2008 Long Term Acquisition Plan

BC hydro

APPENDIX D

BC Hydro's 2007 Load Forecast

Electric Load Forecast

2007/08 to 2027/28

Market Forecasting
Energy Planning
Customer Care and Conservation
BC Hydro

2007 Annual Forecast

Tables of Contents

Tables

Table A3.8 2007 BC Hydro, Low Load Forecast Before DSM and Rate Impacts 100

Figures

Executive Summary

Background and Context

BC Hydro is the third largest utility in Canada and generates nearly 80% of the electricity produced in British Columbia. BC Hydro's total energy requirements including losses and sales to other utilities were 58,175 GWh in F2007. Sales to BC Hydro's residential, commercial, industrial were over 51,427 GWh in F2007. The total integrated peak demand requirements including losses and peak demand from all other utilities was 10,371 MW.

Load forecasting is central to BC Hydro's long-term planning, medium-term investment and short-term and operational and forecasting activities. The BC Hydro Electric Load Forecast is published annually. The forecast is based on several comprehensive end-use and econometric models that use billed sales data up to March 31 of the relevant year as historical information, combined with a wide variety of economic forecasts and inputs from internal, government and third-party sources. The primary purpose of the Electric Load Forecast is to provide decision-making support on the questions of "where, when and how much" electricity is expected to be required on the BC Hydro system.

BC Hydro's load forecasting activities centre on the production of a number of term-specific and location-specific forecasts of energy sales and peak demand requirements to meet user needs for decision-support information. A variety of related products including monthly variance reports, inputs for revenue forecasts and load shape analysis are produced to supplement the forecasts presented in this report.

Sectors and Methodology

The main components of BC Hydro's Load Forecasts consist of: the residential sales forecast, the commercial sales forecast (distribution voltage and transmission voltage), the industrial sales forecast (distribution voltage and transmission voltage) and the peak forecast (distribution and transmission).

The sales forecasts are projections for billed sales and are produced using a variety of end-use and econometric models. The projections from these models result in a sales forecast before incremental Demand Side Management (DSM) and before the impacts from future changes in electricity rates.

Peak forecasts are developed for each of BC Hydro's distribution substations. These forecasts are aggregated on a coincident basis to develop a total distribution peak forecast. Historical trends, intelligence from Key Account mangers and information from sector studies are the bases for peak forecasts for BC Hydro's large transmission customers. These forecasts are aggregated on a coincident basis to develop a total transmission peak forecast.

These specific forecast methods are based on their predictive value and their ability to most appropriately meet the needs of users, which includes simplicity and transparency.

The next section below briefly outlines key aspects of the sector sales and total peak demand requirements[1].

[1] Unless otherwise stated, forecast comparative statements in the entire document are benchmarked against the 2006 Annual Load Forecast before DSM.

2007 Load Forecasts

The 2007 Reference Load Forecasts presented in this entire report are before incremental DSM. At the time of preparing the 2007 Load Forecasts, DSM estimates for all 21 years were in development for the 2008 Long-Term Acquisition Plan (LTAP). These estimates and Load Forecasts with incremental DSM will be contained in BC Hydro's 2008 LTAP.

The 2007 Reference Load forecast before incremental DSM contained in the residential, commercial, industrial and peak sections and tables A3.5 assume the electricity rates increase with the rate of inflation (i.e., no real dollar rate increases). These forecasts are presented as Reference Forecasts before DSM and Rate Impacts.

Load Forecasts with estimates of future electricity rates were prepared to meet the BC Utilities Commission's (BCUC) directives contained in its Decision on BC Hydro's 2006 Integrated Energy Plan (IEP) and LTAP. These forecasts are presented as Reference Load Forecast before DSM and with Rate Impacts in table A3.6. These forecasts are based on current rate structures[2] and do not include estimates of the effect on load due to changes in rate structures.

Residential Forecast

Of the three customer classes, residential, commercial, and industrial, the residential sector is the most stable. Key features of the residential forecast include the following:

- Electricity Use - BC Hydro's residential sector currently consumes about 31% of BC Hydro's total annual billed sales. This electricity is used to provide a range of services including space heating, water heating, refrigeration, and miscellaneous plug-in load which includes computer equipment and home entertainment systems.
- Drivers - The drivers of the residential forecast are number of accounts and average annual use per account. Growth in the total number of accounts is driven by estimates of growth in housing starts.
- Trends – Sales to the residential sector, before weather adjustment, grew by about 612 GWh or 3.8% from F2006 to F2007, and on a weather-normalized basis, grew by 164 GWh or 1.0%. Sales are expected to grow more slowly relative to the previous forecast over the near-term. This reflects a slower projection in use rate and housing starts. Over the long-term, sales are above last year's forecast reflecting a higher forecast in housing starts. Refer to Table 1 for the sales forecast before DSM and potential future changes in electricity rates.

Commercial Forecast

BC Hydro's commercial sector encompasses a wide variety of commercial and publicly-provided services. It includes a diverse set of BC Hydro customers who operate a range of facilities such as office buildings, retail stores and institutions (i.e., hospitals and schools) provided at distribution voltages. It also includes transportation facilities provided at transmission voltages. Key features of the commercial forecast include the following:

- Electricity Use – BC Hydro's commercial sector currently consumes 29% of BC Hydro's total annual billed sales. This electricity is used to provide a range of services (often called end-uses) such as lighting, ventilation, heating, cooling, refrigeration, hot water, etc. These needs vary considerably between different types of buildings.
- Drivers – At an aggregate level, the consumption in commercial sales is closely tied with economic activities in the province. Key drivers for the commercial sector include

[2] Current rate structures refers to rate structures as of March 31, 2006.

regional retail sales, regional employment and regional commercial output. As a result, future economic trends are good indicators of future electricity consumption in the commercial sector.

- Trends – Electricity consumption in the commercial sector can vary considerably from year to year reflecting the level of activity in BC's service sector. Sales to BC Hydro's commercial sector grew by 384 GWh or 2.6% between F2006 and F2007. This growth reflects the strong performance of the BC economy. The current forecast is projected to be above the previous forecast which reflects expected strong performance in the goods and sectors part of the economy. Refer to Table 1 for the sales forecast before DSM and rate impacts.

Industrial Forecast

BC Hydro's industrial sector is concentrated in a limited number of industries, the most important of which are pulp and paper, wood products, chemicals, metal mining and coal mining. The remaining industrial load is made up of a large number of small and medium sized manufacturing establishments. Key features of the industrial forecast include the following:

- Electricity Use - BC Hydro's industrial sector currently consumes 38% of BC Hydro's total annual billed sales. This electricity is used in a variety of applications including fans, pumps, compression, conveyance, processes such as cutting, grinding, stamping and welding and electrolysis.
- Drivers - Industrial electricity consumption is tied closely with the level of economic activity in the province, market conditions and prices, and world and domestic events that impact sales. Future economic trends, measured by GDP, are good indicators of future electricity consumption in the industrial sector since industrial sales are closely correlated with economic growth.
- Trends - Electricity consumption in the industrial sector is quite volatile, driven substantially by economic conditions in the United States, China and Japan that affect commodity markets. Sales to BC Hydro's industrial sector declined by 467 GWh or 2.3% between F2006 and F2007. The industrial forecast is below last year's forecast both in the near-term and the long-term. This year's forecast reflects the impact on recent trends such as an appreciation in the Canadian dollar, a slow down in the US housing starts and lower demand for pulp and paper. In the medium to long-term, the forecast reflects the expected impact of the pine beetle infestation, which is anticipated to slow production and investment in both sawmills and pulp mills. Refer to Table 1 for the sales forecast before DSM and rate impacts.

Peak Demand

Peak demand is composed of the demand for electricity at the distribution level, transmission level plus inter-utility transfers and transmission losses on the integrated system. Key features of the peak forecast include the following:

- Electricity Use – Peak demand is forecast as the maximum expected one-hour demand during the year. For BC Hydro's load, this event occurs in the winter with the peak driven particularly by space heating load. BC Hydro's peak forecast is based on normalized weather conditions which is the rolling average of the coldest daily average temperature over the most recent 30 years.
- Drivers – Key drivers of electricity peak include the level of economic activity, number of accounts, employment and the other discrete development such as new shopping malls, waste treatment plants or industrial facilities that drive substation peak demand.

- Trends – BC Hydro's peak total distribution peak demand grew by about 360 MW or 5.1% between F2006 and F2007. This large increase was mainly attributable to peak growth in metro areas such as Vancouver and Victoria. Transmission demand declined reflecting downward demand for industrial wood and pulp and paper products. While distribution peak demands are expected to continue to grow by on average about 140 MW per annum over the longer term, transmission peak demand is expected to grow on average by 5 MW per annum. Total peak demand, including demands of other utilities served by BC Hydro, is forecast to grow by 160 MW on average over all 21 years. Please refer to Table 1 for the peak forecast before DSM and rate impacts.

Reference Energy and Peak Forecast Before DSM And Rate Impact

Table 1 provides a summary of historical and forecast of sector sales, total energy requirements and total peak demand requirements for selected years before DSM and before rate impacts.

Table 1. Reference Energy and Peak Forecast Before DSM and Rate Impacts for Selected Years

Fiscal Year	BC Hydro Residential (GWh)	BC Hydro Commercial (GWh)	BC Hydro Industrial (GWh)	Total Domestic Sales (GWh)***	Total Gross Require-ments (GWh)	Total Integrated System Peak (MW)
2006/07	16,853 (16,702)*	15,105	19,469	52,828	58,175	10,371 (10,449)*
2007/08	17,087	15,621	19,016	53,093	58,700	10,784
2011/12	18,713	17,443	19,475	57,201	63,236	11,383
2017/18	21,180	19,858	21,103	63,865	70,567	12,175
2027/28	25,124	23,888	20,778	71,675	79,270	13,797
Growth Rates[3]						
5 years: 06/07 to 11/12	2.1% (2.3%)*	2.9%	0.0%	1.6%	1.7%	1.9%
11 years: 05/06 to 16/17	2.1% (2.2%)*	2.5%	0.7%	1.7%	1.8%	1.5%
21 years: 05/06 to 26/27	1.9% (2.0%)*	2.2%	0.3%	1.5%	1.5%	1.4%

Note: * Values shown in brackets are weather normalized actuals. Unless otherwise noted, the growth rates for the peak demand is on a weather-normalized basis.

** In F2006/07 the actual Domestic system peak was 10,113 MW on November 29, 2006. The daily average temperatures in the Lower Mainland during this day was -5.9 degree Celsius. The Domestic Peak demand excludes the peak demand requirements of the other utilities served by BC Hydro.

*** Includes sales to other utilities.

Sensitivity Analysis

BC Hydro's Load Forecast is sensitive to a number of factors, including economic conditions, weather, DSM, electricity rate structures, electricity rates and elasticities. A composite sensitivity analysis using a Monte Carlo model is included in this forecast, the results of which are represented as the High and Low Load Forecasts. Further details on the sensitivity analysis are included in Section 5 and further details on the Monte Carlo

[3] Unless otherwise noted, all growth rates are calculated as annual compound growth rates.

model are included in Appendix 2. Uncertainty in BC Hydro's 20 Year DSM forecast and its impact on the Load Forecast is not reflected in any of the High and Low Forecasts as published in this document.

1 Introduction

BC Hydro's Load Forecast is typically published annually. The Load Forecast consists of a 21-year forecast for future energy and peak demand requirements. These forecasts include the annual Reference Load Forecast or mid–level forecasts that are used for planning future energy and peak supply requirements.

In addition to integrated resource planning, the Load Forecast is used to provide decision-making support for several aspects of BC Hydro's business including: revenue requirements and rate design, system planning and operations and BC Hydro's service plan.

Ranges in the Load Forecasts, referred to as uncertainty bands, are developed using simulation methods. These bands represent the expected ranges around the annual Reference forecasts at certainty level of statistical confidence. These forecasts are produced because there is uncertainty in the variables that predict future loads and in the predictive powers of the forecasting models.

The Reference energy forecast consists of a sales forecast for three main customer sectors (residential, commercial and industrial) and a sales forecast for other utilities supplied by BC Hydro. The Reference Total Gross energy requirements forecast consists of the sector sales forecast, other utility sales forecast plus total line losses.

The sales forecast is developed by analyzing and modeling the relationships between energy sales and the predictors of future sales, which are referred as forecast drivers. Drivers consist of both economic variables and non-economic variables. Economic variables include GDP, housing starts, retail sales, employment and electricity prices (rates). Non-economic variables include weather. The price impact consists of the effect on load due to potential electricity rate changes under current rate structures. Savings or reductions in the load due to changes in rate structures are considered to be part of BC Hydro's 20 Year DSM plan. These savings are not included in the Load Forecasts contained in this document. DSM savings forecasts and Load Forecasts with DSM will be included in BC Hydro's 2008 LTAP filing.

The total Reference peak forecast consists of coincident distribution substation peak demands, peak demands of BC Hydro large transmission connected customers, peak demand supplied by BC Hydro to other utilities, and total transmission losses. The distribution peak demand forecast is developed by analyzing and modelling the relationship between substation peak demand and economic variables. Distribution peak forecasts are prepared under average cold weather conditions or a design temperature. The transmission peak demand involves estimating the future demands of larger customers which are driven by future market conditions and company specific productions plans.

BC Hydro continuously attempts to improve the accuracy of its forecasting process monitoring trends on forecasting approaches, and tracking developments that may affect the forecast. Forecasts are continually monitored and compared to sales. Forecasts are adjusted for variances or if new information on the drivers becomes available.

2 Regulatory Background and Current Initiatives

The British Columbia Utilities Commission (BCUC), various intervenors and other stakeholders have reviewed BC Hydro's electric Load Forecasts over the past three years in the following processes:

- Vancouver Island Gas Plant Certificate of Public Convenience and Necessities (CPCN) Application
- F2005 and F2006 Revenue Requirements Application (RRA)
- 2004 Integrated Electricity Plan
- Vancouver Island Call for Tenders
- F2007 and F2008 RRA
- 2006 Integrated Electricity Plan (IEP) and Long-term Acquisition Plan (LTAP).

In the BCUC's decision on the 2006 IEP/LTAP, the BCUC listed several directives and comments on the Load Forecast. Actions taken in response to these issues and directives are summarized in Table 2.1.

Table 2.1. BC Utilities Commission Directives and Actions

Directives from the 2006 IEP & LTAP	Action
# 3. The Commission Panel directs BC Hydro to include with its next load forecast a report assessing if there are statistically quantifiable trends associated with the temperature metrics used to forecast peak and energy demands, and an analysis of whether these trends should be extrapolated or otherwise incorporated for use in predicting peak and energy usage in the future. Whether BC Hydro determines it should continue to use temperatures based on historical averages or a statistical trend for forecasting peak and energy demand, the Commission Panel expects BC Hydro to provide a clear and consistent rationale for the historical period it uses for calculating averages, estimating trends, or evaluating variability.	Appendix 1B of this document contains a response to this directive. BC Hydro analysis indicates that a 10-year rolling average of degree days is the best representation of weather for forecasting energy sales. In addition, a rolling 30-year period of the coldest daily average temperature is an appropriate method for forecasting peak demand.
# 4. The Commission Panel accepts BC Hydro's undertaking to provide adjustments to a load forecast within the updated forecast, and in a manner that provides an explanation of the adjustments and reconciliation to the load forecast.	Appendix 1.3 discusses adjustments to the forecasts.

# 5. Subject to the issues noted above and in Sections 3.2.4 and 6.1.2, the Commission Panel finds that BC Hydro's load forecast has generally been prepared in accordance with the Commission's Guidelines and further accepts that the results of the 20-year forecast are reasonable for the purposes of the 2006 IEP/LTAP. At the time of filing its next annual load forecast, the Commission Panel directs BC Hydro to provide a review of its prospective forecast range as produced by the Monte Carlo simulation, relative to its historical experience.	Chapter 5 discusses the historical accuracy of previous forecast in the context of the ranges of the forecast as produced by the Monte Carlo model. In Appendix 1B, BC Hydro indicates that the forecast ranges as produced by the Monte Carlo model are a reasonable representation of the range of expected variability around the forecast.

In addition to the above directives, other issues were raised in the BCUC 2006 IEP/LTAP decision. The table below address these other topics.

Other Issues from the 2006 IEP & LTAP Decision	**Action**
Commission's determination in section 6.2 of the Decision directed BC Hydro to file financial forecast of BC Hydro's rates in both real and nominal terms, for a minimum of ten years, but preferably 20 years. The Commission Panel further directs BC Hydro to rely on the report for assumptions regarding retail prices in each of the CPR, the load forecast, and DSM evaluation methodologies.	The 2007 Reference Load Forecast that includes potential long-term rate impacts from financial forecast has been prepared. These forecasts also include the impact of the interim rates as filed in BC Hydro F2009/F2010 RRA. These Load Forecasts are contained in tables A3.6 in Appendix 3.

In the Commission Panel's view BC Hydro should improve the presentation of its transmission level industrial forecast by providing an explanation of the value that is added to the forecast by the consideration of consultant reports in the three industrial sectors discussed when they apparently do not change the "envelope" forecast resulting from the econometric analysis. The Commission Panel expects BC Hydro to justify the expense of the exercise of attributing load to individual customers, when its next load forecast is filed.	Modifications to the industrial forecast methodology have been undertaken. These are the result of incorporation of a consultant's report on BC's forestry sector. See Section 8 for a description of the industrial sector ~~foreastf~~forecast, and Appendix section A1.3 for a description of the industrial sector forecasting methodology. BC Hydro believes that a bottom-up forecast (i.e. attributing load to individual customers) enhances the forecasting process. See Appendix 1A for a description of the Industrial sector forecast methodology.
The Commission Panel is concerned about making a customer-specific adjustment to the forecast if there is no evidence as to whether or not the forecast of GDP is already reflective of the adjustment. If BC Hydro finds that an adjustment to the forecast similar to the current adjustment for Highland Valley Copper is required, the Commission Panel requests that BC Hydro also confirm that any such adjustment is not already reflected in the projection of GDP used in forecasting transmission voltage industrial sales.	Appendix A1.3 discusses adjustments to the forecast. BC Hydro incorporates forecast adjustments for specific large industrial loads (such as Highland Valley Copper) as the contribution to demand is disproportionably larger than their contribution to forecast drivers such as GDP.
The Commission Panel does not believe that there is added value to including a forecast of billed sales in load forecasts. While the Commission Panel agrees that the enhanced accuracy may be small, it believes that providing a forecast that includes the accrual will enhance transparency and provide information on a consistent basis for both future IEP/LTAP and RRA Applications.	BC Hydro continues to publish an annual forecast based on billed sales because: (i) the difference between billed and accrued sales is relatively small, (ii) billed sales are readily available by all rate classes, and as such forecasting models can easily be updated using billed sales; and (iii) modifications to existing forecasting process to include accrued sales would involve extensive computations to develop revised history.

3 Forecast Drivers, Data Sources and Assumptions

3.1. Forecast Drivers

Table 3.1 provides an overview of the key drivers for the reference forecast. Each forecast component is described as activity ~~variables,~~variables; use rate variables and data requirements for these variables. Within the forecast, the activity variable drives the scale of forecast electricity use. The use rate is a variable that represents the intensity of electricity use. The data is a general description of the data requirements to produce the activity and the use rate variable.

Table 3.1. Key Forecast Drivers

Forecast Component	Activity	Use Rate	Data
1. Residential Forecast	• Number of residential accounts by housing type, heating type and region	• Consumption per account	• Historical Number of accounts • Housing starts • Appliance saturation rates from Residential End Use Survey (REUS) • End use efficiency data from the Energy Information Agency (EIA)
2. Commercial (Distribution) Forecast	• Growth Rate of Employment, Commercial Output, Retail Sales • Households (Number of Residential Accounts) • Heating and Cooling Degree Days (HDD/CDD)	• Consumption per unit of each predictor variable in SAE regression model	• Billing data • Commercial Output • Employment • Retail Sales • HDD/CDD • End use saturation rates from Commercial End Use Survey and efficiency data from the EIA.
3. Industrial Distribution Forecast	• GDP	• Consumption per unit of GDP (Based on regression model)	• Billing data • GDP
4. Industrial and Commercial Transmission Forecast	• Customer-specific production information for short-term forecasts	• Customer-specific energy intensity information for short-term forecasts	• Forecasts from industry studies and Key Account Managers • Billing data • GDP
5. Non-Integrated Area (NIA) Forecast	• Number of accounts	• Consumption per account	• Historical Number of accounts • Local conditions in the short-term • Population forecast for longer term • Appliance saturation rates from REUS

Forecast Component	Activity	Use Rate	Data
6. Peak Forecast	• Number of accounts by housing and heating type • Sales to General Rate Class • Industrial activity and trends	• Residential – kW/Account • General – kW/kWh • Transmission – peak demand (kVA)	• Employment forecast and housing starts • Weather data and load research data on load shape • Transmission customer hourly data • Regional economic forecasts and industry reports

3.2. Growth Assumptions

Growth assumptions for key drivers used in the reference forecast are displayed in Table 3.2 below.

Table 3.2. Growth Assumptions (Annual rate of growth)

Fiscal Year	Residential Accounts (%)	Calendar Year	Employment (%)	Real GDP (%)	Retail Sales (%)
Actual					
2006/07	1.9	2006	3.2	3.9	7.0
Forecast					
2007/08	1.8	2007	1.7	3.1	5.0
2008/09	1.7	2008	1.7	3.0	5.0
2009/10	1.7	2009	1.5	3.1	5.3
2010/11	1.6	2010	1.3	3.3	4.8
2011/12	1.6	2011	1.3	3.0	4.9
2012/13	1.6	2012	0.9	2.2	4.6
2013/14	1.6	2013	0.8	2.5	4.4
2014/15	1.6	2014	0.8	2.1	4.4
2015/16	1.5	2015	0.8	2.0	4.3
2016/17	1.5	2016	0.8	2.0	4.3
2017/18	1.5	2017	0.7	1.9	4.2
2018/19	1.5	2018	0.7	1.9	4.3
2019/20	1.5	2019	0.7	1.8	4.4
2020/21	1.4	2020	0.6	1.8	4.4
2021/22	1.4	2021	0.6	1.8	4.4
2022/23	1.4	2022	0.6	1.8	4.4
2023/24	1.3	2023	0.5	1.8	4.3
2024/25	1.3	2024	0.5	1.7	4.1
2025/26	1.3	2025	0.5	1.7	4.1
2026/27	1.2	2026	0.4	1.7	4.2
2027/28	1.2	2027	0.5	1.7	4.1

Information on the sources and the uses of the growth assumptions is shown in Table 3.3.

3.3. Data Sources

Table 3.3. Data Sources and Uses for Growth Assumptions

Variable	Application	Forecast Period	Source
Population	• Used for NIA forecast and as a check on total residential account growth	• 2007-2027	• BC Statistics, BC Population Forecast, February 2007
GDP (Gov. and 3rd party)[4]	• Industrial distribution energy forecast	• 2007-2011 • 2012-2027	• BC Ministry of Finance, February Budget, February 2007 • Conference Board of Canada, Provincial Data, April 2007
GDP (3rd party)	• Industrial and Commercial transmission energy forecast	• 2018-2027	• Conference Board of Canada, Provincial Data, April 2007
Housing Starts	• Residential accounts forecast	• 2007-2027	• Conference Board of Canada, Provincial Data, April 2007
Employment, Retail Sales, & Commercial Output	• Commercial distribution sales • Distribution peak forecast	• 2007-2027	• Conference Board of Canada, Provincial Data, April 2007

[4] The GDP forecast is available from the BC Provincial government for only the first five years of the forecast period thus requiring use of an additional source.

4 Comparison Between 2006 and 2007 Forecasts

The following tables show the difference between this year's forecast before DSM and potential increase in electricity rates and the 2006 Integrated Gross Energy and Peak demand requirements before DSM.

4.1. Integrated Gross Requirements before DSM and Rate Impact

Table 4.1 compares this year's total integrated gross requirements reference forecast with the Annual 2006 forecast. Both the Annual 2007 and 2006 forecasts are before DSM, with no rate impacts.

Table 4.1. Comparison of Integrated Gross System Requirements Before DSM and Rate Impacts (GWh)

Fiscal Year	2007 Forecast	2006 Forecast	2007 Forecast minus 2006 Forecast	Change over 2006 Forecast (%)
2001/02	52,292*	52,292*	-	-
2002/03	53,010*	53,010*	-	-
2003/04	54,756*	54,756*	-	-
2004/05	55,437*	55,437*	-	-
2005/06	57,296*	57,296*	-	-
2006/07	57,879*	58,678	-799	-1.4
2007/08	58,366	60,032	-1,666	-2.8
2008/09	59,944	61,408	-1,464	-2.4
2009/10	61,171	62,639	-1,468	-2.3
2010/11	62,186	64,030	-1,844	-2.9
2011/12	62,847	65,479	-2,632	-4.0
2012/13	63,911	66,767	-2,856	-4.3
2013/14	65,561	67,763	-2,202	-3.2
2014/15	67,093	67,844	-751	-1.1
2015/16	68,033	68,843	-810	-1.2
2016/17	69,184	69,965	-780	-1.1
2017/18	70,152	70,955	-803	-1.1
2018/19	71,133	71,976	-843	-1.2
2019/20	70,998	72,954	-1,956	-2.7
2020/21	72,004	74,010	-2,006	-2.7
2021/22	72,924	74,949	-2,026	-2.7
2022/23	73,912	75,933	-2,022	-2.7
2023/24	74,903	76,888	-1,985	-2.6
2024/25	75,909	77,944	-2,034	-2.6
2025/26	76,846	78,870	-2,025	-2.6
2026/27	77,813	79,842	-2,029	-2.5
2027/28	78,820			

Note. * = actuals

4.2. Total Integrated System Peak Before DSM and Rate Impacts

Table 4.1 compares this year's total integrated peak requirements forecast with the Annual 2006 forecast. Both the Annual 2007 and 2006 forecast are before DSM, with no rate impacts. An explanation of the changes in the forecast are contained in Section 10.3.3 on the Peak Forecast.

Table 4.2. Comparison of Peak Forecasts Before DSM And Rate Impact (Integrated System) (MW)

Fiscal Year	2007 Forecast	2006 Forecast	2007 Forecast minus 2006 Forecast	Change over 2006 Forecast (%)
2001/02	9,003*	9,003*	-	-
2002/03	8,824*	8,824*	-	-
2003/04	9,911*	9,911*	-	-
2004/05	9,762*	9,762*	-	-
2005/06	9,617*	9,617*	-	-
2006/07	10,371 (10,449)**	10,570	-121	-1.1
2007/08	10,784	10,782	2	-
2008/09	10,949	10,955	-6	-0.1
2009/10	11,195	11,166	29	0.3
2010/11	11,305	11,328	-23	-0.2
2011/12	11,383	11,520	-137	-1.2
2012/13	11,487	11,693	-206	-1.8
2013/14	11,693	11,838	-145	-1.2
2014/15	11,859	11,879	-20	-0.2
2015/16	11,984	11,991	-7	-0.1
2016/17	12,073	12,103	-30	-0.2
2017/18	12,175	12,263	-88	-0.7
2018/19	12,321	12,425	-104	-0.8
2019/20	12,471	12,589	-118	-0.9
2020/21	12,624	12,756	-132	-1.0
2021/22	12,781	12,925	-144	-1.1
2022/23	12,941	13,097	-156	-1.2
2023/24	13,105	13,271	-166	-1.3
2024/25	13,272	13,448	-176	-1.3
2025/26	13,443	13,627	-184	-1.3
2026/27	13,618	13,809	-191	-1.4
2027/28	13,797			

Note. * = actuals

**= Weather normalized peak in brackets and variance for F2006/07 is computed on a weather normalized basis.

5 Sensitivity Analysis

5.1. Background

Forecasting into the future is necessarily uncertain. Electricity consumption depends on many variables; economic activity, weather, electricity rates and DSM. The future behavior of all these variables is characterized by significant uncertainty. Moreover load is affected by extraordinary events such as strikes, trade disputes, pine beetle infestations and volatility in commodity markets. World events like 9/11, OPEC actions, wars and revolutions may impact electricity demand.

BC Hydro tries to reduce the uncertainty in its Load Forecast as much as possible by developing accurate, reliable and stable models that specify the relationship between load and its key drivers, and by using reliable and credible sources for forecasts of the key drivers of load.

BC Hydro uses a Monte Carlo model to estimate the uncertainty of BC Hydro's Load Forecast. This model produces a forecast uncertainty band around the base case forecast by examining the impact on load of the uncertainty in a set of key drivers.

The major causal factors used by the model are: economic growth rate (measured by GDP), the electricity rates charged by BC Hydro to its customers, the effective energy reduction achieved by DSM programs, the sales response to electricity rate changes (price elasticity) and weather (reflected by heating degree-days). Probability distributions are assigned to each of these causal factors.

The Monte Carlo model uses simulation methods to quantify and combine the probability distributions, reflecting the relationships between the five causal factors and electricity consumption. A probability distribution for the load forecast is thus obtained which shows the likelihood of various load levels resulting from the combined effect of the input variables. This distribution implies the following bands:

- A low band: There is a 10 per cent chance the outcome will be below this value in a particular year.
- A high band: There is a 10 per cent chance that the outcome will exceed this value in a particular year.

The low and high bands for each major category of the Reference Load Forecast are generated using the Monte Carlo model. A detailed description of the Monte Carlo Model can be found in Appendix 2.

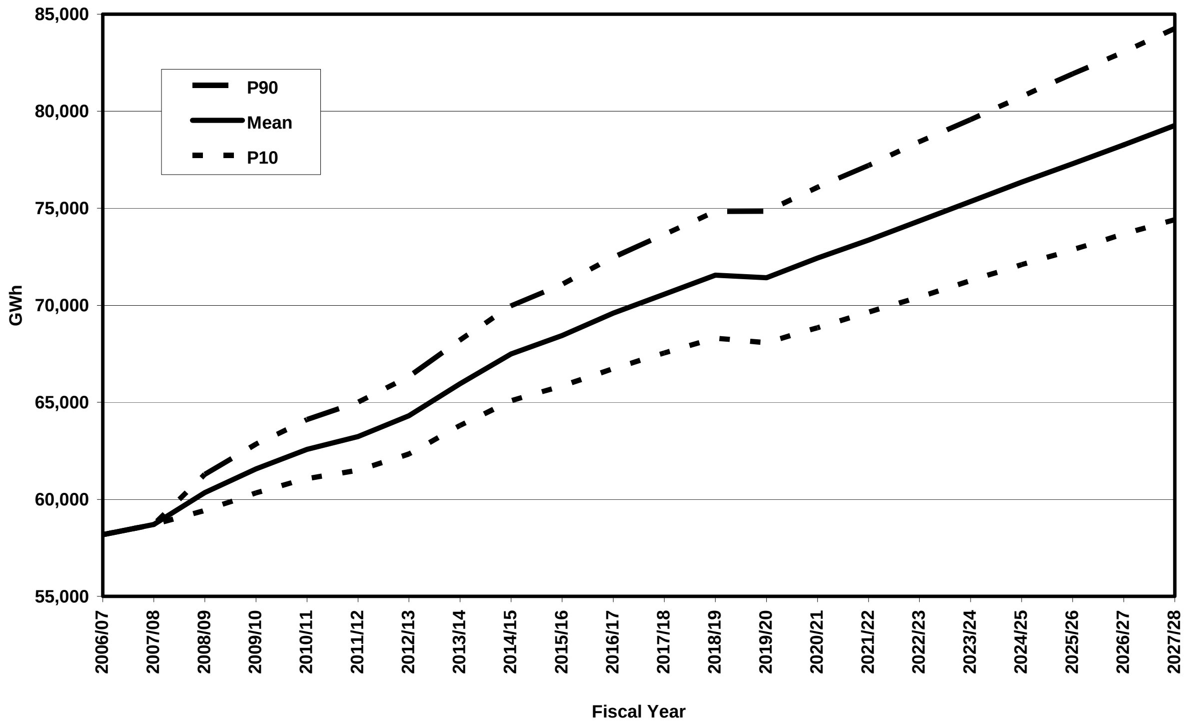
High and low Load Forecasts before DSM and rate impacts are presented in tables A3.7 to A3.8 in Appendix 3. The high and low total peak forecasts contained in these tables are based on the ratios of the Reference total energy requirements forecast to the high and low uncertainty bands.

The high and low Load Forecasts before DSM with rate impacts are also generated using the Monte Carlo model. These forecasts are contained in tables A3.9 to A3.10 in Appendix 3. The high and low peak forecasts contained in these tables are also based on ratios of the Reference total energy requirements to the high and low uncertainty bands.

All of these uncertainty bands exclude the impacts of incremental DSM.

Figure 5.1 illustrates the high and low bands for Total Gross Requirements before DSM and rate impacts.

Figure 5.1 High and Low bands for Total Gross Requirements Before DSM and Rate Impacts



5.2 Key Issues

In the BCUC decision on the 2006 IEP/LTAP, BC Hydro was directed to provide a review of its prospective forecast range as produced by the Monte Carlo model, relative to its historical experience. The BCUC was concerned that BC Hydro's prospective forecast band could be conservative relative to what has been historical experienced. The historical experience is captured in the figure below showing historical forecasts and actual total gross requirements.

Figure 5.2 Historical Actual and Forecasts of Total Gross Requirements

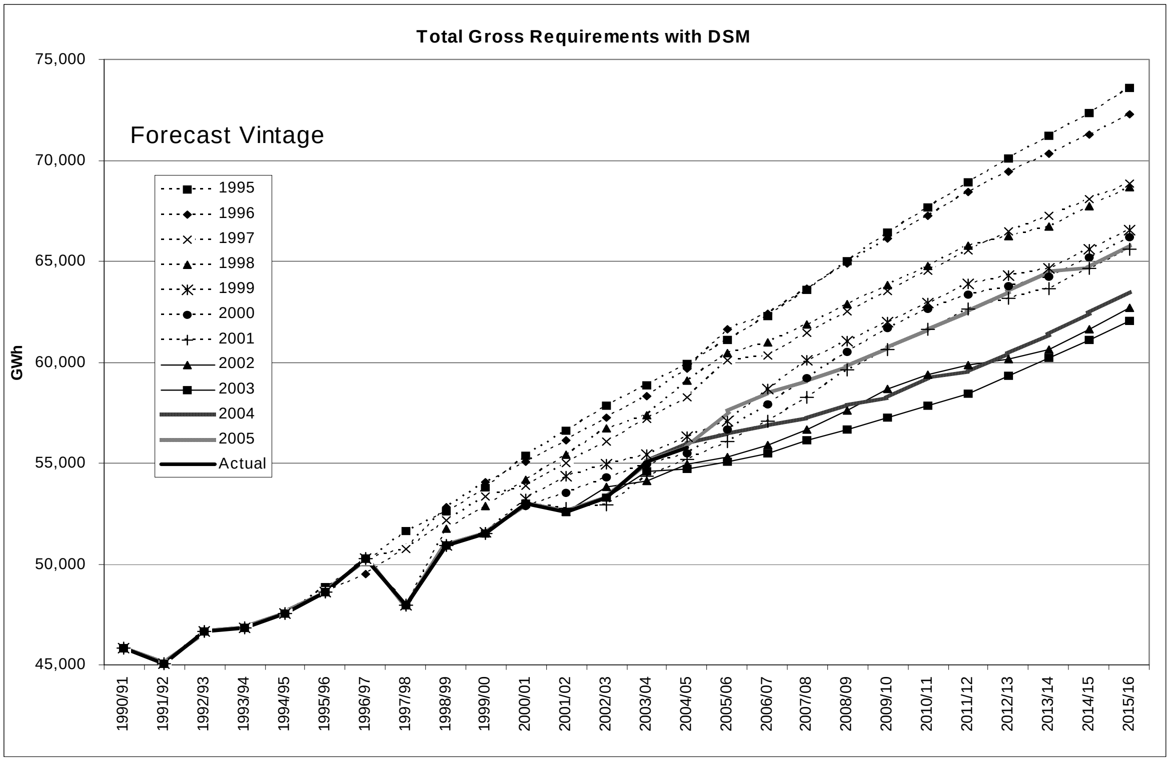


Table 5.1 Historical, Weather Normalized and Labour Disruption Adjusted Forecasts of Total Gross Requirements for the 10th Year of the Forecast Period

Vintage of Forecast	10th Year of Forecast Period	Forecast	Actual	Weather Normalized and Labour Disruption Adjusted Actual
1993	2002/03	58,293	53,298 (-8.6%)	53,497 (-8.2%)
1994	2003/04	60,735	55,051 (-9.4%)	55,250 (-9.0%)
1995	2004/05	59,926	55,747 (-7.0%)	56,142 (-6.3%)
1996	2005/06	61,640	57,621 (-6.5%)	57,951 (-6.0%)
1997	2006/07	60,305	58,175 (-3.5%)	58,018 (-3.8%)

Notes:

1. Value in brackets is the percentage difference between the Forecast and the Actual for the third column and weather normalized and labour disruption adjusted actual for the fourth column.

Table 5.1 shows that for forecasts made 10 years ahead, the maximum range of variability in the forecasts (i.e. actual relative to forecast) is somewhat less than 10 percent. The average percentage difference between actual and forecast requirements for successive forecasts made from 1993 to 1997 at 10 years into the forecast period is 7.0%. The average percentage difference between weather normalized and labour disruption adjusted requirements and forecast is 6.7%.

There appears to be a decrease in the variance in the long-term projections over successive forecasts. This decrease is closer to the prospective range of the current forecast uncertainty bands which is about 4.4% 10 years into the future.

BC Hydro is of the view that the methodology of the Monte Carlo model is reasonable and that the range of the uncertainty bands for the current forecasts are also reasonable.

6. Residential Forecast

6.1. Sector Description

BC Hydro's residential sector currently consumes about 32% of BC Hydro's total annual billed sales. This electricity is used to provide a range of services (often called end-uses). The largest end-uses are space heating, water heating, refrigeration, and miscellaneous plug-in load which include computer equipment and home entertainment systems such as plasma TVs. Since space and water heating loads are dependent on the outside temperature, monthly residential sales can be strongly affected by the weather, but sales variations due to the weather tend to cancel out over the long-term.

Of the three customer classes, (residential, commercial, and industrial), the residential sector is the most stable. Growth in the number of residential accounts is currently about 1.9% per year. After many years of growth in use per account, growth in use per account is forecast to level out, growing at less than 1% per year over the entire forecast period. Of the 1.54 million residential accounts served at the end of F2006/07, 59% were single/duplex, 8% were row houses, 25% were apartments, and 8% were mobile and miscellaneous. Geographically, 58% of the residential accounts are in the Lower Mainland, 9% are in the North Region, 12% are in the South Interior, and 21% are on Vancouver Island. Vancouver Island has the highest percentage of electrically heated accounts because of the relatively recent availability of natural gas. On a sales basis, 53% of residential sales were made in the Lower Mainland, 9% in the North Region, 12% in the South Interior, and 26% in Vancouver Island.

6.2. Forecast Summary

Sales to the residential sector grew by 3.8% before weather normalization between F2005/06 and F2006/07. This growth was mainly due to a 1.9% increase in average number of accounts, and a 1.9% increase in use per account. Based on the current forecast for housing starts, the new forecast for number of accounts at the end of F2011/12 is 1,674,000 which is 4,600 or 0.27% higher than the 2006 forecast. However, this is more than offset by a 0.47% decrease in the forecast for use per account in F2011/12. Overall, the new sales forecast for F2011/12 is down by 0.24% compared to the 2006 forecast before DSM and rate impacts.

6.3. Residential Forecast Comparison

Before DSM and rate impacts, the 2007 forecast is lower than the 2006 forecast for the first six years, but higher for all remaining years. The differences in the residential sales forecast compared to the previous forecast are: down 151 GWh (0.9%) in F2007/08, down 45 GWh (0.2%) in F2011/12, up 308 GWh (1.5%) in F2017/18 and up 934 GWh (3.9%) in F2026/27.

The main reasons for the difference between the 2006 forecast and the 2007 forecast are: (a) lower anchor point; (b) higher forecast for account growth; and (c) updated forecast for use rate.

a) Anchor Point: In 2006, the forecast called for F2006/07 billed sales to be 16,887 GWh. Actual weather normalized billed sales for F2006/07 were 16,702 GWh, 185 GWh or 1.1% lower than forecast. Lower weather normalized sales for F2006/07 put downward pressure on the 2007 forecast.

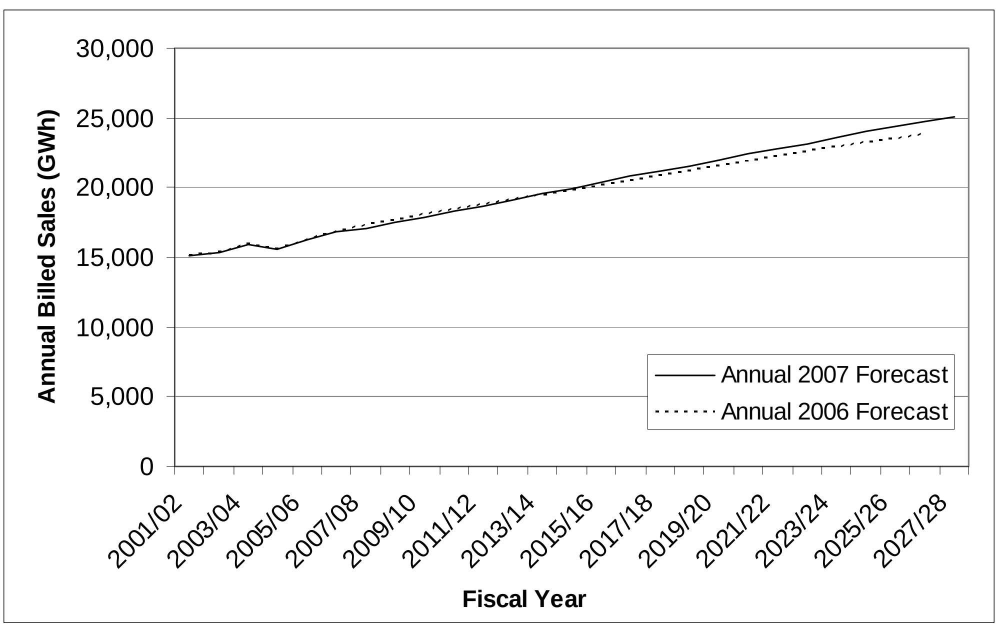
(b) Number of Accounts: The ending number of accounts for F2006/07 was 1,540,176. This was 952 accounts or 0.06% below the forecast value of 1,541,128.

Except for F2007/08, the 2007 forecast for number of accounts is higher than the 2006 forecast. So although the 2007 forecast for number of accounts starts off lower than the 2006 forecast, by F2008/09, the 2007 forecast for number of accounts is higher than the 2006 forecast. In the 2006 forecast, 5, 11, and 21 year growth rates for number of accounts were 1.61%, 1.48%, and 1.30% respectively. In the current forecast, the 5, 11, and 21 year growth rates for number of accounts are 1.68%, 1.61%, and 1.48% respectively.

(c) Use Rate: Compared to the 2006 forecast, the 2007 forecast calls for usage per account to be lower for the first seven years, but higher for the remaining years. This higher forecast for growth in use per account put upward pressure on the current forecast in the later years. In the 2006 forecast, the 5, 11, and 21 year growth rates for use per account were 0.46%, 0.43%, and 0.39% respectively. In the current forecast, the 5, 11, and 21 year growth rates for use per account are 0.40%, 0.47%, and 0.41% respectively.

For F2007/08, the lower anchor point, the lower forecast for number of accounts, and the lower forecast for use per account, all combined to produce a sales forecast that was 151 GWh or 0.87% lower than the 2006 forecast. The lower forecast for use rate, which is immediately reflected in the sales forecast, kept the new sales forecast lower than the 2006 forecast for the first six years of the forecast period. However, for the following years, the cumulative effect of a higher forecast for account growth, plus a forecast for higher growth in use rate resulted in the 2007 sales forecast being higher than the 2006 forecast.

Figure 6.1. Comparison of Forecasts for Residential Sales before DSM and Rate Impacts



6.4. Key Issues

Table 6.1 shows the forecast for total residential sales and regional residential sales before the impact of potential rate increases and DSM.

The use rate forecast is based on projections of factors such as housing mix (single family, row house, apartment, etc.), heating fuel choices (electric versus non-electric), appliance penetration rates, appliance life span and changes in electricity demands. Currently, 20 per cent of BC Hydro's residential accounts are heated electrically, and on average they require about 14,600 kWh per year. The average overall usage may not change much for reasons stated below.

Ten years ago, the average annual residential weather-normalized use rate was 10,230 kWh per year. Currently, the average annual residential weather-normalized use rate is 10,940 kWh per year. Improvements in building insulation and appliance efficiency have offset increased usage of electronics to moderate the growth of the annual residential use rate. Over the last ten years, the average annual use rate grew by about 71 kWh per year, corresponding to an average annual compound growth rate of 0.68%.

Over the longer term, the use rate trend is not expected to change significantly because of the offsetting effects of the following residential trends:

- First, increased electric space heating market share is expected to be offset by smaller housing units. Due to limited availability of land for residential development, the trend in major metropolitan centres is expected to be towards denser housing. Since row houses and apartments are more likely to be built with electric heat than single family homes, the market share for electrically heated housing is expected to increase. Although new row houses and apartments tend to be larger than existing similar dwellings, they generally have a smaller floor area than detached single family homes, and therefore have lower space heating load requirements. The increase in market share of electric space heating is also offset to some extent by improvements in building standards, and by the construction of the Vancouver Island gas pipeline, which has made gas space heat available to Island residents. However, natural gas prices are projected to be higher for Vancouver Island compared to the Mainland over the entire forecast period. As a result, the growth in the penetration rate of gas heating is anticipated to be slower for Vancouver Island than it was for the Mainland.
- Second, there is the issue of more efficient appliances versus higher penetration. Manufacturers throughout Canada and the United States are expected to continue to improve the energy efficiency of major electrical appliances. As older models wear out and are replaced by newer ones, electricity consumption for major appliances such as refrigerators, freezers, ovens and ranges is forecast to decrease. However, new models of these major appliances tend to be larger and include more features than models currently in use. Therefore, some of the reduction in electricity use resulting from improvements in electricity efficiency will be offset by an increase in appliance size and features.
- Third, a projected decrease in the number of people per household would tend to reduce electricity use per account. However, this reduction is expected to be offset by an increase in the penetration level of small appliances. An increase in electricity use is also projected from lifestyle changes and technological improvements, which is expected to cause an increase in demand for electronic, entertainment and telecommunication devices in the home. A trend towards home offices is also expected to

produce a long-term increase in residential electricity consumption. In the long-term, the expected overall impact of these various trends is that the factors working to increase the use rate will be offset by the factors working to decrease it, leading to average growth in use rate being about 0.5% per year over the entire forecast period before the impact of rate increases and DSM.

6.5. Forecast Methodology

The forecast for residential sales is calculated as forecast number of accounts times forecast use per account. These two main drivers are discussed below.

For the first year of the forecast, growth in number of accounts is forecast based on recent trends. For all subsequent years, percentage growth in number of accounts is set equal to percentage growth in forecast housing starts, which are provided by a third party.

To develop the residential sales forecast for the entire BC Hydro service area, the total service area was divided into four customer service regions, and a forecast was prepared for each region. These regions were Lower Mainland, Northern Region, South Interior and Vancouver Island. For each region, a third party housing stock forecast was prepared based on the housing starts forecast in the region, and on other regional factors such as trends in housing mix and gas availability.

A use rate forecast was also developed for each region based on projections of penetration rates and individual consumption levels by end use (space heating, water heating, major appliances and small lifestyle appliances).

The residential sales forecast for a region is the sum of the requirements for each end use. The requirements for each end use are the product of the number of accounts having that end use and the energy used by an average account having that end use.

The residential forecast was prepared using both the recently released Statistically Adjusted End Use (SAE) model and the older REEPS model. The forecast results produced by both models were consistent with each other.

Refer to Appendix 1.1.4 for the residential sales forecast methodology for further details on the sales methodology.

Drivers – The drivers of the residential forecast are number of accounts and average annual use per account. The growth in the number of accounts is driven by housing starts. Since household size is gradually decreasing, account growth is expected to be somewhat higher than population growth. Account growth can vary considerably from year to year in response to BC’s economy. In F1993/94, over 38,000 accounts were added, but in F2001/02, only about 13,000 accounts were added. With a strengthened BC economy, account growth for F2007/08 is forecast to be about 27,000. With growth expected in both the number of accounts and use per account, the annual compound growth in sales before the impact of expected rate increases and DSM is forecast to be 1.9% over the entire forecast period.

Figure 6.2. Comparison of Forecasts of Number of Residential Accounts

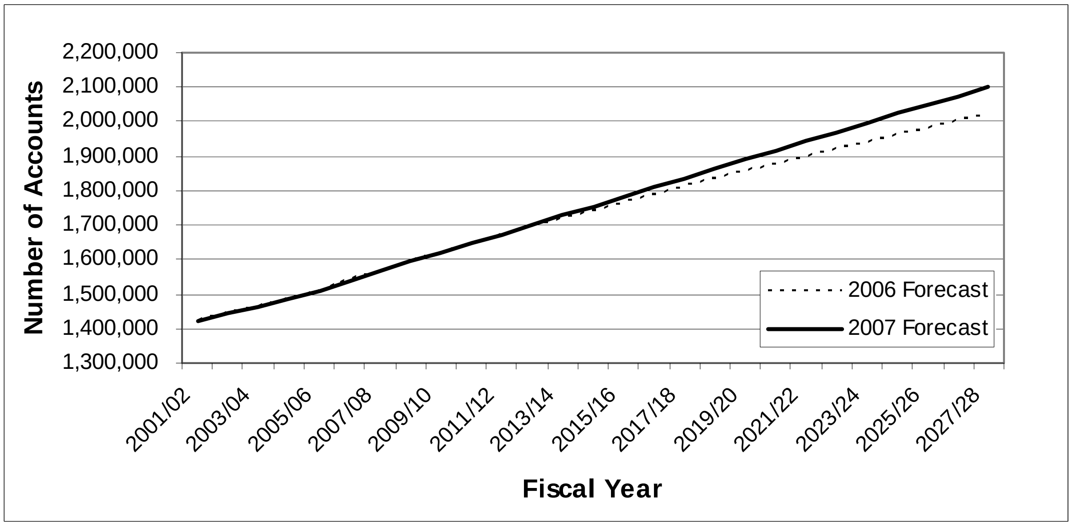
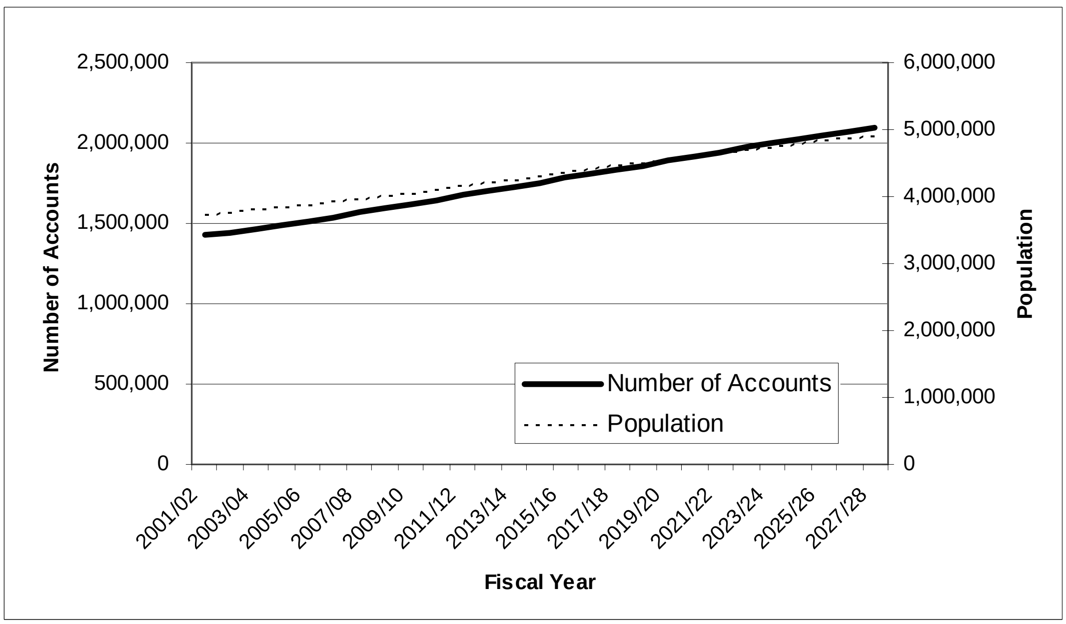


Figure 6.3. Comparison of Number of Accounts versus Population



6.6. Risks and Uncertainties

Uncertainty in the residential sales forecast is due to uncertainty in three factors: forecast for number of accounts, forecast for use per account, and weather.

(a) Number of Accounts: In the short-term, an error in the forecast for account growth would not result in a significant error in the forecast for total number of accounts. This is because account growth is currently running at about 1.9%, so an error of 1% in the forecast for account growth would contribute an error of about 0.019% to the forecast for total number of accounts. However, in the long-term, there is a risk from the cumulative effect of errors in the forecast for account growth.

(b) Use per Account: Most of the risk in the residential forecast is due to the forecast for use per account. This is due to two reasons:

I. Unlike the forecast for account growth, an error of 1% in the forecast for use per account in any year would contribute an error of 1% to the forecast for residential sales for that year.

II. The forecast for use per account is the net result of many conflicting forces. Some of the forces working to increase use rate are:

- increases in home sizes
- natural gas prices increasing faster than electricity prices
- increases in electric space heating share
- increases in real disposable income
- increases in saturation levels of appliances

Some of the forces working to decrease use rate are:

- increases in heating system efficiencies
- new dwellings being built with higher insulation standards
- heat from additional appliances reduces electric heating load
- increased use of programmable thermostats
- decreases in household sizes

Although all these positive and negative forces were recognized when the forecast for use rate was developed, there is uncertainty inherent in the forecasts for all these forces.

(c) Weather: In the short-term, weather is highly variable. Therefore, in any one year, there is a risk that weather may have a significant impact on residential sales. For example, the El Nino event of F1997/98 is estimated to have reduced residential sales by about 4%. Since average weather is expected to be close to the rolling 10-year normal values used in the forecast, weather is not viewed as being a high risk to the long-term forecast for residential sales.

Potential forecast risks/issues that have not been included in this forecast, but monitored on which has been initiated, include:

- Effects of provincial and regional carbon taxes
- Electric-powered vehicles
- Cross-fuel elasticities
- A potential shift to electricity for residential heating
- Changes in transmission loss factors due to new transmission infrastructures

Table 6.1. Residential Sales Before DSM and Rate Impacts (GWh)

Fiscal Year	**Lower Mainland** Sales	**Vancouver Island** Sales	**South Interior** Sales	**Northern Region** Sales	**BC Hydro Total** Sales
Actual (values shown in brackets are weather-normalized)					
2001/02	7,975 (7,911)	4,001 (3,931)	1,656 (1,649)	1,458 (1,455)	15,090 (14,946)
2002/03	8,120 (8,199)	3,981 (4,046)	1,729 (1,747)	1,457 (1,464)	15,287 (15,456)
2003/04	8,447 (8,468)	4,123 (4,145)	1,803 (1,785)	1,526 (1,528)	15,899 (15,926)
2004/05	8,316 (8,473)	4,021 (4,151)	1,805 (1,823)	1,478 (1,514)	15,620 (15,961)
2005/06	8,637 (8,788)	4,251 (4,330)	1,856 (1,861)	1,498 (1,560)	16,241 (16,539)
2006/07	8,879 (8,804)	4,426 (4,377)	1,975 (1,936)	1,574 (1,585)	16,853 (16,702)
Forecast (Residential sales forecast based on “normalized weather”)					
2007/08	9,080	4,448	1,997	1,562	17,087
2008/09	9,403	4,513	1,998	1,579	17,494
2009/10	9,667	4,591	2,036	1,588	17,882
2010/11	9,960	4,678	2,077	1,593	18,307
2011/12	10,253	4,761	2,103	1,596	18,713
2012/13	10,571	4,847	2,134	1,599	19,150
2013/14	10,845	4,917	2,163	1,599	19,525
2014/15	11,149	4,994	2,191	1,601	19,935
2015/16	11,465	5,073	2,222	1,600	20,360
2016/17	11,788	5,157	2,251	1,601	20,796
2017/18	12,081	5,223	2,279	1,597	21,180
2018/19	12,390	5,291	2,304	1,596	21,582
2019/20	12,697	5,359	2,329	1,595	21,980
2020/21	13,035	5,432	2,356	1,597	22,421
2021/22	13,306	5,491	2,382	1,595	22,773
2022/23	13,625	5,554	2,411	1,593	23,182
2023/24	13,945	5,615	2,437	1,592	23,588
2024/25	14,274	5,681	2,465	1,592	24,012
2025/26	14,561	5,729	2,489	1,588	24,367
2026/27	14,874	5,785	2,513	1,585	24,758
2027/28	15,166	5,837	2,539	1,582	25,124
Growth Rates (values shown in brackets are weather-normalized)					
5 years: 01/02 to 06/07	2.2% (2.2%)	2.0% (2.2%)	3.6% (3.3%)	1.5% (1.8%)	2.2% (2.3%)
5 years: 06/07 to 11/12	2.9% (3.1%)	1.5% (1.7%)	1.3% (1.7%)	0.3% (0.1%)	2.1% (2.3%)
11 years: 06/07 to 17/18	2.8% (2.9%)	1.5% (1.6%)	1.3% (1.5%)	0.1% (0.1%)	2.1% (2.2%)
21 years: 06/07 to 27/28	2.6% (2.6%)	1.3% (1.4%)	1.2% (1.3%)	0.0% (0.0%)	1.9% (2.0%)

7 Commercial Forecast

7.1. Sector Description

BC Hydro's commercial sector currently consumes about 29% of BC Hydro's total sales. This electricity is used to provide a range of services such as lighting, ventilation, heating, cooling, refrigeration and domestic hot water. These vary considerably between the different types of buildings.

The commercial sector consists of distribution sales (92% of the total) and transmission sales (8% of the total). Within the distribution voltage (< 60 kV), there are currently two major demand levels (kW): General Under 35kW, which includes small offices, small retails/grocery stores, restaurants, motels and common areas of apartment buildings and General Over 35kW, which includes large offices, large retails/grocery stores, universities, hospitals and hotels. Also part of the total commercial sales includes street lighting, irrigation and BC Hydro Own Use, which is electricity that BC Hydro's buildings and facilities use. Commercial transmission customers, which includes universities, major ports and transportation facilities, use electricity at higher voltages (>60 kv).

7.2. Forecast Summary

Electricity consumption of the commercial sector can vary considerably from year to year reflecting the level of activity in BC's service sector. Between F2005/06 and F2006/07, total sales grew by 384 GWh or 2.6%. This growth combined with a stronger forecast of economic drivers have put upward pressure in the short-term sales forecast. Total commercial sales are expected to grow by 516 GWh or 3.4% before rate impact and DSM between F2007 and F2008. Looking five, eleven and twenty-one years into the forecast, the commercial sales growth is expected to be 2.9 per cent, 2.5 per cent and 2.2 per cent. Commercial distribution sales growth is forecast to be relatively stable over the entire forecast period as economic drivers of sales increase over most of this period. Transmission sales are forecast to experience slower growth towards the end of the forecast period relative to distribution sales. The driver of the long-term commercial transmission sales forecast is GDP which trends slightly below last year's growth.

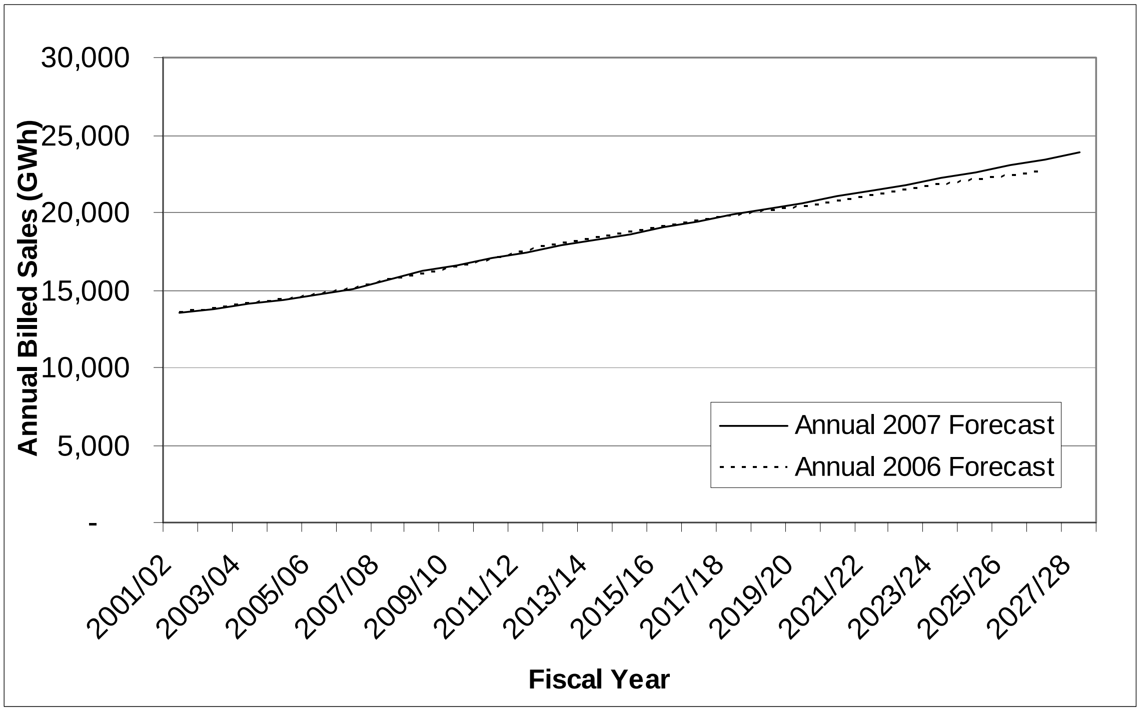
7.3. Commercial Forecast Comparison

When compared with the 2006 forecast, the 2007 commercial sales forecast before DSM and rate impacts is 13 GWh lower (-0.1%) for F2007/08, 55 GWh lower (-0.3%) for F2011/12, 137 GWh lower (0.7%) for F2017/18 and 706 GWh higher (3.1%) for F2026/27.

The 2007 commercial forecast is close to the 2006 forecast for most of the forecast period. In the short and medium-terms, this year's forecast is slightly lower than last year's forecast. This reflects a slight reduction in commercial distribution sales and transmission sales compared to last year. Commercial distribution sales are below last year's forecast as revised assumptions reflecting a gain in efficiency of end-uses have been incorporated into the current forecasting model. The commercial transmission forecast is lower due to revised expectations on a transmission customer expansion. The increase in the forecast over the long-term is mainly due to the stronger employment and retail sales forecast (as shown in Table 3.2), which are two main drivers of commercial distribution sales.

Table 7.1 provides a summary of historical and forecast sales by the four regions before DSM and rate impacts.

Figure 7.1. Comparison of Forecasts for Commercial Billed Sales before DSM and Rate Impacts



7.4. Key Issues

The following paragraphs discuss the regional commercial sales growth projection for each of BC Hydro main service regions: Lower Mainland, Vancouver Island, South Interior and Northern Region.

Lower Mainland:

Approximately 65 per cent of the sales in the commercial sector is located in the Lower Mainland. Relative to the 2006 forecast, the 2007 commercial sales growth rates decrease in the Lower Mainland in the short-term, but increase starting in F2014/15.

In the Lower Mainland, the commercial sales growth is expected to be 3.0 per cent, 2.7 per cent and 2.4 per cent, over the next five, eleven and twenty-one years of the forecast respectively.

Among the four regions, Lower Mainland has the strongest employment growth, expecting to grow by 1.7 per cent per year on average from 2007 to 2011 and by 0.9 per cent from 2012 to 2030.

80 per cent of the total economic output in the Lower Mainland comes from commercial activity. The output growth continues to be driven by the service sector, supported by an optimistic outlook for population growth in the region. Lower Mainland commercial economic output is expected to grow at an annual average rate of 3.1 per cent from 2007 to 2011 and by 2.1 per cent over the long-term.

A combination of strong employment, population gains and robust commercial output will maintain strong consumer demand in the Lower Mainland over the forecast period, translating into solid growth in retail sales. Overall, retail sales are expected to advance by an average annual growth rate of 5.2 per cent in the medium-term and 4.5 per cent in the long-term, the strongest of the four main planning regions.

Vancouver Island:

Of the total BC Hydro commercial sales, Vancouver Island makes up 16 per cent. Compared to the 2006 forecast, commercial sales in Vancouver Island is higher throughout the forecast years.

With an aging population and slowing rate of population growth, Vancouver Island’s employment rate and output are expected to slow. Overall, the commercial sales growth is expected to be 1.9 per cent, 1.8 per cent and 1.6 per cent, over the next five, eleven and twenty-one years of the forecast respectively.

The service sector in Vancouver Island expanded by only 0.8 per cent in 2006, but growth will develop over the near-term, advancing by an average of 2.7 per cent from 2007 to 2011 and then slowing to an average of 1.6 per cent over 2012-2030. In the long-term, growth in the service sector will be sustained by an increase in demand for financial services, health care and personal providers, as Vancouver Island is a retirement destination for baby boomers.

Employment growth on Vancouver Island will remain below provincial average, growing by 1.2 per cent from 2007 to 2011 and slowing to 0.3 per cent per annum in the long-term. Growth in employment will be held back, as baby boomers increasingly retire in the next decade.

Strong gains in employment in the near-term will help to boost income, which will translate into robust gains in retail sales. Overall, retail sales are expected to grow on an annual average of 4.8 per cent in the short-term, and 3.9 per cent over the long-term as employment conditions weaken.

South Interior:

10 per cent of BC Hydro’s total commercial sales can be attributed to the South Interior. Compared to the 2006 forecast, the South Interior has a lower forecast for most years.

Overall, commercial sales growth is expected to be 3.7 per cent, 3.0 per cent and 2.3 per cent, over the next five, eleven and twenty-one years of the forecast respectively.

Employment will grow on an average of 1.0 per cent in the short-term (2007-2011), helped by the accelerated harvesting activities associated with the mountain pine beetle infestation. However, the pine beetle infestation is expected to dampen employment in the forestry sector over the long run, as output and employment growth will decelerate over the forecast, eventually turning negative.

The service sector is expected to make steady gains over the 2007-2011 time frame, with commercial output and retails sales growing on an average of 2.3 and 4.5 per cent respectively. Over the long-term, as population and employment growth slow down, commercial output and retail sales will retreat to an average of 1.3 and 3.6 per cent during 2012-2030.

Northern Region:

The Northern Region makes up the final 9 per cent of the BC Hydro's total commercial sales. Relative to the 2006 forecast, the Northern Region has a lower forecast starting F2012/13.

Overall, the commercial sales growth before DSM is expected to be 3.4 per cent, 2.1 per cent and 1.3 per cent, over the next five, eleven and twenty-one years of the forecast respectively.

Due to major construction projects, employment growth in the Northern Region will remain robust in the next 2-3 years. Between 2010 and 2018, employment is expected to shrink and then remain essentially unchanged thereafter. As in the Southern Interior, the main reason for the drop is the decline in the forestry sector caused by the mountain pine beetle infestation. Employment will grow on average 1.2 per cent over 2007-2011 and decline to an average of 0.4 per cent between 2012 to 2030.

Commercial output and retail sales are expected to behave similarly to the employment sector, as they are high correlated. Commercial output and retail sales will grow on average 1.9 and 4.8 per cent over 2007-2011 and 1.4 and 3.3 per cent over 2012-2030 respectively.

7.5. Methodology

The main determinant of the commercial electricity sales forecast is the level of future economic activity in the province. This includes economic drivers such as retail sales, employment and commercial output. These economic variables are combined in the BC Hydro's SAE models that are used to develop commercial distribution sales for each of BC Hydro's four major service regions. The methodology for the commercial sales forecast is described in Appendix 1.2.

Drivers – At an aggregate level, consumption in the commercial sector is tied closely with economic activity in the province. The stronger the economy, the more services needed, the greater the electricity consumption of the commercial sector. Regional economic drivers such as retail sales, employment, and commercial output are good indicators of electricity consumption in the sector. At a more detailed level, the consumption in the commercial sector is related to the growth in the number of facilities and the amount of energy required to service various end uses.

7.6. Risk and Uncertainties

Commercial sales models are highly dependent on the outcome of the regional economic drivers. The regional economic forecast comes from the Conference Board of Canada. In the SAE model, heating degree days and cooling degree days are used to calculate the heating and cooling variables. Total commercial sales are not as sensitive to weather compared to residential sales.

Factors Leading to Lower than Forecast Commercial Sales

- The high Canadian dollar discourages exports and decreases service sector output, one of the key economic drivers of the commercial forecast.
- The pine beetle infestation will cause forestry employment to decline in the long-term.
- Increased interest rates will encourage consumers to save and invest instead of spending, decreasing retail sales.

- The aging provincial population will decrease future employment growth.

Factors Leading to Higher than Forecast Commercial Sales

- The short and long-term effects of the 2010 Olympic Games, which could increase employment and bring in more immigrants from both inside and outside of Canada.
- The reversal of Canadian dollar to below parity with the US dollar will enhance exports.
- Lowering of interest rates may encourage consumer expenditures.
- Substantially warmer summers (increasing air conditioning loads) or colder winters (increasing heating loads) relative to historical patterns.

Table 7.1. Commercial Sales Before DSM and Rate Impacts (GWh)

Fiscal Year	Lower Mainland Sales	Vancouver Island Sales	South Interior Sales	Northern Region Sales	BC Hydro Total Sales
Actual					
2001/02	8,828	2,277	1,298	1,180	13,583
2002/03	8,938	2,290	1,323	1,178	13,729
2003/04	9,280	2,317	1,361	1,194	14,151
2004/05	9,381	2,341	1,382	1,258	14,362
2005/06	9,626	2,410	1,425	1,260	14,721
2006/07	9,857	2,477	1,482	1,290	15,105
Forecast					
2007/08	10,246	2,512	1,539	1,325	15,621
2008/09	10,561	2,560	1,615	1,447	16,182
2009/10	10,872	2,609	1,677	1,466	16,622
2010/11	11,139	2,665	1,729	1,515	17,049
2011/12	11,421	2,721	1,778	1,524	17,443
2012/13	11,697	2,772	1,825	1,531	17,828
2013/14	11,979	2,821	1,872	1,554	18,226
2014/15	12,263	2,868	1,919	1,596	18,645
2015/16	12,565	2,916	1,963	1,606	19,051
2016/17	12,869	2,962	2,007	1,615	19,448
2017/18	13,176	3,009	2,050	1,623	19,858
2018/19	13,477	3,055	2,083	1,627	20,242
2019/20	13,784	3,103	2,105	1,632	20,627
2020/21	14,095	3,150	2,129	1,638	21,013
2021/22	14,404	3,197	2,164	1,645	21,405
2022/23	14,718	3,242	2,200	1,649	21,808
2023/24	15,032	3,285	2,237	1,654	22,209
2024/25	15,352	3,331	2,271	1,659	22,615
2025/26	15,678	3,377	2,306	1,666	23,026
2026/27	15,998	3,421	2,343	1,672	23,430
2027/28	16,361	3,472	2,378	1,676	23,888
Growth Rates					
5 years: 01/02 to 06/07	2.2%	1.7%	2.7%	1.8%	2.1%
5 years: 06/07 to 11/12	3.0%	1.9%	3.7%	3.4%	2.9%
11 years: 06/07 to 17/18	2.7%	1.8%	3.0%	2.1%	2.5%
21 years: 06/07 to 27/28	2.4%	1.6%	2.3%	1.3%	2.2%

8 Industrial Forecast

8.1 Sector Description

BC Hydro's industrial sector is concentrated in a limited number of goods producing industries, the most important of which are pulp and paper, forestry, mining and chemicals served at transmission voltage. The remaining industrial load is made up of a large number of small and medium sized distribution voltage served manufacturing establishments. Approximately 80% of industrial sales are to customers served at transmission voltages (>60 kV) with the remaining 20% to distribution voltage accounts (<60 kV). BC Hydro's industrial sector currently accounts for 37% of BC Hydro's total annual billed sales.

Unlike the residential sector, industrial sector sales are not strongly correlated to weather but are more commodity-price driven. Electricity is used in a wide range of applications including fans, pumps, compression, conveyance and processes such as cutting, grinding, stamping and welding and electrolysis. In comparison to the commercial sector, space conditioning, lighting, refrigeration and freezing loads are relatively less important.

8.2. Forecast Summary

Total industrial sales were 19,469 GWh in F2006/07. The sales forecast to all industrial customers, before DSM and rate impacts, is expected to grow to 19,475 GWh in F2011/12, 21,103 GWh in F2017/18, and 20,778 GWh in F2027/28. These represent growth rates of 0.0% over the next five years (F2006/07 to F2011/12), 0.7% over the next 11 years (F2006/07 to F2017/18), and 0.3% over the next 21 years of the forecast (F2006/07 to F2027/28).

The decline in the growth rates reflects revised projections for the larger pulp and paper and wood sectors which combined make of about half of all industrial sales. Revised expectations for these sectors are based on information and forecast data contained in industry and consultant reports referenced by BC Hydro.

Table 8.1. contains the industrial sales forecast before DSM and rate impacts.

8.3. Industrial Forecast Comparison

The 2007 forecast is lower than the 2006 forecast for each year of the forecast. The differences in the total industrial sales forecast compared to the 2006 forecast, before DSM and rate impacts, are: down 1,351 GWh (6.6%) in F2007/08, down 2,320 GWh (10.6%) in F2011/12, down 1,177 GWh (5.3%) in F2017/18 and down 3,595 GWh (14.8%) in F2026/27.

The main reasons for the difference between the 2006 forecast and the 2007 forecast are: (a) revised anchor point, (b) revised forestry sector forecast, (c) revised methodology and (d) lower industrial distribution sales forecast. Further explanation for these reasons includes:

(a) **Revised Anchor Point**: Between F2005/06 and F2006/07, total sales declined by 467 GWh or 2.3%. Most of this decline was in the pulp and paper sector which fell by 275 GWh or 2.7%. This reflects several factors including a decline in demand for newsprint, an appreciation of the Canadian dollar and impact of step rates and DSM. A lower sales value in the base year of F2006/07 means that the forecast starts from a lower point than the 2006 forecast.

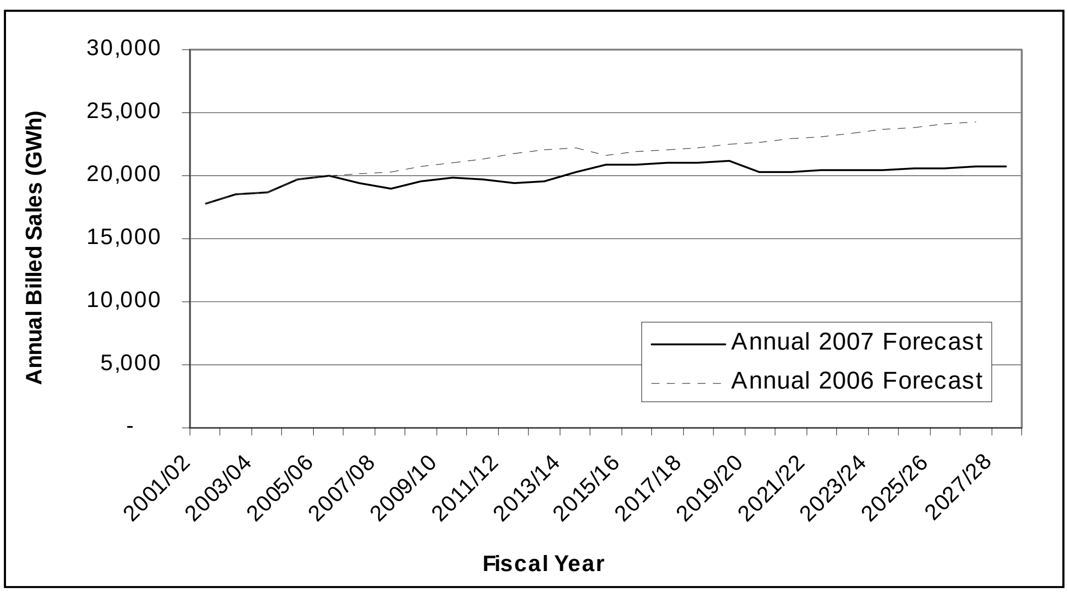
(b) **Revised Forestry Sector Forecast**: BC Hydro incorporated information and forecast data from AMEC's August 2007 report on the BC forestry sector. This report conducted a market outlook for each major BC forestry product, performed a timber supply analysis and examined the impact of the mountain pine beetle infestation on the log supply and fiber supply. Long-term production forecast data for BC major pulp mills were also used to develop the forecast for large pulp and paper customers. Timber production estimates from the report were used to develop adjustments to the larger and smaller sawmill customers.

Incorporating information from the AMEC report and from BC Hydro's Key Account Mangers has contributed to a decline in forecasts for the pulp and paper and wood sector relative to the 2006 forecast. The combined wood and pulp and paper sector is below the 2006 forecast by 1,218 GWh (11.8%) in F2007/08, down 1,273 GWh (12.0%) in F2011/12, down 1,997 GWh (18.0%) in F2017/18 and down 3,237 GWh (26.3%) in F2026/27

(c) **Revised Methodology**: In response to BCUC's 2006 IEP/LTAP Decision, BC Hydro has revised its methodology to directly incorporate the results of consultant reports that are not already captured in general economic drivers. The revised methodology is intended to capture the predicted structure changes within the next decade to the forestry sector which is a significant share of industrial sales[5]. In addition, the revised methodology incorporates significant events and announcements that may impact customer plans for future operations.

(d) **Lower Industrial Distribution Forecast:** The 2006 and 2007 industrial distribution are both based on a regression model that estimates the relationship between sales and GDP. The 2007 forecast incorporates long-term adjustments to wood sector to reflect the impact of the pine beetle infestation. The details of the forecast results are contained in the following section.

Figure 8.1. Comparison of Forecasts for Industrial Billed Sales before DSM and Rate Impacts



[5] Earlier load forecasts, including the 2006 forecast, used a load sharing approach to determine long-term forestry sales. The overall transmission industrial forecast was split into sub-sectors from years 11 to 20 of the forecast period based on a sector's expected share of load in the 10th year of the forecast. This resulted in a growing long-term forestry sector forecast that did not fully reflect the impact of the mountain pine beetle and structural changes in the industry. The 2007 forestry load forecast uses a more sector specific approach to enhance the methodology.

8.4. Key Issues and Sector Outlook

8.4.1 Forestry Background and Outlook

The BC Forest industry includes more than 100 major wood product producers located throughout the province along with 15 large pulp and paper mills. These facilities produce a wide range of products including dimensional and structural lumber, oriented strand board, medium density fiberboard, plywood, fuel pellets and other specialty products. Coastal saw mills currently operate in a very challenging financial environment because of higher harvesting costs caused by steep terrain, out-dated equipment and relatively high labour costs. In comparison, the interior industry has produced higher financial returns primarily because of higher efficiency levels and an abundant supply of low cost beetle-killed timber. Paper production is concentrated on the BC coast. Wood-products exports destined for the US market such as dimensional lumber, OSB, and plywood are generally produced in the BC interior while Asian product exports are generally produced on the BC coast.

BC Hydro has developed its forecast for wood and pulp and paper sales based on information from Key Account Managers, sector research published by major banks, industry conferences, and the AMEC study.

The sections below briefly summarize the short-term and medium to long-term outlook for the Wood Products and the Pulp and Paper sectors.

Wood Products Outlook: Short-Term

The forestry sector as a whole faced a series of significant challenges in 2007. These factors include:

A Strong Canadian Dollar - After rising more than 30% between 2002 and 2006, the Canadian dollar continued to rise another 15% relative to the US dollar during 2007. The impact is particularly acute since the output of BC’s wood producers is priced in US dollars, but production costs are predominantly in Canadian dollars. The dollar’s rise contributed to mill curtailments and closures in 2007; many are reflected in the 2007 forecast as continuing.

Weak US Housing Starts - After reaching a peak of 2.1 million single family housing starts in early 2006 the US housing market is in a downturn that economists expect will last into 2009. Demand for new housing has fallen to a 12 year low because of higher interest rates, tougher lending practices and a large inventory of unsold homes. Despite being relatively low cost relative to other North American competitors, BC producers have begun to make significant production curtailments to balance supply with demand.

Low Lumber Prices and Export Taxes - A new seven-year softwood lumber agreement with the United States took effect on October 12, 2006. In the short-term the most significant impact on BC producers is the export tax which increases, in increments, from 0% to 15% as the price of lumber falls.

Price of Lumber (USD per thousand board feet)	Export Tax
> 355	0 %
< 355 but > 335	5%
< 335 but > 315	10%
< 315	15%

The double hit of a 15% tax coupled with current low lumber prices below $250/mbf U.S. has caused widespread lumber production curtailments across Canada.

Market Share - Over the last five years significant investments have been made in Eastern Europe's forestry industry. German softwood lumber exports to the US have risen more than 300% and now have a 10% market share. Russia's vast timber resources are another source of future softwood lumber competition given the Russian government's desire to promote the development of a large domestic sawmilling industry. Canada's share of the Japanese housing market continues to decline because of European and Russian exports.

In the short-term, BC Hydro's forecast assumes that sawmills will reduce production and reduce shifts in response to these factors. Interior production will be low in 2008 before rebounding closer to capacity by 2009. This results in a slower growing sales forecast.

Significant declines in US housing activity during the second half of 2006 and all of 2007 are expected to curtail some BC forestry production for at least the remainder of 2008.

Wood Products Outlook: Medium-term to Long-term

Coastal forestry production is expected to remain flat for the foreseeable future. The primary causes include: 1) increased competition in established Canadian markets such as Japan; and 2) higher harvesting costs caused by steep terrain, out-dated equipment and higher labour costs.

Once interior production rebounds it will remain fairly stable during the next four years. Mills have an incentive to operate and take advantage of beetle-killed timber before the wood deteriorates.

In the longer term, interior forestry production will decline from the high levels experienced between 2004 and 2006 as annual allowable cuts fall and the impact from the pine beetle is fully realized. The forecast relies on a 20 year lumber production forecast prepared by AMEC that predicts the decline will begin in F2012/13 and continue until about 2018/19 before reaching a lower long-term production level.

Key issues for BC lumber sales in the medium-term include:

- Changes in domestic timber supply. A move to smaller, poorer quality, second growth timber on Vancouver Island and beetle destruction of large volumes of wood are expected to eventually raise fiber costs. In the shorter-term there has been a significant increase in the allowable cut to take advantage of dead and beetle-damaged timber. Allowable cuts are expected to begin falling within 4-5 years.
- Changes in stumpage policy. The BC government has implemented market-based stumpage pricing in the coastal and interior regions. Stumpage prices are now determined based on timber auctions instead of market prices. This change has reduced stumpage on the coast and led to a moderate increase in the BC interior. Within 10 years, the change should benefit interior producers who will pay less stumpage as the value of beetle killed wood declines due to degradation.
- Changes in lumber demand. On-going oversupply in the North American market is likely to keep prices depressed until sometime in F2009/10 and lead to more rationalisation of mills and mill closures.

- Competition. Eastern European and Russian production increases will cause competition for Canadian exports.

Pulp and Paper Outlook: Short-Term

The BC pulp and paper industry includes more than 20 mills scattered throughout all regions of the province. The industry produces and exports a wide variety of products including newsprint, unbleached kraft (UBK) and bleached chemical pulp and thermo-mechanical pulp (TMP) and marked bleached thermo-mechanical pulp (CTMP) which can come from either hardwood or softwood.

Softwood is predominantly used by mills in the Prince George, Quesnel and South Interior regions. Hardwood is used by more northern mills located in the Chetwynd area. Vancouver Island uses softwood to produce TMP and CTMP.

BC pulp capacity continues a moderate decline that began in the mid 1990's. Since 2002, capacity has fallen from 9.1 million metric tonnes in 2002 to 8.2 million metric tonnes. Bleached kraft pulp capacity has been in long-term decline since the mid-1990's as paper producers have shifted towards lower cost mechanical pulp alternatives.

In the short-term forecast, pulp and paper electrical consumption has been reduced for several reasons including: (i) persistence of a higher Canadian dollar that has reduced the competitiveness of this industry; (ii) continued lower demand for North American newsprint; (iii) lower lumber production and a tightening of fiber supply availability; and (iv) customers with self generation will continue reducing sales in response to new rates.

Pulp and Paper Outlook: Medium to Long-term

Many of the issues impacting the operations for pulp and paper mills in the short-term are expected to be exacerbated over the medium and long-term. For example, in the medium-term it is expected that the U.S housing market will recover, however over the same time period the impact of the Mountain Pine Beetle infestation will have reduced interior harvest viability. This will reduce fiber supply for BC pulp mills which use residual chips from lumber and whole log chipping. This is expected to lower sales and expected production during middle part of the forecast period (between F2010/11 to F2015/16).

Other issues over the medium and long-term facing BC pulp producers are

- Ongoing decline in the North American newsprint market, where demand has decreased by 4% annually for the past four years; this is expected to foreshadow a slow decline in the world newsprint market.
- Slowing demand growth for most printing and writing paper grades, with some bright spots such as directory paper (example: Yellow Pages). Several BC companies continue to make a successful transition away from kraft pulp and newsprint to higher value products.
- Growing demand for paper products and market pulp by China and other developing economies because of increased needs for packaging materials and tighter markets for fiber (positive factors for BC). Continued expansion of production of newer, low cost mills in developing countries (negative factor for BC).

- The risk of major equipment failure as some assets near end-of-life. Some mills may be forced to close because they lack the cash flow to fix or replace their capital intensive assets.
- A number of BC pulp and paper mills are reasonably high cost producers compared to competitors in Latin America and Asia. A significant amount of re-investment would be needed to upgrade existing capital.

In response to these issues, It is anticipated that producers will shift newsprint capacity to higher value coated and uncoated mechanical speciality papers. As such, there is some increase in sales reflected in the forecast towards F2016/17. Beyond that period, the sales forecast is relatively flat.

8.4.2. Medium-Term Mining Outlook

Some 20 mines currently purchase power from BC Hydro, with more metal mines and coal mines currently in development. Most production is for export and there is relatively little domestic processing or manufacturing based on mineral production. Coal is sold primarily to Japan and China with the demand for metallurgical coal decreasing in Japan but increasing in China. Reflected in the 2007 forecast are three large potential mining projects in the Northwest corridor of the province. Due to project-specific costing and construction issues, changing conditions in the Northwest, forecasted consumption from these projects has been delayed relative to their expected announced start dates.

BC mineral exploration spending, including gold, copper, molybdenum, zinc, and coal, has rebounded from a low of $40 million per year in 2000 to more than $265 million in 2006 because of record high mineral prices. Mineral prices are expected to remain high for the next 2 – 4 years before returning to more historically average levels. Coal prices remain elevated because of strong Asian demand and transportation bottlenecks in Australia, which is the world's largest metallurgical coal exporter.

Key issues for BC mining sales in the medium-term include:

- A renewed interest in the BC mining industry with increasing exploration spending and numerous companies submitting mining projects to the Environmental Assessment Office. As well, there is the potential for a new transmission power line to be constructed in the Northwest corridor of the Province. These two factors increase the viability of new mines opening in BC and have put upward pressure on the metal mining sales forecast.
- At least two BC coal mines are nearing the end of their reserve lives over the medium to long-term. This has put downward pressure on the coal mining sales forecast.
- A recent negative recommendation by the joint Federal and Provincial environmental assessment review of the Kemess North mining project has resulted in Northgate announcing that it has written off its $32 million investment in the project. As such, this has put downward pressure on the sales forecast.
- Based on the expectation of sustained higher copper prices, Highland Valley Copper has indicated that operations will continue until at least F2019/20. Beyond this, a reduction in their load has been reflected in the forecast since this load is a significant share of sales in this sector.

8.4.3 Chemical Outlook

The BC kraft chemical-based pulp and paper sector buys a significant portion of the province's chemical plant output. As such, the sales forecast are similar to trend in the pulp and paper forecast.

8.4.4 Distribution Outlook

Key industrial distribution sub-sectors are manufacturing (40%), wood products and forestry (38%), mining (10%), construction (6%), and agriculture and fishing (6%). BC Hydro does not have disaggregated GDP forecasts by industry category and it has relied on the overall GDP forecast as the driver of industrial sales. As such, the growth in industrial distribution load is expected to remain relatively stable and follow trends in the overall BC economy over the next few years. BC Hydro has also reflected adjustments to the GDP-based regression forecast to account for a reduction in wood production expected in medium and long-term.

8.5. Forecast Methodology

In the 2006 forecast two industrial transmission forecasts were developed before DSM. First, a forecast for each industrial transmission account was developed using historical trends, company/industry analysis, and customer specific information from BC Hydro Key Account Managers. This is referred to as the bottom-up forecast. A second top-down forecast was developed using a regression model of the relationship between total industrial transmission sales and GDP. These two forecasts were blended over the first five years and then the medium-term and long-term sales forecast was based on the growth rate of the GDP-based regression model. In this year's forecast, BC Hydro has developed a single forecast for each industrial transmission account for all 21 years for wood and pulp and paper customers and 11 years for all customers in the other industrial sectors. The growth rates for industrial customers, beside wood and pulp and paper, over the second 10 years are based on a regression; sales and GDP.

The industrial distribution forecast is based on results from a regression model and customer-specific adjustments.

Drivers – The drivers of the industrial forecast include consultant reports, annual reports and information on BC Hydro major transmission accounts. Specific production forecasts were available and are used to develop the sales forecast for the larger transmission pulp and paper accounts. A forecast of GDP developed by the Conference Board of Canada is used in a regression model to develop the long-term sales forecast for the larger transmission non-forestry sectors. The sales in industrial distribution before adjustments and DSM is based on GDP regression model forecast. The BC economy has continued to grow steadily with real GDP increasing 3.1% between 2006 and 2007. The average annual growth rate in GDP is forecast to be 3.0% over the next five years, 1.9% over the next 11 years and 1.7 over the next 21 years.

8.6. Risks and Uncertainties

The factors below highlight some of the items that may contribute to higher or lower sales in the industrial forecast.

Factors Leading to Lower than Forecast Industrial Sales

- Further increases in the value of the Canadian dollar could reduce pulp and paper sector production. BC's coastal pulp and paper mills are particularly vulnerable when a high Canadian dollar coincides with depressed commodity prices.

- North American newsprint demand continues to decline. Chinese newsprint exports could increase significantly over the next 5 years leading to continued price declines and closures at BC facilities.
- The depressed housing market in the United States has reduced the demand for BC lumber. Rises in interest rates or a deepening of the economic slowdown could prolong currently depressed lumber prices and lead to more BC production curtailments.
- A reduction in growth in BRIC countries (Brazil, Russia, India and China) growth could lead to a slowing of commodity demand and commodity prices for base metals, coal, and molybdenum.
- The rejection of new mining projects by the BC Environmental Assessment Office or the federal Department of Fisheries and Oceans.

Factors Leading to Higher than Forecast Sales

- Strengthening world demand for market pulp and energy-intensive paper grades could increase electricity demand in the pulp and paper sector, although the BC industry appears to be operating close to full capacity;
- Growth in China and India exceeds forecasted levels causing increasing demand for wood, pulp, paper, chemical, and mineral products.

Table 8.1. Industrial Sales Before DSM and Rate Impacts (GWh)

Fiscal Year	Transmission Voltage Customers						Distribution	
	Metal Mines	Coal Mines	Wood	Pulp & Paper	Chemical	Other	All Sectors	Total Sales
Actual								
2001/02	1,952	554	885	7,957	1,626	880	3,884	17,739
2002/03	1,873	516	928	8,534	1,798	902	4,046	18,596
2003/04	1,906	467	937	8,785	1,787	950	3,893	18,725
2004/05	1,990	507	1,003	9,178	1,812	938	4,208	19,635
2005/06	2,312	507	1,110	9,037	1,744	953	4,272	19,936
2006/07	2,297	475	1,195	8,678	1,587	985	4,252	19,469
Forecast								
2007/08[6]	2,346	528	1,193	7,940	1,579	1,027	4,403	19,016
2008/09	2,491	534	1,205	8,156	1,641	1,073	4,471	19,571
2009/10	2,516	546	1,322	8,075	1,688	1,103	4,544	19,794
2010/11	2,015	557	1,342	8,374	1,688	1,151	4,630	19,757
2011/12	1,968	568	1,362	7,996	1,688	1,187	4,706	19,475
2012/13	2,043	580	1,284	7,996	1,692	1,225	4,742	19,562
2013/14	2,825	538	1,163	7,996	1,703	1,265	4,789	20,279
2014/15	3,326	549	1,137	7,996	1,703	1,307	4,820	20,838
2015/16	3,275	561	1,107	7,996	1,703	1,350	4,843	20,835
2016/17	3,352	540	1,078	8,105	1,703	1,396	4,863	21,037
2017/18	3,433	550	1,000	8,105	1,703	1,444	4,868	21,103
2018/19	3,464	555	997	8,105	1,718	1,458	4,890	21,187
2019/20	2,452	560	994	8,105	1,734	1,471	4,912	20,228
2020/21	2,474	565	991	8,105	1,749	1,484	4,932	20,300
2021/22	2,496	570	988	8,105	1,765	1,497	4,953	20,374
2022/23	2,518	575	985	8,105	1,781	1,510	4,966	20,440
2023/24	2,540	580	982	8,105	1,796	1,523	4,984	20,510
2024/25	2,561	585	979	8,105	1,811	1,536	5,001	20,578
2025/26	2,583	590	976	8,105	1,826	1,549	5,016	20,645
2026/27	2,604	595	973	8,105	1,842	1,562	5,031	20,712
2027/28	2,626	600	970	8,105	1,857	1,575	5,045	20,778
Growth Rates:								
5 years: 01/02 to 06/07	3.3%	-3.0%	6.2%	1.7%	-0.5%	2.3%	1.8%	1.9%
5 years: 06/07 to 11/12	-3.0%	3.6%	2.7%	-1.6%	1.2%	3.8%	2.0%	0.0%
11 years: 06/07 to 17/18	3.7%	1.3%	-1.6%	-0.6%	0.6%	3.5%	1.2%	0.7%
21 years: 06/07 to 27/28	0.6%	1.1%	-1.0%	-0.3%	0.8%	2.3%	0.8%	0.3%

[6] F2007/08 forecast reflects a coastal forestry labour disruption between July 2007 and October 2007. It was anticipated that electricity sales to some coastal pulp and paper mills would be reduced.

9 Non-Integrated Areas and Other Utilities Forecast

9.1. Non Integrated Area Summary

Characteristics - The non-integrated area (NIA) consists of locations served by BC Hydro, but are not connected to the BC Hydro transmission grid. It has three components: the Purchase Area, Zone II, and Fort Nelson.

The Purchase Area consists of six locations in the South Interior, namely Lardeau, Crowsnest, Newgate, Kingsgate-Yahk, Kelly Lake, and Keenleyside Dam. BC Hydro's billing system does not break out sales to the Purchase Area separately, but information on energy and capacity purchases to serve the Purchase Area is available. To serve customers in the Purchase Area, BC Hydro purchases electricity from various neighbouring electric utilities.

Zone II consists of nine locations in the Northern Region, namely Masset, Sandspit, Atlin, Dease Lake, Eddontenajon, Telegraph Creek, Anahim Lake, Bella Bella, and Bella Coola.

In F2006/07, annual generation requirements for the Purchase Area, Zone II, and Fort Nelson were 16 GWh, 110 GWh, and 170 GWh respectively.

At the end of F2006/07, there were 6,485 accounts in Zone II, and 3,207 accounts in Fort Nelson, which together represented 0.6% of all the accounts in the BC Hydro service area.

In F2006/07, sales to the NIA represented about 0.5% of total BC Hydro service area sales. Fort Nelson is not connected to the BC Hydro transmission grid, but it is connected to the Alberta grid. Unlike Zone II customers, Fort Nelson customers are charged the same rates as BC Hydro Integrated system customers. In F2006/07, sales to Fort Nelson were 157 GWH, which was 58% of all the sales in the NIA. Because of activity in the oil and gas sector, there is more potential for growth in Fort Nelson than in other NIA locations.

Drivers – The drivers of the NIA forecast are the number of accounts and the average annual use per account. For each community, the number of accounts is driven by a population forecast for its local health area, which is provided by BC Stats. Average annual use per account is assumed to grow at the same rate as the rest of the Northern Region. In Fort Nelson, there are currently two large accounts that represent about 60% of all sales. Those two accounts are forecast separately and added to the forecast for the rest of the customers in Fort Nelson. Additional forecasts were also included for three new large accounts which are expected to be connected in F2007/08. One of these three new large accounts is expected to terminate in two years.

Trends – With the exception of Fort Nelson, growth in the NIA tends to be slower than growth in the rest of the system. Excluding Fort Nelson, F2006/07 sales grew by 1.04% over F2005/06, and were 3.20% below the 2006 Forecast for F2006/07. Excluding Fort Nelson, the updated sales forecast for the NIA for F2011/12 is down by 0.53% compared to the 2006 Forecast because of the lower anchor point for F2006/07, and because of the lower trends associated with the lower anchor point. Including Fort Nelson, the new sales forecast for NIA for F2011/12 is up by 18.50% mainly because of two new large accounts expected in Fort Nelson.

Risks and Uncertainties – The main risks to the forecast for the NIA are discrete events such as the opening or closing of a large new account.

Table 9.1. Non Integrated Area Sales Before DSM and Rate Impacts (GWh)

Fiscal Year	**Purchase Area** Sales	**Zone II** Sales	**Fort Nelson** Sales	**Total NIA** Sales
Actual				
2001/02	19 (estimate)	99	137	255
2002/03	20 (estimate)	98	157	275
2003/04	21 (estimate)	98	161	280
2004/05	20 (estimate)	97	174	291
2005/06	18 (estimate)	97	155	270
2006/07	15 (estimate)	101	157	272
Forecast				
2007/08	16	103	191	310
2008/09	16	104	253	373
2009/10	16	105	254	375
2010/11	16	106	233	355
2011/12	16	107	236	359
2012/13	16	107	240	364
2013/14	17	108	243	368
2014/15	17	109	246	372
2015/16	17	109	250	376
2016/17	17	110	253	379
2017/18	17	110	256	383
2018/19	17	111	259	387
2019/20	17	111	262	391
2020/21	18	112	265	395
2021/22	18	112	268	398
2022/23	18	112	271	402
2023/24	19	113	274	405
2024/25	19	113	276	408
2025/26	19	113	279	411
2026/27	20	113	282	414
2027/28	20	113	284	417
Growth Rates				
5 years: 01/02 to 06/07	-4.9%	0.5%	2.7%	1.3%
5 years: 06/07 to 11/12	2.1%	1.1%	8.6%	5.7%
11 years: 06/07 to 17/18	1.2%	0.8%	4.6%	3.2%
21 years: 06/07 to 27/28	1.5%	0.6%	2.9%	2.1%

Note: The sales in the table above represent part of the total sales for residential, commercial, and industrial sales as shown in other sections of this document.

Table 9.2. Non Integrated Area Generation Requirements (GWh)

Fiscal Year	Purchase Area	Zone II	Fort Nelson	Total NIA
Actual				
2001/02	20	105	149	274
2002/03	21	104	163	288
2003/04	22	106	167	295
2004/05	21	105	168	294
2005/06	19	105	201	325
2006/07	16	110	170	295
Forecast				
2007/08	17	111	206	334
2008/09	17	112	273	403
2009/10	17	113	275	405
2010/11	17	114	252	384
2011/12	17	115	256	388
2012/13	17	116	259	393
2013/14	18	117	263	397
2014/15	18	117	267	401
2015/16	18	118	270	406
2016/17	18	119	274	410
2017/18	18	119	277	414
2018/19	18	120	280	418
2019/20	18	120	284	422
2020/21	19	121	287	426
2021/22	19	121	290	430
2022/23	19	121	293	434
2023/24	20	122	296	438
2024/25	20	122	299	441
2025/26	21	122	302	445
2026/27	21	122	305	448
2027/28	21	122	307	451
Growth Rates				
5 years: 01/02 to 06/07	-4.9%	0.8%	2.7%	1.5%
5 years: 06/07 to 11/12	2.1%	1.0%	8.5%	5.6%
11 years: 06/07 to 17/18	1.2%	0.8%	4.5%	3.1%
21 years: 06/07 to 27/28	1.5%	0.5%	2.9%	2.0%

Table 9.3. Non Integrated Area Peak Requirements (MW)

Fiscal Year	**Purchase Area** Peak	**Zone II** Peak	**Fort Nelson** Peak	**Total NIA** Peak
Actual				
2001/02	6	22	24	51
2002/03	6	21	25	52
2003/04	6	24	26	56
2004/05	6	23	29	58
2005/06	5	21	34	61
2006/07	5	24	29	58
Forecast				
2007/08	5	24	43	72
2008/09	5	24	45	74
2009/10	5	24	45	74
2010/11	5	24	42	72
2011/12	5	25	43	72
2012/13	5	25	43	73
2013/14	5	25	44	74
2014/15	5	25	44	75
2015/16	5	25	45	75
2016/17	5	25	46	76
2017/18	5	25	46	77
2018/19	5	26	47	78
2019/20	5	26	47	78
2020/21	5	26	48	79
2021/22	6	26	48	80
2022/23	6	26	49	80
2023/24	6	26	49	81
2024/25	6	26	50	82
2025/26	6	26	50	82
2026/27	6	26	51	83
2027/28	6	26	51	83
Growth Rates				
5 years: 01/02 to 06/07	-3.6%	2.1%	4.0%	2.4%
5 years: 06/07 to 11/12	1.1%	0.3%	8.1%	4.6%
11 years: 06/07 to 17/18	0.8%	0.5%	4.3%	2.6%
21 years: 06/07 to 27/28	1.3%	0.4%	2.7%	1.8%

Note: Non-Integrated peak requirements are not included in the peak forecast as shown in other section of this document.

9.2. Other Utilities Summary

Characteristics – The Other Utilities served by BC Hydro are: City of New Westminster, Fortis BC, Seattle City Light and Hyder. The City of New Westminster is surrounded by BC Hydro's Lower Mainland region. The Fortis BC service area is part of south-eastern British Columbia which is outside the BC Hydro service area. Seattle City Light is in the state of Washington, and Hyder is in the state of Alaska. Hyder is served at distribution voltage, but the other three utilities are served at transmission voltage.

In accordance with a BCUC decision dated June 9, 1993, BC Hydro is obligated to provide Fortis BC with up to 200 MW under tariff rates.

BC Hydro is obligated to serve Seattle City Light in accordance with a treaty between British Columbia and Seattle dated March 30, 1984. The treaty terminates on January 1, 2066.

Since Stewart, BC, is connected to the BC Hydro grid, and since Hyder, Alaska, is 5 km away from Stewart, BC Hydro also serves Hyder.

In F2006/07, annual energy sales to City of New Westminster, Fortis BC, Seattle City Light, and Hyder were 429 GWh, 972 GWh, 310 GWh, and 1 GWh respectively.

Drivers – The forecast for the City of New Westminster is based on trend analysis. The forecast for Fortis BC is based on information received annually from that utility. The forecast for Seattle City Light is defined by the treaty, and the forecast for Hyder is 1 GWh per year.

Trends – The City of New Westminster is forecast to continue the modest growth of about 1% which has been the average over the last ten years. The forecast for purchases by Fortis BC from BC Hydro are relatively growing at the same rate as last year's forecast over the long term. Both Seattle City Light and Hyder are forecast to have no significant growth.

Risks and Uncertainties – The main risk to the forecast for the City of New Westminster is a discrete event such as a large new account. The main risk to the forecast for Fortis BC is a change in how that utility plans to meet its supply requirements. Since the forecast for Seattle City Light is based on a signed treaty, the risk is minimal over the entire forecast period. The load for Hyder is so small, that any associated risks and uncertainties are also minimal.

Table 9.4. Sales to Other Utilities before Rate Impacts (GWh)

Fiscal Year	**City of New Westminster** Sales	**Fortis BC** Sales	**Seattle City Light** Sales	**Hyder, Alaska** Sales	**Total Other Utilities** Sales
Actual					
2001/02	383	678	310	1	1,373
2002/03	400	672	310	1	1,384
2003/04	411	774	310	1	1,497
2004/05	411	758	300	1	1,470
2005/06	415	820	320	1	1,556
2006/07	429	972	310	1	1,712
Forecast					
2007/08	432	937	312	1	1,652
2008/09	436	920	310	1	1,763
2009/10	440	981	310	1	1,832
2010/11	444	1,056	310	1	1,893
2011/12	448	1,122	312	1	1,932
2012/13	452	1,176	310	1	1,967
2013/14	456	1,198	310	1	1,989
2014/15	460	1,211	310	1	2,007
2015/16	464	1,227	312	1	2,029
2016/17	468	1,238	310	1	2,043
2017/18	472	1,252	310	1	2,061
2018/19	476	1,266	310	1	2,077
2019/20	480	1,282	312	1	2,098
2020/21	484	1,291	310	1	2,110
2021/22	488	1,303	310	1	2,126
2022/23	492	1,315	310	1	2,142
2023/24	496	1,330	312	1	2,161
2024/25	500	1,340	310	1	2,170
2025/26	504	1,350	310	1	2,185
2026/27	508	1,360	310	1	2,200
2027/28	512	1,373	312	1	2,219
Growth Rates					
5 years: 01/02 to 06/07	2.3%	7.5%	0.0%	0.0%	4.5%
5 years: 06/07 to 11/12	0.9%	2.9%	0.1%	-2.3%	1.9%
11 years: 06/07 to 17/18	0.9%	2.3%	0.0%	-1.1%	1.6%
21 years: 06/07 to 27/28	0.8%	1.7%	0.0%	-0.6%	1.2%

10 Peak Forecast

10.1. Peak Description

BC Hydro's peak demand is defined as the maximum expected amount of electricity consumed in a single hour under an average cold temperature assumption referred to as the design temperature. BC Hydro is a winter peaking utility, because the system's demand is more sensitive to colder temperatures than warmer summer temperatures. On a cold winter day, the total BC Hydro system typically peaks between 5:00 pm and 6:00 pm. Vancouver Island has a morning and an evening peak as residential space heating is a larger component of the Island load.

The domestic peak includes distribution substation peaks, transmission customer peaks and the peak demand of the City of New Westminster and system transmission losses. The Integrated system peak demand is the domestic peak demand plus the peak demands from the other served utilities such as Fortis BC and system transmission losses.

Distribution substation peaks are the most sensitive to ambient temperature. Distribution peak demand is driven by the number of residential accounts and employment. In addition, distribution peak demand includes other larger discrete loads such as shopping malls, waste treatment facilities and other infrastructure projects that contribute to the peak at specific distribution substations.

Transmission peak demand is responsive to external market conditions and changes in demands for BC's key industrial commodities such as wood, pulp and paper and mining sectors. Information on industry reports and market intelligence form BC Hydro's Key Account Mangers are the sources of information used to develop the transmission peak demand forecast.

10.2. Peak Forecast Summary

For F2007/08, the total integrated system peak forecast, including peak requirements from the other utilities served by BC Hydro, is 10,784 MW before incremental DSM and excluding rate impacts. The integrated system peak is forecast to grow from 10,371 MW in F2007 to 11,383 MW in F2012, to 12,175 MW in F2018, and 13,797 MW in F2027/28. These increases represent growth rates of 1.9 per cent over the next five years (F2006/07 to F2011/12), 1.5 per cent over the next 11 years (F2006/07 to F2017/18), and 1.4 per cent over the next 21 years of the forecast (F2006/07 to F2027/28). The total integrated system peak forecasts before DSM and with rate impacts for all 21 years are provided in Appendix 3.

BC Hydro's all time total domestic system peak of 10,113 MW occurred on November 29, 2006. The daily average temperature for that day recorded at the Vancouver International Airport was -5.9 ºC[7]. For F2006/07, the weather normalized domestic peak is estimated as 10,176 MW and 10,449 MW for the total integrated system peak.

[7] The total BC Hydro distribution peak is the sum of four distribution peaks in each of the main four service regions. Each of the four distribution peaks have a design temperature based on the rolling average of the annual coldest daily average temperature over the most recent 30 years. For the Lower Mainland, the design temperature is -5.3 ºC; for Vancouver Island, the temperature is -3.6 ºC; for South Interior, the temperature is -16.4 ºC and for Northern Region, the temperature is -28.5 ºC.

Between F2005/06 and F2006/07, the weather normalized domestic system peak demand grew by 364 MW or 3.7%. This reflects the strong growth in the distribution sector during this time period. The total coincident distribution peak grew by 361 MW or 5.1% after weather adjustments. The coincident transmission peak demand declined by 31 MW or 1.6% over the same time period and the non coincident peak demand declined by 70 MW or 1.3%.

The recent decline in transmission peak reflects lower demand in the forestry sector. Lower transmission demand is expected to continue due to factors such as the pine beetle infestation, the appreciation of the Canadian dollar, low lumber prices, a decline in U.S housing demand and a decline in demand for newsprint. It is anticipated that the distribution peak will continue to experience growth as the BC goods and service sector expands. In addition, several metropolitan areas are expected to have strong growth in distribution peak demand due to expansion in housing, infrastructure and other smaller commercial projects.

10.3. Peak Forecast Comparison

10.3.1. Distribution Peak Comparison

The figure 10.1 compares the Annual 2006 and current total BC Hydro coincident distribution substation peak forecasts before DSM and rate impacts.

The distribution peak forecast is above last year's forecast. The increase reflects the strong growth historical growth between F2005/06 and F2006/07, an increase in the drivers of the peak forecast including housing starts and employment, and strong growth in demand from discrete projects include Winter Olympic facilities. Most of the growth in the distribution peak is occurring in larger metropolitan areas including Vancouver, Richmond, the City of New Westminster and Victoria.

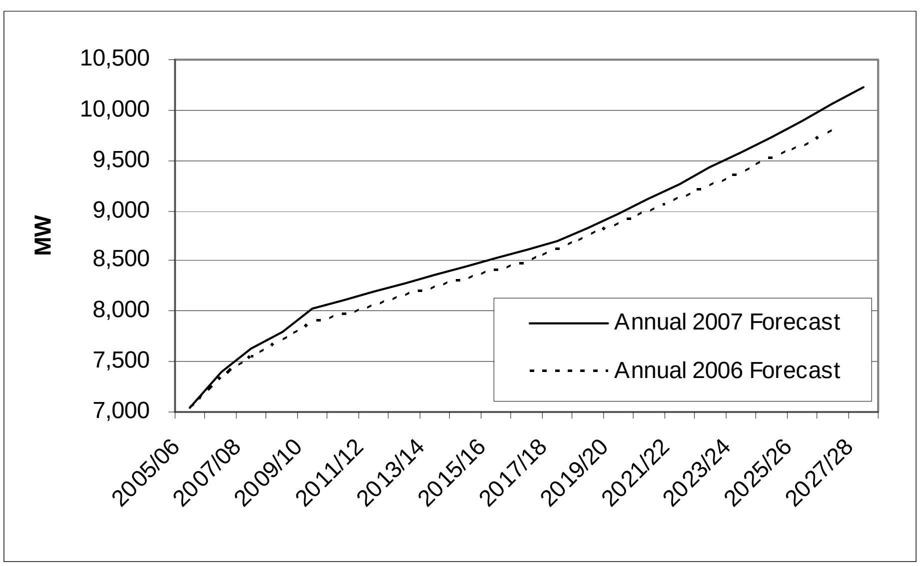
Long-term projections (the second 10 years of the forecast) reflect growth in the distribution energy forecast in each of the four major service regions.

Table 10.1 2007 and 2006 Distribution Peak Forecasts before DSM and Rate Impacts (MW)

Fiscal Year	2007 Forecast	2006 Forecast	2007 Forecast Less 2006 Forecast	% Difference
2005/06	7,040*	7,040*	-	0.0%
2006/07	7,402*	7,336	66	0.9%
2007/08	7,618	7,544	74	1.0%
2008/09	7,799	7,719	80	1.0%
2009/10	8,024	7,877	146	1.9%
2010/11	8,103	7,954	149	1.9%
2011/12	8,199	8,053	146	1.8%
2012/13	8,283	8,143	140	1.7%
2013/14	8,366	8,233	133	1.6%
2014/15	8,447	8,318	129	1.5%
2015/16	8,530	8,402	128	1.5%
2016/17	8,610	8,488	123	1.4%
2017/18	8,692	8,609	83	1.0%
2018/19	8,832	8,731	101	1.2%
2019/20	8,975	8,856	119	1.3%
2020/21	9,121	8,982	139	1.5%
2021/22	9,270	9,111	159	1.7%
2022/23	9,421	9,241	180	1.9%
2023/24	9,575	9,373	202	2.2%
2024/25	9,732	9,508	225	2.4%
2025/26	9,892	9,644	248	2.6%
2026/27	10,055	9,782	273	2.8%
2027/28	10,221			

* = Weather Normalized Actual

Figure 10.1. Comparison of Annual 2007 vs. Annual 2006 BC Hydro's Distribution Peak Forecast before DSM and Rate Impacts



10.3.2. Transmission Peak Comparison

Figure 10.2 compares the Annual 2006 and current total BC Hydro coincident transmission peak forecasts before DSM and rate impacts. The transmission peak forecast is below last year's forecast for the entire forecast period. This reflects historical decline in the peak between F2005/06 and F2006/07 on a coincident and non-coincident basis. With this decline the peak demand starts from a lower point compared to last year's forecast. This year's forecast also reflects revised expectations for transmission customers in the forestry sector. In the short-term, the decline in demand reflects low lumber prices, record low U.S housing starts, a higher Canadian dollar and declining demand for newsprint. In the long-term, demand in the forestry sector is forecast to lower due to the impact of pine beetle infestation and the assumption of low levels of investment in infrastructure in forestry operations.

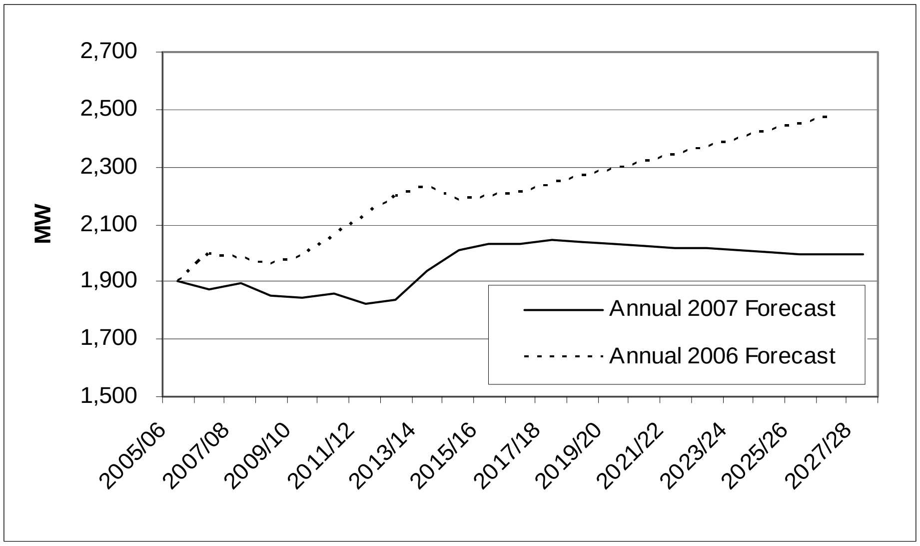
Over the long-term, (i.e. in the last 10 years) the long-term transmission energy forecast is below last year's forecast. This contributes to a slower growing transmission peak relative to last year's forecast.

Table 10.2. 2007 and 2006 Transmission Peak Forecasts before DSM and before Rate Impacts (MW)

Fiscal Year	2007 Forecast	2006 Forecast	2007 Forecast Less 2006 Forecast	% Difference
2005/06	1,904*	1,904*	-	0.0%
2006/07	1,873*	1,992	(119)	-6.0%
2007/08	1,893	1,982	(89)	-4.5%
2008/09	1,858	1,961	(104)	-5.3%
2009/10	1,853	1,992	(139)	-7.0%
2010/11	1,871	2,060	(189)	-9.2%
2011/12	1,844	2,131	(287)	-13.5%
2012/13	1,853	2,193	(340)	-15.5%
2013/14	1,958	2,231	(274)	-12.3%
2014/15	2,027	2,179	(152)	-7.0%
2015/16	2,058	2,197	(139)	-6.3%
2016/17	2,058	2,215	(157)	-7.1%
2017/18	2,069	2,240	(170)	-7.6%
2018/19	2,062	2,265	(203)	-9.0%
2019/20	2,056	2,291	(235)	-10.3%
2020/21	2,050	2,317	(267)	-11.5%
2021/22	2,044	2,343	(299)	-12.8%
2022/23	2,039	2,370	(331)	-14.0%
2023/24	2,035	2,397	(362)	-15.1%
2024/25	2,031	2,424	(394)	-16.2%
2025/26	2,027	2,452	(425)	-17.3%
2026/27	2,024	2,480	(456)	-18.4%
2027/28	2,021			

* = Actual

Figure 10.2. Comparison of Annual 2007 vs. Annual 2006 BC Hydro's Transmission Peak Forecast before DSM and Rate Impacts



10.3.3. System Forecast Comparison

Table 10.3 compares the Annual 2006 and current total Integrated System peak forecasts before DSM and rate impacts. The Integrated Peak forecast is the sum of the coincident distribution, transmission, peak forecasts for the other utilities and system transmission losses.

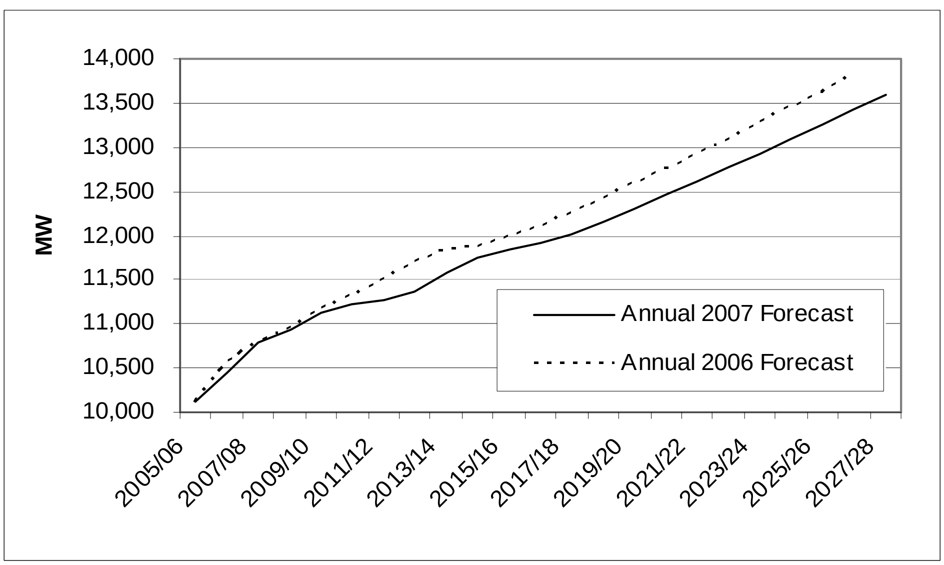
For F2007/08, this year's forecast is very close to last year's forecast as there is offsetting changes in the distribution and transmission peak demands (i.e. the distribution portion is above last year's forecast while the transmission forecast is below last year's forecast). Beyond the current year, the 2007 forecast is lower due to factors discussed in the transmission forecast section.

Table 10.3 Total Integrated Peak Forecast Comparison (MW)

Fiscal Year	2007 Forecast	2006 Forecast	2007 Forecast Less 2006 Forecast	% Difference
2005/06	10,130*	10,130*	-	0.0%
2006/07	10,449*	10,570	(121)	-1.1%
2007/08	10,784	10,782	2	0.0%
2008/09	10,949	10,955	(6)	-0.1%
2009/10	11,195	11,166	29	0.3%
2010/11	11,305	11,328	(23)	-0.2%
2011/12	11,383	11,520	(137)	-1.2%
2012/13	11,487	11,693	(206)	-1.8%
2013/14	11,693	11,838	(145)	-1.2%
2014/15	11,859	11,879	(20)	-0.2%
2015/16	11,984	11,991	(7)	-0.1%
2016/17	12,073	12,103	(30)	-0.2%
2017/18	12,175	12,263	(88)	-0.7%
2018/19	12,321	12,425	(104)	-0.8%
2019/20	12,471	12,589	(118)	-0.9%
2020/21	12,624	12,756	(132)	-1.0%
2021/22	12,781	12,925	(144)	-1.1%
2022/23	12,941	13,097	(156)	-1.2%
2023/24	13,105	13,271	(166)	-1.3%
2024/25	13,272	13,448	(176)	-1.3%
2025/26	13,443	13,627	(184)	-1.3%
2026/27	13,618	13,809	(191)	-1.4%
2027/28	13,797			

* = Weather Normalized Actual

Figure 10.3. Comparison of Annual 2007 vs. Annual 2006 BC Hydro's Integrated System Peak Forecast before DSM and Rate Impacts



10.4. Peak Forecast Methodology

10.4.1 Distribution Peak Methodology

At the distribution level, electricity demand is closely linked to the historical trends in distribution substation load growth and the economic outlook for each forecast region in the province. As such, the regional economic outlook is one of the primary inputs into distribution peak demand forecasts. BC Hydro obtains a regional economic forecast from the Conference Board of Canada.

The distribution peak forecast is developed using forecasts from two main sources. These include forecasts from an econometric model referred to as the distribution peak guidelines forecast and forecasts for each of the BC Hydro's distribution substations. The substation forecasts are based on the growth in the guidelines forecasts, expected transfers among substations and anticipated new large loads (i.e. discrete projects) that are specific to each substation.

The distribution peak guideline forecast is prepared for 15 different planning areas for the first 11 years of the forecast period. The forecast provides a guideline for the total non-coincident (MVA) growth for all of the substations serving distribution customers in that area. The main stock drivers, used in the model, are the forecasts of employment and the number of residential customer accounts, which is driven by housing starts.

After the distribution peak guidelines and substation forecasts are completed for each of the 15 areas, the substation peak forecasts for each distribution substation is prepared. Next, these forecasts are aggregated from 15 planning areas to develop a total distribution substation peak for each the four major service regions (i.e. the Lower Mainland, Vancouver Island, Northern Region and South Interior). Regional power factors and coincidence factors are applied to aggregated forecasts to produce four regional coincident distribution peak forecast (MW). For the last 10 years of the forecast period, the distribution peak forecast for each region is derived using the growth rate in the distribution energy sales forecast.

A total BC Hydro distribution substation peak forecast is prepared as a coincident sum of the four regional distribution peak forecasts.

The equations and other details describing the development of the distribution peak forecast are located in Appendix A1.4.

10.4.2. Transmission Peak Methodology

The transmission peak forecast is prepared on a customer-by-customer account basis. Market intelligence from BC Hydro's key account managers, historical hourly load data and reports on industry outlooks are used to develop the transmission peak forecast. The forecast for each account is prepared on a non-coincident basis for system planning purposes. These forecasts are aggregated into four total regional peak forecasts (i.e. a total transmission peak forecast for each of the four main service regions). Regional coincidence factors and power factors are applied to each of these total regional peak forecasts to establish regional coincident transmission peak forecasts. For the last 10 years of the forecast period, the transmission peak forecast for each region is derived using the growth rate in the transmission energy sales forecast.

A total BC Hydro transmission peak forecast is prepared as a coincident sum of the four regional transmission peak forecasts

The equations and other details describing the development of the transmission peak forecast are located in Appendix A1.4.

10.4.3. System Forecast Methodology

A total system peak forecast is prepared as the sum of the total coincident distribution peak, total coincident transmission peak, total other utilities peak demands and total system transmission losses.

A system transmission loss ratio of 8.7% is applied to the domestic distribution and transmission peak forecasts based on historical information.

The system peak forecast is prepared for the BC Hydro domestic system and the total integrated system. The domestic peak demand is the peak demands of the total domestic distribution and transmission peaks, the peak demand of the City of New Westminster and system transmission losses. The Integrated peak demand is the domestic peak demand plus the peak demands from the other utilities (i.e. Seattle City Light and Fortis BC) and system transmission losses.

10.5. Risks and Uncertainties

Uncertainties and risks in the peak forecast come from several factors such as the assumptions on the growth of forecast drivers and model parameters to the anticipated normal weather assumption and its impact on the peak demand.

Upward Pressure on Peak Demand:

- The strong housing demand is continued in BC with the higher number of residential accounts growth.
- Stronger regional growth in employment than anticipated.
- Continued high commodity prices and market demand for BC’s exports.
- More discrete spot load in distribution peak demand than predicted.

Downward Pressure on Peak Demand:

- Slow down in the housing market – more vacancies and less development than expected.
- Lower commodity prices and a slowdown in the US economy.
- The pine beetle infestation results in additional future forestry sector challenges

BC Hydro quantifies the overall uncertainty in the peak demand using the results of the Monte Carlo uncertainty model as described in section 5.

11 Glossary

Accrued Sales Monthly Accrued Sales are an estimate of electricity delivered within a specific month. Most customer meters are not read at every month-end, so the amount of electricity delivered in a month is not known precisely. In accordance with GAAP, monthly accrued sales are used for monthly financial reporting.

Backcasting Estimating econometric or other models over a historical time period and comparing the predictions of the models to actual results over the same time period.

Billed Sales The amount of electricity billed. Because bills are produced after the electricity has been delivered, monthly billed sales lag monthly delivery of electricity.

Binary Variable is a variable whose value is either zero or one. Binary variables are often used as independent variables in regression models in order to account for events that either occur or do not occur. In this latter context, binary variables are often referred to as "dummy variables" in regression.

Calibration Estimating econometric or other models over a historical time period.

Coincidence Factor A ratio reflecting the relative magnitude of a region's (or customer's or group of customers') demand at the time of the system's maximum peak demand to the region's (or customer's or group of customers') maximum peak demand.

Commercial Output Commercial output focuses on the provisions of services in the economy and so includes such things as public administration, insurance agents, bankers, wholesale and retail trade, food services, accommodation provisions etc.

Consumer Price Index (CPI) An inflation index calculated by comparing the price of a typical bundle of goods in the year in question to the price of the same goods in a set reference year.

Cooling Degree Day (CDD) is a measure of warmness, defined by the number of degrees above 18 degrees Celsius for the average daily temperature.

Demand-Side Management (DSM) Refers to activities that occur on the demand side of the revenue meter and are influenced by the utility. DSM activities result in a change in electricity sales. Past DSM savings include incremental load displacement and energy efficiency savings. Note that BC Hydro's historical sales includes the impact of DSM savings realized up to that year.

Distribution voltage customer A BC Hydro customer who receives electricity via distribution lines that operate at lower voltages (60 kV and less).

Domestic System Peak includes the peak requirements for BC Hydro's distribution and transmission customers in its service territory; sales to the City of New Westminster and system transmission and distribution losses.

Econometric modelling The use of statistical techniques, typically regression analysis of time-series and/or cross-sectional data, to detect statistically verifiable relationships, coherent with economic theory, between an explained variable (e.g. electricity consumption) and explanatory variables (e.g. industry output, prices of alternative energy inputs and GDP).

Elasticity The proportionate change in a dependent variable, (e.g. electricity consumption, divided by the proportionate change in a specified independent variable; electricity price). A dependent variable is highly elastic with respect to a given independent variable if the calculated elasticity is much greater than one. The dependent variable is inelastic if the elasticity is less than one.

End-use model A model used to analyze and forecast energy demand, which focuses on the end uses or services provided by energy. Typical end uses are lighting, process heat and motor drive. For a given industry, the model estimates the influence of prices and technological change on the evolution of the secondary energy inputs required to satisfy the industry's end uses over time.

Energy The amount of electricity delivered or consumed over a certain time period, measured in multiples of watt-hours. A 100-watt bulb consumes 200 watt-hours in two hours.

Energy Efficiency Is the ratio of the energy service delivered from a process or piece of equipment to the energy input. Energy efficiency is a dimensionless number, with a value between 0 and 1 or, when multiplied by 100, is given as a percentage.

GAAP Generally Accepted Accounting Principles

Gigawatt-hour (GWh) A measure of electrical energy, equivalent to one million kilowatt-hours. (See Units of Measure.)

Gross Domestic Product (GDP) A measure of the total flow of goods and services produced by the economy over a specified time period, normally a year or quarter. It is obtained by valuing outputs of goods and services at market prices (alternatively at factor cost), and then aggregating the total of all goods and services.

Heating Degree Day (HDD) Is a measure of coldness, defined by the number of degrees below 18 degrees Celsius for the average daily temperature.

Integrated System That portion of the BC Hydro system which is connected as one whole. Non-integrated facilities refer to generating facilities that are not connected to the system, located in remote areas of the province.

Integrated System Peak includes the peak requirements for BC Hydro’s distribution and transmission customers in its service territory; sales to Other Utilities, which includes Seattle City Light, New Westminster, Fortis BC and Hyder Alaska (Tongass Power and Light Co. Inc.); and system transmission and distribution losses.

Intensity A unitized measure of energy consumption, typically in kilowatt-hours per unit of stock. For example, kWh per account in the residential sector or kWh per unit of production in the industrial sector.

Kilowatt-hour (kWh) A measure of electrical energy, equivalent to the energy consumed by a 100-watt bulb in 10 hours. (See Units of Measure.)

Load The total amount of electrical power demanded by the utility's customers at any given time, typically measured in megawatts (MW).

Load Displacement Projects that involve the installation of self-generation facilities at customer sites, with the electricity generated being used on-site by the customer, with a resultant decrease in the purchase of electricity from BC Hydro.

Megawatt (MW) A unit used to measure the capacity or potential to generate or consume electricity. One MW equals one million watts. (See Units of Measure.)

Monte Carlo method A technique for estimating probabilities involving the construction of a model and the simulation of the outcome of an activity a large number of times. Random sampling techniques are used to generate a range of outcomes. Probabilities are estimated from an analysis of this range of outcomes.

MVA Megavolt-Amps – a unit of apparent power. Apparent power is real power in MW divided by power factor.

Natural conservation The increase in energy efficiency that would occur in the absence of any utility-induced demand-side management program, all other things being equal.

Non-coincident refers to use of a coincidence factor that is a ratio reflecting the relative magnitude of a region's (or customer's or group of customers') demand at the time of the system maximum peak demand to the region's (or customer's or group of customers') maximum peak demand.

Non-Integrated Area (NIA) See Integrated System.

Normalization The correction of actual customer sales and peak demand for factors such as unusually warm or cold weather.

Ordinary Least Squares (OLS) is a method of choosing parameters to minimize the sum of squares of errors produced as a function of a set of variables.

Price elasticity of demand The percentage change in quantity demanded, divided by the percentage change in price that caused the change in quantity demanded.

Real price increases that have been adjusted for changes in prices of all goods. The nominal price of an item may rise by 10 per cent over a year, but inflation (and assumed wages) may have risen by seven per cent over the same time period. Therefore the effective price increase faced by the consumer is close to three per cent. It is necessary to deflate current prices by an appropriate inflation index (the CPI in Canada) to convert money values to constant prices or real terms.

Reference Forecast Before DSM and Rate Impacts is the energy and peak demand forecast developed under the current methodology. It is developed under the assumption that electricity rates increase at the rate of inflation and normal weather conditions.

Region A geographical sub-division of the BC Hydro service area used within the BC Hydro Load Forecast. Four regions exist: Lower Mainland, Vancouver Island, South Interior and the Northern Region.

Retail Sales are in nominal or current dollars whereas the output is measured in real dollars based to the year 1997.

Stock A quantity representing a number of energy consuming units. For example, in the residential sector, stock is the number of accounts or housing units; in the commercial sector, stock is represented by the floor area of commercial building space.

System coincident peak demand The greatest combined demand of all BC Hydro customers faced by the generation system during a given fiscal year.

Transmission voltage customer A BC Hydro customer that is supplied its electricity via high-voltage transmission lines (60 kV or above).

Units of measure The large amounts of electricity generated and consumed on a system-wide basis are discussed in multiples of the basic units of watt and watt-hours. Kilowatts and megawatts are used to measure power, and kilowatt-hours, megawatt-hours, and gigawatt-hours are used to measure energy. The equivalence are:

1 kilowatt (kW)	=	1000 watts
1 megawatt (MW)	=	1000 kilowatts or 1 million watts
1 kilowatt-hour (kWh)	=	1000 watt-hours
1 megawatt-hour (MWh)	=	1000 kilowatt-hours or 1 million watt-hours

1 gigawatt-hour (GWh)	=	1000 megawatt-hours or 1 billion watt-hours

Appendix 1A Forecast Processes and Methodologies

There are a number of key components to the demand and sales forecast: the residential forecast; the commercial forecast (distribution and transmission voltage), the industrial forecast (distribution voltage and transmission voltage), and the regional and system peak forecasts. The peak forecast includes the distribution voltage and transmission voltage peak demands. This section covers the methodology used for each of these forecast components. After the discussion on the methodology, a response to the BCUC Directive 3 from its 2006 IEP/LTAP decision is appended.

A1.1.1 Residential Sales Weather Normalization

Weather-normalized sales are an estimate of the sales that would have been made if normalized weather had been experienced (i.e. a 10 year rolling average of heating degree days). Sales are adjusted using heating degree-days (a standard approach used by the utility industry)[8]. A heating degree-day is measure of coldness, defined by the number of degrees below 18 degrees Celsius in (A1.1), for the average daily temperature. For example, if the average temperature on day t is 12 degrees Celsius then that day has 18-12 = 6 heating degree-days. The heating degree-days for a month are the sum of the heating degree-days for the days in that month.

Formally, for day t heating degree-days is defined in (A1.1) where max is the maximum function.

(A1.1) $\text{heating degree-day}_t = \max(18°\text{C} – \text{average daily temperature, zero})$

Note that heating degree days are never negative because space heating systems are not required to produce heat at temperatures above 18°C.

We assume that the monthly residential use rate for a given class of residential accounts can be modelled using the following cubic polynomial (A1.2.).

(A1.2) $\text{use rate}_t = \alpha + \beta*HDD_t + \chi*HDD_t^2 + \delta*HDD_t^3 + \varepsilon_t$

The most recent 36 months of data available is used to estimate each regression, which is modelled using ordinary least squares. To calculate the weather-normalized use rate for a particular period, the heating degree-days for the period are substituted into the estimated regression equation (A1.2).

It is important to note the following points:

- First, weather normalization is undertaken for the residential sector since only limited evidence exists of weather response for the commercial distribution sector. This means that when weather-normalized total sales and requirements are reported, only the residential part of the total is actually weather-normalized. Research is being conducted to determine if and how the commercial distribution loads should be weather normalized at the regional level.
- Second, the model above normalizes the use per account or the use rate rather than sales. Normalized sales are then calculated as normalized use

[8] Modifications for weather normalization to include both heating and cooling variables are on going.

rate multiplied by the average number of accounts for the class. Eight classes are used in these calculations, namely a heating and non-heating class in each of the four regions.

- Third, because this forecast uses billed sales rather than the unknown actual consumption by class, monthly heating degree-days are allocated using a 35/50/15 per cent adjustment to match the assumed pattern of meter reading. For example, to weather normalize the month of November, November sales would be regressed against the summation of 1) 35% of November degree days 2) 50% of October degree days and 3) 15% of September degree days.

A1.1.2 Commercial Sales Weather Normalization

A similar model to the residential model above, which is used to normalize sales, have been developed to weather normalize the commercial general sales for General Under 35 and Over 35 classes.

In addition, BC Hydro is researching alternative method to conduct weather normalization in the context of the Statistically Adjusted End Use Model.

A1.1.3 Peak Forecast Weather Normalization

Peak weather normalization is carried out for various substations to determine what the peak demand would be at design temperature. Design temperature is a rolling 30 year average of the coldest daily average temperature. See Appendix A1.4 under the peak methodology section for more details.

A1.1.4 Residential Forecast Methodology

The residential energy forecast is determined by forecasting the number of accounts times rate of use based on the following expression:

(A1.3) $RES = \Sigma_k \Sigma_j \Sigma_i R_{ijk} * RUR_{ijk}$,

where:

- RES is residential consumption;
- R is the number of residential accounts;
- RUR is the residential use rate;
- i indexes 20 appliances (space heating, space cooling, water heater, refrigerator, freezer, clothes washer, clothes dryer, dishwasher, range, lighting and so on);
- j indexes four housing types (single/duplex, row, apartment and other); and
- k indexes four regions (Lower Mainland, Northern Region, South Interior and Vancouver Island).

The residential energy forecast is determined by forecasting the number of accounts multiplied by the rate of use. The forecast in the growth of the number of residential accounts is based on a forecast of housing starts. The number of residential accounts is then the current number of residential accounts plus the forecast of additional accounts to be added each year.

Use rates forecast come from appliance saturation rates and unit energy consumption per end use (as well as their trends) to determine the average use rate by dwelling type, by region and changes in these rates over time.

Appliance saturation rates and unit energy consumption come from the Residential End-Use Energy Planning System model (REEPS) as updated using the Residential End Use Survey (REUS) and the Conservation Potential Review (CPR).

The residential Statistically Adjusted End Use (SAE) Models were also run in parallel with the REEPs model. The general framework of the SAE model is described in the commercial section below. This description also applies to the SAE models for the residential sector. Note for the residential SAE model some of the economic drivers are different to the commercial economic drivers.

A1.2. Commercial Forecast Methodology

Distribution

BC Hydro forecasts commercial distribution sales[9] by using the Statistically Adjusted End-Use model (SAE). This model incorporates end-use information, economic data, weather data and market data to construct regional forecasts.

The statistically adjusted end-use modeling framework begins by defining energy use (Use_m) in year and month (m) as the sum of energy used by heating equipment ($Heat_m$), cooling equipment ($Cool_m$), and other equipment ($Other_m$). Formally,

(A1.4) $$USE_m = Heat_m + Cool_m + \text{Other}_m$$

Equation (A1.4) can be shown in a regression form, as shown below in (A1.5):

(A1.5) $$USE_m = a + b_1 \times XHeat_m + b_2 \times XCool_m + b_3 \times XOther_m + \varepsilon_m$$

Here, $XHeat_m$, $XCool_m$, and $XOther_m$ are explanatory variables constructed from end-use information, economic drivers, dwelling data and weather data and ε_m is the error term for the regression. The estimated model can then be thought of as a statistically adjusted end-use model, where the estimated coefficients are the adjustment factors or the relative contribution by the major end uses to the total consumption.

The equations used to construct these X-variables are simplified end-use models, and the X-variables are the estimated usage levels for each of the major end uses based on the end use models.

<u>Constructing XHeat</u>. Space heating energy is specified to depend on the following types of variables:

- Heating degree days (weather),

[9] The commercial sales are composed of commercial general rate class, transmission and BC Hydro Own Use, Irrigation, Street-lighting. The SAE model is used to forecast the sales for the commercial general rate class. The sales forecast for BC Hydro Own Use, Irrigation, and Street-lighting is done using historical sales data and trend analysis.

- Heating equipment saturation levels (fraction of building stock for the commercial sector),
- Assumptions about heating equipment operating efficiencies,
- Average number of days in the billing cycle for each month,
- Economic variables ~~include employment~~include employment, retail sales and commercial output.

The heating variable is represented as the product of an annual equipment index and a monthly usage multiplier. That is,

(A1.6) $$XHeat_m = HeatIndex_m \times HeatUse_m$$

where, $XHeat_m$ is estimated heating energy use in a year (y) and month (m), $HeatIndex_y$ is the annual index of heating equipment in the year (y), and $HeatUse_m$ is the monthly usage multiplier.

The heating equipment index (HeatIndex) depends on the space heating equipment saturation levels normalized by average operating efficiency levels. As a result, the index will increase over time if there are increases in heating equipment saturation levels, and will decrease over time if there are improvements in equipment and building efficiency levels. Heating system usage levels (HeatUse) are driven on a monthly basis by economic variables and non-economic factors, such as weather (Heating Degree Days).

Constructing XCool. The explanatory variable for cooling loads is constructed in a similar manner. The amount of energy used by cooling systems depends on the following types of variables:

- Cooling degree days (weather),
- Cooling equipment saturation levels (fraction of building stock for the commercial sector),
- Assumptions about cooling equipment operating efficiencies,
- Average number of days in the billing cycle for each month,
- Economic variables include employment, retail sales and commercial output.

The cooling variable is represented as the product of an equipment-based index and monthly usage multiplier. That is,

(A1.7) $$\mathrm{XCool}_m = \mathrm{CoolIndex}_m \times \mathrm{CoolUse}_m$$

where, $XCool_m$ is estimated cooling energy use in a year and month (m),

$CoolIndex_y$ is an index of cooling equipment for the year (y), and

$CoolUse_m$ is the monthly usage multiplier.

As with space heating, the cooling equipment index (CoolIndex) depends on the cooling equipment saturation levels normalized by average operating efficiency levels. As a result, the cooling index will increase over time if there are changes in cooling equipment saturation levels, and will decrease over time if there are improvements in equipment efficiencies or the thermal efficiency of buildings. Space cooling system usage levels (CoolUse) are driven on a monthly basis by several factors, including weather (Cooling Degree Days) and similar economic factors used to develop heating usage.

Constructing XOther. Monthly estimates of consumption for non-weather sensitive end uses can be derived in a similar fashion. Non-weather sensitive end-uses include lighting, refrigeration, cooking, clothes washing and drying, entertainment and other miscellaneous equipment. Based on end-use concepts, other sales are driven by:

- Appliance and equipment saturation levels,
- Appliance efficiency levels,
- Average number of days in the billing cycle for each month, and
- Economic factors

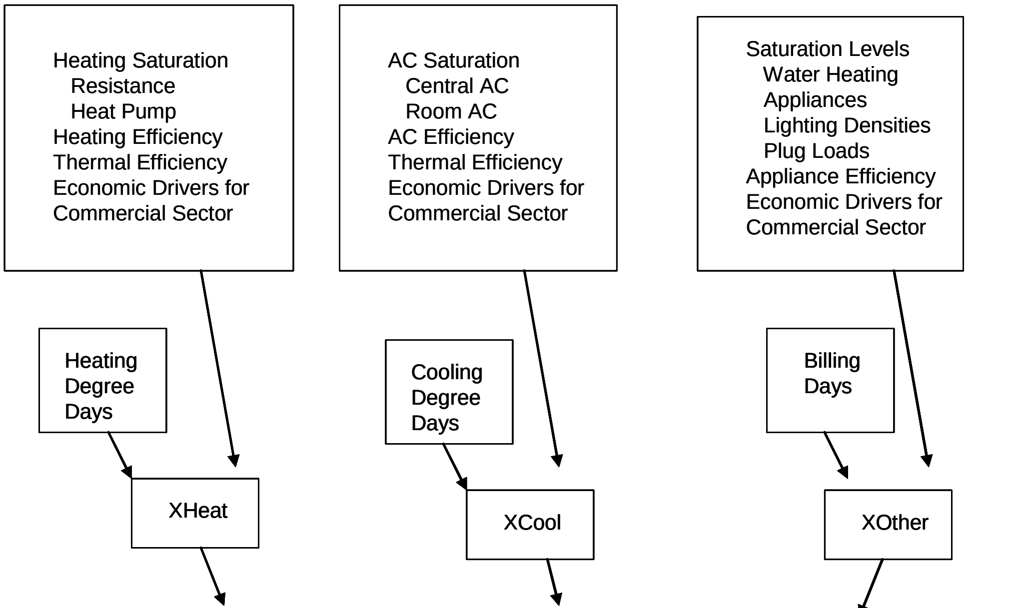
The explanatory variable for other uses is defined as follows:

(A1.8) $XOther_m = OtherEqpIndex_m \times OtherUse_m$

The first term on the right hand side of this expression ($OtherEqpIndex_y$) embodies information about appliance saturation and efficiency levels. The second term (OtherUse) captures the impact of changes in economic variables that impact use of other equipment. These economic variables are similar to those used for explaining heating and cooling.

The figure below summarized the inputs that are used in the construction of the regression variables (i.e. the predictor variables) for the commercial sector.

Figure A1.1 Statistically Adjusted End Use (SAE) Model



$$USE_m = a + b_1 \times XHeat_m + b_2 \times XCool_m + b_3 \times XOther_m + \varepsilon_m$$

The main reason BC Hydro adopted the statistically adjusted end use model for the commercial sector is to enhance transparency. In the Annual 2005 forecast, the commercial sector load forecast was based on a regression approach using GDP as the main driver. This year, BC Hydro ran the SAE models for the distribution class by the four regions. To investigate whether heating and cooling degree days should be included in the SAE models, multiple regressions were run to test the correlations. When HDD and CDD were included in the regional models, the degree of correlation greatly improved over the set of models without HDD and CDD.

Transmission

The commercial transmission energy forecast is developed using a Bottom-Up Account (BUA) methodology to reflect expected growth in the commercial transmission customers. Over the past two years a number of pipeline transportation companies have made proposals that would affect commercial transmission sales. BC Hydro will continue assessing if and when these loads should be included in the forecast.

A bottom up forecast is developed for the first 11 years of the forecast period. After that time period, the growth in the total commercial forecast is based on the following equation:

(A1.9) Sales Growth Rate = GDP Elasticity to Commercial Transmission Sales* Real GDP Growth Rate Forecast.

where:

- Real GDP Growth Rate Forecast is forecasted growth rate of real GDP as provided by the Conference Board of Canada.
- The GDP Elasticity of Commercial Transmission Sales is 0.38 based on a historical regression between commercial transmission sales and real GDP.

The regression model and the results of the regression are provided below. The commercial transmission regression model is based on the following expression

(A1.10) $CT = \alpha + \beta*GDP_t + \chi*\text{binary variable}$

where:

- CT is commercial transmission sales
- α and β are the regression coefficients from a time series regression of commercial transmission sales on provincial GDP.
- The binary variable is used to measure the impact change in BC Hydro billing system changes on commercial transmission sales. In 1996, BC Hydro undertook a signification reallocation of its customers between General Over and General Under 35 rate classes.

Model A1.10	**Model A1.10**
Estimation Method	OLS
Constant	298.6 (71.8)[10]
Independent X Variable	110.6 (24.9) (X = GDP)
binary	1.94 (0.64) Binary for 1996
Adjusted R-sq	0.92
Durbin-Watson	1.29
Autocorrelation Range (AR)	<1.56 or >0.86
Autocorrelation Detected?	No. DW is inconclusive

A1.3. Industrial Forecast Methodology

Industrial Distribution

The industrial distribution energy forecast is developed using regression methods based on the following expression:

[10] Numbers in parenthesis are standard errors.

(A1.11) $$INDD = (e^{\alpha + \beta * T})*GDP$$

where:

- INDD is industrial distribution sales
- α and β are the regression coefficients from a time series regression of industrial distribution sales on provincial real GDP.
- e is exponential base
- T is a time trend variable

The results of the industrial distribution regression forecast are provided in the table below.

Model A1.11	Model A1.11
Estimation Method	OLS
Constant	3.53(0.017)[11]
Independent Trend Variable	-0.013(0.002)
Adjusted R-sq	0.78
Durbin-Watson	2.164
Autocorrelation Range (AR)	1.34 < or >1.01
Autocorrelation Detected?	No. DW is outside AR

The forecast as produced by estimated regression and adjustments to regression based results are provided in the table below.

Table A1.1 Adjustments to Industrial Distribution

Fiscal Year	Regression Forecast	Adjustments to the Regression Forecast[1]	Final Forecast
	Industrial Distribution OLS		Industrial Distribution Forecast plus Adjustments
2007/08	4,403	0.0	4,403
2008/09	4,471	0.0	4,471
2009/10	4,544	0.0	4,544
2010/11	4,630	0.0	4,630
2011/12	4,706	0.0	4,706
2012/13	4,742	0.0	4,742
2013/14	4,793	-3.9	4,789
2014/15	4,828	-7.7	4,820
2015/16	4,858	-15.5	4,843

[11] Numbers in parenthesis are standard errors.

2016/17	4,886	-23.2	4,863
2017/18	4,910	-42.6	4,868
2018/19	4,933	-42.6	4,890
2019/20	4,955	-42.6	4,912
2020/21	4,975	-42.6	4,932
2021/22	4,996	-42.6	4,953
2022/23	5,016	-50.3	4,966
2023/24	5,034	-50.3	4,984
2024/25	5,051	-50.3	5,001
2025/26	5,067	-50.3	5,016
2026/27	5,081	-50.3	5,031

Notes:

1. Adjustments to reflect impact on wood sector due to pine beetle infestation.

Industrial Transmission

The industrial transmission voltage energy forecast is based on a Bottom-Up Account (BUA) transmission forecast for each account.

An annual energy forecast is developed for each industrial transmission customer account, for a 11-year period and for a 21-year period for each wood and pulp and paper account. The forecast for the forestry accounts are based on information from Key Account managers and production forecasts contained in the 2007 AMEC report on the forestry sector produced for BC Hydro. The forecasts for the non-forestry sectors for years 12 to 21 are based on a same method (equation A1.11) as described in the commercial transmission section. The industrial transmission (excluding forestry sector) elasticity of GDP used to develop the forecast over this time period is estimated to 0.49 and the results of the regression model that determined this elasticity are provided in the table below.

Model A1.12	Model A1.12
Estimation Method	OLS
Constant	2541.4 (387.7)[12]
Independent X Variable	19.4 (3.1) (X = GDP)
Adjusted R-sq	0.88
Durbin-Watson	3.177
Autocorrelation Range (AR)	<1.34 or >1.01
Autocorrelation Detected?	No. DW is outside AR

A1.4. Peak Forecast Methodology

The peak demand forecast is built up in three main stages, each with several steps. First, the substation peak in MVA non-coincident[13], second, the four main service

[12] Numbers in parenthesis are standard errors.
[13] Non-coincident is defined in the glossary.

region peak forecasts in MW are determined on a region coincident basis and third, the system peak in MW on a system coincident basis.

Stage 1: Substation Peak Forecast

The substation peak forecast is built up in several sub steps: 1 (a) first the weather normalized peak loads by substation/area and short-term forecasts; 1 (b) second the substation peak forecast guidelines are developed from an econometric model for each planning area; 1(c) third an 11-year substation forecast for each substation; and, 1 (d) finally the substation and guideline peak forecast are averaged together. The appropriate equations and description of the sub steps are provided below.

1 (a) Weather Normalized Substation Peak and Short-term Forecast

The equation below is the basis for a linear regression model that estimates the relationship between substation peak demand and temperature:

(A1.13) $KVA = \alpha + \beta * min$

where:

- KVA is the read peak load; and
- min is the minimum mean temperature for the coldest day during the reading period.
- α and β are the regression coefficients of transmission from a time series regression of peak substations readings on temperatures.

Using the estimated regression coefficients, the weather-normalized peak is then calculated based on the design day temperature for that substation[14]:

(A1.14) $NKVA = \alpha + \beta * designmin$

where:

- NKVA is weather-normalized peak; and
- designmin is the design mean temperature for the substation.

The first step involves estimating a relationship between substation peak demand and temperature and determining weather normalized substation peak for each substation for the previous winter. This information is produced by equation A1.13. The weather normalized substation peak along with historical growth rates of substation peak demands, expected transfers of substation load and expected discrete load additions or closures are used by BC Hydro Distribution planners to prepare a short-term forecast for each substation for the upcoming winter. The first step is completed with an estimate of the weather normalized peak for each

[14] A regression model using non-linear variables as an alternative to a linear regression model was also used for weather normalization.

substation for the base year or the most recent historical year.

1(b) Distribution Peak Guideline Forecast.

In the section sub step, a distribution substation peak guideline forecast is prepared for 15 planning areas for the next 11 years using the following forecasting and (econometric model) equation:

(A1.15) $SK_{it} = [\alpha_1 SFDHTG + \alpha_2 SFDNON + \alpha_3 MULTHTG + \alpha_4 MULNON + \alpha_5 U35E + \alpha_6 O35E]$

where:

- SK_{it} is the total substation peak for the i^{th} planning area;
- SFDHTG is the number of single-family electrically heated homes;
- SFDNON is the number of single-family non-electrically heated homes;
- MULTHTG is the number of multi-family electrically heated homes;
- MULTNON is the number of multi-family non-electrically heated homes;
- U35E is annual energy consumption General under 35 kW;
- O35E is annual energy consumption General over 35 kW;
- the coefficients $\alpha 1$, $\alpha 2$, $\alpha 3$, and $\alpha 4$ are kW contribution to the distribution peak per dwelling in area i, for the four dwelling types under normal temperature conditions; and the coefficients, $\alpha 5$ and $\alpha 6$ represent the increase in peak demand due to a one-kWh increase in the General rate class Under 35 and Over 35 kW energy consumption.

  The forecasting equation for the distribution peak guideline model is provided in equation A1.15. The guideline forecast provides the expected total substation growth from the base year for each planning area. The drivers of the guideline forecast are based on regional economic information such as housing starts and employment. The guideline forecast is provided to BC Hydro Distribution planners from Market Forecast without adjustments for specific capacity additions or transfers.

1(c) Long-term Substation Forecast

In the third sub-step, an eleven-year substation peak forecast is prepared for each substation using the guidelines, trends in substation growth, load transfers between substations and larger substation load additions. The long-term substation forecast includes a forecast for the first year and for the next 10 years of the forecast period. During step three, BC Hydro planners may have additional and information or revised information from field engineers on expected increases or decreases on discrete customer loads as well as operational requirements for substations. This new information, along with the impact of the guideline forecast, may result in a change to the initial short-term forecast for each substation forecast from the first step. The long-term forecasts for each substation are summed up to fifteen planning regions totals. These are the total long-term substation forecasts for each planning region.

1(d) Average of Long-term Substation Forecast and Guideline Forecast

The fourth sub step is the calculation of the blending or averaging of the long-term substation forecast and the guideline forecast for each of the 15 planning areas. Prior to the forecasts being averaged, the long-term substation peak forecast and the guideline are aggregated from 15 planning areas into four regional total substation forecasts. These sets substation forecasts (i.e. the long-term substation forecast and the peak guideline forecast) are then averaged together for each of the four service regions based on the following equation:

(A1.16) $PK_{it} = \Sigma_{it} SK_{itGuideline} + SK_{i\ Substation\ Forecast}$

Stage 2: Regional Peak Forecast

The regional peak is forecast developed using:

(A1.17) $RPK_{jt} = \Sigma_j [PK_{it}*DCF_j*PF_j + TP_j*TCF_j*PF_j + OP_j*OCF_j]$

where:

- DCF is the regional distribution peak coincidence factor;
- PF is the regional power factor for distribution and transmission;
- TP is the transmission peak; this is the aggregate of the transmission account peak forecast in each service region.
- TCF is the transmission coincident factor;
- OP is the other utility peak sales;
- OCF is the other utility coincident factor; and
- PK is the weighted average distribution substation forecast

A transmission peak forecast is prepared for each commercial and industrial transmission account using a bottom up approach. This involves using the historical peak data, information from Key Account Managers and market information and industry reports.

Stage 3: System Coincident Peak Forecast

Finally, system coincident peak is the sum of coincidence-adjusted regional peaks and includes transmission losses:

(A1.18) $SPK = (1 + TL)*\Sigma_j RPK_{jt} *SCF_j$

where:

- TL is the transmission loss factor; and
- SCF are the system coincidence factors for each of the four regions.

Appendix 1B: Temperature Trends and Weather Normalization

In the BCUC Decision on BC Hydro's IEP/LTAP application, the BCUC directed BC Hydro to:

1. Perform a statistical analysis to justify its use of 10 years of historic data for weather normalization
2. Provide a report on if there are any statically quantifiable trends associated with temperature metrics used to forecast peak and energy and asses whether these trends should be extrapolated or otherwise incorporated into forecasting peak or energy.
3. Provide a clear and consistent rational for the historical period it uses for calculating averages, estimating trends or evaluating variability for the forecasting energy and peak demand.

Each of these items is dealt with in the sections below.

1. Analysis for 10 Year Historic Data

BC Hydro uses a 10-year rolling average of degree days (i.e. 10-year rolling heating and 10-year rolling cooling) for forecasting residential and commercial sales because it finds that a rolling 10-year average is a better predictor of the actual heating degree days as compared to using a fixed 30-year period.

A statistical analysis as contained in Ex. B-10 BCUC IR 2.392.1 from the 2006 IEP/ LTAP proceeding shows that a 10-year rolling average, over a five year period from 2000 to 2005, is a better predictor than the fixed 30-year period provided by Environment Canada. The 30-year period had total percentage error of 6.7% while the rolling 10-year normal had a total percentage error of 1.1%.

A similar analysis was conducted over a seven year period from 2000 to 2006 and the results are show in the table below. The additional analysis confirms a rolling 10-year period is a better predictor of the observed heating degree relative to a fixed 30-year period as provided by Environment Canada.

Table A1.2 Heating Degree Days: 10-Year Rolling Average vs. Fixed 30-Year

Year	Environment Canada Fixed 30 Year Period	Rolling 10 Years	Observed	(Observed Less Fixed 30 Year Period) squared errors	(Observed Less Rolling 10 Years) squared errors
2000	2,926.4	2,777.2	2,902.9	552.3	15,800.5
2001	2,926.4	2,776.9	2,851.9	5,550.3	5,625.0
2002	2,926.4	2,773.0	2,850.9	5,700.3	6,068.4
2003	2,926.4	2,796.1	2,659.6	71,182.2	18,632.3
2004	2,926.4	2,768.7	2,528.0	158,722.6	57,936.5
2005	2,926.4	2,752.9	2,665.8	67,912.4	7,586.4
2006	2,926.4	2,759.7	2,724.8	40,642.6	1,218.0
Total	-	-	-	1,692,340.8	48,664.4

The following table show the relative precision of a 10-year rolling and 30-year rolling period of the average degree days. The 10-year period is a better predictor.

Table A1.3 Heating Degree Days: 10-Year Rolling Average vs. 30-Year Rolling Average

Year	Rolling 30 Years	Rolling 10 Years	Observed	(Observed Less Fixed 30 Year Period) squared errors	(Observed Less Rolling 10 Years) squared errors
2000	2,934.9	2,777.2	2,902.9	1,024.0	15,800.5
2001	2,926.8	2,776.9	2,851.9	5,610.0	5,625.0
2002	2,911.3	2,773.0	2,850.9	3,648.2	6,068.4
2003	2,896.2	2,796.1	2,659.6	55,979.6	18,632.3
2004	2,881.9	2,768.7	2,528.0	125,245.2	57,936.5
2005	2,866.9	2,752.9	2,665.8	40,441.2	7,586.4
2006	2,847.2	2,759.7	2,724.8	14,981.8	1,218.0
Total	-	-	-	1,169,426.0	48,664.4

On a cooling degrees basis, the following table shows the relative precision of a 10 year rolling average of cooling degree days versus a fixed 30 year period.

Table A1.4 Cooling Degree Days: 10-Year Rolling Average vs. Fixed 30-Year

Year	Environment Canada Fixed 30 Year Period	Rolling 10 Years	Observed	(Observed Less Fixed 30 Year Period) squared errors	(Observed Less Rolling 10 Years) squared errors
2000	44.2	54.5	28.2	256.0	691.7
2001	44.2	52.4	23.1	445.2	858.5
2002	44.2	51.7	57.5	176.9	33.6
2003	44.2	57.3	88.4	1,953.6	967.2
2004	44.2	64.3	129.8	7,327.4	4,290.3
2005	44.2	65.1	60.2	256.0	24.0
2006	44.2	65.4	59.2	225.0	38.4
Total	-	-	-	18,769.0	1,267.4

The following table shows a comparison between a rolling 10-year period and rolling 30 year period of cooling degree days. Again, the rolling 10-year period is a better predictor of the observed.

Table A1.5 Cooling Degree Days: 10-Year Rolling Average vs. Rolling 30-Year

Year	Rolling 30 Years	Rolling 10 Years	Observed	(Observed Less Fixed 30 Year Period) squared errors	(Observed Less Rolling 10 Years) squared errors
2000	44.3	54.5	28.2	259.2	691.7
2001	44.4	52.4	23.1	453.7	858.5
2002	43.2	51.7	57.5	207.4	33.6
2003	44.0	57.3	88.4	1,971.4	967.2
2004	46.3	64.3	129.8	6,972.3	4,290.3
2005	49.8	65.1	60.2	108.2	24.0
2006	50.9	65.4	59.2	68.9	38.4
Total	-	-	-	15,252.3	1,267.4

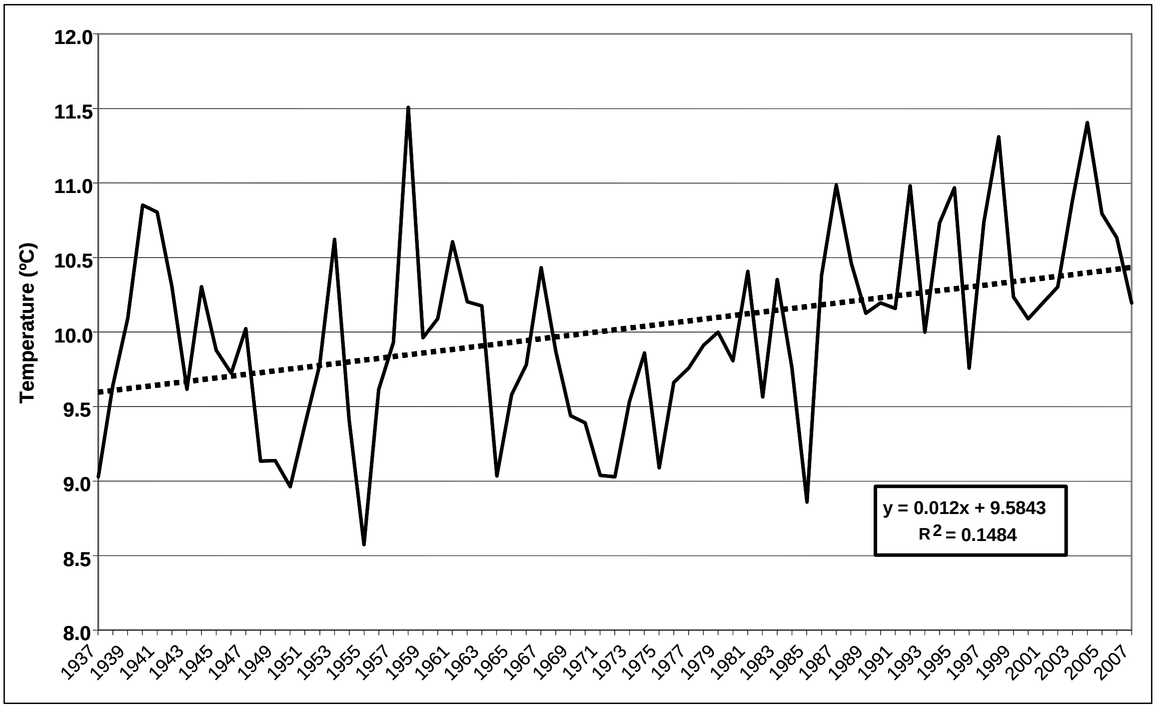
2. Statistical Analysis on Temperature Metrics

The temperature metric used for forecasting energy is a 10-year rolling average of heating degree days. This metric is a function of the daily average temperature where by a heating degree day is calculated as:

18 Degrees Celsius – (daily average temperature), where the daily average temperature is calculated as the average of the daily maximum and minimum temperatures.

BC Hydro examined various regressions on the daily average temperatures over the period from 1937 to 2007 as recorded in the Vancouver International Airport. The average temperature and trend line is shown Figure A1.2. The trend line in the figure below indicates that temperature increases by 0.012 degree C per year, or 1.2 degrees per century. By extrapolation over the 20-year forecast period, this would suggest an increase the average temperature by 0.24 degrees C.

Figure A1.2 Average Annual Temperature at Vancouver Airport



Trend regression lines were computed over the entire the data set and various shorter time period segments. The regression trend line that covered the entire data were significant in terms of the overall regression and the individual coefficients. Linear regressions over shorter periods such as 10-year blocks were not statistically significant. The tables below show the results of two linear trend regressions.

Figure A1.3 Linear Trend of Daily Average Temperature based on 1937-2007

SUMMARY OUTPUT — **Linear Trend based on 1937-2007**

Regression Statistics	
Multiple R	0.385
R Square	0.148
Adjusted R Square	0.136
Standard Error	0.595
Observations	71

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4.260	4.260	12.019	0.001
Residual	69	24.456	0.354		
Total	70	28.716			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-13.555	6.799	-1.994	0.050	-27.119	0.008
X Variable 1 (Year)	0.012	0.003	3.467	0.001	0.005	0.019

Figure A1.4 Linear Trend of Daily Average Temperature based on 1937-1999

SUMMARY OUTPUT — **Linear Trend based on 1937-1999**

Regression Statistics	
Multiple R	0.277
R Square	0.077
Adjusted R Square	0.062
Standard Error	0.610
Observations	63

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.890	1.890	5.081	0.028
Residual	61	22.689	0.372		
Total	62	24.579			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-8.800	8.316	-1.058	0.294	-25.429	7.830
X Variable 1	0.010	0.004	2.254	0.028	0.001	0.018

The figure below shows the daily average temperatures and equation of the trend regression line for the entire sample period.

Figure A1.5 Linear Trend of Daily Average Temperature based on 1990-1999

SUMMARY OUTPUT — **Linear Trend based on 1990-1999**

Regression Statistics	
Multiple R	0.243
R Square	0.059
Adjusted R Square	-0.058
Standard Error	0.519
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.136	0.136	0.503	0.496
Residual	8	2.159	0.270		
Total	9	2.295			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-70.404	114.071	-0.617	0.554	-333.452	192.644
X Variable 1	0.041	0.057	0.709	0.498	-0.091	0.172

The above regression based on data from 1990-1999 is typical of regressions based on 10 years of Vancouver Airport data. All 62 possible 10-year regressions using the available Vancouver 1937-2007 data were done. The slope coefficient was not statistically significantly different from zero in 55 cases; it was statistically significant in only 7 cases. Moreover, the calculated value of the slope coefficient was positive in 33 cases and negative in 28 cases. This lack of statistical significance coupled with instability in sign makes the short-term 10-year regression unsuitable for forecasting temperature. Note that if the slope coefficient is set to zero in the 10-year regression model, the model reduces to a 10-year rolling average.

Figure A1.6 Evaluation on 8 years 2000-2007

Evaluation on 8 Years 2000-2007

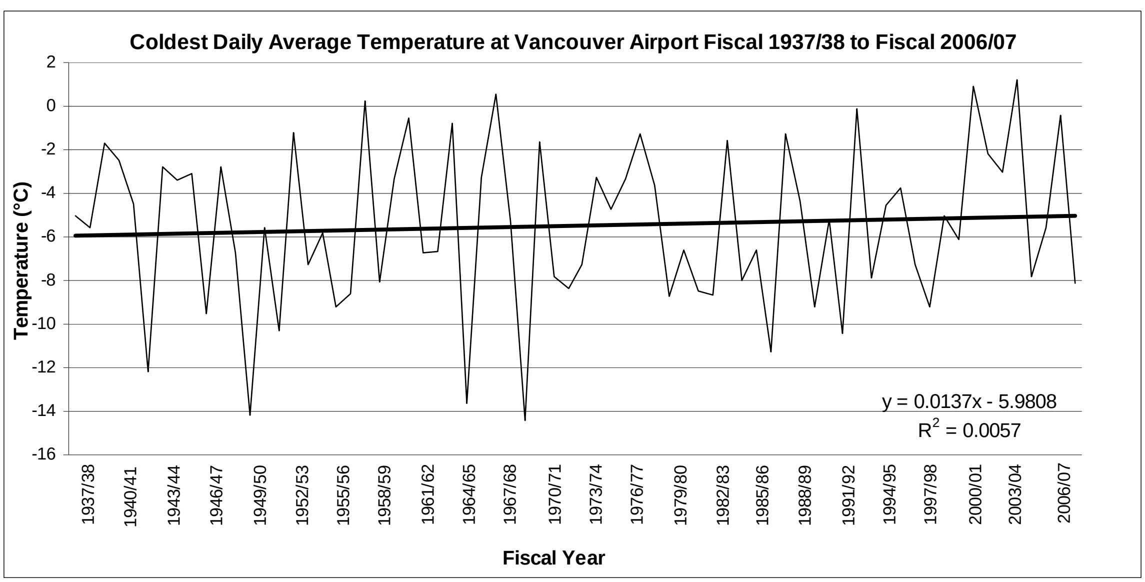
	Actual	MA30	MA30 error	MA10	MA10 error	Linear All (1937-1999)	Linear All error	Linear 1990 (1990-1999)	Linear 1990 error
2000	10.088	10.035	-0.053	10.508	0.419	10.250	0.162	10.731	0.642
2001	10.197	10.058	-0.138	10.497	0.300	10.259	0.063	10.771	0.574
2002	10.303	10.097	-0.206	10.501	0.197	10.269	-0.034	10.812	0.509
2003	10.885	10.139	-0.745	10.433	-0.452	10.278	-0.606	10.852	-0.032
2004	11.405	10.184	-1.221	10.521	-0.884	10.288	-1.117	10.893	-0.512
2005	10.794	10.236	-0.558	10.588	-0.205	10.297	-0.496	10.933	0.140
2006	10.631	10.293	-0.338	10.571	-0.060	10.307	-0.324	10.974	0.343
2007	10.195	10.325	0.130	10.659	0.463	10.317	0.121	11.015	0.819
Sum of Squared Error (SSE)			2.549		1.374		1.987		1.660

The 10-year moving average (MA10) clearly performs best, as measured by the sum of squared errors. This is the method which is used in the current forecast.

In future forecasts, consideration may be given introducing a small annual degree-day adjustment for the long-term.

As for peak demand, the current metric used for forecasting is the 30-year rolling average of the coldest daily average temperature. The figure below shows the coldest daily average temperature at the Vancouver International Airport from fiscal 1937/38 to fiscal 2006/07.

Figure A1.7 Coldest Daily Average Temperature at Vancouver Airport Fiscal 1937/38 to Fiscal 2006/07



The result of the trend regression line for the above figure is provided in the table below. The trend regression has a very low R square value and the overall regression is not significant.

Figure A1.8 Linear Trend of Coldest Daily Average Temperature between Fiscal 1937/38 to Fiscal 2006/07

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.076
R Square	0.006
Adjusted R Square	-0.009
Standard Error	3.711
Observations	70

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5.400	5.399	0.392	0.533
Residual	68	936.607	13.774		
Total	69	942.006			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-5.981	0.897	-6.669	0.000	-7.770	-4.191
X Variable 1	0.014	0.022	0.626	0.533	-0.030	0.058

The trend regression line was also done for the most recent 30 years. The result was also not significant, as indicated below.

Figure A1.9 Linear Trend of Coldest Daily Average Temperature between Fiscal 1977/78 to Fiscal 2006/07

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.305
R Square	0.093
Adjusted R Square	0.061
Standard Error	3.344
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	32.148	32.148	2.876	0.101
Residual	28	313.040	11.180		
Total	29	345.188			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-7.284	1.252	-5.817	0.000	-9.849	-4.719
X Variable 1	0.120	0.071	1.696	0.101	-0.025	0.264

3. Rational for Period for Forecasting

BC Hydro supports the use of a rolling 10-year period for forecasting and weather normalizing energy sales because:

1. It is the best predictor of observed degree days relative other periods.

2. A 10-year rolling period is a better predictor of actual temperature trends relative other predictors such as linear trends.
3. It is consistent with other utilities that forecast on a weather normalized basis.

BC Hydro supports the use of using a rolling 30-year period for peak demand forecasting because:

1. Linear trend regressions are not significant over long time periods.

2. This approach is consistent with the practice of other utilities that forecast on a weather-normalized basis.

Appendix 2. Monte Carlo Methods

This Appendix describes the Monte Carlo model that is used to assess the uncertainty associated with BC Hydro's Load Forecast. The description includes a discussion of the methodology, assumptions and parameters of the model.

Load forecasting involves considerable uncertainty. The demand for electricity depends on a large number of factors which fluctuate widely with time and which are difficult to measure. Some of these factors include population, gross domestic product, weather, technology, conservation, alternate energy source options, and the business climate experienced by major customers and the changing tastes and behaviour of end use customers. The challenge of assessing the uncertainty of the load forecast is to quantify the way in which uncertainty in the major causal factors flows through to impact the resultant load.

To quantify load forecast uncertainty, BC Hydro uses a Monte Carlo model and Monte Carlo simulation techniques. The model and simulation analysis proceeds as follows:

- First, several major input variables or causal factors are identified. These are: Economic Growth (measured by GDP); Price of Electricity (electricity rates); the effectiveness of DSM; Weather (measured by heating degree days) and Elasticity of Load (with respect to GDP and BC Hydro Electricity rates).
- Second, probability distributions are assigned to each input variable and a model is specified that defines the mathematical relationship between the input variable and the output variables.
- Third, a large number of random samples are taken from the input probability distributions. The model is used, with each sample as input, to calculate a large number of simulations of the output variables. These simulations are used to construct probability distributions for the output variables.

The Monte Carlo model calculates the impact of the major causal factors that drive load. The model perturbs a base case forecast by calculating the impacts for each of the causal factors. The impact factors are random variables. Each of the sectors - Residential, Commercial and Industrial - is perturbed separately, and has separate impact factors, but essentially the same methodology is used for all of them. The model is implemented in Microsoft EXCEL augmented with Palisade Corporation's @RISK software. Energy demand for each sector is computed by the following equation.

(A2.1) $$E_t = {}_0E_t \, I_t^P I_t^G I_t^W I_t^U I_t^D$$

Here ${}_0E_t$ is base case energy demand, E_t is perturbed energy demand, and the impact factors are identified by their superscripts; P for electricity price (rates), G for GDP, W for weather, U for residual error and D for DSM.

Equation (A2.1) is used to calculate the random variable for energy demand before DSM. A random variable for DSM savings is then calculated and subtracted to give energy after-DSM.

Impact of GDP Uncertainty: In order to assess the impact of uncertainty in future GDP, the base case GDP is perturbed. The base case GDP is denoted by ${}_0G_t$ and the perturbed GDP is denoted by G_t. The perturbed GDP starts off being equal to the base case GDP in the first year. It then grows at a growth rate equal to the base case GDP growth rate (${}_0g_t$) plus a random perturbation growth rate (g_t). This random perturbation is a normally distributed random variable with zero mean and a standard deviation of 1.70%. That is:

(A2.2) $g_t \sim N(0,1.70\%)$

The perturbed GDP is calculated by:

(A2.3.) $G_t = G_{t-1} [1 + {}_0g_t + g_t]$.

The impact factor for GDP is then given by the following equation:

(A2.4) $I^G{}_t = \exp(\alpha \ln(G_t / {}_0G_t)) = (G_t / {}_0G_t)^{\alpha}$

where α_0 is the elasticity of load with respect to GDP.

Impact of Price Uncertainty (BC Hydro electricity rates): The calculation of the impact factor for price changes ($I^P{}_t$) is treated similarly. A random variable, the perturbed price P_t , is calculated starting from the base case price ${}_0P_t$. The perturbed price starts out being equal to the base case price in the initial year. It then grows at a rate equal to the base case growth rate plus a random perturbation. In the model, the random perturbation has a triangular distribution with parameters (-2.5%, 0, +2.5%). However, unlike the case of GDP, the impact of price change is assumed to take place with time lags. This assumption is made because it may take customers some time to adjust their consumption to price changes. It takes time to process information and to arrive at decisions. Moreover, capital investments may have to be made and may take time to complete.

The time lagged effect of price changes is modeled by introducing different elasticities for price changes that occurred at different time periods in the past and by making these elasticities decline geometrically as they refer to times more remote from the present.

Let ε_k be the Elasticity of Load at time t with respect to a price change at time t-k , k=0,1,2,..., and let λ be a parameter such that $0 < \lambda < 1$. Assume that:

(A2.5) $\varepsilon_k = \varepsilon_0 \lambda^k$

It follows that as k increases, that is as one goes back in time from time t, the elasticity defined here goes to zero, because the lag parameter is less than one.

The model also offers the option of a linear phase in from short to long run elasticity over a specified number of years. The phase in option is not used in the 2007 forecast.

While the income elasticities are unchanged from the 2006 load forecast, the price (customer rate) elasticities have been revised to be -0.05 for each sector over both short-term and long-term as listed in Table A2.1.

Table A2.1 gives the elasticity parameters used in the current Monte Carlo model.

Table A2.1. Elasticity Parameter for Monte Carlo Model

	Mean	Probability Distribution
Short-term Price Elasticities		
Residential	-0.050	Triangular (-0.075, -0.05, -0.025)
Commercial	-0.050	Triangular (-0.075, -0.05, -0.025)
Industrial	-0.050	Triangular (-0.075, -0.05, -0.025)
Long-term Price Elasticities		
Residential	-0.050	Triangular (-0.075, -0.05, -0.025)
Commercial	-0.050	Triangular (-0.075, -0.05, -0.025)
Industrial	-0.050	Triangular (-0.075, -0.05, -0.025)
GDP Elasticity		
Residential	0.670	Triangular (0.470, 0.670, 0.870)
Commercial	0.780	Triangular (0.580, 0.780, 0.980)
Industrial	0.500	Triangular (0.300, 0.500, 0.700)

In Table A2.1, Triang(a , b , c) refers to a probability distribution known as a triangular distribution because its graph is a triangle. This distribution is zero for values of its random variable less than a or greater than c. It has a maximum (most probable) value at b.

Residual error: This factor incorporates the effect on load of other factors such as changes in technology, consumer taste, household structure, business type, and inter-regional differences. The residual error factor starts out at 1.00 in the base year and grows at a rate that is, in each year, a random variable with the triangular distribution. The impact factor is defined by the following equations:

(A2.6) $I^U_t = I^U_{t-1} (1 + g^U_t) \qquad I^U_0 = 1$

where g^U_t denotes a random variable with a triangular distribution. Again, the @RISK software allows the specification of probability distributions in the model.

Impact of Demand Side Management Uncertainty. The impact of uncertainty in energy savings due to DSM is treated separately from the other impacts. DSM savings are viewed as a random variable (S_t). This variable is subtracted from the previously calculated before DSM energy ~~demand to~~demand to yield an after-DSM forecast. .

(A2.7) $E_t^{after} = E_t^{before} - S_t$

The variability of DSM, as represented by the random variable S_t, was not incorporated into any of the 2007 forecast uncertainty bands as presented in this document.

Impact of Weather: Variations in weather are an important source of uncertainty in load. The weather impact is most important for the residential and commercial loads, so weather impact is modeled only for these sectors. In British Columbia, the impact of cold weather on residential heating load is the most important weather effect and is modeled using heating degree days (HDD). HDD is an indicator of how much energy is needed to heat housing up to a comfortable temperature. Summer cooling load is much smaller, so the small effect of cooling degree days (CDD) is not modeled.

The weather analysis is based on the last 10 years of daily temperature data at Vancouver International Airport. For every day, the number of heating degree days is calculated by the formula: HDD=max(0, Daily Temperature -18). Then, the annual sum of HDD was calculated for each year.

A standard probability distribution of the Beta type was found to provide the best fit to this data. The Beta distribution has 4 parameters, and is written Beta(a1,a2,Min,Max). Min and max are the maximum and minimum, while a1 and a2 determine the shape of the distribution.

The weather impact factor is calculated by:

(A2.8) $$I^{W}_{t} = \exp\{ \varepsilon_{W} \log(HDD_{t} / 2{,}725) \}$$

where ε_W is the elasticity of Residential or Commercial load with respect to HDD. ε_W is estimated judgmentally to be 0.374 for Residential and 0.05 for Commercial. The number 2,725 is the mean value of HDD in the Lower Mainland as calculated from a 10-year rolling historical average.

I^{W}_{t} is a random variable as are the other impact factors. However it differs from the other impact factors in that its properties are the same for all years. This is because weather in each year is independent of weather in all other years. Therefore the width of the 80% confidence region for I^{W}_{t} does not increase with time.

Appendix 3. Forecast Tables

Table A3.1 shows the Regional non-coincident (MVA) and coincident peak (MW) forecast for distribution before DSM and rate impacts.

Table A3.2 shows the Regional non-coincident (MVA) and coincident peak (MW) forecast for transmission before DSM and rate impacts.

Table A3.3 shows the Domestic and Regional peak forecast before DSM and rate impacts.

Table A3.4 shows the total distribution, transmission and domestic system peak forecast before DSM and rate impacts.

Table A3.5 summarizes BC Hydro's 2007 Reference Load Forecast before DSM and rate impacts.

Table A3.6 summarizes BC Hydro's 2007 Reference Load Forecast before DSM with rate impacts.

Table A3.7 summarizes BC Hydro's High Load Forecast resulting from the Monte Carlo uncertainty analysis before DSM and rate impacts.

Table A3.8 summarizes BC Hydro's Low Load Forecast resulting from the Monte Carlo uncertainty analysis before DSM and rate impacts.

Table A3.9 summarizes BC Hydro's High Load Forecast resulting from the Monte Carlo uncertainty analysis before DSM with rate impacts.

Table A3.10 summarizes BC Hydro's Low Load Forecast resulting from the Monte Carlo uncertainty analysis before DSM with rate impacts.

Table A3.1. Regional Non-Coincident and Coincident Distribution Peaks Before DSM and Rate Impacts

	Lower Mainland		**Vancouver Island**		**South Interior**		**Northern Region**	
	Non-Coinc. Peak (MVA)	**Coinc. Peak (MW)**	**Non-Coinc. Peak (MVA)**	**Coinc. Peak (MW)**	**Non-Coinc. Peak (MVA)**	**Coinc. Peak (MW)**	**Non-Coinc. Peak (MVA)**	**Coinc. Peak (MW)**
Actual								
2006/07	4,455	4,067	1,896	1,753	985	926	767	704
Weather-Normalized Actual								
2006/07	4,581	4,286	1,927	1,777	1,006	955	784	712
Forecast (Weather-Normalized)								
2007/08	4,720	4,416	1,971	1,818	1,036	984	814	739
2008/09	4,848	4,536	2,007	1,852	1,061	1,007	828	752
2009/10	5,037	4,713	2,046	1,887	1,073	1,019	840	763
2010/11	5,078	4,750	2,073	1,912	1,086	1,031	848	770
2011/12	5,150	4,818	2,094	1,932	1,095	1,040	853	775
2012/13	5,212	4,876	2,114	1,950	1,103	1,048	858	779
2013/14	5,274	4,935	2,134	1,968	1,110	1,054	861	782
2014/15	5,338	4,994	2,153	1,986	1,115	1,059	864	785
2015/16	5,403	5,055	2,172	2,004	1,121	1,064	866	787
2016/17	5,467	5,115	2,192	2,022	1,125	1,068	869	789
2017/18	5,532	5,175	2,212	2,041	1,128	1,072	871	791
2018/19	5,648	5,284	2,239	2,065	1,142	1,084	872	792
2019/20	5,767	5,396	2,265	2,090	1,155	1,097	873	793
2020/21	5,889	5,509	2,292	2,115	1,169	1,110	875	794
2021/22	6,013	5,625	2,320	2,140	1,183	1,124	876	795
2022/23	6,140	5,744	2,347	2,165	1,197	1,137	877	796
2023/24	6,269	5,865	2,375	2,191	1,212	1,151	878	797
2024/25	6,401	5,989	2,403	2,217	1,226	1,164	879	798
2025/26	6,536	6,115	2,432	2,243	1,241	1,178	880	800
2026/27	6,674	6,244	2,461	2,270	1,256	1,192	882	801
2027/28	6,815	6,375	2,490	2,297	1,271	1,207	883	802
Growth Rates:								
5 years: 06/07 to 11/12	2.4%	2.4%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
11 years: 06/07 to 17/18	1.7%	1.7%	1.3%	1.3%	1.1%	1.1%	1.0%	1.0%
21 years: 06/07 to 27/28	1.9%	1.9%	1.2%	1.2%	1.1%	1.1%	0.6%	0.6%

Notes:
1. Growth rates based on weather normalized actual peak.
2. Non-coinc. refers to non-coincident peak and coinc. refers to Regional coincident peak.
3. Vancouver Island peak values include Gulf Island peak demand.

Table A3.2. Regional Non-Coincident and Coincident Transmission Peaks Forecast Before DSM and Rate Impacts

	Lower Mainland		**Vancouver Island**		**South Interior**		**Northern Region**	
	Non-Coinc. Peak (MW)	**Coinc. Peak (MW)**	**Non-Coinc. Peak (MW)**	**Coinc. Peak (MW)**	**Non-Coinc. Peak (MW)**	**Coinc. Peak (MW)**	**Non-Coinc. Peak (MW)**	**Coinc. Peak (MW)**
Actual								
2006/07	641	415	602	460	332	261	1,071	796
Forecast								
2007/08	667	473	589	454	372	268	1,105	795
2008/09	681	484	576	443	361	260	1,063	765
2009/10	681	483	576	443	363	261	1,054	759
2010/11	689	489	576	443	370	266	1,066	767
2011/12	697	495	526	405	375	270	1,063	765
2012/13	702	498	526	405	389	280	1,058	761
2013/14	707	502	526	405	394	284	1,202	866
2014/15	712	505	526	405	411	296	1,282	923
2015/16	718	510	526	405	427	308	1,305	939
2016/17	804	571	516	397	436	314	1,217	876
2017/18	808	574	516	397	451	325	1,214	874
2018/19	811	576	516	397	432	311	1,219	878
2019/20	815	579	516	397	414	298	1,224	881
2020/21	818	581	516	398	396	285	1,229	885
2021/22	822	583	517	398	379	273	1,234	889
2022/23	825	586	517	398	363	261	1,239	892
2023/24	828	588	517	398	348	250	1,245	896
2024/25	832	590	517	398	333	240	1,250	900
2025/26	835	593	518	399	319	229	1,255	904
2026/27	838	595	518	399	305	220	1,260	907
2027/28	842	598	518	399	292	210	1,266	911
Growth Rates:								
5 years: 06/07 to 11/12	1.7%	3.6%	-2.7%	-2.5%	2.4%	0.6%	-0.2%	-0.8%
11 years: 06/07 to 17/18	2.1%	3.0%	-1.4%	-1.3%	2.8%	2.0%	1.1%	0.8%
21 years: 06/07 to 27/28	1.3%	1.7%	-0.7%	-0.7%	-0.6%	-1.0%	0.8%	0.6%

Notes:

1. Growth rates based on weather normalized actual peak.
2. Non-coinc. refers to non-coincident peak and coinc. refers to Regional coincident peak.

Table A3.3. Domestic System and Regional Peak Forecast Before DSM and Rate Impacts

	Lower Mainland (MW)	Vancouver Island (MW)	South Interior (MW)	Northern Region (MW)	Domestic System (MW)	Vancouver Island with Trans. Losses (MW)
Actual						
2006/07	4,643	2212	1373	1501	10098	2324
Weather-Normalized Actual						
2006/07	4864	2237	1401	1509	10176	2350
Forecast (Weather Normalized)						
2007/08	5,110	2,272	1,452	1,535	10,441	2,390
2008/09	5,247	2,295	1,467	1,517	10,606	2,408
2009/10	5,430	2,330	1,480	1,522	10,852	2,445
2010/11	5,478	2,356	1,497	1,537	10,963	2,460
2011/12	5,555	2,337	1,510	1,540	11,040	2,440
2012/13	5,619	2,355	1,528	1,541	11,145	2,459
2013/14	5,683	2,373	1,537	1,648	11,351	2,478
2014/15	5,747	2,391	1,555	1,708	11,516	2,496
2015/16	5,814	2,409	1,572	1,726	11,641	2,515
2016/17	5,936	2,419	1,582	1,666	11,730	2,526
2017/18	6,001	2,438	1,596	1,665	11,832	2,545
2018/19	6,114	2,462	1,595	1,670	11,978	2,571
2019/20	6,228	2,487	1,595	1,675	12,128	2,597
2020/21	6,346	2,512	1,596	1,679	12,281	2,623
2021/22	6,465	2,538	1,597	1,684	12,438	2,649
2022/23	6,587	2,563	1,599	1,689	12,598	2,676
2023/24	6,712	2,589	1,601	1,694	12,762	2,703
2024/25	6,839	2,615	1,604	1,699	12,930	2,730
2025/26	6,969	2,642	1,608	1,703	13,101	2,758
2026/27	7,101	2,669	1,612	1,708	13,276	2,786
2027/28	7,237	2,696	1,617	1,713	13,455	2,814
Growth Rates:						
5 years: 06/07 to 11/12	2.7	0.9	1.5	0.4	1.6	0.8
11 years: 06/07 to 17/18	1.9	0.8	1.2	0.9	1.4	0.7
21 years: 06/07 to 27/28	1.9	0.9	0.7	0.6	1.3	0.9

Notes:

1. Regional peaks include distribution losses but exclude transmission losses, unless otherwise stated.
2. The Domestic Peak is defined in the Glossary.
3. Lower Mainland peak includes peak supply requirements to the City of New Westminster and supply requirements to Seattle City Lights.
4. South Interior peak includes peak supply requirements to Fortis BC and Northern includes Hyder
5. Peak forecasts and growth rates are on a weather-normalized basis.
6. The recorded Domestic peak for the winter of F2006/07 was 10,113 MW on March 29, 2007. The actual Domestic peak value as stated above has been reduced to account for losses associated with peak transfers to other utilities including Fortis BC and Seattle City Light.
7. Vancouver Island Peak with transmission losses is the Vancouver Island Regional peak before DSM adjusted for estimated transmission losses.
8. The Actual, Weather Normalized and Forecast peak values for all Vancouver Island peak values include the Gulf Island peak demand.

Table A3.4. Total Distribution Transmission and Domestic System Peak Forecast Before DSM and Rate Impacts

	Distribution	Transmission	Domestic System Peak
	Weather-Normalized Peak	**Peak**	**Weather-Normalized Peak**
	MW	**MW**	**MW**
Historical			
2004/05	6,944	1,980	9,747
2005/06	7,040	1,904	9,812
2006/07	7,402	1,873	10,176
Forecast			
2007/08	7,618	1,893	10,441
2008/09	7,799	1,858	10,606
2009/10	8,024	1,853	10,852
2010/11	8,103	1,871	10,963
2011/12	8,199	1,844	11,040
2012/13	8,283	1,853	11,145
2013/14	8,366	1,958	11,351
2014/15	8,447	2,027	11,516
2015/16	8,530	2,058	11,641
2016/17	8,610	2,058	11,730
2017/18	8,692	2,069	11,832
2018/19	8,832	2,062	11,978
2019/20	8,975	2,056	12,128
2020/21	9,121	2,050	12,281
2021/22	9,270	2,044	12,438
2022/23	9,421	2,039	12,598
2023/24	9,575	2,035	12,762
2024/25	9,732	2,031	12,930
2025/26	9,892	2,027	13,101
2026/27	10,055	2,024	13,276
2027/28	10,221	2,021	13,455
Growth Rates			
5 years: 06/07 to 11/12	2.1%	-0.3%	1.6%
11 years: 06/07 to 17/18	1.5%	0.9%	1.4%
21 years: 06/07 to 27/28	1.5%	0.4%	1.3%

Notes:

1. Distribution peak includes distribution losses.
2. Domestic system includes total distribution peak, transmission peak, and supply requirements to the City of New Westminster and transmission losses.

LOAD FORECAST TABLES
Table A3.5-A3.10

Table A3.5. 2007 BC Hydro, Reference Load Forecast Before DSM and Rate Impacts

	BC Hydro Service Area Sales										Integrated System	
	Residential	Commercial	Industrial	Total BCH	Nwest Fortis BC	Total Domestic Sales	Firm Export	Total Firm Sales	Losses	Total Gross Requirement	Total Gross Requirement	Peak
	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(MW)
Actual												
2002/03	15,287	13,729	18,596	47,612	1,072	48,685	314	48,999	4,299	53,298	53,010	8,824
2003/04	15,899	14,151	18,725	48,775	1,185	49,960	313	50,273	4,778	55,051	54,756	9,911
2004/05	15,620	14,362	19,635	49,618	1,169	50,787	301	51,088	4,642	55,731	55,437	9,762
2005/06	16,241	14,721	19,936	50,898	1,235	52,133	321	52,454	5,167	57,621	57,296	9,617
2006/07	16,853	15,105	19,469	51,427	1,400	52,828	311	53,139	5,036	58,175	57,879	10,371
Forecast												
2007/08	17,087	15,621	19,016	51,724	1,369	53,093	313	53,406	5,294	58,700	58,366	10,784
2008/09	17,494	16,182	19,571	53,247	1,356	54,603	311	54,914	5,433	60,347	59,944	10,949
2009/10	17,882	16,622	19,794	54,298	1,421	55,719	311	56,030	5,546	61,576	61,171	11,195
2010/11	18,307	17,049	19,757	55,113	1,500	56,613	311	56,924	5,645	62,569	62,186	11,305
2011/12	18,713	17,443	19,475	55,631	1,570	57,201	313	57,514	5,722	63,236	62,847	11,383
2012/13	19,150	17,828	19,562	56,540	1,628	58,168	311	58,479	5,825	64,304	63,911	11,487
2013/14	19,525	18,226	20,279	58,030	1,654	59,684	311	59,995	5,963	65,958	65,561	11,693
2014/15	19,935	18,645	20,838	59,418	1,671	61,089	311	61,400	6,095	67,495	67,093	11,859
2015/16	20,360	19,051	20,835	60,246	1,691	61,937	313	62,250	6,189	68,439	68,033	11,984
2016/17	20,796	19,448	21,037	61,281	1,706	62,987	311	63,298	6,297	69,595	69,184	12,073
2017/18	21,180	19,858	21,103	62,141	1,724	63,865	311	64,176	6,391	70,567	70,152	12,175
2018/19	21,582	20,242	21,187	63,011	1,742	64,753	311	65,064	6,487	71,551	71,133	12,321
2019/20	21,980	20,627	20,228	62,835	1,762	64,597	313	64,910	6,510	71,420	70,998	12,471
2020/21	22,421	21,013	20,300	63,734	1,775	65,509	311	65,820	6,610	72,430	72,004	12,624
2021/22	22,773	21,405	20,374	64,552	1,791	66,343	311	66,654	6,700	73,354	72,924	12,781
2022/23	23,182	21,808	20,440	65,430	1,807	67,237	311	67,548	6,798	74,346	73,912	12,941
2023/24	23,588	22,209	20,510	66,307	1,826	68,133	313	68,446	6,895	75,341	74,903	13,105
2024/25	24,012	22,615	20,578	67,205	1,840	69,045	311	69,356	6,995	76,351	75,909	13,272
2025/26	24,367	23,026	20,645	68,038	1,854	69,892	311	70,203	7,087	77,290	76,846	13,443
2026/27	24,758	23,430	20,712	68,900	1,868	70,768	311	71,079	7,182	78,261	77,813	13,618
2027/28	25,124	23,888	20,778	69,790	1,885	71,675	313	71,988	7,282	79,270	78,820	13,797
Growth Rates:												
5 yrs 06/07-11/12	2.1%	2.9%	0.0%	1.6%	2.3%	1.6%	0.1%	1.6%	2.6%	1.7%	1.7%	1.9%
11 yrs 06/07-17/18	2.1%	2.5%	0.7%	1.7%	1.9%	1.7%	0.0%	1.7%	2.2%	1.8%	1.8%	1.5%
21 yrs 06/07-27/28	1.9%	2.2%	0.3%	1.5%	1.4%	1.5%	0.0%	1.5%	1.8%	1.5%	1.5%	1.4%

Table A3.6 2007 BC Hydro, Reference Load Forecast Before DSM and with Rate Impacts

	BC Hydro Service Area Sales										Integrated System	
	Residential	Commercial	Industrial	Total BCH	Nwest Fortis BC	Total Domestic Sales	Firm Export	Total Firm Sales	Losses	Total Gross Requirement	Total Gross Requirement	Peak
	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(MW)
Actual												
2002/03	15,287	13,729	18,596	47,612	1,072	48,685	314	48,999	4,299	53,298	53,010	8,824
2003/04	15,899	14,151	18,725	48,775	1,185	49,960	313	50,273	4,778	55,051	54,756	9,911
2004/05	15,620	14,362	19,635	49,618	1,169	50,787	301	51,088	4,642	55,731	55,437	9,762
2005/06	16,241	14,721	19,936	50,898	1,235	52,133	321	52,454	5,167	57,621	57,296	9,617
2006/07	16,853	15,105	19,469	51,427	1,400	52,828	311	53,139	5,036	58,175	57,879	10,371
Forecast												
2007/08	17,087	15,621	19,016	51,724	1,369	53,093	313	53,406	5,294	58,700	58,366	10,783
2008/09	17,457	16,147	19,529	53,133	1,353	54,486	311	54,797	5,422	60,219	59,816	10,925
2009/10	17,792	16,538	19,694	54,025	1,414	55,438	311	55,749	5,518	61,267	60,862	11,137
2010/11	18,176	16,927	19,616	54,720	1,489	56,209	311	56,520	5,605	62,125	61,742	11,223
2011/12	18,517	17,260	19,270	55,047	1,554	56,600	313	56,913	5,662	62,575	62,187	11,261
2012/13	18,967	17,657	19,374	55,998	1,612	57,611	311	57,922	5,769	63,691	63,298	11,375
2013/14	19,350	18,063	20,098	57,511	1,639	59,150	311	59,461	5,910	65,371	64,974	11,587
2014/15	19,738	18,461	20,632	58,832	1,655	60,487	311	60,798	6,035	66,833	66,431	11,739
2015/16	20,120	18,826	20,589	59,535	1,671	61,206	313	61,519	6,117	67,636	67,230	11,840
2016/17	20,527	19,197	20,765	60,489	1,684	62,172	311	62,483	6,216	68,699	68,289	11,914
2017/18	20,909	19,604	20,832	61,345	1,702	63,047	311	63,358	6,309	69,667	69,253	12,016
2018/19	21,314	19,990	20,924	62,228	1,720	63,948	311	64,259	6,407	70,666	70,248	12,164
2019/20	21,699	20,364	19,970	62,033	1,739	63,772	313	64,085	6,427	70,512	70,090	12,308
2020/21	22,133	20,743	20,040	62,917	1,752	64,669	311	64,980	6,525	71,505	71,079	12,458
2021/22	22,494	21,143	20,125	63,762	1,769	65,531	311	65,842	6,619	72,461	72,031	12,621
2022/23	22,905	21,548	20,196	64,649	1,785	66,434	311	66,745	6,717	73,462	73,028	12,783
2023/24	23,274	21,913	20,237	65,424	1,802	67,226	313	67,539	6,804	74,343	73,905	12,926
2024/25	23,699	22,320	20,309	66,327	1,816	68,143	311	68,454	6,904	75,358	74,917	13,095
2025/26	24,026	22,703	20,356	67,085	1,828	68,913	311	69,224	6,988	76,212	75,767	13,251
2026/27	24,429	23,119	20,437	67,984	1,843	69,827	311	70,138	7,087	77,225	76,778	13,433
2027/28	24,766	23,548	20,482	68,796	1,858	70,654	313	70,967	7,178	78,145	77,694	13,596
Growth Rates:												
5 yrs 06/07-11/12	1.9%	2.7%	-0.2%	1.4%	2.1%	1.4%	0.1%	1.4%	2.4%	1.5%	1.4%	1.7%
11 yrs 06/07-17/18	2.0%	2.4%	0.6%	1.6%	1.8%	1.6%	0.0%	1.6%	2.1%	1.7%	1.6%	1.3%
21 yrs 06/07-27/28	1.8%	2.1%	0.2%	1.4%	1.4%	1.4%	0.0%	1.4%	1.7%	1.4%	1.4%	1.3%

Table A3.7 2007 BC Hydro, High Load Forecast Before DSM and Rate Impacts

Fiscal Year	BC Hydro Service Area Sales										Integrated System	
	Residential	Commercial	Industrial	Total BCH	Nwest Fortis BC	Total Domestic Sales	Firm Export	Total Firm Sales	Losses	Total Gross Requirement	Total Gross Requirement	Peak
	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(MW)
Actual												
2002/03	15,287	13,729	18,596	47,612	1,072	48,685	314	48,999	4,299	53,298	53,010	8,824
2003/04	15,899	14,151	18,725	48,775	1,185	49,960	313	50,273	4,778	55,051	54,756	9,911
2004/05	15,620	14,362	19,635	49,618	1,169	50,787	301	51,088	4,642	55,731	55,437	9,762
2005/06	16,241	14,721	19,936	50,898	1,235	52,133	321	52,454	5,167	57,621	57,296	9,617
2006/07	16,853	15,105	19,469	51,427	1,400	52,828	311	53,139	5,036	58,175	57,879	10,371
Forecast												
2007/08	17,328	15,877	19,216	52,421	1,369	53,790	313	54,103	5,365	59,468	59,126	10,924
2008/09	18,002	16,525	19,823	54,350	1,356	55,706	311	56,017	5,548	61,565	61,149	11,169
2009/10	18,465	17,076	20,122	55,663	1,421	57,084	311	57,395	5,687	63,082	62,661	11,467
2010/11	18,956	17,591	20,139	56,686	1,500	58,186	311	58,497	5,808	64,305	63,905	11,618
2011/12	19,436	18,081	19,914	57,431	1,570	59,001	313	59,314	5,909	65,223	64,818	11,740
2012/13	19,934	18,539	20,045	58,518	1,628	60,146	311	60,457	6,030	66,487	66,077	11,877
2013/14	20,368	19,020	20,832	60,220	1,654	61,874	311	62,185	6,190	68,375	67,960	12,121
2014/15	20,835	19,495	21,433	61,763	1,671	63,434	311	63,745	6,337	70,082	69,663	12,313
2015/16	21,321	19,978	21,470	62,769	1,691	64,460	313	64,773	6,450	71,223	70,799	12,471
2016/17	21,837	20,440	21,708	63,985	1,706	65,691	311	66,002	6,576	72,578	72,150	12,590
2017/18	22,287	20,931	21,813	65,031	1,724	66,755	311	67,066	6,689	73,755	73,323	12,725
2018/19	22,761	21,408	21,947	66,116	1,742	67,858	311	68,169	6,808	74,977	74,540	12,911
2019/20	23,257	21,860	20,987	66,104	1,762	67,866	313	68,179	6,850	75,029	74,588	13,101
2020/21	23,751	22,316	21,094	67,161	1,775	68,936	311	69,247	6,966	76,213	75,768	13,284
2021/22	24,156	22,791	21,198	68,145	1,791	69,936	311	70,247	7,074	77,321	76,872	13,472
2022/23	24,653	23,278	21,302	69,233	1,807	71,040	311	71,351	7,194	78,545	78,092	13,673
2023/24	25,121	23,774	21,410	70,305	1,826	72,131	313	72,444	7,312	79,756	79,299	13,874
2024/25	25,618	24,258	21,510	71,386	1,840	73,226	311	73,537	7,431	80,968	80,507	14,076
2025/26	26,027	24,753	21,601	72,381	1,854	74,235	311	74,546	7,540	82,086	81,622	14,279
2026/27	26,520	25,252	21,711	73,483	1,868	75,351	311	75,662	7,661	83,323	82,855	14,501
2027/28	26,932	25,777	21,789	74,498	1,885	76,383	313	76,696	7,774	84,470	83,999	14,704
Growth Rates:												
5 yrs 06/07-11/12	2.9%	3.7%	0.5%	2.2%	2.3%	2.2%	0.1%	2.2%	3.3%	2.3%	2.3%	2.5%
11 yrs 06/07-17/18	2.6%	3.0%	1.0%	2.2%	1.9%	2.2%	0.0%	2.1%	2.6%	2.2%	2.2%	1.9%
21 yrs 06/07-27/28	2.3%	2.6%	0.5%	1.8%	1.4%	1.8%	0.0%	1.8%	2.1%	1.8%	1.8%	1.7%

Table A3.8 2007 BC Hydro, Low Load Forecast Before DSM and Rate Impacts

Fiscal Year	BC Hydro Service Area Sales										Integrated System	
	Residential	Commercial	Industrial	Total BCH	Nwest Fortis BC	Total Domestic Sales	Firm Export	Total Firm Sales	Losses	Total Gross Requirement	Total Gross Requirement	Peak
	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(MW)
Actual												
2002/03	15,287	13,729	18,596	47,612	1,072	48,685	314	48,999	4,299	53,298	53,010	8,824
2003/04	15,899	14,151	18,725	48,775	1,185	49,960	313	50,273	4,778	55,051	54,756	9,911
2004/05	15,620	14,362	19,635	49,618	1,169	50,787	301	51,088	4,642	55,731	55,437	9,762
2005/06	16,241	14,721	19,936	50,898	1,235	52,133	321	52,454	5,167	57,621	57,296	9,617
2006/07	16,853	15,105	19,469	51,427	1,400	52,828	311	53,139	5,036	58,175	57,879	10,371
Forecast												
2007/08	16,846	15,364	18,814	51,024	1,369	52,393	313	52,706	5,222	57,928	57,606	10,643
2008/09	17,006	15,826	19,307	52,139	1,356	53,495	311	53,806	5,318	59,124	58,738	10,729
2009/10	17,322	16,163	19,456	52,941	1,421	54,362	311	54,673	5,405	60,078	59,692	10,924
2010/11	17,672	16,509	19,373	53,554	1,500	55,054	311	55,365	5,484	60,849	60,486	10,996
2011/12	18,009	16,810	19,032	53,851	1,570	55,421	313	55,734	5,538	61,272	60,904	11,031
2012/13	18,400	17,119	19,078	54,597	1,628	56,225	311	56,536	5,624	62,160	61,788	11,106
2013/14	18,695	17,434	19,722	55,851	1,654	57,505	311	57,816	5,739	63,555	63,179	11,269
2014/15	19,042	17,782	20,242	57,066	1,671	58,737	311	59,048	5,853	64,901	64,521	11,404
2015/16	19,394	18,121	20,191	57,706	1,691	59,397	313	59,710	5,927	65,637	65,253	11,494
2016/17	19,771	18,446	20,355	58,572	1,706	60,278	311	60,589	6,018	66,607	66,219	11,555
2017/18	20,079	18,754	20,370	59,203	1,724	60,927	311	61,238	6,088	67,326	66,934	11,616
2018/19	20,435	19,099	20,439	59,973	1,742	61,715	311	62,026	6,173	68,199	67,803	11,744
2019/20	20,760	19,407	19,479	59,646	1,762	61,408	313	61,721	6,179	67,900	67,500	11,856
2020/21	21,155	19,735	19,522	60,412	1,775	62,187	311	62,498	6,265	68,763	68,359	11,985
2021/22	21,398	20,034	19,547	60,979	1,791	62,770	311	63,081	6,329	69,410	69,002	12,093
2022/23	21,761	20,385	19,596	61,742	1,807	63,549	311	63,860	6,414	70,274	69,863	12,232
2023/24	22,104	20,707	19,636	62,447	1,826	64,273	313	64,586	6,493	71,079	70,664	12,363
2024/25	22,483	21,064	19,689	63,236	1,840	65,076	311	65,387	6,581	71,968	71,550	12,510
2025/26	22,744	21,340	19,696	63,780	1,854	65,634	311	65,945	6,643	72,588	72,167	12,625
2026/27	23,065	21,710	19,749	64,524	1,868	66,392	311	66,703	6,726	73,429	73,005	12,777
2027/28	23,380	22,085	19,804	65,269	1,885	67,154	313	67,467	6,809	74,276	73,849	12,927
Growth Rates:												
5 yrs 06/07-11/12	1.3%	2.2%	-0.5%	0.9%	2.3%	1.0%	0.1%	1.0%	1.9%	1.0%	1.0%	1.2%
11 yrs 06/07-17/18	1.6%	2.0%	0.4%	1.3%	1.9%	1.3%	0.0%	1.3%	1.7%	1.3%	1.3%	1.0%
21 yrs 06/07-27/28	1.6%	1.8%	0.1%	1.1%	1.4%	1.1%	0.0%	1.1%	1.4%	1.2%	1.2%	1.1%

Table A3.9 2007 BC Hydro, High Load Forecast Before DSM with Rate Impacts

Fiscal Year	BC Hydro Service Area Sales										Integrated System	
	Residential	Commercial	Industrial	Total BCH	Nwest Fortis BC	Total Domestic Sales	Firm Export	Total Firm Sales	Losses	Total Gross Requirement	Total Gross Requirement	Peak
	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(MW)
Actual												
2002/03	15,287	13,729	18,596	47,612	1,072	48,685	314	48,999	4,299	53,298	53,010	8,824
2003/04	15,899	14,151	18,725	48,775	1,185	49,960	313	50,273	4,778	55,051	54,756	9,911
2004/05	15,620	14,362	19,635	49,618	1,169	50,787	301	51,088	4,642	55,731	55,437	9,762
2005/06	16,241	14,721	19,936	50,898	1,235	52,133	321	52,454	5,167	57,621	57,296	9,617
2006/07	16,853	15,105	19,469	51,427	1,400	52,828	311	53,139	5,036	58,175	57,879	10,371
Forecast												
2007/08	17,092	15,626	19,021	51,739	1,369	53,108	313	53,421	5,295	58,716	58,374	10,785
2008/09	17,910	16,378	19,690	53,978	1,353	55,331	311	55,642	5,511	61,153	60,737	11,093
2009/10	18,326	16,903	19,956	55,185	1,414	56,599	311	56,910	5,639	62,549	62,128	11,369
2010/11	18,780	17,390	19,944	56,114	1,489	57,603	311	57,914	5,750	63,664	63,264	11,500
2011/12	19,173	17,813	19,648	56,634	1,554	58,188	313	58,501	5,827	64,328	63,922	11,575
2012/13	19,692	18,288	19,800	57,780	1,612	59,392	311	59,703	5,954	65,657	65,247	11,725
2013/14	20,153	18,782	20,590	59,525	1,639	61,164	311	61,475	6,119	67,594	67,180	11,980
2014/15	20,614	19,277	21,198	61,089	1,655	62,744	311	63,055	6,269	69,324	68,904	12,176
2015/16	21,040	19,696	21,181	61,917	1,671	63,588	313	63,901	6,363	70,264	69,840	12,299
2016/17	21,503	20,129	21,397	63,029	1,684	64,713	311	65,024	6,478	71,502	71,074	12,399
2017/18	21,954	20,616	21,498	64,068	1,702	65,770	311	66,081	6,591	72,672	72,239	12,534
2018/19	22,438	21,086	21,632	65,156	1,720	66,876	311	67,187	6,710	73,897	73,461	12,721
2019/20	22,857	21,540	20,683	65,080	1,739	66,819	313	67,132	6,744	73,876	73,435	12,895
2020/21	23,382	21,988	20,785	66,155	1,752	67,907	311	68,218	6,862	75,080	74,635	13,082
2021/22	23,813	22,458	20,900	67,171	1,769	68,940	311	69,251	6,973	76,224	75,775	13,277
2022/23	24,286	22,975	21,011	68,272	1,785	70,057	311	70,368	7,094	77,462	77,009	13,480
2023/24	24,747	23,413	21,091	69,251	1,802	71,053	313	71,366	7,203	78,569	78,112	13,662
2024/25	25,244	23,893	21,198	70,335	1,816	72,151	311	72,462	7,322	79,784	79,323	13,865
2025/26	25,624	24,348	21,273	71,245	1,828	73,073	311	73,384	7,422	80,806	80,342	14,051
2026/27	26,097	24,826	21,365	72,288	1,843	74,131	311	74,442	7,537	81,979	81,511	14,261
2027/28	26,479	25,335	21,437	73,251	1,858	75,109	313	75,422	7,644	83,066	82,595	14,454
Growth Rates:												
5 yrs 06/07-11/12	2.6%	3.4%	0.2%	1.9%	2.1%	2.0%	0.1%	1.9%	3.0%	2.0%	2.0%	2.2%
11 yrs 06/07-17/18	2.4%	2.9%	0.9%	2.0%	1.8%	2.0%	0.0%	2.0%	2.5%	2.0%	2.0%	1.7%
21 yrs 06/07-27/28	2.2%	2.5%	0.5%	1.7%	1.4%	1.7%	0.0%	1.7%	2.0%	1.7%	1.7%	1.6%

Table A3.10 2007 BC Hydro, Low Load Forecast Before DSM with Rate Impacts

Fiscal Year	BC Hydro Service Area Sales										Integrated System	
	Residential	Commercial	Industrial	Total BCH	Nwest Fortis BC	Total Domestic Sales	Firm Export	Total Firm Sales	Losses	Total Gross Requirement	Total Gross Requirement	Peak
	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(GW.h)	(MW)
Actual												
2002/03	15,287	13,729	18,596	47,612	1,072	48,685	314	48,999	4,299	53,298	53,010	8,824
2003/04	15,899	14,151	18,725	48,775	1,185	49,960	313	50,273	4,778	55,051	54,756	9,911
2004/05	15,620	14,362	19,635	49,618	1,169	50,787	301	51,088	4,642	55,731	55,437	9,762
2005/06	16,241	14,721	19,936	50,898	1,235	52,133	321	52,454	5,167	57,621	57,296	9,617
2006/07	16,853	15,105	19,469	51,427	1,400	52,828	311	53,139	5,036	58,175	57,879	10,371
Forecast												
2007/08	17,082	15,616	19,011	51,709	1,369	53,078	313	53,391	5,292	58,683	58,361	10,782
2008/09	17,034	15,904	19,355	52,293	1,353	53,646	311	53,957	5,334	59,291	58,905	10,759
2009/10	17,299	16,176	19,430	52,905	1,414	54,319	311	54,630	5,402	60,032	59,646	10,914
2010/11	17,615	16,458	19,279	53,352	1,489	54,841	311	55,152	5,463	60,615	60,252	10,952
2011/12	17,887	16,714	18,888	53,489	1,554	55,043	313	55,356	5,501	60,857	60,489	10,954
2012/13	18,263	17,033	18,938	54,234	1,612	55,846	311	56,157	5,586	61,743	61,371	11,029
2013/14	18,582	17,361	19,606	55,549	1,639	57,188	311	57,499	5,708	63,207	62,831	11,204
2014/15	18,899	17,678	20,089	56,666	1,655	58,321	311	58,632	5,812	64,444	64,063	11,321
2015/16	19,234	17,971	20,004	57,209	1,671	58,880	313	59,193	5,876	65,069	64,685	11,391
2016/17	19,567	18,270	20,132	57,969	1,684	59,653	311	59,964	5,956	65,920	65,532	11,432
2017/18	19,875	18,594	20,158	58,627	1,702	60,329	311	60,640	6,029	66,669	66,277	11,499
2018/19	20,218	18,892	20,187	59,297	1,720	61,017	311	61,328	6,104	67,432	67,036	11,608
2019/20	20,532	19,201	19,248	58,981	1,739	60,720	313	61,033	6,111	67,144	66,744	11,720
2020/21	20,919	19,519	19,284	59,722	1,752	61,474	311	61,785	6,194	67,979	67,575	11,844
2021/22	21,215	19,843	19,357	60,415	1,769	62,184	311	62,495	6,270	68,765	68,358	11,977
2022/23	21,554	20,163	19,380	61,097	1,785	62,882	311	63,193	6,347	69,540	69,129	12,100
2023/24	21,840	20,486	19,409	61,735	1,802	63,537	313	63,850	6,419	70,269	69,854	12,218
2024/25	22,229	20,811	19,434	62,474	1,816	64,290	311	64,601	6,502	71,103	70,685	12,355
2025/26	22,494	21,133	19,457	63,084	1,828	64,912	311	65,223	6,571	71,794	71,373	12,482
2026/27	22,815	21,479	19,515	63,809	1,843	65,652	311	65,963	6,652	72,615	72,191	12,631
2027/28	23,111	21,834	19,534	64,479	1,858	66,337	313	66,650	6,728	73,378	72,951	12,766
Growth Rates:												
5 yrs 06/07-11/12	1.2%	2.0%	-0.6%	0.8%	2.1%	0.8%	0.1%	0.8%	1.8%	0.9%	0.9%	1.1%
11 yrs 06/07-17/18	1.5%	1.9%	0.3%	1.2%	1.8%	1.2%	0.0%	1.2%	1.7%	1.2%	1.2%	0.9%
21 yrs 06/07-27/28	1.5%	1.8%	0.0%	1.1%	1.4%	1.1%	0.0%	1.1%	1.4%	1.1%	1.1%	1.0%