

**Site C Review - Responses to questions raised by Deloitte
August 16th, 2017**

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No.	
91	Date/Source of Question: Email from [REDACTED] August 16 7:56pm
	Response provided by: [REDACTED]
	Functional Approver: [REDACTED]
	<p>Question: Data Request for Load Forecasting Model</p> <ul style="list-style-type: none"> • Long term GDP input data into the 2016 load forecast
	<p>Response: Section 10.2 below shows the forecast of the major economic drivers that are included in: the residential SAE model, used to develop the residential accounts forecast such as housing starts; the commercial SAE model and the other manufacturing loads within the light industrial sector (i.e. non wood, coal, and oil and gas loads).</p> <p>The other manufacturing sales, within the light industrial sector, are based on a regression model using provincial real GDP as the driver. The regression model, show in Appendix 1, pg. 69 of the December 2012 Load Forecast document accounts for historical downward trend in the ratio sales/GDP because the time trend is negative. BC Hydro uses the GDP forecast from the province in applicable models.</p> <p>The other SAE models are regional in nature and GDP, employment, retail sales and other drivers are provided by the Provincial Government on a regional basis.</p> <p>This table was included in the one of the response to information requests in the F17-F19 Revenue Requirements.</p>

Table 10.1 provides a summary of the load forecast components and key data drivers.

Key Forecast Drivers

Forecast Component	Data
1. Residential Forecast	<ul style="list-style-type: none"> • Historical billed sales use per account • Housing starts and historical accounts • Real personal disposable income and people per account • Actual and 10 years rolling of Heating Degree Day (HDD) and Cooling Degree Day (CDD) for normal temperature. • Temperature data from Environment Canada • Appliance saturation rates (i.e. shares) from BC Hydro's Residential End Use Survey. Forecast of saturation and efficiency data from the US Energy Information Administration (EIA)

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Forecast Component	Data
2. Commercial (Distribution) Forecast	<ul style="list-style-type: none"> • Historical billing data • Commercial GDP Output • Employment and Retail Sales • Actual and 10 year rolling average of HDD and CDD • Forecast of end use saturation and efficiency data from the EIA
3. Industrial Distribution Forecast	<ul style="list-style-type: none"> • Historical billing data • Real Provincial GDP • Wood production forecasts from consultants and historical sales • Information from customers for coal and oil and gas
4. Large Commercial and Industrial Transmission Forecast	<ul style="list-style-type: none"> • Historical billing data • Domestic and global GDP projections from World Bank, IMF, and Robert Fairholm • Production forecasts from consultants • Mid High and Low Commodity prices • Information Key Account Managers and Interconnection • See Information (see table below on Data Sources)
5. Non-Integrated Area (NIA) Forecast	<ul style="list-style-type: none"> • Historical Billing data • Historical number of accounts • Local spot loads • BC Statistics Population forecasts
6. Peak Forecast	<ul style="list-style-type: none"> • 10 years of temperature normalized substation data. • Light industrial / commercial energy forecast and housing starts and accounts forecast • 30 years of the coldest daily average temperature by region • Load research data on load shapes based on Smart Metering Data for coincidence factors and peak intensities. • Historical peak demand and load factors • Energy forecast

10.2 Data Sources and Application

Information on the sources and uses of the data for the May 2016 Load Forecast

Variable	Application	Forecast Period	Source
GDP	<ul style="list-style-type: none"> • Industrial distribution energy forecast 	<ul style="list-style-type: none"> • 2015-2020 • 2020-2044 	<ul style="list-style-type: none"> • BC Ministry of Finance –February 2016 Budget • Robert Fairholm, March 2015,
Housing Starts	<ul style="list-style-type: none"> • Residential accounts forecast 	<ul style="list-style-type: none"> • 2015-2044 	<ul style="list-style-type: none"> • Robert Fairholm, March 2015
Commercial GDP Output	<ul style="list-style-type: none"> • Commercial distribution energy forecast 	<ul style="list-style-type: none"> • 2015-2044 	<ul style="list-style-type: none"> • Robert Fairholm, March 2015
Employment, Retail Sales	<ul style="list-style-type: none"> • Commercial distribution sales 	<ul style="list-style-type: none"> • 2015-2044 	<ul style="list-style-type: none"> • Robert Fairholm, March 2015
Commodity Prices Mid, High and Low	<ul style="list-style-type: none"> • Large Industrial 	<ul style="list-style-type: none"> • 2015 -2044 	<ul style="list-style-type: none"> • See Sectors Below

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Mining sales	<ul style="list-style-type: none"> • Mining 	Various	<ul style="list-style-type: none"> • P&E Report (proprietary) - March 2016 • GFMS Annual 2015 Surveys for Gold, Copper and Base Metals; • Consensus Economic Metal and Coal Price Forecasts March 2016 report (proprietary); • Ministry of Energy and Mines – Provincial Overview of Exploration and Mining in British Columbia, 2015; • Ministry of Energy and Mines - British Columbia Coal Industry Overview, 2015; and • PricewaterhouseCoopers BC Mining Outlook 2016 - March 2016 (proprietary).
Forestry Sales	<ul style="list-style-type: none"> • Forestry 	Various	<ul style="list-style-type: none"> • Brian McClay & Associates Ince., Pulp Price Forecasts; • Brian McClay & Associates Ince., Market Pulp Monthly; • Murray Hall (Murray Hall Consulting Ltd.) • Russ Taylor (International Wood Markets Group) • Jim Girvan (MDT Ltd.) • Rob Schuetz (IFS Ltd.). • ERA Forest Products Research, Commodity-Price Update; • ERA Forest Products Research, Forest Products Overview; • ERA Forest Products Research, Forest Products Monthly; and Madison's, Madison's Lumber Reporter. • Temanex Consulting Inc.
Oil and Gas Sales and LNG	<ul style="list-style-type: none"> • Oil and Gas 	Various	<ul style="list-style-type: none"> • Subscription services: PIRA Energy Group, Bloomberg New Energy Finance Services, Wood Mackenzie and IHS Inc.; • National Energy Board; • U.S. Energy Information Administration; • RBN Energy; and • Natural gas industry companies (corporate presentations, annual reports and news releases). • Sproule Forecasts, three-year oil and gas price forecasts; • BC Oil & Gas Commission, Monthly Drilling Report; • Government of B.C. (2016), B.C. Supply & Distribution of Natural Gas in B.C.; and • RBN Energy, daily analysis on topical subjects in the North American oil and gas industry.

10.2 Growth Assumptions

The growth assumptions for key economic drivers used in the Reference (Mid) load forecast for the residential and light industrial and commercial sectors are shown in Table 10.2 below.

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The other residential and commercial drivers include temperature which is a 10 year rolling average of heating and cooling degree days. For example, the annual total 10 year average heating degree days for the Lower Mainland is 2,796.

The average efficiency forecasts as per the Energy Information Administration forecasts are provided in tables or pdf in BC Hydro response to AMPC IR 1.19.6. Exhibit B-10.

Residential Drivers

Fiscal Year	Calendar	Population BC Hydro Service Area	Housing Starts BC Hydro	Residential Accounts	Population BC Hydro Service Area per Account	Real Disposable Income Year over Year Growth Per cent
Forecast						
F2017	2016	4,278,807	26,368	1,779,597	2.40	2.3%
F2018	2017	4,329,603	25,853	1,805,393	2.40	2.5%
F2019	2018	4,388,148	25,746	1,831,066	2.40	2.9%
F2020	2019	4,452,301	25,728	1,856,704	2.40	2.9%
F2021	2020	4,523,934	27,180	1,883,776	2.40	3.2%
F2022	2021	4,597,328	29,836	1,913,491	2.40	3.8%
F2023	2022	4,673,317	31,407	1,944,793	2.40	3.3%
F2024	2023	4,753,237	31,528	1,976,248	2.41	3.1%
F2025	2024	4,836,752	31,033	2,007,234	2.41	2.9%
F2026	2025	4,916,593	30,116	2,037,328	2.41	2.7%
F2027	2026	4,989,598	29,066	2,066,378	2.41	2.5%
F2028	2027	5,060,992	28,112	2,094,473	2.42	2.6%
F2029	2028	5,123,861	27,336	2,121,782	2.41	2.4%
F2030	2029	5,183,900	26,748	2,148,495	2.41	2.2%
F2031	2030	5,243,115	26,648	2,175,099	2.41	2.3%
F2032	2031	5,296,016	26,398	2,201,440	2.41	2.1%
F2033	2032	5,342,561	25,342	2,226,715	2.40	1.7%
F2034	2033	5,385,320	23,723	2,250,384	2.39	1.3%
F2035	2034	5,422,183	22,008	2,272,346	2.39	1.1%
F2036	2035	5,455,861	20,672	2,292,984	2.38	1.1%

Commercial and Light Industrial Drivers

Fiscal Year	Calendar	Commercial Employment Annual Growth %	Commercial Real Retail Sales Annual Growth %	Real Commercial GDP Annual Growth %	Light Industrial Real Provincial GDP Annual Growth %
Forecast					
F2017	2016	0.6%	2.0%	2.0%	2.4%
F2018	2017	1.3%	2.5%	2.4%	2.4%
F2019	2018	1.8%	2.8%	3.5%	2.3%
F2020	2019	1.5%	2.8%	2.9%	2.3%
F2021	2020	1.5%	2.7%	2.5%	2.3%
F2022	2021	2.1%	3.1%	4.1%	4.0%

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F2023	2022	1.8%	3.5%	2.8%	5.3%
F2024	2023	1.7%	3.3%	2.6%	3.4%
F2025	2024	1.5%	3.1%	2.4%	2.5%
F2026	2025	1.3%	2.9%	2.3%	2.2%
F2027	2026	1.2%	2.9%	2.3%	2.0%
F2028	2027	1.3%	2.8%	2.3%	2.2%
F2029	2028	1.2%	2.7%	2.3%	2.0%
F2030	2029	1.1%	2.5%	2.0%	2.1%
F2031	2030	1.1%	2.5%	2.0%	1.8%
F2032	2031	1.0%	2.3%	1.9%	1.9%
F2033	2032	0.9%	2.0%	1.8%	1.9%
F2034	2033	0.8%	1.7%	1.7%	1.7%
F2035	2034	0.7%	1.4%	1.6%	1.5%
F2036	2035	0.7%	1.3%	1.6%	1.5%

For Real GDP: the short term forecast (2016 to 2020) for is based on the BC Ministry of Finance, February 2016 Budget and the remainder years are based on Robert Fairholm March 2015 forecast.