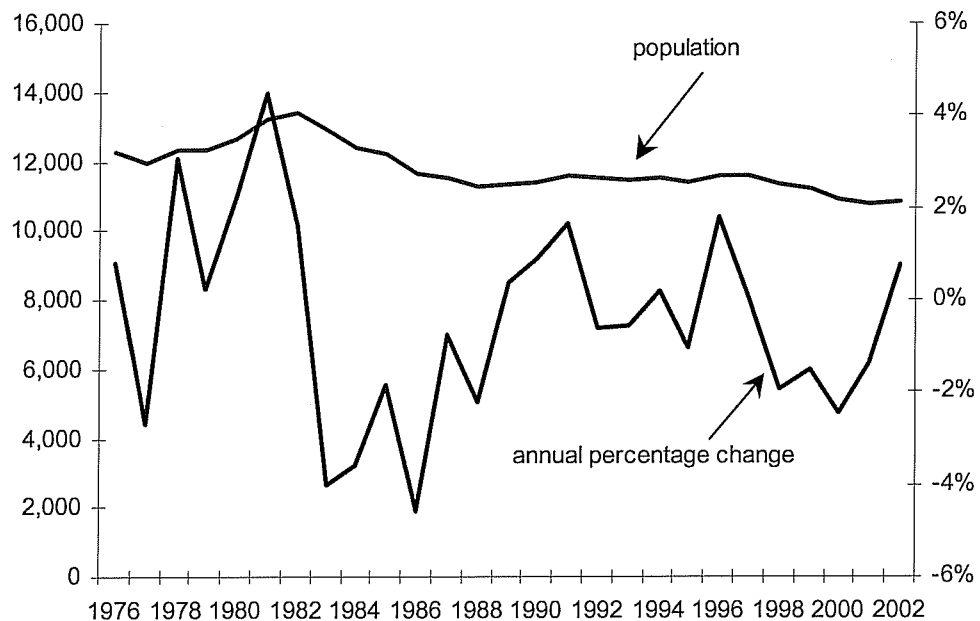


Figure 2 Population in Kitimat, Year-to-Year Change, 1976 to 2002

Source: BC Stats

The 1957-1961 decline, according to the Regional Index, was due to "an extended reduction in the number of persons employed by Alcan."⁵ The

⁵ "In 1956 the Company employed about 3,500 persons, while in 1961 it employed 2,000" -- *Regional*

population decline between 1983 to 1988 was most likely connected with the economic recession in the province, which hit the resource sector extremely hard. The most recent population decline from 1996 to 2001 was quite steep. In fact, based on Census information available for 1996 and 2001, Kitimat ranked the 25th fastest declining municipality in Canada (with population 5,000 and over) in terms of population change.⁶

Population of Terrace

Because of geographical proximity and economic interdependence, the Kitimat-Terrace area is a natural extension of the focus of our analysis in this study. In this section, we will examine the population growth in Terrace.

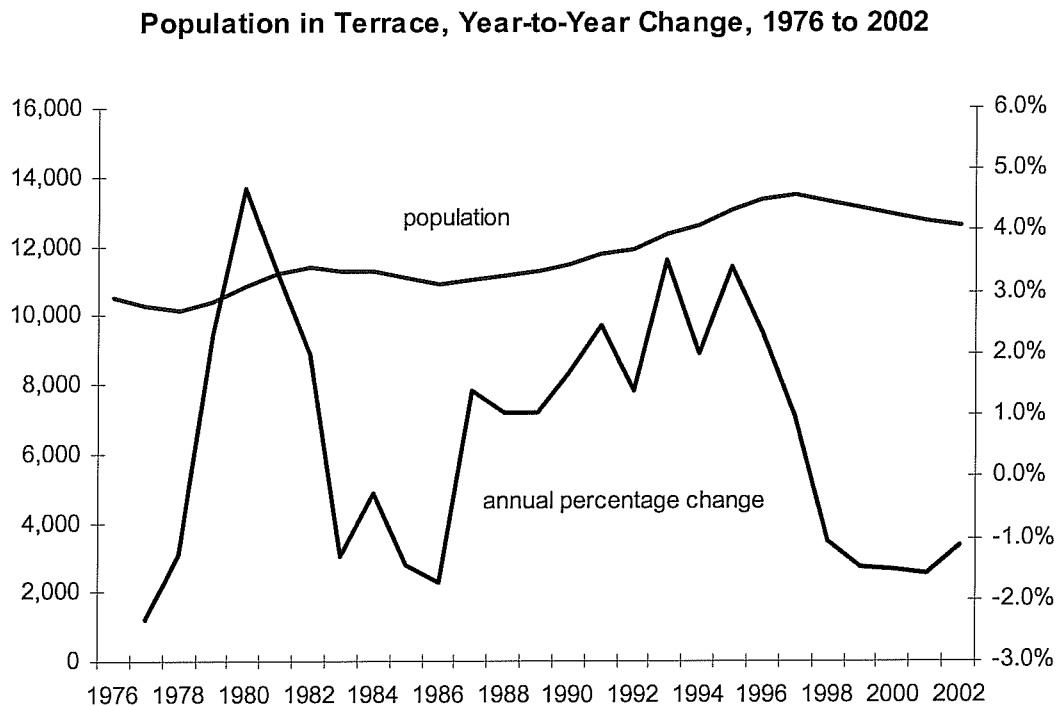


Figure 3 Population in Terrace, Year-to-Year Change, 1976 to 2002

Source: BC Stats

Sixty-four kilometres north of Kitimat lies the City of Terrace. Although its geographic area is only 7.4 per cent of that of Kitimat,⁷ Terrace's population is slightly larger. As Figure 3 shows, from 1976 to 2002, despite short periods of

Index of British Columbia, January 1966 (Bureau of Economics and Statistics, Department of Industrial Development, Trade and Commerce), p. 479.

⁶ The cause of population decline is probably associated with difficulties faced by the resource economies. It is also true that the employment level from Alcan declined gradually during the same period of time.

⁷ The land area in Terrace was 19.21km², as opposed to Kitimat's 259.59 km² in 1996. Source: Statistics Canada, Census of Population and Housing

population decline (-3.6 per cent between 1976 and 1978, -3.4 per cent from 1983 to 1986, and -5.6 per cent from 1998 to 2002), the city experienced positive population growth (10.3 per cent between 1979 and 1982, and 21.7 per cent from 1987 to 1997). In 2002, Terrace's population was estimated at 12,568, approximately 16 per cent larger than that of Kitimat.

Kitimat and Terrace contain the majority of the people in the local area of Kitimat-Terrace. This area also includes the communities of Braun Island (pop. 142), Kemano (pop. 367), Lakelse Lake (pop. 248), Rosswood (pop. 181), Gossen Creek (pop. 170), Jackpine Flats (pop. 255), Old Remo (pop. 227), Usk (pop. 147), Thornhill, and Copper City (pop. 312).⁸

Population of Kitimat-Stikine Regional District, 1976 to 2002

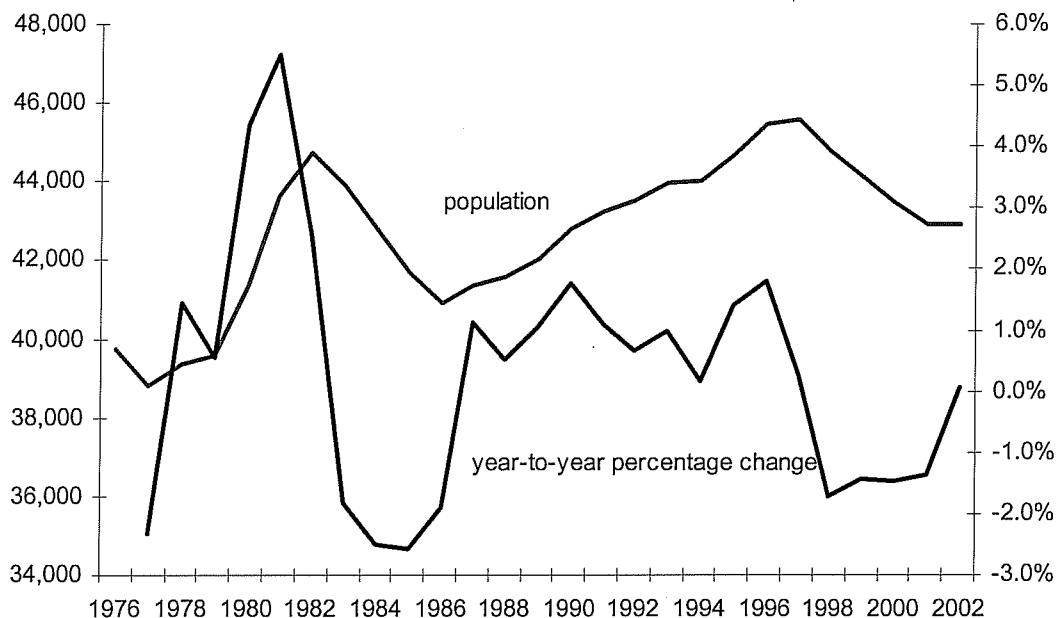


Figure 4 Population of Kitimat-Stikine Regional District, 1976 to 2002

Source: BC Stats

Together, the Kitimat-Terrace area accounts for over 55 per cent of the population in the Kitimat-Stikine Regional District. The Regional District's population growth shows a similar pattern to that of the Kitimat-Terrace area, as indicated in Figure 4. From 1976 to 2002, the Regional District experienced positive population growth—between 1978 and 1982 (13.5 per cent), and from 1987 to 1997 (10.2 per cent), with short spans of population decline from 1983 to 1986 (-6.8 per cent) and from 1998 to 2002 (-4.2 per cent).

⁸ Population estimates in 1991. Source: *British Columbia Regional Index*, 1995 edition.

Population Migration

A glimpse of the age breakdown of the population migration in the Kitimat-Stikine Regional District helps to better understand the economic conditions in the area.⁹ In Figure 5 and Figure 6, we have shown net interprovincial migration and net intraprovincial migration for the Regional District from 1986 to 2000 for five age cohorts:

- 0-17 years,
- 18-24 years,
- 25-44 years,
- 45-64 years, and
- 65 years and over.

**Interprovincial Net Migration in Kitimat-Stikine Regional District
1986/87 to 2000/01**

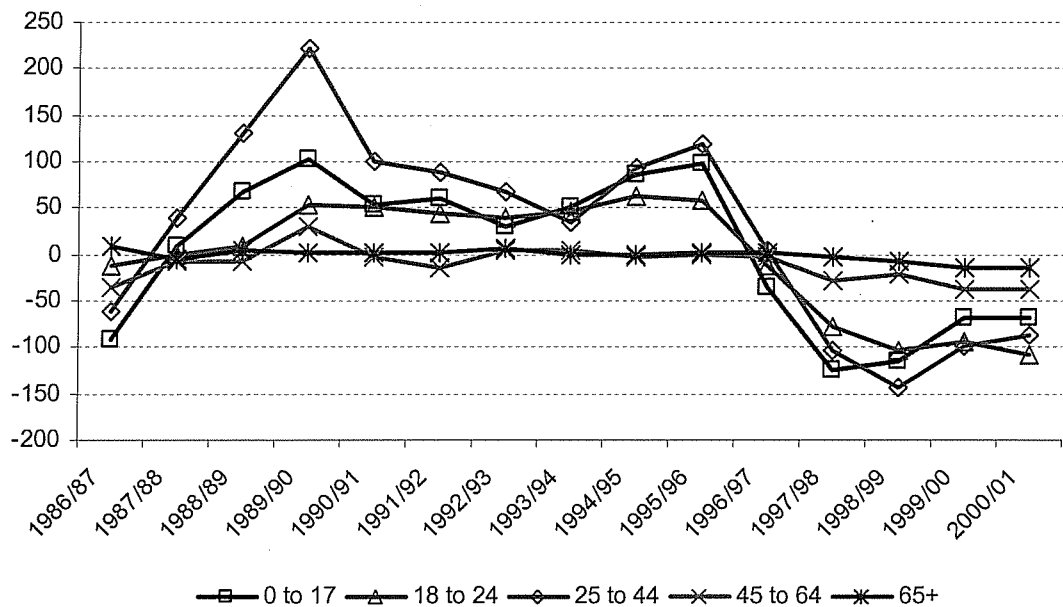


Figure 5 Interprovincial Net Migration in Kitimat-Stikine Regional District, 1986/7 to 2000/01

Source: BC Stats

The movement of those of ages 0-17 years generally follows the age cohorts of 25-44 years old and of 45-64 years old, as the former are generally dependent upon the latter two. Those in the age group of 18-24 years move most likely to pursue post-secondary education and/or to take up entry-level jobs. The

⁹ Similar data for geographic areas smaller than the Regional District are not available.

movement of those of ages 25 to 64 is most likely reflective of employment conditions in the area.

Figure 5 shows net interprovincial (between provinces) migration for the Regional District. Net interprovincial migration remained positive up to 1996/97 for those in the 0-17, 18-24 and 25-44 age cohorts, possibly indicating that the Regional District's economy was perceived as better than that of some other provinces in the country. Those in the age groups of 45-64 and 65 and over were least likely to move between provinces.

On the other hand, the net intraprovincial (within the province) migration pattern in Figure 6 shows a much different picture. With the exception of those in the age groups of 0-17 and 25-44 showing in positive territory in the period from 1993/94 to 1995/96 (also in 1989/90 for the 25-44 age group), and those in the

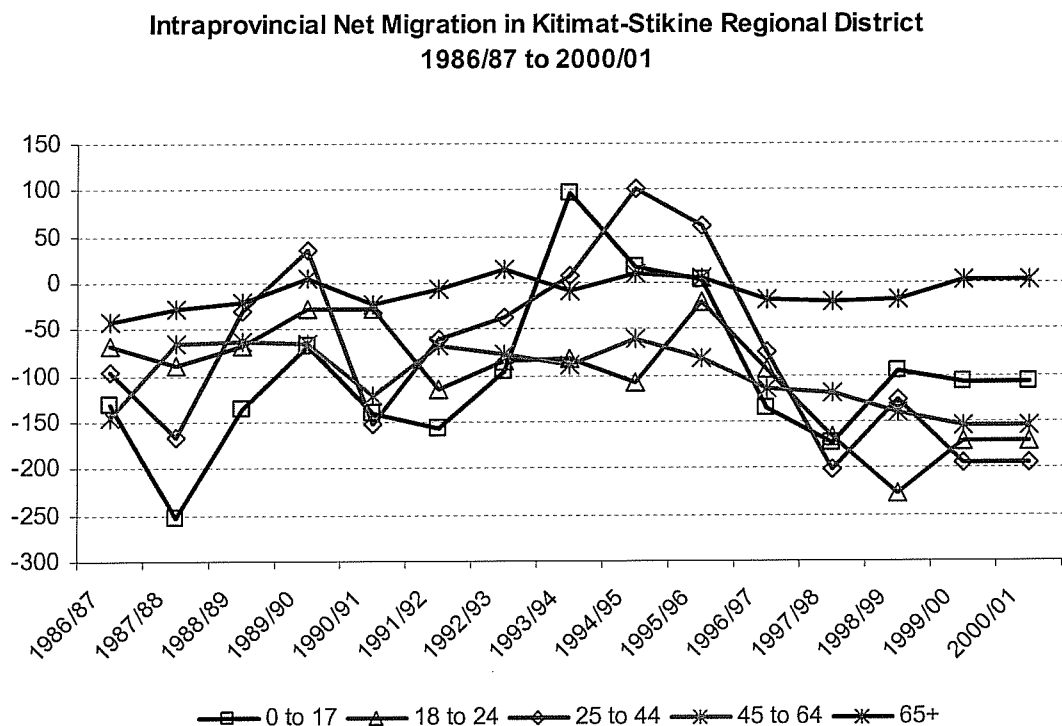


Figure 6 Intraprovincial Net Migration in Kitimat-Stikine Regional District, 1986/7 to 2000/01

Source: BC Stats

age group of 65 and over showing little movement, all age cohorts showed out-migration greater than in-migration through all years. This may be reflective of the need to pursue post-secondary education outside this Regional District, and/or perceived better economic opportunities in other parts of the province.

Figures 5 and 6 illustrate the sensitivity of the Regional District to economic influences, in terms of decisions of people to leave or stay, or to migrate to the area.

Economic Structures of Kitimat and Terrace

Although Kitimat and Terrace are quite closely linked on the basis of trade and services, they exhibit very different economic profiles. The Kitimat economy is dominated by the large Alcan aluminum smelter, with the Eurocan pulp and paper complex and a methanol-ammonia plant playing a more recent and secondary role. The community supplies basic trade and service functions although the longer-established centre of Terrace tends to provide more highly developed services.

The economy of Terrace is based primarily on the forest industries. Although industrial employment is dominated by logging, sawmilling and chip production, the largest number of employment positions is provided by trade, services and administration activity. This reflects the community's growing importance as a regional service centre and as a trans-shipment point for rail and truck freight.

Table 1 Experienced Labour Force by Industry, Kitimat

	Kitimat		Kitimat	BC
	1991	1996	% Distribution-96	
Total Industries	5,825	5,570	100.0	100.0
Primary Industry	170	95	1.7	5.7
Agriculture & related	20	40	0.7	2.4
Fishing & Trapping	10	0	0.0	0.5
Logging & Forestry	130	55	1.0	2.1
Mining, Quarry & Oil Well	10	0	0.0	0.8
Manufacturing Industry	2,660	2,575	46.2	10.4
Construction Industry	295	255	4.6	7.5
Transportation & Communication	215	140	2.5	7.5
Wholesale Trade	50	50	0.9	4.8
Retail Trade	575	545	9.8	12.5
Finance, Insur. & Real Estate	175	145	2.6	5.8
Business Service	150	85	1.5	6.8
Government Service	340	210	3.8	5.9
Educational Service	345	370	6.6	6.9
Health & Social Service	230	350	6.3	9.5
Accom., Food & Beverage	310	400	7.2	8.4

Source: Statistics Canada

Table 1 and Table 2 summarize the breakdown of labour force by industry in these two communities. They are based on Census data for 1991 and 1996. Also indicated in the Tables is the distribution of the labour force by industry for 1996 in both the area under study and in BC.

Table 2 Experienced Labour Force by Industry, Terrace

	Terrace		Terrace	BC
	1991	1996	% Distribution-96	
Total Industries	6,115	6,610	100.0	100.0
Primary Industry	570	505	7.6	5.7
Agriculture & related	75	75	1.1	2.4
Fishing & Trapping	20	20	0.3	0.5
Logging & Forestry	435	395	6.0	2.1
Mining, Quarry & Oil Well	40	15	0.2	0.8
Manufacturing Industry	570	560	8.5	10.4
Construction Industry	355	550	8.3	7.5
Transportation & Communication	640	545	8.2	7.5
Wholesale Trade	305	335	5.1	4.8
Retail Trade	920	1,020	15.4	12.5
Finance, Insur. & Real Estate	260	250	3.8	5.8
Business Service	165	330	5.0	6.8
Government Service	425	475	7.2	5.9
Educational Service	490	560	8.5	6.9
Health & Social Service	560	570	8.6	9.5
Accom., Food & Beverage	490	405	6.1	8.4

Source: Statistics Canada

Using these Tables, we can learn that the Manufacturing industry accounted for the largest share of the experienced labour force (3,230 or 27 per cent in 1991 and 3,135 or 26 per cent in 1996) in the local area of Kitimat/Terrace. It is understood that the leading industry is the aluminum smelter at Kitimat, followed by paper and allied products with mills at Kitimat, a number of sawmills concentrated in Terrace, and Methanex Corp. at Kitimat. It should be noted that the manufacturing industry was the only sector that provided a higher share of employment in Kitimat than in BC.

Chapter 4 Economic Impact of Aluminum Production on Kitimat-Terrace

The purpose of this study is to quantify the economic impact of Alcan's aluminum smelter at Kitimat on the local economy and on the provincial economy. In this Chapter, we provide analysis of the impact on Kitimat itself as well as the Kitimat-Terrace area. The local area of Kitimat-Terrace includes the District of Kitimat, the City of Terrace and the communities of Brauns Island, Kemano, Lakelse Lake, Rosswood, Gossen Creek, Jackpine Flats, Old Remo, Usk, Thornhill, and Copper City.

There is good reason for extending the analysis from Kitimat to Kitimat-Terrace. Although the majority of Alcan's employees working at the smelter live at Kitimat, a number of them (235) live in Terrace and commute to work. Many Kitimat residents shop in Terrace, which generally serves as a local service centre. In this study, we will quantify not only the direct economic contribution to Kitimat by Alcan's aluminum works, but also the spill-over effects to local communities.

Economic Base Method – Theoretical background

The method that we use in this study to quantify the economic impact of the aluminum industry on the Kitimat-Terrace economy is called the "economic base method".¹⁰ As discussed in Chapter 2, the fundamental premise of this model is that the economy of a community can be represented by income flows classified as basic or non-basic, depending on where the income comes from.

Basic income flows into the community from the outside world, usually in return for goods and services produced in the community and exported from it. Outsiders may also come to the community and spend money that they have earned elsewhere. Incomes earned by public servants (teachers, health care workers, and government employees) are also considered basic, since health and education expenditures are generally provided from general tax revenues and are not user-paid services. Transfer payments from senior governments – pensions, employment insurance payments and income assistance – are also considered to be basic. Finally, investment income is classified as basic as well.

On the other hand, **nonbasic income** is paid to individuals in the community for goods and services they provide to others in the community, where the relevant

¹⁰ The description of the economic base method here is found in *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996*, BC Stats, Victoria, 1999, p. 8.
<http://www.bcstats.gov.bc.ca/data/bus%5Fstat/econ%5Fdep/econ%5Fdep.htm>

commodities are actually purchased within the community. Banking services, dry-cleaning, and hair-cutting are examples of this category.¹¹

Figure 7 illustrates the interactions between the economic components of a community from the perspective of economic base methodology. Each of the arrows in this diagram represents a flow of dollars. Community residents are at the centre of the diagram and receive income from a variety of sources. They, in turn, use these incomes to make purchases and pay taxes. To the extent that they make purchases from the outside world, they need sufficient salaries from basic employers or other outside sources to enable them to pay.

To take one example of the interactions, if basic employment declines then basic incomes will decline. In the short run, transfers will increase as displaced workers begin to draw employment insurance, but not enough to offset the loss in basic salaries and not in the long run. The assumption underlying this model is

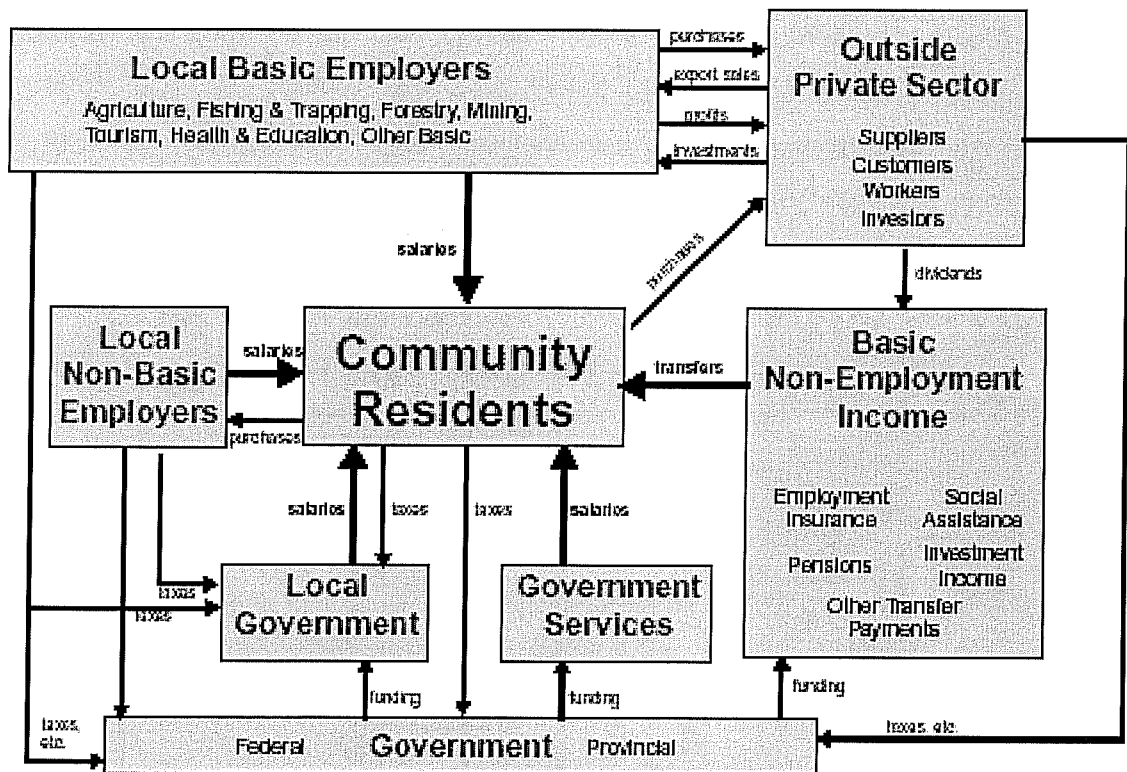


Figure 7 Income Flows in a Community Using an Economic Base Model

Source: *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996*

that purchases by community residents will decline when basic income declines—both purchases from the outside and purchases from local nonbasic

¹¹ The model recognizes the reality of impure or “mixed” service—such as shopping or use of transportation by tourists,—and describes the challenge of accurately allocating “mixed” services as basic or nonbasic. (*British Columbia Local Area Economic Dependencies and Impact Ratios*, p.9).

employers. The latter decline will in turn further reduce the total wages paid to community residents who work in the nonbasic sectors.

The same kind of reasoning can be used to examine situations where basic income coming into a community increases. (This may come about through an increase in basic employment, or, as an alternative example, through the inflow of a significant number of wealthy seniors.) As basic income increases, local spending will increase and nonbasic employment will rise to meet these increased demands.

In summary, in the economic base model, the basic sector “drives” the economy of a community. With a change in economic activity in the basic sector (through an increase of employment or inflow of income), there will be a “chain” effect or “multiplier” effect or “indirect” effect to the non-basic sector of the community because it supplies goods and services to the basic sector. The “chain” or “multiplier” effect gets even larger when the increase of household income of those directly and indirectly impacted further “induces” demand for more goods and services. This latter impact is “induced” impact. Using this reasoning, the economic base model is able to quantify the economic impact of an initial change of economic activity in the basic sector.

Therefore, given a change in a base sector, we are able to estimate what change it will produce as a result of the multiplier effect on the whole community. We can say, for example, that 100 new jobs will produce X new jobs through direct, indirect and induced impacts.

Application

British Columbia Local Area Economic Dependencies and Impact Ratios – 1996

BC Stats has published a series of research papers aimed at quantifying economic impacts on communities throughout BC in the 1990's, using the economic base model. The most recent paper is *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996*. We will utilize some of the research findings in this paper for the purposes of our current study.

Two sets of indicators will be used to estimate the economic impact of aluminum production on Kitimat and the Kitimat-Terrace area respectively. One is “economic dependencies”, defined as the share of after-tax income of industries in the basic sector in a local area. The other is “employment impact ratios”, which measures the direct, indirect and induced employment impact of industries in the basic sector.

The *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996* defines the basic sectors as:

Forestry (including logging, pulp and paper, sawmills, other wood manufacturing, forest management, related transportation, construction, etc.)

Mining (including mining, mineral processing, quarries, gravel pits, petroleum extraction and processing)

Fishing and Trapping (including fish processing)

Agriculture and food processing

Tourism (including accommodation, and a portion of food services, retail trade, transportation, etc.)

High technology industries (primarily high tech manufacturing, but may include some high tech services)

Public sector (including education, health services, justice, other public services and government)

Construction (but excluding that portion of construction which is driven by one of the other basic industries)

Other basic industries (including parts of manufacturing, transportation, etc.)

Transfer payments (from government to individuals: primarily employment insurance, income assistance, Old Age Security payments, Canada Pension Plan payments)

Other Non-Employment Income (primarily investment income and corporate pension plans)

For the purposes of our study, aluminum production is considered to be mineral processing, which belongs to the "Mining" sector.

Employment impact ratios in the *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996* are shown for these industries:

- Logging
- Pulp and Paper
- Wood Manufacturing
- Mining
- HighTech
- Agriculture and Food
- Tourism

- Public Sector, and
- Construction

However, “Mining” in the published impact ratios is just mining alone, and does not include mineral processing or oil and gas. For this reason and for the purposes of being able to define ratios for Kitimat alone, we requested a special tabulation by BC Stats for mineral processing, using the same dataset and methodology as in the *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996*.¹² The results of that tabulation will be seen set out separately from “Mining” in the tables ahead, Table 4 and Table 5.

The Migration and No-Migration Scenarios

Employment impact ratios provided in the above publication show two scenarios for induced impacts – No Migration (low) and With Migration (high).

In the **No-Migration** scenario, it is assumed that when there are changes in basic employment levels or other basic income changes, workers affected do not move. Then, in the case of job losses, employment insurance and income assistance prevent spending from dropping to zero.

The **Migration** scenario assumes that each worker's spending is equal to their after-tax income when they are employed and equals zero when they are not employed. The only way that this scenario makes sense in a contemporary Canadian community is if there is migration – on losing a job the worker in question leaves the community, or conversely, if a new job opens up it is taken by someone who moves into the community. As long as there is migration, safety net considerations are not relevant.¹³

Safety net considerations do not affect indirect employment ratios, but do reduce the magnitude of induced impacts (the overall impacts of income reduction) so that the No Migration ratios are smaller than Migration ratios.

Summary of Income Dependencies and Employment Impact Ratios for Kitimat and Kitimat-Terrace Area

Table 3 summarizes income dependencies calculated for Kitimat and the Kitimat-Terrace area by estimating the local after-tax income derived from each of the 11 independent (non-overlapping) basic sectors.

¹² The BC Stats study presents a set of indicators for a total of 62 “local areas” across BC. The area appropriate to our current study is Kitimat-Terrace.

¹³ *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996*, BC Stats, Victoria, 1999, p. 19.

Table 3 Income Dependencies in Kitimat and Kitimat-Terrace

	Dependencies (%)	
	Kitimat	Kitimat-Terrace
Forestry	20	24
Mining	37	17
Fishing & Trapping	0	0
Agriculture & Food Processing	0	1
Tourism	3	5
High Tech Industries	5	2
Public Sector	16	23
Construction	3	7
Other Basic Industries	1	3
Transfer Payments	8	11
Other NonEmployment Income	5	5
Total	100.0	100.0

Source: BC Stats British Columbia Local Area Economic Dependencies and Impact Ratios – 1996

NB: in the above Table, aluminum production is included in the “Mining” category, whose definition includes “mineral processing”.

From Table 3, we learn that aluminum production is the largest basic industry and accounts for fully 37 per cent of income creation amongst all “basic” industries in Kitimat. In the combined Kitimat-Terrace area, aluminum production accounts for approximately 17 per cent of income creation amongst all “basic” sectors. It is the third largest after the public sector and the forestry sector.

Table 4 and Table 5 present employment impact ratios for selected industries in Kitimat and Kitimat-Terrace respectively. Note that in these Tables, aluminum production, which was specially tabulated for purposes of this study, is classified under “Mineral Processing”.

Table 4 Employment Impact Ratios for Selected Industries in Kitimat

	Indirect	Indirect and Induced, No Migration	Indirect and Induced, Migration
Logging	1.19	1.23	1.29
Pulp and Paper	1.19	1.31	1.41
Wood Manufacturing	1.12	1.15	1.21
Mining	1.23	1.28	1.34
High Tech Industries	1.09	1.25	1.35
Agriculture and Food	1.07	1.08	1.09
Tourism	1.04	1.07	1.10
Public Sector	1.05	1.10	1.18
Construction	1.15	1.20	1.28
Mineral Processing	1.08	1.20	1.30

Source: BC Stats – special tabulation using data and methodology in British Columbia Local Area Economic Dependencies and Impact Ratios – 1996

In Table 4 we can see that the Mineral Processing Industry (aluminum production in Kitimat) has an employment impact of from 1.08 to 1.30, which means that for every 100 new jobs in the industry, the total impact goes from 108 to 130 new jobs in Kitimat.

Table 5 Employment Impact Ratios for Selected Industries in Kitimat-Terrace

	Indirect	Indirect and Induced, No Migration	Indirect and Induced, Migration
Logging	1.23	1.35	1.52
Pulp and Paper	1.52	1.72	1.94
Wood Manufacturing	1.25	1.35	1.52
Mining	1.43	1.50	1.61
High Tech Industries	1.17	1.39	1.57
Agriculture and Food	1.15	1.19	1.28
Tourism	1.06	1.10	1.17
Public Sector	1.08	1.15	1.28
Construction	1.28	1.37	1.51
Mineral Processing	1.17	1.35	1.52

Source: BC Stats – special tabulation using data and methodology in British Columbia Local Area Economic Dependencies and Impact Ratios – 1996

Employment impact ratios shown in Table 4 indicate that for 100 change of employment opportunities in aluminum production, the indirect impact is 108 jobs, and the total impact is an average of 125 jobs in Kitimat.¹⁴ Similarly, in Table 5, the employment ratios there indicate that for 100 change of employment opportunities in aluminum production, the indirect impact is 117 jobs, and the total impact is an average of 144 jobs in Kitimat-Terrace.

It is interesting to note that aluminum production is of higher significance in income determination (as shown by a larger share in the Income Dependencies table, Table 3) in Kitimat than in the combined Kitimat-Terrace area. However, it has a smaller employment impact in Kitimat (Table 4) than in the combined Kitimat-Terrace area (Table 5). This can be explained by the estimation techniques of the economic base model. When estimating indirect impacts, the model looks for all industries that supply goods and services to aluminum production. This means that changes in basic jobs in Kitimat affect jobs in Terrace and beyond.

¹⁴ The indirect and induced impact ratios range from 1.20 to 1.30 for a direct impact of 1.0. We believe that the actual impact will lie in between these two extremes. For illustrative purposes, we have shown a simple average of the two ratios.

Local Economic Impacts

Once we have these employment impact ratios, it is straightforward to estimate total economic impact on the local area due to a change of employment level at Alcan's Kitimat Works. For example, the "1" in each ratio is the direct employment by the industry.¹⁵ If there is an increase of 100 new hires (the **direct** impact) at the Kitimat smelter, total employment impact will be in the following ranges:

In Kitimat (using Table 4) -

from

$100 \times (1.08 - 1) = 8$ **indirect** plus $100 \times (1.20 - 1.08) = 12$ **induced** employment opportunities, i.e., 120 **total jobs** (under the **No Migration** scenario)

to:

$100 \times (1.08 - 1) = 8$ **indirect** plus $100 \times (1.30 - 1.08) = 22$ **induced** employment opportunities, i.e., 130 **total jobs** (under the **Migration** scenario).

In the Kitimat-Terrace Area (using Table 5)-

from

$100 \times (1.17 - 1) = 17$ **indirect** plus $100 \times (1.35 - 1.17) = 18$ **induced** employment opportunities, i.e., 135 **total jobs** (under the **No Migration** scenario)

to:

$100 \times (1.17 - 1) = 17$ **indirect** plus $100 \times (1.52 - 1.17) = 35$ **induced** employment opportunities, i.e., 152 **total jobs** (under the **Migration** scenario).

The above calculations, then, tell us that the total impact of 100 jobs at the Kitimat smelter is actually 120-130 jobs in Kitimat overall, or 135-152 jobs in the Kitimat-Terrace area overall.

In summary, these impacts are shown in Figure 8 and Figure 9.

¹⁵ In *British Columbia Local Area Economic Dependencies and Impact Ratios – 1996*, employment and jobs are generally treated as equivalent concepts and assumed to be "full-time" employment unless otherwise stated. The same principle applies in this report.

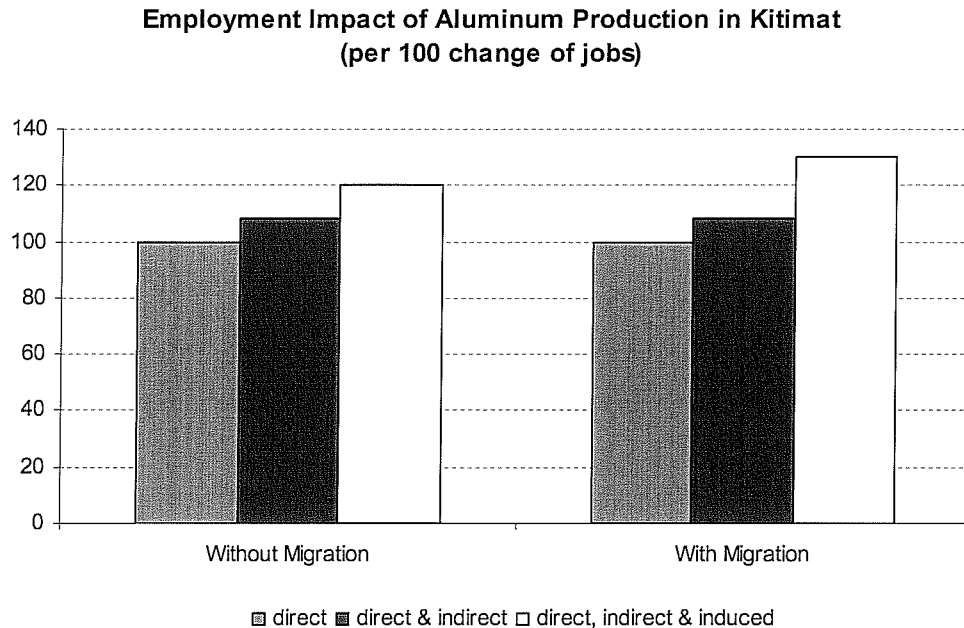


Figure 8 Employment Impact of Aluminum Production in Kitimat (per 100 change of jobs)

Source: Special Tabulation using data and methodology in British Columbia Local Area Economic Dependencies and Impact Ratios – 1996

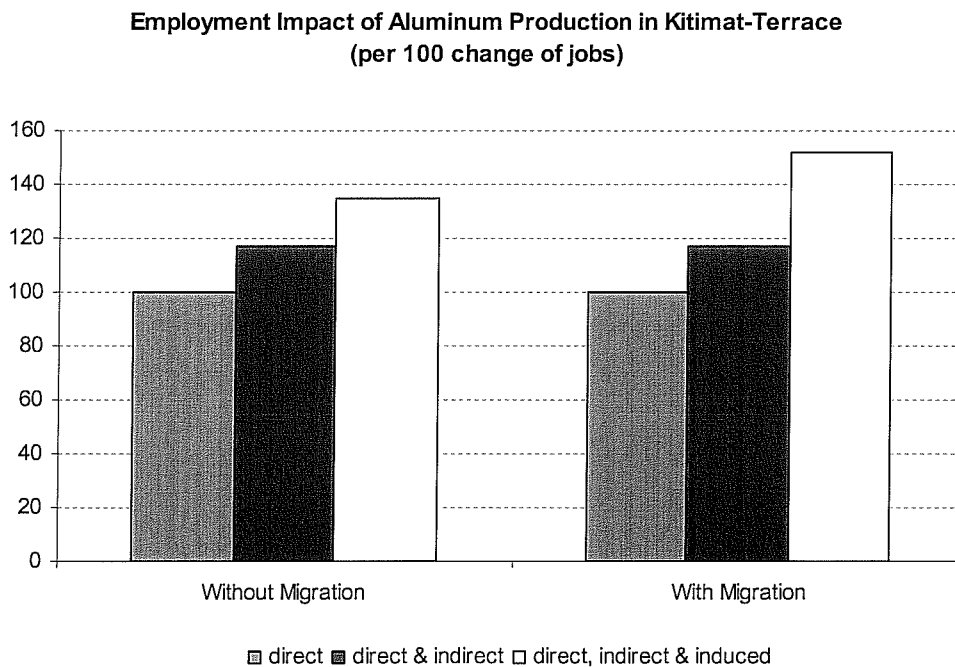


Figure 9 Employment Impact of Aluminum Production in Kitimat-Terrace (per 100 change of jobs)

Source: Special Tabulation using data and methodology in British Columbia Local Area Economic Dependencies and Impact Ratios – 1996

Chapter 5 Economic Impact of Aluminum Production on the Province of BC

The importance of Alcan's smelter at Kitimat goes far beyond the Kitimat-Terrace area. For the province, the smelter at Kitimat plays an important role in contributing to the province's overall manufacturing activity and exports. The following is from "Kitimat's Export Performance and Manufacturing GDP Contribution":¹⁶

"BC's primary metal manufacturing exports equaled \$1.1 billion in 1997, unwrought aluminum exports were \$506 million. Kitimat's contribution is one-third of metal exports or \$413 million and 81% of unwrought aluminum exports. Alcan Kitimat Works is BC's largest value-added exporter.

BC's primary metal manufacturing exports equaled \$1 billion in 1999, unwrought aluminum exports were \$513 million. Kitimat's contribution is one-third of metal exports or \$434 million and 84% of unwrought aluminum exports.

BC's primary metal manufacturing exports equaled \$1 billion in 2000, unwrought aluminum exports were \$623 million. Kitimat's contribution is one-third of metal exports or \$493 million and 79% of unwrought aluminum exports."

In this section, we provide a framework that can be used to measure economic impact on the province as a result of an increase/decrease of the production of aluminum.

Methodology

BC Input-Output Model (BCIOM)

The framework we will use consists of provincial economic multipliers for different industries in the BC economy, derived from the BC Input-Output Model (BCIOM) as described in Chapter 2 and found in the publication *British Columbia Provincial Economic Multipliers and How to Use Them*.

When the operations of various industries in the economy are closely related or "linked" to each other, an increase of activity in one industry will increase the level of activity in other industries. These linkages mean that changes in one industrial sector will have indirect and induced effects in other sectors. The total

¹⁶ "Kitimat's Export Performance and Manufacturing GCP Contribution", prepared by the Economic Development Officer, District of Kitimat, 2002.

effect of the change is the sum of direct, indirect and induced effects, and the BCIOM captures these inter- and intra-industry linkages.

The BCIOM structures the business sector of the entire provincial economy in terms of who makes what and who uses what.¹⁷ In principle, the model contains the “recipes” for every output of the economy. Therefore, it is conceptually possible to predict how an increase in demand for the products of one industry will impact on other industries and hence on the entire economy. In other words, if we think of the whole economy as a pie, what we can estimate here is how much bigger (or smaller) the pie gets, given some change in production.

Multipliers in the Publication *BC Provincial Economic Multipliers and How to Use Them*

The current (1996) version of the BCIOM assumes that 243 industries make or use 679 commodities. It is capable of producing approximately 17,000 different multipliers for the BC economy. In reality though, the published data summarizes the information into 21 industries at “small aggregation” and 58 industries at “medium aggregation”.¹⁸ The multipliers that result are:

21x14=294 industry multipliers and 21x12=252 government revenue multipliers for industries at small aggregation, and

58x14=812 industry multipliers and 58x12=696 government revenue multipliers for industries at medium aggregation.

(In the above formulas, the “14” represents the 14 multipliers derived for industry outputs and employment, as seen in the table which follows; and the “12” represents the 12 multipliers possible for government, that is government taxes at 3 levels--federal, provincial, municipal--with each level given 2 multipliers--direct+indirect, and induced--under 2 different scenarios.)

Primary Metal Industry Multipliers

In the following table are the **industry multipliers** for Primary Metal Industries in BC,¹⁹ the category to which Alcan’s Kitimat smelter belongs:

¹⁷ For a more detailed description of the BCIOM, please refer to *British Columbia Provincial Economic Multipliers and How to Use Them*, Garry Horne and Teresa Qing Zhuang, BC Stats, Ministry of Management Services, June 2002.

http://www.bcstats.gov.bc.ca/pubs/pr_PEM.htm

¹⁸ For a complete explanation of the reasons, see “Appendix A: Employment Ratios”, *British Columbia Provincial Economic Multipliers and How to Use Them*, p.25. The industry lists at small and medium aggregations may be found in “Appendix C: Industry Multipliers”, same source, pp. 30 ff.

¹⁹ At medium aggregation.

Table 6 Industry Multipliers for Primary Metal Industries

Primary Metal Industries		
Output	Own Indirect	0.02
	Total Indirect	0.53
	SN Induced	0.11
	NSN Induced	0.22
Employment (Person Years / \$ Million) 2000 ²⁰	Direct	3.00
	Own Indirect	0.06
	Total Indirect	2.51
	SN Induced	0.98
	NSN Induced	2.05

Notes:

SN Induced: With Safety Net Scenario: (see discussion on page 30)

NSN Induced: No Safety Net Scenario

*Own indirect 'refers to indirect impacts of an industry on itself. Industries have indirect linkages not only to other industries but also to other firms within the same industry. When industries are very disaggregated, an industry's linkages to itself are minimal. The more highly aggregated an industry is, though, the more pronounced the effect.'*²¹

Source: British Columbia Provincial Economic Multipliers and How to Use Them

Choosing Which Multipliers to Use

In choosing the appropriate multipliers to use in estimating economic impact due to an external factor, there are considerations to be kept in mind. One relates to whether an Open or Closed model should be used, the other is concerned with whether With Safety Net scenario or No Safety Net scenario should be used.

Open vs. Closed Models

The **Open model** is the one that estimates direct and indirect effects only. It can always be used – it treats personal spending by wage-earners as exogenous and never leads to contradictions or inconsistent results. Induced impacts are always zero when the Open model is used.

The **Closed model** takes the induced impacts into account. However, it is more difficult to justify in many situations. For example, because induced impacts are largely a reflection of consumer spending, it may be questionable to estimate the induced impacts of an activity that would itself be largely driven by consumer spending.

For applications which involve exports or capital spending, either the Open or Closed model can be used and the results interpreted accordingly. However,

²⁰ Person-years per million dollars (year 2000 dollars) of output. One person-year can be thought of as one Full-Time Equivalent (FTE) person.

²¹ *British Columbia Provincial Economic Multipliers and How to Use Them*, p.12

when changes in demand are caused by domestic personal expenditures, in whole or in part, only the Open model makes sense.

With Safety Net Scenario vs. No Safety Net Scenario

The **With Safety Net** scenario is equivalent to No Migration scenario (described on page 22), which is appropriate in measuring immediate impacts. Over a long period of time though, the **No safety Net** scenario, equivalent to the Migration scenario, would be more appropriate. (The discussion of these scenarios is in the previous Chapter, beginning on page 22.)

We now have enough information to state the impact of the activity of Alcan's smelter on the economy of BC.

Application--BC Input-Output Model (BCIOM)

Using Multipliers to Calculate the Smelter's Impact

We will use an example to illustrate the use of multipliers to estimate the impact on the BC economy of a change in demand for Alcan's Kitimat smelter's products.

Employment Impact of 100 New Jobs

Assume that Alcan decides to hire 100 new employees for its Kitimat smelter. (The same calculation can be performed in cases where employment is reduced by 100. The magnitude of the total impact will be the same, but with an opposite sign.) What is the impact on the economy in the province as a whole?

From the table on page 29, we know that, for \$1 million change of output in the primary metal industry, there will be 3.0 direct jobs created, 2.51 indirect jobs created, and $(2.51+0.98)=3.49$ indirect and induced jobs created using the With Safety Net Scenario. The employment impact ratio is therefore calculated using the formula

$$\text{EmploymentImpactRatio} = \frac{\text{DirectJobs} + \text{IndirectJobs} + \text{InducedJobs}}{\text{DirectJobs}}$$

So a range of likely total employment impacts on the province will be:

With Safety Net multiplier: $(3.0+2.51+0.98)/(3.0)=2.16$

For a total of $100 \times 2.16 = 216$ jobs

Without Safety Net multiplier: $(3.0+2.51+2.05)/(3.0)=2.52$

For a total of $100 \times 2.52 = 252$ jobs

Conclusion: Calculated Impact on BC of 100 Jobs

For the 100 new jobs at the Kitimat smelter, the impact on BC's economy will be 216 jobs (using the With Safety Net multiplier) or 252 jobs (using the Without Safety Net multiplier).

On average, the total employment impact of a change of 100 jobs is 234, direct, indirect, and induced.

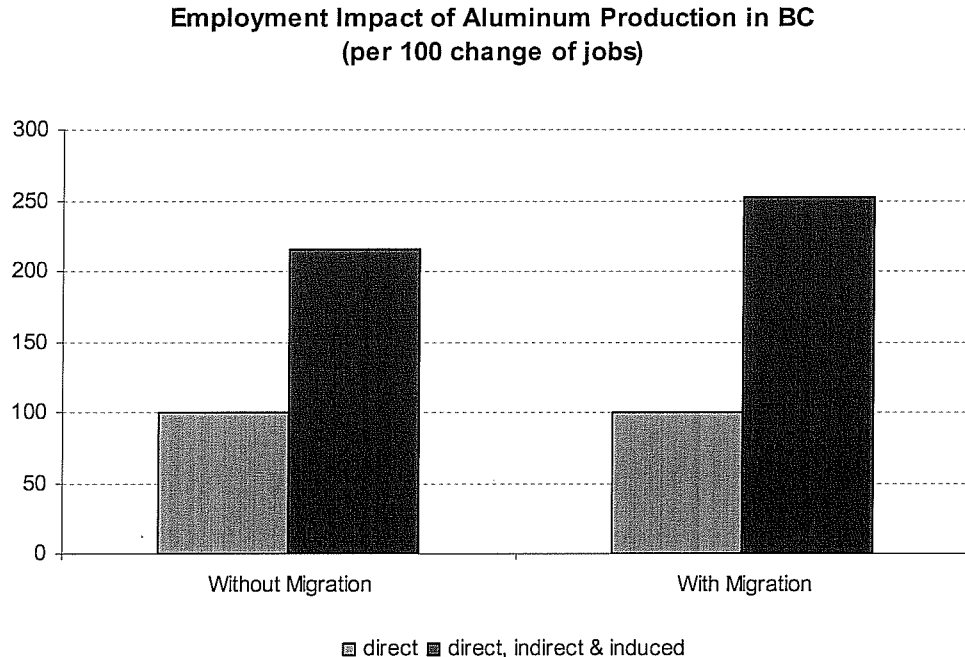


Figure 10 Employment Impact of Aluminum Production in BC (per 100 change of jobs)

Source: RKA

Calculations of Other Economic Impacts

Other economic impacts: from the multiplier table (page 29) we know that a \$1 million increase in output in the primary metal industry results in 3.0 direct jobs. Therefore 100 direct jobs is equivalent to a \$33.33 million increase in output in the primary metal industry. Impact on the whole BC economy will be:

With Safety Net

Output: $(1.0 + 0.53 + 0.11) \times 33,333,333 = \$54,666,666$

Without Safety Net

Output: $(1.0 + 0.53 + 0.22) \times 33,333,333 = \$58,333,333$

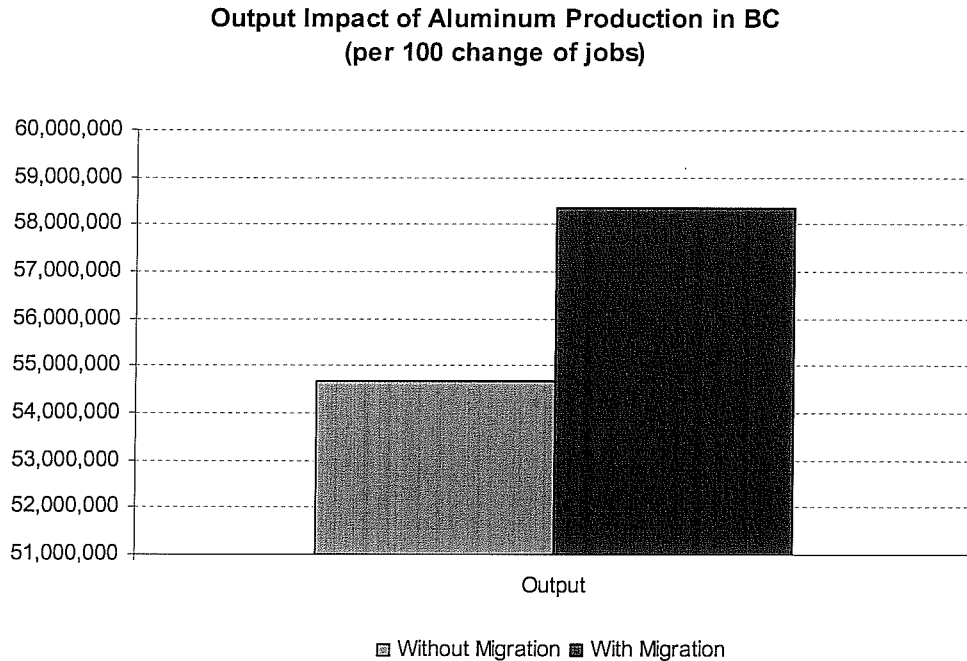


Figure 11 Output Impact of Aluminum Production in BC (per 100 change of jobs)

Source: RKA

To summarize, the additional 100 new hires at Kitimat's smelter will generate a province-wide impact of:

Output: \$54.67 to \$58.33 million, or an average of \$56.5 million

Employment: 216 to 252 jobs, or an average of 234 jobs

These same ratios and impacts can be applied to scenarios other than the 100 jobs that we have been using as an example. A scenario of 200 new jobs being added would double the impact that we have set out. Likewise, scaling back on the employment at the aluminum plant would result in proportional negative impacts on BC's economy.

Chapter 6 Economic Impact of Aluminum Production on Government Revenue

In Chapter 5 we used multipliers to quantify the Kitimat smelter's economic impacts in terms of industrial output and jobs. In addition to those economic impacts another aspect of such impacts is government tax revenue generated. In this Chapter, we will set out to quantify the impact of aluminum production on government revenue in terms of three levels of taxes generated: Personal Income Taxes, Indirect Taxes Less Subsidies, and Corporate Income Taxes. We will specify the source of information and the techniques applied to estimate each of these tax revenues.

Methodology

Source for Personal Income Taxes

Personal income taxes are calculated by applying industry-specific income tax rates to total personal income in each industry. For the purposes of estimating personal income taxes at the provincial level, we have relied on information available from the publication *British Columbia Provincial Economic Multipliers and How to Use Them*. Specifically, we use the government revenue multipliers for primary metal industries in BC.

Source for Indirect Taxes Less Subsidies

These taxes include indirect taxes on products, and subsidies and indirect taxes on production.²² Again, they are industry-specific, and available in *British Columbia Provincial Economic Multipliers and How to Use Them*.

Source for Corporate Income Taxes

For the purposes of estimating Corporate Income Taxes, we have relied upon the Statistics Canada publication *Financial and Taxation Statistics for Enterprises*.

²² Indirect taxes are taxes representing a business cost that are likely to be reflected in the market price paid by the purchaser. They include the GST, provincial sales taxes, customs duties, customs and excise duties, natural resource taxes, profits of provincial liquor boards, property taxes, motor vehicle licenses (for businesses), and capital and place of business taxes. Subsidies are transfer from governments to a business towards current cost of production.

Government Revenue Multipliers

In the following table are the **government revenue multipliers** for Primary Metal Industries in BC. They capture both Personal Income Taxes and Indirect Taxes Less Subsidies:

Table 7 Government Revenue Multipliers for Primary Metal Industries

		Primary Metal Industries
Federal Taxes	SN Dir+Ind	0.025
	NSN Dir+Ind	0.033
	SN Induced	0.005
	NSN Induced	0.012
Provincial Taxes	SN Dir+Ind	0.028
	NSN Dir+Ind	0.032
	SN Induced	0.011
	NSN Induced	0.024
Municipal Taxes	SN Dir+Ind	0.006
	NSN Dir+Ind	0.006
	SN Induced	0.003
	NSN Induced	0.006

Notes:

SN Dir+Ind: With Safety Net Scenario – Direct + Indirect

NSN Dir+Ind: No Safety Net Scenario – Direct + Indirect

SN Induced: With Safety Net Scenario

NSN Induced: No Safety Net Scenario

Source: British Columbia Provincial Economic Multipliers and How to Use Them

Application

Impact on Tax Revenues: personal taxes and indirect taxes less subsidies

With these multipliers at hand, we can now continue with our tax impact analysis using the example of an increase of 100 direct new jobs at Alcan's Kitimat Works. From the example in Chapter 5 using the Industry Multiplier table (page 29), we estimated that these new jobs in the primary metal industry represent \$33 million in output of that industry.

Applying the multiplier figures from the table on page 34, such an output could generate government revenue (personal income taxes and indirect taxes less subsidies) of the following order:

With Safety Net Scenario

Provincial Govt. Revenue: $(0.028+0.011) \times 33,333,333 \approx \$1,300,000$

Municipal Govt. Revenue: $(0.006+0.003) \times 33,333,333 \approx \$300,000^{23}$

No Safety Net Scenario

Provincial Govt. Revenue: $(0.032+0.024) \times 33,333,333 = \$1,866,667$

Municipal Govt. Revenue: $(0.006+0.006) \times 33,333,333 \approx \$400,000$

Tax Revenues Estimates: personal taxes and indirect taxes less subsidies

To summarize, these 100 new jobs may generate

Provincial Government Revenues: \$1.3 to \$1.87 million

Municipal Government Revenues: \$300,000 to \$400,000

Impact on Tax Revenues: Corporate Income Tax

Estimating corporate income tax poses some difficulties in our analysis due to lack of readily available data.²⁴ We have estimated total economic impact of an increase of 100 new jobs at Alcan's Kitimat Works in terms of industrial output as (from Chapter 5, page 32):

Direct output impact: \$33,333,333 in the primary metal industry

Indirect and Induced output impact: \$21,333,333 to \$24,999,999 in all industries

(The total was \$54,666,666 to \$58,333,333).

In order to derive a corporate income tax rate, we have relied upon the Statistics Canada publication *Financial and Taxation Statistics for Enterprises*. This publication contains annual aggregate data of Canadian enterprises classified by 57 industry groups. The industry breakdowns are based on the North American

²³ Note that because this is an input-output model for the province, the municipal government revenue is not just revenue at Kitimat, but all municipalities where industries have been impacted through linkage to the primary metal industry.

²⁴ The 1996 BC Input-Output Model does not provide government revenue multipliers for corporate income taxes. One reason is the lack of data on net corporate profits, and another reason is the volatile nature of corporate profitability in many industries.

Industry Classification System for companies and enterprises (NAICS, Canada 1997).²⁵

The most recent *Financial and Taxation Statistics for Enterprises* was released in 2002, with data for 1998, 1999 and 2000.

Corporate Income Tax Calculations for Direct Impact

In this study, we apply profit margins for the Primary Metal Manufacturing industry from that publication to our estimates of output impact of \$33.33 million in order to arrive at an estimate of the profit level. We also calculate an approximation of "corporate tax rate" for Primary Metal Manufacturing using information available from the publication.²⁶ We then apply this corporate income tax rate to the estimated profit level. Finally, since corporate income taxes are both federal and provincial, we use published federal and provincial corporate income tax rates to allocate the share of corporate income tax to the province.²⁷

Corporate Income Tax Calculations for Indirect and Induced Impact

To calculate corporate income taxes applicable to the range of indirect and induced industrial outputs, we first apply profit margins for All Industries from *Financial and Taxation Statistics for Enterprises* to our estimates of output impact (\$21.33 to \$24.99 million). That gives us a range of profit levels. We also calculate an approximation of "corporate tax rate" for All Industries using information available from the publication. We then apply this corporate income tax rate to the estimated profit levels. Finally, we use published federal and provincial corporate income tax rates to allocate the share of corporate income taxes to the province.

Corporate Income Tax Estimates

To summarize, corporate income tax revenues for the province generated from an increase of 100 direct jobs at Alcan's Kitimat Works are estimated to be:

With Safety Net Scenario - \$453,559

Without Safety Net Scenario - \$487,156.

²⁵ The data include: asset, liability and equity items encompassed in a balance sheet, revenue and expense items as reported on an income statement, along with several common financial performance ratios.

²⁶ Derived from "Profit before income tax" and "Income tax".

²⁷ The Federal corporate income tax rate for the Manufacturing sector is 22.12%, and the provincial corporate income tax rate for Manufacturing is 13.5%. Corresponding general rates are 24.12% and 13.5% respectively.

Total Government Revenues Estimates

In total, government revenue impact on both the province and municipalities, combining personal income taxes, indirect taxes less subsidies and corporate income taxes, is

Provincial Government Revenues: \$1.75 to \$2.36 million

Municipal Government Revenues: \$300,000 to \$400,000.

This is represented in Figure 12.

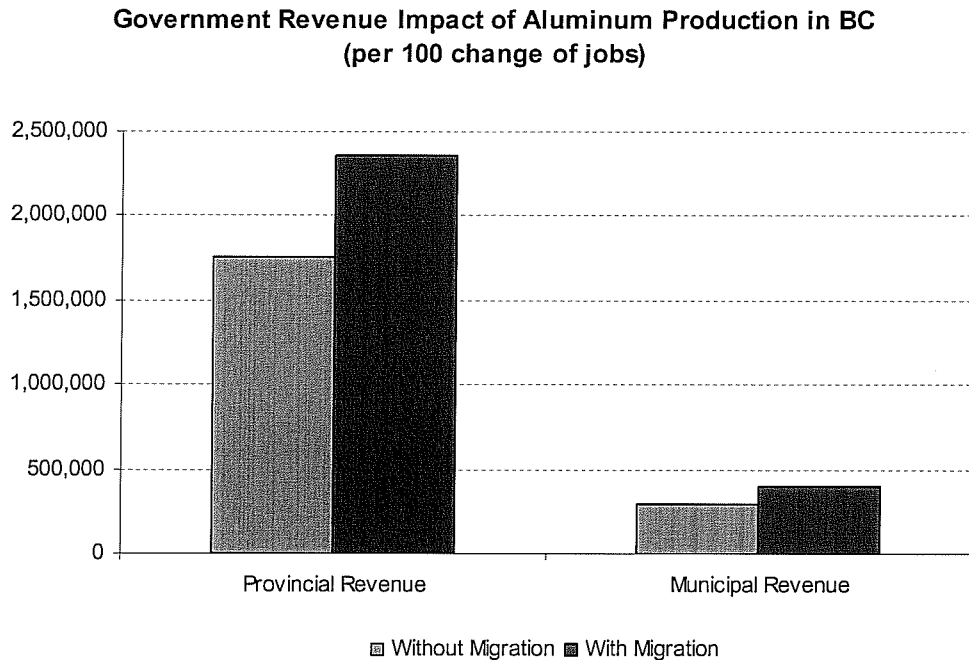


Figure 12 Government Revenue Impact of Aluminum Production in BC (per 100 change of jobs)

Source: RKA

Chapter 7 Power Sales, and Aluminum vs. Electricity Markets

Sale vs. Use of Power by Alcan

One function of this study is to consider the impact of an alternate scenario, the use of electricity generated by Alcan at Kemano not for the production of aluminum, but for sale onto the power market.

At first, a logical approach might appear to be to examine the multipliers for the generation of hydroelectricity, to compare them with those for aluminum production. Indeed some differences between the two activities can readily be found. For instance, the number of Kitimat-Terrace jobs at the power plant is considerably less than the jobs at the smelter, as seen in figures for the years for which the data is available:

- At the end of 1998: **1835** employed at the smelter in Kitimat, **111** at the powerhouse in Kemano²⁸ (power plant jobs around 6 percent of smelter jobs)
- At the end of 1999: **1,817** employed at the smelter in Kitimat and **93** employees in Kemano²⁹ (power plant jobs around 5 percent of smelter jobs)

However, a much more important consideration comes from analysis of the alternatives facing Alcan in Kitimat. That is, that a model which portrays the substitution of hydroelectric generation for aluminum smelting would be a false one.

Kitimat's Aluminum Production: additive

We know that whatever conditions exist in the aluminum and electrical power markets, the Kemano power plant will run anyway. Approximately the same number of people will be employed to run it. It makes no difference whether the power is sold or applied to aluminum production. The economic impacts of that activity continue to exist. The key point for this study is that the impacts of the smelting of aluminum and of the production of electricity are additive; the second does not replace the first. To perform a detailed analysis of the impacts of power generation and sales is not only unnecessary, it may be distracting from the fact that aluminum production adds to economic impact on the local area and on BC—it does not subtract from hydroelectricity's impacts.

²⁸ – PricewaterhouseCoopers

²⁹ 1999 BC Report: (Alcan)

The electrical resource directed into Kitimat aluminum production is truly additive to provincial economic impact. The result is jobs, indirect and induced impacts, municipal and provincial government revenues--all the income for British Columbians that we identified in the previous chapters. These are the results that the Government was seeking in exchange for the benefits bestowed on Alcan in the 1949 Industrial Development Act and subsequent Agreements.

Market Demand and Prices for Aluminum and Hydroelectric Power--The Recent Past

Over the last five years for which we have data, the following table, compiled from the *British Columbia Financial and Economic Review*, reflects the changes in the world market for aluminum, and the remarkable changes in the market for electric power.

Table 8 British Columbia Exports by Selected Commodities, Millions of dollars

Commodity	1997	1998	1999	2000	2001
Unwrought aluminum	506	536	513	623	491
Total Metallic Mineral	1,790	1,537	1,355	1,709	1,336
Electricity	223	323	471	1,987	1,406
Total Energy Products	3,082	3,267	3,215	6,019	5,687

Source: *British Columbia Financial and Economic Review*, 1998-2002

The combination of demand and price accounts for changes in the export market

Annual Percentage Change in Exports of Selected Commodities in BC

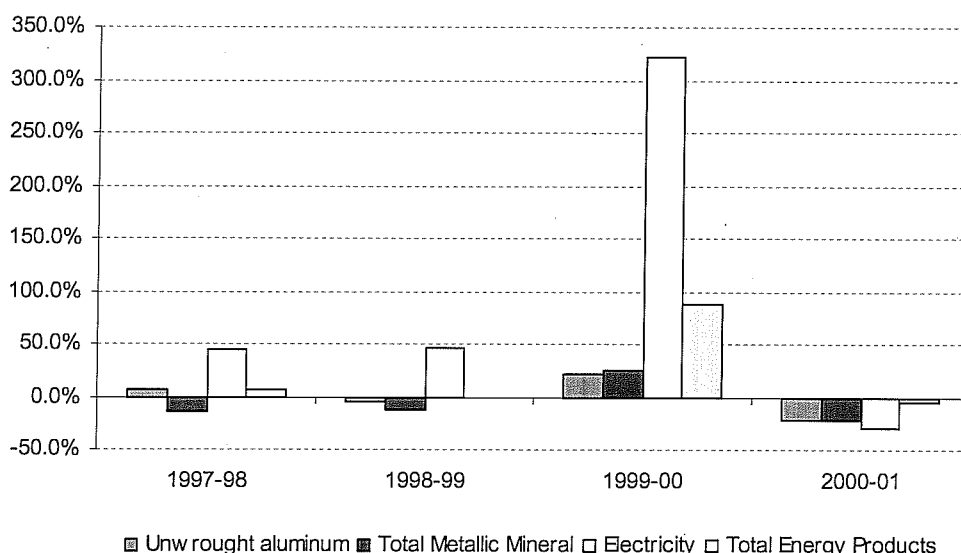


Figure 13 Annual Percentage Change in Exports of Selected Commodities in BC

Source: *British Columbia Financial and Economic Review*, 1998, 1999, 2000 and 2001

for both aluminum and electricity, but while aluminum has fluctuated around a comparatively steady market (with a downturn in 2001) electricity's market and price skyrocketed in 2000, a probable sign of volatility (and ongoing high value) to come.

The size and rapidity of these changes in the markets can be seen in Figure 13. Figure 13 shows the tremendous growth in the value of electricity exports in the short period of 1999-2000. It should be noted, too, that the period of 2000-2001 shows slight reductions from the previous year – but the exports of electricity in fact stayed very large in comparison with the mid-1990's.

A Steady Market vs. a Volatile Market

For more information and references on aluminum and electricity markets, please see the Appendix. To summarize the market situation, the market for BC aluminum, which is a world market, looks to be fairly steady, but not spectacular. The market for BC electricity, likewise, should become calmer after the frenzy of 2000-2001, but no steep declines seem likely, and the long-term prospect is for increase in demand and price – while volatility is an ever-present possibility. The market for electrical power is the one that will be most changeable in BC.

Chapter 8 Conclusions

The hydroelectricity produced at Kemano has been historically tied to aluminum production and gave rise to Kitimat's growth, creating a major part of the economy of the Kitimat-Terrace area. Population changes and migration patterns are tied to the gains and declines in employment at the Kitimat smelter. We have also seen that Manufacturing accounted for the largest share of the experienced labour force (3,230 or 27 per cent in 1991 and 3,135 or 26 per cent in 1996) in the local area of Kitimat/Terrace, and that the leading manufacturer is the aluminum smelter at Kitimat.

The employment impact ratios of aluminum production on Kitimat were found to be:

1.08 (Indirect), and 1.20 -1.30 (Indirect and Induced).

For Kitimat-Terrace they are

1.17(Indirect), 1.35 -1.52(Indirect and Induced)

Those ratios tell us that the total impact of 100 new jobs at the Kitimat smelter is actually 120-130 jobs in Kitimat overall, or 135 - 152 jobs in the Kitimat-Terrace area overall. The averages are 125 jobs in Kitimat, and 144 jobs in Kitimat-Terrace.

We calculated the impact of 100 new hires at Kitimat's smelter, to find a province-wide impact of:

Output: \$54.67 to \$58.33 million, or an average of \$56.5 million

Employment: 216 to 252 jobs, or an average of 234 jobs

(The same calculation can be performed in cases where employment is reduced by 100. The magnitude of the total impact will be the same, but with an opposite sign.)

The estimates we have derived are comparatively conservative. For example, a similar study in Washington State concluded that 100 jobs in its aluminum industry support 290 jobs elsewhere in the State economy.³⁰ Studies prepared for and released by Alcan, by PricewaterhouseCoopers suggest a multiplier of

³⁰ "The multiplier is relatively large, comparable in size to the aerospace multiplier, because of the aluminum industry's high wages and high level of in-state spending." –"The Washington State Aluminum Industry Economic Impact Study", Richard S. Conway, Jr. August 2000, p.v.

“almost 2.0”, or that every 100 jobs actually represent 200 jobs in Kitimat alone.³¹ A similar year 2000 report shows 1847 jobs as representing “Total estimated direct, indirect/induced employment of 4,650”, a multiplier of 2.5, although it is not clear whether pension income paid out by Alcan to pensioners is also a contributor to the impacts on employment.³²

While we acknowledge the conservative approach we have taken, we are very confident in the validity of the methods we have adopted, and we nonetheless consider that the impact of aluminum production on Kitimat, its area, and the economy of BC, is substantial, even at the lowest estimate.

In total, government revenue impact on both the province and municipalities, combining personal income taxes, indirect taxes less subsidies and corporate income taxes, is (for every 100 increase of jobs in aluminum production):

Provincial Government Revenues: \$1.75 to \$2.36 million

Municipal Government Revenues: \$300,000 to \$400,000

Again, the estimates are conservative.³³

The impact of Kitimat's aluminum production is additive to that of the generation of electricity by Alcan. The electrical resource directed into Kitimat aluminum production is truly additive to provincial economic impact.

³¹ “This means Alcan directly and indirectly supports about 67%, or two-thirds, of the total employment in Kitimat. This is likely a conservative estimate of Alcan’s portion of employment supported in the community because Alcan’s employees have high average incomes, and also because the smelter itself spends such a substantial amount of money with local businesses.”—“Kitimat Works Contributes to the British Columbia Economy in a Number of Ways”, 1999 report on 1998 financial information, PricewaterhouseCoopers, p. 12.

³² Alcan British Columbia – *Performance 2000*, Alcan Primary Metal, BC, 2000, p. 28
<http://www.alcaninbc.com/pr/2000/images/alcanreport2000.pdf>

³³ Our “effective” corporate income tax rate, derived from information available from the Financial and Taxation Statistics for Enterprises, 2000, was 22.6 per cent for the Primary Metal Manufacturing industries, and it was an “average tax rate”. Applying the “marginal tax rate” to estimate incremental impact would yield a higher value, but that was not done due to unavailability of data.

Appendix—Aluminum and Electricity Market Considerations

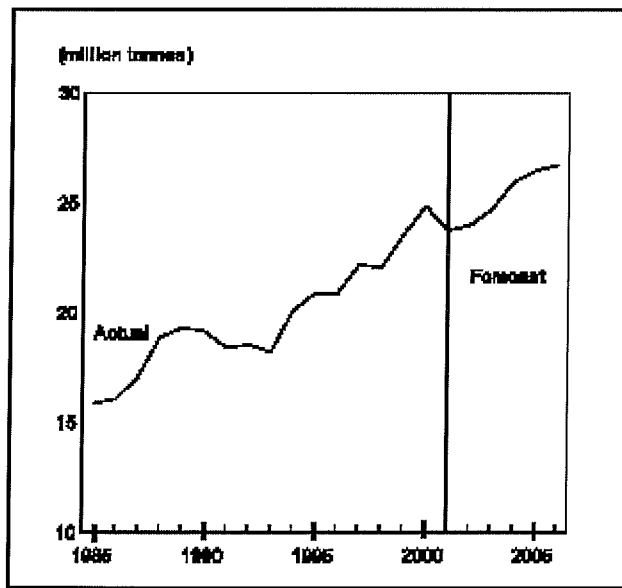
Aluminum Outlook

In 2003 the aluminum market waits in anticipation of a turnaround after a very rough period. The optimism for recovery of 1-2 years ago has dimmed, and hopes for the start of the recovery are now placed in the 2003-2004 period. The previously long-held belief in steady yearly growth after that continues to prevail, but tempered with acknowledgment that world aluminum stocks remain high, that supply will continue to rise to meet demand with the growth of new suppliers, and that prices should remain unspectacular even if demand grows steadily.

Aluminum Demand

The world's use of primary aluminum, according to Natural Resources Canada's "Aluminum Demand Outlook 2002" was "approximately 5% lower in 2001 than... in 2000. In the longer term, annual growth of 1-3% is forecast for the middle part of this decade."³⁴

World Primary Aluminum Use, 1985-2006



Sources: Natural Resources Canada; International Consultative Group on Nonferrous Metals Statistics.

Figure 14 World Primary Aluminum Use, 1985-2006

Source: Natural Resources Canada Nonferrous Metals Outlook – December 2002

Typical of the rosy earlier predictions for growth was this, from Harnisch, Wing, et al: "... we project a worldwide demand of 27.5 MT/yr for primary

³⁴ Wayne Wagner, "Aluminum", Nonferrous Metals Outlook - December 2001, Natural Resources Canada, website
<http://www.nrcan.gc.ca/mms/pdf/nfo/nfo01/alum-e.pdf>

aluminum in 2010.”³⁵ In its 2003 forecast (December 2002) Natural Resources Canada shows world demand to 2006 very much in line with those projections.³⁶

Aluminum Prices

Shorter Term

When demand fell the price drop around 2001 was quite dramatic, to below 60 cents (US³⁷) per pound from highs above 70 cents in the late 1990's. Recoveries forecast for 2002 and 2003 have not materialized, though a price improvement took place in late 2002 and the price remains level.

In early 2002 Hydro Québec³⁸, and in Summer 2002 both BMO³⁹ and CIBC⁴⁰, while cautious, made projections for price rises in 2003 (mid 70 cents range) that have yet to be seen. In April 2003 the price has been around 60-65 cents.⁴¹

Longer Term

Table 9 World Bank 2002 Aluminum Prices Projections⁴²

Year		1970	1980	1990	2000	2001	2002	2003	2005	2010	2015
\$US/mt	Current \$	556	1456	1639	1549	1444	1340	1400	1500	1600	1700
\$US/mt	Constant 1990 \$	1982	1848	1639	1592	1505	1389	1409	1448	1439	1434
¢US/lb	1990 \$	90	84	75	72	68	63	64	66	65	65

(Actual price April 2003 = 1320 US dollars, 60 cents per lb, down from 64 cents in March⁴³)

The World Bank figures are in keeping with the presence of large newly developed suppliers (notably China) on the world market, capable of continuing to meet demand. From a recent Northwest Power Planning Council document: “Most new world aluminum smelting capacity has been added outside of the traditional western economies, often in countries where social agendas may be

³⁵ Primary Aluminum Production: Climate Policy, Emissions and Costs, Harnisch, Wing, Jacoby and Prinn, Sep 2000

³⁶ Wayne Wagner, “Aluminum”, Nonferrous Metals Outlook - December 2002, Natural Resources Canada, website <http://www.nrcan.gc.ca/mms/pdf/nfo/nfo02/alum-e.pdf>

³⁷ All references to prices for aluminum are in US dollars and cents.

³⁸ Strategic Plan 2002–2006 Financial and Economic Outlook, Hydro Québec, p. 92.

³⁹ June Decline Disrupts Commodity Price Recovery, Bank of Montreal Sectoral Outlook, July 2002, <http://www.bmo.com/economic>

⁴⁰ Bart Melek, CIBC World Markets -- Metals Market Outlook June 11, 2002, www.cibcwm.com/research

⁴¹ Government of BC, Ministry of Energy and Mines, Weekly Metal Prices, <http://www.em.gov.bc.ca/Mining/MiningStats/07weekly.htm>

⁴² “Global Commodity Price Prospects”, *Global Economic Prospects 2003*, Appendix 2, The World Bank, 2003, pp. 195,196

⁴³ Government of BC, Ministry of Energy and Mines, Weekly Metal Prices, <http://www.em.gov.bc.ca/Mining/MiningStats/07weekly.htm>

driving the capacity decisions as much as aluminum market fundamentals. The disintegration of the former Soviet Union and the liberalization of trade in China have had a significant effect on the development of a world aluminum market. The addition of more capacity over time and improving aluminum smelting technology is reflected in declining aluminum price trends. On average, prices decreased by about 0.8 percent annually from 1960 to 2001. The downward trend is particularly pronounced from 1980 to the present.”⁴⁴

View from the US Northwest

Some more regional perspectives on the situation for aluminum in western North American come from the Northwest Power Planning Council⁴⁵: “Only a small fraction of the region's aluminum capacity has resumed operation. There does not appear to be much optimism for a quick recovery of aluminum prices. Some analysts expect the Global aluminum market to remain in surplus until 2005.”

“... A growing share of the regional smelting capacity has become swing capacity. That is, it can operate profitably during times of strong aluminum prices, but tends to be shut down during periods of weak aluminum markets or high electricity prices.”

“Historically, older and less efficient smelters are not frequently closed permanently. Their depreciated capital costs allow them to operate when electricity and aluminum prices are attractive. They may provide an inexpensive option for aluminum supplies in tight aluminum markets. In addition, permanent closure may involve expensive site clean up.”⁴⁶

Hydroelectricity Outlook

The market for hydroelectric power is characterized by continued future demand, growing at quite a steady rate, a demand that will be carefully tracked and projected by utilities and governments as they have done for years. Very little has been left to chance – though the vagaries of the weather play a large part in renewable resources. Conditions of certainly growing populations and their use of appliances, and supply limited by availability of hydroelectric power or reasonably-priced fuel, virtually guarantee strong demand.

But extreme volatility in price is a feature of this otherwise predictable market situation--as we have learned since the low-rainfall summer of 2000 with its skyrocketing power prices. Along with possible spurts in price prompted by

⁴⁴ “Forecasting Electricity Demand Of The Region’s Aluminum Plants” (Draft), Northwest Power Planning Council Portland, Oregon , December 2002 Council document 2002-20, p. 3
<http://www.nwcouncil.org/library/2002/2002-20.htm>

⁴⁵ Ibid., p. 4.

⁴⁶ Ibid., p. 10.

uncontrollable short-term scarcity, prices are certain to maintain, and grow steadily.

Demand for Hydroelectricity

Says the US Department of Energy: "Total electricity demand is projected to grow by 1.9 percent per year from 2001 through 2020 and 1.8 percent per year from 2021 to 2025."⁴⁷

Overall electricity consumption (not just renewables) shows growth of 2.1 percent per year in North America, 2 percent occurring in the USA, 1.7 percent in Canada. Non-renewable sources of electricity are widely held to be the growth area, in Canada, North America, and the world, in the next 20 years.

Pacific and Northwest US

The US Department of Energy's Energy Information Administration shows "delivered [electricity] consumption, all sectors" for the US Pacific area, as dropping from 2000 to 2002 by 1.83 percent per year, but then a growth from 2002 to 2012 of 2.53 percent per year (from 1.435 to 1.843 quadrillion Btu per year).⁴⁸

The Northwest Power Planning Council states, "Total consumption of electricity is forecast to grow from 20,442 average megawatts in 2000 to 28,464 average megawatts by 2025, an average yearly rate of growth of 1.33 percent."⁴⁹

BC

BC Hydro's Integrated Electricity Plan: Jan 2000⁵⁰ shows steady growth in capacity to 2010, but with a levelling of existing (including renewable) sources. The largest projected gain is via Combined Cycle Gas Turbines (CCGTs).

In BC's region and the province, then, as well as world-wide, consumption growth will be steady, on a smooth line, which cannot be equally said about pricing.

⁴⁷ "Electricity", *International Energy Outlook 2002*, U.S. Department of Energy, March 2002, p. 127. www.eia.doe.gov/oiaf/ieo/index.html

⁴⁸ Supplement Tables to the Annual Energy Outlook 2003 (Energy Information Administration, US Department of Energy) p. 58, table 9. <http://www.eia.doe.gov/oiaf/aeo/supplement/supref.html>

⁴⁹ Draft Forecast of Electricity Demand for the 5th Pacific Northwest Conservation and Electric Power Plan, Northwest Power Planning Council Portland, Oregon, August 2002, Council document, p. 11. <http://www.nwcouncil.org/library/2002/.htm>

⁵⁰ Integrated Electricity Plan, An Update to the 1995 IEP, BC Hydro, January 2000, p. 38.

Hydroelectricity Prices

According to the US Department of Energy's Annual Energy Outlook, "Average electricity prices are projected to decline from 7.3 cents per kilowatthour in 2001 to a low of 6.3 cents (2001 dollars) by 2007 as a result of cost reductions in an increasingly competitive market where excess generating capacity has resulted from the recent boom in construction and the continued decline in coal prices. Electricity industry restructuring contributes to declining projected prices through reductions in operating and maintenance costs, administrative costs, and other miscellaneous costs. After 2008, average real electricity prices are projected to increase by 0.4 percent per year as a result of rising natural gas prices and a growing need for new generating capacity to meet electricity demand growth."⁵¹

Hydroelectric Prices: BC

BC Hydro's Service Plan Feb 2003 raises the following concerns: "The continuation of the dry weather being experienced this winter could put meeting the 2002/03 target at risk. Future earnings are likely to remain highly variable due to non-controllable factors such as water inflows to reservoirs, market prices for natural gas and electricity, and interest rates. BC Hydro's gross margin is declining each year as more expensive energy sources are needed to meet the increase in load demand."⁵² Rate hikes are definitely in the future.

Hydro discusses a levelling out, and a reduction in the pace of deregulation in the US: "Other factors include the on-going controversy arising from the 2000-2001 California electricity crisis, the collapse of Enron Corp., and the questionable trading and accounting practices of many energy companies. Many companies have scaled-back their energy trading activities, some companies have exited trading completely. The consequences for BC Hydro are that wholesale electricity prices and trading margins are much lower than they have been over the past few years. This situation may persist across the west for several years, although BC Hydro feels the regional market will still provide opportunities for the company to optimize the value of its generation assets."⁵³

BC Hydro discusses prices that are reduced from the heights reached in the volatile 2000-2001: "Several risk factors to future market prices exist. Economic activity in the Western Electricity Coordinating Council (WECC) region may slow down. Weaker aluminum prices could delay the return of smelters and suppress electricity demand."⁵⁴

⁵¹ Annual Energy Outlook 2003 With Projections to 2025 Overview, US Department of Energy
<http://www.eia.doe.gov/oiaf/aeo/index.html>

⁵² *BC Hydro Service Plan For Fiscal Years 2003/2004 to 2005/2006*, BC Hydro, February 2003, p. 8

⁵³ *BC Hydro Service Plan For Fiscal Years 2003/2004 to 2005/2006*, BC Hydro, February 2003, p. 7

⁵⁴ *BC Hydro Service Plan For Fiscal Years 2003/2004 to 2005/2006*, BC Hydro, February 2003, p. 24

Volatility

BC Hydro, finally, summarizes the volatility of the pricing situation for electric power: "Market prices that are relevant to BC Hydro are strongly influenced by market conditions in the Pacific Northwest and in California, where the majority of BC Hydro's electricity trade transactions occur. Factors such as the level of water inflows, gas prices, unit outages and weather conditions in the Pacific Northwest and California all influence the market price. Any change in market prices could have a significant impact on BC Hydro's electricity trade revenues, cost of energy and, ultimately, net income. Energy continues to be amongst the most volatile traded commodities as market prices can vary significantly from period to period."

Aluminum and Electricity Markets' Mutual Impact

Strikingly, the aluminum and electricity markets impact on each other, certainly in the West of North America. The price of electricity is a very significant factor in the smelting of aluminum, its cost and profitability. The presence of large aluminum smelters in the region has critically influenced the flexibility of electric utilities to respond to surges in demand that strained their capacities.

The aluminum-hydroelectric relationship was a determinant in government policy in the US Northwest as well as in BC during the development of 20th century industrialization –policy which was entrenched in the regulated electrical system.

Both markets (aluminum and hydroelectricity) are also influenced by a third factor, the price of non-renewable energy, in particular natural gas. When low it tends to enhance electrical utilities' capacity to meet demand. At the same time it tends to boost industrial activity which promotes demand for aluminum. The play of the three factors, and their prices, can make the difference in decisions whether to operate aluminum smelting capacity, or leave it idle.

The Northwest Planning Council deals with the complexity of the interrelationship: "The expectation of higher electricity prices and rapid expansion of aluminum smelting capacity in China have changed the outlook for the region's smelters substantially. Aluminum prices are still important, but the cost of electricity has become a critical element for Northwest smelters. Since electricity prices are related to natural gas prices in the long-term, and high natural gas prices are associated with the high economic growth case, it may now make more sense to assume lower aluminum demand in the higher economic growth cases. However, if high aluminum prices are still associated with higher economic growth, then it is possible that the high economic growth cases will favor aluminum plant operation given that electricity prices are not too high. In short, it is not clear how aluminum demand will be related to the economic growth conditions."⁵⁵

⁵⁵ Forecasting Electricity Demand Of The Region's Aluminum Plants" (Draft), Northwest Power Planning Council Portland, Oregon , December 2002 Council document 2002-20 P. 5

The Northwest document also makes the point that plants in the region have largely been built on the expectation of low energy prices/high aluminum prices: "With the medium natural gas price assumptions, the Council currently is seeing draft spot market electricity price forecasts moving up to the \$35 to \$40 per megawatt-hour range. Few smelters would be able to operate with electricity prices at that level. It is unclear how much of the aluminum load [the Bonneville Power Authority] might serve in the future, but Bonneville's future electricity prices may also be higher than most aluminum plants can afford except when aluminum prices are especially high."⁵⁶

A Reliable Market vs. a Volatile Market

In short, the market for BC aluminum, which is the world market, looks to be fairly predictable, but not spectacular. The market for BC electricity, likewise, should become calmer after the frenzy of 2000-2001, but no steep declines seem likely, and the long-term prospect is for increase in demand and price – while volatility is an ever-present possibility. The market for electrical power is the one that will be most changeable in BC; and at times the incentive to sell power, rather than use it to produce aluminum, will likely be strong.

⁵⁶ Forecasting Electricity Demand Of The Region's Aluminum Plants" (Draft), Northwest Power Planning Council Portland, Oregon , December 2002 Council document 2002-20 p. 4

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In the District's submission, this schedule is reasonable in light of the abbreviated timetable that has been established for this regulatory process and, in particular, the November 27, 2006 deadline for BC Hydro's response to the Intervenor's Information Requests.

In connection with the foregoing, the District notes that Dr. Roslyn Kunin, one of the proposed witnesses for its panel, is unavailable to appear before the Commission until the week of December 18. The District requests leave to file Dr. Kunin's report dated July 2003, a copy of which is enclosed, as evidence in this matter on the condition that she will be made available for cross-examination on December 18, 2006 or at some later date set by the Commission.

Please call if you require any further information.

Yours truly,

Hunter Litigation Chambers

Per:



John J.L. Hunter

JJLH/mso

Encl.

cc Client

BC Hydro

Registered Intervenor