Dennis Swanson
Director, Regulatory Affairs

FortisBC Inc.
Suite 100 - 1975 Springfield Road
Kelowna, BC V1Y 7V7
Ph: (250) 717-0890
Fax: 1-866-335-6295
electricity.regulatory.affairs@fortisbc.com
www.fortisbc.com

September 28, 2011

Via Email

Ms. Alanna Gillis
Acting Commission Secretary
BC Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC V6Z 2N3

Dear Ms. Hamilton:

Re: FortisBC Inc. (FortisBC) Application for 2012 -2013 Revenue Requirements and Review of 2012 Integrated System Plan Responses to System Loss Information Requests

Please find attached FortisBC's responses to the British Columbia Utilities Commission first round of Information Requests and the British Columbia Old Age Pensioners' Association et al. (BCOAPO) supplemental Information Requests related to system losses.

If further information is required, please contact the undersigned at (250) 717- 0890.

Sincerely,

Dennis Swanson
Director, Regulatory Affairs

SYSTEM LOSSES AND PEAK

1.0 Reference: 2012 and 2013 Forecast

Exhibit B-1, Tab 3, Section 3.0, pp. 1-2;

Figure 3.0 - Normalized Gross Load Composition

FortisBC states "For 2012 and 2013 gross system losses are forecast at 8.82 and 8.76 percent, using a two year rolling average from actual system loss calculation and forecast loss reduction in 2013 because of Advanced Metering Infrastructure (AMI) based programs." (Tab 3, p. 1)

1.1 The graph below has been developed from the data in Figure 3.0. Please explain the relatively constant decrease in losses between 2006 and 2010 and the marked increase between 2010 and 2011? Are there any non-recurring activities that explain the increased losses in 2009 and 2011?

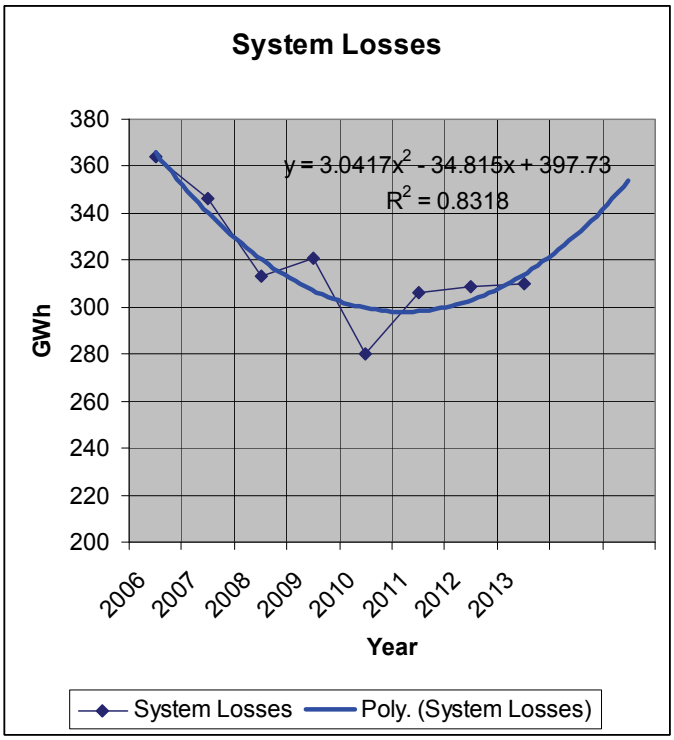
Response:

The Company is unable to measure exact system loss rates. Loss numbers presented represent an estimate based on engineering principles and gross load data combined with multi-year as-billed loss studies. Loss rates viewed over multiple years will be more accurate but the loss rate for any individual year has a much greater uncertainty. FortisBC has used average loss rates to forecast system losses for a number of years.

The steady decline in historical loss rates from 2006 to 2009/2010 is explained by the system improvements undertaken by the Company. This decline has been recognized in the load forecast by decreasing the averaging period used to forecast losses, from four years to two years. As these system improvements come to completion, loss rates are expected to stabilize.

The low loss rate in 2010 is likely due to the lower 2010 load.

1 1.2 Please explain how FortisBC intends to mitigate the increasing losses being
2 forecasted to 2013 and beyond by the trend-line.



3

4 **Response:**

5 The Company is not forecasting losses to increase in the manner shown in this graph. The
6 Company is forecasting losses to flatten out, as stated in Tab 3, Section 3.5, page 11 of the
7 2012-13 RRA, with only small declines due to the AMI-based loss reduction program. This is
8 visually represented in the above graph by the 2011, 2012 and 2013 data points.

9 Please see the response to BCUC IR1 Q232.2 regarding loss mitigation.

1.3 The losses shown in Exhibit B-1, Table 3.0 (Tab 3, p. 2) are the same values quoted in the reference above, which are calculated on a two year rolling average. Please provide the actual system loss calculations for 2011, 2012 and 2013, and explain how the OTR Project has affected losses.

Response:

The forecast loss numbers for 2011, 2012 and 2013 are calculated as follows.

The calculation for 2011 is as stated in the application in Tab 3, Section 3.5, page 11. For clarity, the mathematical formula is given below:

2009 Losses = 9.23%

2010 Losses = 8.42%

2011/12/13 Losses before AMI adjustment = (9.23% + 8.42%) / 2 = 8.82%

Please refer to BCUC IR1 Q1.4 for the detailed calculation of the 2013 AMI loss adjustment.

The 230 kV transmission portion of the Okanagan Transmission Reinforcement (OTR) project was placed in service in late 2010. The estimated impact of OTR on energy losses is 14.5, 18.1 and 19.6 GWh/Year in 2011, 2012 and 2013 respectively. These losses have not been included in FortisBC's load forecast. However, losses will increase (in percentage terms) as load increases, and likewise, FortisBC did not increase its loss percentage for this load growth. On a net basis, it is likely that the increase in losses due to load growth would offset approximately half of the estimated losses from the OTR project.

The Company believes that the forecast of losses should be revised to reflect these two factors and proposes to reduce the forecast losses in 2012 by 9.0 GWh and in 2013 by 9.8 GWh, and by 10 GWh in 2014 and beyond.

1.4 Please also explain the specific changes made to the loss analysis to compensate for the loss reduction anticipated from the AMI Project.

Response:

The Company provided the following information in its response to BCUC IR1 Q231.2 (Exhibit B-4 of the 2012-13 RRA):

b) "Stolen energy is energy provided by FortisBC but not paid for directly by the customers using the electricity. This unbilled energy is presently included in the gross load purchased annually and accounted for in system losses versus revenue. As AMI technology will provide additional tools to identify energy theft more of these customers will be identified and move from unmetered to metered energy. The result will be a gradual increase in sales revenue and a corresponding decline in system losses while gross load will remain unchanged. The assumption made in this application for the years 2013 - 2017 is that unmetered energy will become metered consumption. Beginning in 2018 and continuing until 2022 the prediction is that these customers will either find more efficient ways to consume electricity or will move off the electric grid to alternate sources of energy. The impact on the load forecast in the latter period is a gradual decline in sales revenue and a corresponding reduction in gross load."

Specifically,

For the years 2013-2017, the AMI project increases the residential sales and reduces the losses by the same amount. As a result, there is no impact on the gross residential load, but the gross loss rate is reduced.

In 2013, the gross load is 3,543.1 GWh, the sales before AMI are 3,230.5 GWh, and the gross loss rate before AMI is therefore 8.82% as calculated:

(3,543.1 Gross Load – 3,230.5 Sales) = 312.6 GWh losses

312.6 Losses / 3,543.1 Gross Load = 8.82% losses.

The AMI project increases the sales and decreases the losses by the same amount of 2.3 GWh for no change in the gross load. Therefore the after AMI loss rate is as shown in Tab 3, Section 3.5, page 11:

: (312.6 – 2.3) Adjusted Losses / 3,543.1 Gross Load = 8.76%.

2.0 Reference: Losses

Exhibit B-1, Tab 3, Section 3.5, p. 11

System Loss Composition

2.1 Please provide the composition of these actual and forecast system losses (calculated, not rolling average), in GWh by year, in the table below complete with a mitigation plan to reduce the system losses by type of loss?

	Type of System Loss	2006	2007	2008	2009	2010	2012	2013	Total
1	Losses in the transmission and distribution system								
2	Company use								
3	Losses due to wheeling through the BC Hydro system								
4	Unaccounted-for energy (meter inaccuracies)								
5	Unaccounted-for energy (theft)								
	Total	364	346	313	321	280	306	309	

Response:

FortisBC is unable to provide the requested data as the company has insufficient information to apportion total system losses in this manner. Currently, the Company only has knowledge of the total system losses and these are calculated by subtracting the total energy billed in a given interval from the total energy generated or imported in the same interval. Additional metering infrastructure such as that proposed in the Advanced Metering Initiative project would be required to support the collection of loss data at this granularity.

Estimates of components 1 through 3 are provided below.

Table BCUC IR1 2.1

	Type of System Loss	2006	2007	2008	2009	2010	2011	2012	2013	Total
		GWh								
1	Losses in the transmission and distribution system	313	310	272	258	227	n/a	n/a	n/a	1380
2	Company use	12	13	11	12	12	n/a	n/a	n/a	61
3	Losses due to wheeling through the BC Hydro system	40	23	30	51	41	n/a	n/a	n/a	183
4	Unaccounted-for energy (meter inaccuracies)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
5	Unaccounted-for energy (theft)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
	Total	364	346	313	321	280	306	309	310	2,549

Please see the response to BCUC IR1 Q232.2 below regarding mitigation of losses.

2.2 Please provide the value of these system losses, in dollars by year using BC Hydro's RS 3808 to convert the GWh to dollars assuming firm power (capacity included), in the table below.

	Type of System Loss	2006	2007	2008	2009	2010	2012	2013	Total
1	Losses in the transmission and distribution system								
2	Company use								
3	Losses due to wheeling through the BC Hydro system								
4	Unaccounted-for energy (meter inaccuracies)								
5	Unaccounted-for energy (theft)								
	Total								

Response:

Please also see the response to BCUC IR1 Q2.1 above.

Table BCUC IR1 2.2

	Type of System Loss	2006	2007	2008	2009	2010	2011	2012	2013	Total
		$000s								
1	Losses in the transmission and distribution system	12,013	11,802	11,217	10,631	11,206	n/a	n/a	n/a	56,569
2	Company use	468	513	469	506	590	n/a	n/a	n/a	2,546
3	Losses due to wheeling through the BC Hydro system	1,517	863	1,222	2,084	1,999	n/a	n/a	n/a	7,685
4	Unaccounted-for energy (meter inaccuracies)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
5	Unaccounted-for energy (theft)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
	Total	13,999	13,178	12,908	13,221	13,794	15,929	16,377	17,519	67,099

3.0 Reference: System Loss Composition

Exhibit B-1, Tab 3, Appendix 3C, p. 3C-2

Residential (Energy Forecast)

FortisBC states "A sale increase by the AMI-based revenue protection programs will be offset by a reduction in losses so that the total impact of the AMI-based programs on the gross load is zero" (Tab 3, p. 3C-2)

3.1 Please explain this statement and how the expected reduction in losses (2 GWh) will be realized and tracked.

Response:

AMI technology will enable FortisBC to identify more comprehensively both the incidence and value of energy theft. Electricity theft is currently reflected in gross system load and offset by system losses versus sales revenue. It is anticipated that a portion of the customers, once detected, will remain on the grid and begin paying for the energy consumed.

The expected loss reduction and associated revenue increase will be difficult to quantify. However, AMI would provide better information for calculating losses than is currently available since all metered consumption will be available on an hourly basis rather than a monthly or bi-monthly basis. The increased granularity of the metered consumption data will minimize the need to estimate the unbilled load and therefore increase the precision of loss calculations.

It remains to be seen whether the increased precision of the total loss calculation will result in baseline and post-implementation estimates of normalized non-technical losses of sufficient resolution to allow determination and quantification of a reduction.

4.0 Reference: Peak Demand

Exhibit B-1, Tab 3, Section 3.6, Table 3A2, p. 12

System Winter peak

4.1 Please explain the reasons behind the very large increase (approximately 7 percent) in the 2011 winter peak demand as compared to the average in 2006 through 2010? Why is this increase expected to be sustained in 2012 and 2013?

Response:

Historical peaks in Table 3A1 (not 3A2) are normalized, not actual. The Company continues to work towards improvements in its peak normalization methods, however, normalized peaks are not used to forecast peaks and therefore peak normalization does not affect forecast peak values. While the Company is still working on developing a final replacement peak normalization methodology, improved numbers for the winter peaks are presented in the table below along with the actual peaks for the last five years.

Table BCUC IR1 4.1

						5-year	Approved	Forecast		
	2006	2007	2008	2009	2010	Average	2011	2011	2012	2013
Current Normalized System Peak										
Winter Peak (MW)	672	648	672	661	661	663	723	710	721	731
Summer Peak (MW)	517	528	510	521	577	531	578	560	567	575
Actual System Peak										
Winter Peak (MW)	711	659	746	700	707	705	723	710	721	731
Summer Peak (MW)	548	561	532	553	554	550	578	560	567	575
Improved Normalized System Peak										
Winter Peak (MW)	732	699	707	700	714	711	723	710	721	731

6.0 Reference: System Planning Forecasts

Exhibit B-1, Tab 3, Appendix 3F, Section F.4, pp. 3F-4, 3F-5

1-in-20 Peak Forecast

"This provides a peak forecast for transmission planning studies that has a quantitative risk index, as is necessary to achieve consistency with industry practice and established reliability standards."

6.1 Please provide the relevant industry and reliability standards that specify the approach used in the 1-in-20 peak forecast.

Response:

The statement is meant to indicate that it is standard industry practice to for a utility to attempt to quantify risk, not to state that there is a single standard accepted by all utilities. There are currently no standards, mandatory or other, that prescribe the risk level and confidence bands of a load forecast. Local conditions in the economy and weather vary significantly in different jurisdictions, making the application of uniform risk standards impractical. For example, a 95% confidence band will be wider in jurisdiction A vs. B, if weather patterns in A are more variable than in B. Several utilities (Bonneville Power, PacifiCorp, ISO New England and others) compute confidence bands for 90% and 95% confidence (1-in-10 and 1-in-20 risk levels). BC Hydro employs Monte Carlo methods to compute a 90% confidence band, indicating there is a 10% probability that the actual peak load will exceed the forecast peak load in a particular year. Similarly, the PJM interconnection employs a 90% confidence level. A large geographic jurisdiction, such as PJM, Bonneville, ISONE, will generally have a lesser variance due to extreme weather, as non-uniform weather conditions will mitigate the total effect. Smaller areas, such as FortisBC, are exposed to a greater relative risk. The objective of the 1-in-20 load forecast at FortisBC is to provide system planners with a benchmark level that quantifies the risk of the transmission plan. Transmission adequacy is extremely important, as shortages in transmission cannot be mitigated in the short term except with customer outages.

6.2 Please provide a summary table of the 1-in-20 peak forecast annual results, showing escalated projected loads for each year, and identify which year sets the peak.

Response:

The base year for winter peaks is 1990 and for summer peaks is 1998. The Peak Load Forecast summary table is provided in Appendix B (page 9) of the Company's Long Term Capital Plan (2012 Integrated System Plan, Volume 1), and reproduced below.

Table BCUC IR1 6.2 Summer and Winter "1-in-20" Peak Load Forecasts

Year	Summer Peak	Winter Peak
	(MW)	
2011	652	843
2012	661	856
2013	669	869
2014	678	880
2015	685	890
2016	688	895
2017	692	902
2018	697	910
2019	703	918
2020	708	926
2021	714	935
2022	720	943
2023	726	951
2024	732	960
2025	738	969
2026	744	977
2027	750	986
2028	756	995
2029	763	1004
2030	769	1013
2031	775	1022
2032	782	1031
2033	788	1041
2034	795	1051
2035	802	1061
2036	808	1071
2037	815	1081
2038	823	1092
2039	830	1103
2040	837	1113

6.3 Please describe whether the data from the year which defined the 1-in-20 peak has been examined for any outlier conditions which may have influenced the peak in the peak month or months.

Response:

Temperature appears to be the decisive factor of winter peak demands. The peak in 1990 occurred on December 29, which is the coldest day of the study period with a minimum temperature of -25.4^{o}C.

228.0 Reference: Load Forecasting

Exhibit B-1-1, Long Term Capital Plan, Section 2.1, p. 9; Appendix B, pp. 1-8

Distribution Loads

"In preparing the Distribution Load Forecast (found at Appendix B), Load is forecast first at the distribution feeder level, then built up to the transformer level using historical coincident factors. Where appropriate, the Distribution Load Forecast is adjusted to reflect information available through the relevant official community plans and through ongoing discussions with regional or municipal planners and local developers."

228.1 Please provide a restated version of the tabular data provided in Exhibit B-1-1, Appendix B to include apparent and real power (KVA) for the period 2010 to 2031. Segmented by year and substation, please also include the corresponding number of user accounts, population and energy sales (GWh) serviced by each substation.

Response:

The tabular data included in Appendix B of Exhibit B-1-1 is already stated in apparent power (kVA).

FortisBC does not routinely track peak real power (kW) or energy sales (GWh) served by the Company's substations. Further, these values are not used in future forecasts in any way. Some substations are equipped with metering which records these values however generating a report containing this information would be very labour intensive. Individual queries for each substation would have to be developed and run to extract the values. The data would then need to be manually checked for integrity. For example, the kWh counters could roll over one or more times in a year and this would need to be corrected for. As well, if maintenance or construction was conducted at a site, the substation load may have been served by a mobile transformer and this energy would thus not be included in the total. Finally, not all locations have the required

metering devices, or it may not have been installed for long enough to capture the necessary historical information.

FortisBC does not track or forecast customer count increases on per-feeder or per-substation basis; thus, counts for future years are not available.

Population data at the level of detail requested is not available.

228.1.1 For the above question, please include historical data for the period 1990 to 2010. Copies of tabular and graphical data are requested in the form of an electronic spreadsheet.

Response:

Data from 2004 to 2010 is included in the tables below. For the reasons explained in the response to BCUC IR1 Q228.2 below, data prior to 2004 is not included. The spreadsheet is found in Attachment 5A.

North Okanagan Load Forecast (Winter), kVA

North Okanagan								Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
SEX T1	29232	28464	29031	29145	30328	32700	29001	29450	28418	29635	30655	31780	32695	33622
GLE T2	13396	13404	14830	14485	19658	23900	19412	24520	25819	27343	28195	28594	30091	30944
GLE T3	27325	23079	31796	29166	30618	25300	27661	28243	29061	30017	30935	31802	32492	33189
HOL T1	24552	21792	24667	27900	29323	25600	30101	26742	28096	29312	31770	32888	33792	34750
HOL T3	22272	22056	23484	26470	26674	20600	19431	16400	17213	17885	18655	19312	19816	20378
DGB T1	16780	17357	19774	19637	23931	22600	20271	28265	29437	30448	31348	32214	33626	34580
DUC T1	4929	8514	8960	9072	11969	11900	8090	6350	7185	7556	7795	8050	8281	8516
DUC BCH	0	0	0	0	0	0	0	35700	36700	37200	37400	37600	37700	37800
JOR T1	15829	17849	16802	17820	3517	2955	3157	3330	3489	3636	3778	3906	4018	4132
OKM T1	23296	22537	25927	25414	29732	22190	23821	23614	25751	27178	27904	28717	29255	29952
OKM T2	15085	13339	13750	11874	14071	12900	11283	10301	10745	11242	11671	11835	12363	12699
LEE tert	17622	18712	20512	19129	23138	14600	14921	14921	14790	15414	10947	11316	11642	11972
BLK T1	0	0	0	0	0	12900	12299	12691	13349	13974	16255	16633	17155	17661
ELL T1	0	0	0	0	0	0	14625	14988	20364	21611	22874	24574	24967	25728
BWS T1	0	0	0	0	14772	10700	13719	16281	16964	17558	18010	19134	19484	20003
BEV T1	0	0	0	0	0	0	23258	19480	20493	21457	22417	23327	23731	24450
REC T1/T2	23136	21864	24528	25732	24741	28000	27953	29307	30341	33933	34839	35372	36037	36565
SAU T1	20808	20184	22944	20784	22606	21100	23000	25570	26966	28065	28652	28990	29567	30010
Totals	254262	249151	277005	276628	305078	287945	322004	366152	385183	403462	414099	426045	436711	446953

North Okanagan Load Forecast (Winter), kVA

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
34487	35359	36235	37152	37986	38906	39837	40780	41658	42542	43435	44338	45251	46173
31686	32451	33165	33971	34845	35665	36502	37355	38165	38989	39801	40625	41461	42308
33855	34522	35188	35899	36517	37211	37911	38617	39273	39928	40590	41257	41930	42607
35664	36575	37491	38427	39286	40242	41207	42183	43088	44003	44928	45862	46805	47759
20910	21442	21995	22540	23039	23600	24167	24741	25271	25806	26349	26897	27451	28010
35370	36192	37060	38000	38922	39835	40775	41740	42645	43557	44465	45388	46323	47268
8751	8978	9193	9421	9635	9871	10107	10345	10567	10792	11019	11248	11479	11713
38100	38200	38400	38580	38766	38937	39121	39301	39481	39660	39841	40021	40201	40381
4239	4347	4456	4567	4670	4783	4898	5014	5121	5230	5340	5451	5563	5676
30575	31173	31796	32406	32992	33626	34263	34907	35502	36103	36708	37317	37931	38549
13022	13337	13654	14024	14335	14679	15028	15384	15719	16051	16387	16728	17072	17420
12281	12594	12911	13232	13529	13858	14190	14526	14838	15153	15471	15793	16118	16446
18128	18588	19032	19516	19959	20444	20931	21425	21887	22353	22822	23296	23775	24260
26436	27136	27816	28462	29120	29836	30552	31272	31938	32620	33307	33999	34698	35404
20502	21032	21625	22120	22613	23163	23724	24292	24805	25332	25866	26404	26948	27495
25118	25780	26427	27045	27668	28347	29028	29712	30346	30994	31646	32303	32967	33638
37042	37547	38048	38569	39025	39527	40033	40540	41006	41469	41934	42399	42865	43331
30419	30821	31221	31656	32033	32446	32859	33274	33658	34038	34419	34801	35183	35566
456585	466074	475712	485587	494939	504975	515133	525408	534967	544621	554328	564127	574020	584004

South Okanagan Load Forecast (Winter), kVA

South Okanagan								Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
RGA T3	16332	20520	19971	14364	21456	16160	16280	16512	16708	16955	17152	17293	17431	17571
OKF T1	13419	13338	14600	14000	9518	8339	9985	10074	10170	10270	10311	10506	10574	10647
WEB T1	7192	6802	6802	7454	11345	7315	7181	8833	9268	9341	9399	9434	9531	9650
AWA T1	6465	7347	6759	6048	7891	6440	7252	7413	7521	7792	7813	7824	7902	7981
KAL T1	6317	4726	6481	6268	9541	6500	6600	6689	6780	7261	7340	8020	8085	8150
SUM T2	15343	15266	16885	15744	17683	17055	18121	18499	18749	18972	19181	19364	19521	19677
WAT T1	10496	8752	14980	17189	18762	17290	17523	17760	18001	18215	18415	18590	18741	18891
WES T1/T2	21328	20064	22848	21088	23696	22470	24262	24683	25017	25315	25593	25837	26046	26255
TRC T1	6556	6252	7033	6696	7582	4567	6786	7261	7232	7145	7014	7421	7433	7446
PIN T1	5755	5876	7559	6177	8008	7190	7604	7626	7730	7822	7908	7983	8048	8112
PIN T2	11090	10904	12616	11270	12285	10986	12741	15055	15211	15355	15553	15727	15841	15959
OSO T1	10879	10721	10211	10960	6926	6870	7321	7420	7520	7610	7694	7767	7830	7751
OSO T2	7050	6424	9261	8160	9024	7175	9385	5061	5129	5191	5248	5298	5341	5383
NKM T1	0	0	0	0	7919	6450	6758	10690	11321	11943	12495	12668	12768	12867
KER T1	11390	10416	11862	11585	13796	11830	13002	12948	13525	13848	13907	13881	14028	14214
HED T1	4859	2709	4800	4640	6081	4934	5216	5521	5570	5605	5628	5694	5772	5807
OLI T1	7631	7336	9568	6170	6652	7858	9457	8287	8239	8555	8930	8902	8838	8927
PRI T4	17388	16653	19700	17300	19935	17560	18657	20608	20835	21019	21172	21506	21659	21814
HUT T4/5/6	12880	13136	13264	13488	14864	9504	9646	9777	9909	10027	10137	10234	10317	10399
HUT T8	12621	16499	6890	6283	6614	6380	7000	7095	7191	7276	7356	7426	7487	7547
Totals	204991	203741	222090	204884	239578	202873	220777	227811	231627	235514	238246	241375	243191	245048

South Okanagan Load Forecast (Winter), kVA

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
34487	35359	36235	37152	37986	38906	39837	40780	41658	42542	43435	44338	45251	46173
31686	32451	33165	33971	34845	35665	36502	37355	38165	38989	39801	40625	41461	42308
33855	34522	35188	35899	36517	37211	37911	38617	39273	39928	40590	41257	41930	42607
35664	36575	37491	38427	39286	40242	41207	42183	43088	44003	44928	45862	46805	47759
20910	21442	21995	22540	23039	23600	24167	24741	25271	25806	26349	26897	27451	28010
35370	36192	37060	38000	38922	39835	40775	41740	42645	43557	44465	45388	46323	47268
8751	8978	9193	9421	9635	9871	10107	10345	10567	10792	11019	11248	11479	11713
38100	38200	38400	38580	38766	38937	39121	39301	39481	39660	39841	40021	40201	40381
4239	4347	4456	4567	4670	4783	4898	5014	5121	5230	5340	5451	5563	5676
30575	31173	31796	32406	32992	33626	34263	34907	35502	36103	36708	37317	37931	38549
13022	13337	13654	14024	14335	14679	15028	15384	15719	16051	16387	16728	17072	17420
12281	12594	12911	13232	13529	13858	14190	14526	14838	15153	15471	15793	16118	16446
18128	18588	19032	19516	19959	20444	20931	21425	21887	22353	22822	23296	23775	24260
26436	27136	27816	28462	29120	29836	30552	31272	31938	32620	33307	33999	34698	35404
20502	21032	21625	22120	22613	23163	23724	24292	24805	25332	25866	26404	26948	27495
25118	25780	26427	27045	27668	28347	29028	29712	30346	30994	31646	32303	32967	33638
37042	37547	38048	38569	39025	39527	40033	40540	41006	41469	41934	42399	42865	43331
30419	30821	31221	31656	32033	32446	32859	33274	33658	34038	34419	34801	35183	35566
456585	466074	475712	485587	494939	504975	515133	525408	534967	544621	554328	564127	574020	584004

Kootenay Load Forecast (Winter), kVA

Kootenay								Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
KAS T1	9232	8702	9085	7395	7370	7440	8815	9189	9197	9399	9527	9533	9581	9640
COF T3	6853	5450	5040	5615	5931	6286	6276	6479	6642	6690	6725	6748	6807	6860
CRA T5	3300	0	0	5337	6032	5990	6577	6767	6811	6969	7015	7052	7079	7128
CRE T1	14719	11850	11528	12880	11934	13050	13279	13532	13683	13784	13975	14038	14114	14204
CRE T2	11371	11500	9346	9128	10229	9480	11879	13108	13305	13426	13492	13601	13689	13779
AAL T2	1800	3850	11589	12599	13032	13900	14207	14461	13969	13997	14124	14191	14471	14440
VAL T1	3413	3278	3400	3610	3786	4300	4543	4841	4890	4934	4975	5011	5042	5072
VAL T2	5186	4400	4260	4453	4536	2125	4581	4627	4674	4716	4755	4790	4819	4848
PAS T1	3820	3549	3673	3528	2664	3450	3547	3520	3528	3539	3696	3657	3669	3691
PLA T1	12242	11398	12074	10455	12791	13150	13533	13723	13830	13960	14066	14193	14270	14352
TAR T1	3360	2880	2826	3152	3240	1509	3000	2959	2950	2940	2928	2955	2947	2944
COT T1	323	350	337	357	495	540	594	663	670	676	682	687	691	695
SAL T1	7056	6912	6371	6763	6263	7050	7405	7559	7648	7657	7757	7835	7865	7911
HER T1	160	200	1520	1576	1620	1208	1832	1857	1876	1893	1909	1922	1934	1946
FRU T1	6465	6432	6563	7409	7954	7660	6000	7163	7075	7052	6988	6892	7195	7185
YMR T1	1187	1075	1102	960	1056	1339	1387	1482	1497	1511	1523	1534	1544	1553
CAS T1	16644	17064	17700	16690	16509	11950	12045	12149	12106	12148	12487	12522	12560	12617
BLU T1	7640	8330	7768	8543	8777	7700	7940	8083	8183	8246	8303	8374	8424	8476
OOT T1	0	0	0	0	9034	8050	8307	9442	9511	9564	9694	9782	9816	9871
BEP T1	7870	8082	8035	7556	7911	8025	8440	10886	9475	9590	9664	8823	8846	8910
GLM T1	10388	9977	9974	10254	10950	10654	11216	11818	14081	14163	14240	14328	14429	14540
STC T1	7367	6783	7315	7477	7065	7610	7700	8458	8457	8414	8690	8621	8721	8756
CSC T1	8112	7336	8418	9300	9812	8850	10330	10849	10947	10950	11005	11160	11231	11285
Totals	154809	149228	154084	155036	168991	161316	173433	183614	185007	186217	188218	188249	189743	190705

Kootenay Load Forecast (Winter), kVA

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
9714	9766	9808	9860	9910	9964	10013	10062	10109	10155	10201	10246	10291	10335
6892	6925	6961	7002	7036	7071	7106	7143	7176	7208	7240	7272	7304	7336
7180	7215	7250	7287	7324	7364	7400	7437	7471	7505	7539	7572	7605	7639
14284	14369	14439	14515	14586	14662	14738	14811	14879	14946	15014	15080	15146	15212
13851	13921	13998	14073	14141	14213	14286	14359	14424	14490	14554	14619	14683	14747
14510	14597	14683	14778	14829	14907	14986	15063	15133	15198	15267	15335	15403	15470
5100	5128	5155	5183	5208	5234	5261	5288	5312	5336	5360	5384	5407	5431
4875	4901	4928	4954	4978	5003	5029	5054	5077	5100	5123	5146	5169	5191
3718	3751	3759	3778	3798	3819	3839	3857	3874	3892	3910	3927	3944	3962
14432	14511	14592	14667	14737	14813	14889	14965	15033	15101	15169	15236	15303	15369
2943	2944	2947	2945	2944	2944	2945	2945	2945	2945	2945	2945	2945	2945
699	703	707	710	714	717	721	725	728	731	735	738	741	744
7950	8000	8044	8084	8123	8165	8207	8249	8286	8324	8361	8398	8435	8472
1957	1967	1978	1988	1998	2008	2018	2029	2038	2047	2056	2065	2075	2084
7194	7214	7255	7327	7348	7380	7417	7457	7495	7526	7559	7593	7627	7660
1562	1570	1579	1587	1594	1603	1611	1619	1626	1634	1641	1648	1656	1663
12699	12796	12850	12912	12974	13045	13114	13177	13237	13297	13358	13417	13475	13534
8520	8566	8614	8659	8700	8745	8790	8834	8875	8915	8955	8995	9034	9073
9927	9989	10042	10091	10140	10193	10246	10297	10344	10391	10438	10484	10530	10576
10078	10132	10187	10237	10288	10342	10395	10447	10494	10542	10590	10636	10683	10729
14607	14680	14759	14841	14914	14989	15065	15142	15212	15280	15348	15417	15484	15552
8801	8870	8900	8954	8994	9042	9090	9133	9176	9217	9259	9300	9341	9381
11333	11398	11470	11529	11581	11640	11701	11761	11814	11867	11920	11973	12026	12078
192826	193913	194905	195960	196859	197863	198867	199854	200758	201650	202541	203427	204307	205181

Note: Historical totals include decommissioned substations (not shown).

Boundary Load Forecast (Winter), kVA

Boundary	2004	2005	2006	2007	2008	2009	2010	Year 0 2011	Year 1 2012	Year 2 2013	Year 3 2014	Year 4 2015	Year 5 2016	Year 6 2017
CHR T1	4275	4116	4572	4277	4788	4489	4884	4968	5015	5057	5097	5131	5160	5189
RUC T1	11278	10076	10289	10502	9337	7793	6699	6806	6920	7130	7125	7101	7164	7223
RUC T2	9040	9815	8820	7820	8619	8360	9140	8877	8939	9191	9294	9313	9314	9386
GFT T3	4221	6392	6485	6827	9163	9120	9964	10883	10986	11079	11165	11240	11304	11368
KET T1/T2	0	0	0	0	7006	10700	11354	11660	11734	11787	11887	12041	12071	12131
Totals	43281	44738	45410	44039	38913	40462	42041	43194	43594	44244	44567	44825	45014	45297

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
5216	5242	5269	5295	5318	5344	5369	5395	5418	5441	5463	5486	5508	5531
7273	7294	7323	7366	7402	7438	7470	7505	7539	7571	7602	7633	7665	7696
9462	9506	9543	9586	9634	9684	9728	9772	9814	9857	9898	9938	9979	10019
11426	11484	11541	11598	11650	11707	11762	11818	11868	11918	11968	12018	12067	12116
12191	12260	12328	12382	12437	12498	12559	12618	12671	12724	12778	12831	12883	12935
45568	45786	46004	46227	46442	46670	46889	47108	47310	47511	47709	47906	48102	48297

Note: Historical totals include decommissioned substations (not shown).

North Okanagan Load Forecast (Summer), kVA

North Okanagan								Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
SEX T1	27696	25944	28704	28704	27462	30390	25810	27667	26209	27334	28579	29459	30521	31579
GLE T2	18799	16645	17155	16345	19446	21297	22820	25180	26595	27727	29098	30298	31302	32388
GLE T3	25172	28665	30638	30806	28524	28477	26458	28614	29640	30772	31423	32219	32983	33817
HOL T1	19536	17760	20047	20750	23653	22679	20953	21745	22918	24259	26322	27247	28137	29113
HOL T3	23736	23832	25972	27342	24562	27469	22470	16819	17687	18650	19367	20071	20664	21380
DGB T1	13510	14203	17424	19774	19343	21070	21734	24098	25253	26317	27181	28450	29312	30328
DUC T1	4469	7744	9058	12631	10224	15868	0	5079	5840	6029	6428	6576	6784	7019
DUC BCH	0	0	0	0	0	0	0	28553	29827	29684	30843	30717	30886	31158
JOR T1	4702	5000	5339	4170	2984	1366	1706	1787	1881	1971	2050	2123	2190	2266
OKM T1	20152	19527	23362	22407	27683	27843	19617	21473	23301	24507	24959	25410	26063	26644
OKM T2	12949	12774	13574	13108	12028	12899	12474	9287	9733	10356	10743	11094	11428	11834
LEE tert	13129	11762	15072	14805	21683	17931	12665	13340	13197	13830	9312	9644	9949	10294
BLK T1	0	0	0	0	0	7515	11289	10909	11373	11779	13552	14718	14844	15325
ELL T1	0	0	0	0	0	0	18915	14121	19371	20592	21709	23241	23917	24757
BWS T1	0	0	0	0	0	3778	2578	3884	4111	4335	4543	4676	4808	4984
BEV T1	0	0	0	0	0	0		19480	20587	21675	22663	23625	24101	24983
REC T1/T2	22200	19560	21864	24681	23386	22259	20821	25868	26570	29444	29430	29136	30138	30281
SAU T1	18240	16824	18047	19944	20143	19724	21597	24265	25820	26411	26351	26209	26776	27008
Totals	224290	220240	246256	255467	261121	280565	261907	322168	339910	355674	364553	374915	384803	395157

North Okanagan Load Forecast (Summer), kVA

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
32490	33467	34492	35387	36443	37488	38563	39658	40644	41648	42789	43822	44870	46064
33310	34270	35330	36291	37351	38417	39515	40643	41659	42682	43852	44911	45985	47210
34550	35284	36039	36713	37526	38319	39124	39944	40685	41439	42292	43062	43842	44731
30030	30962	31852	32696	33663	34643	35635	36638	37553	38480	39536	40490	41457	42561
22049	22737	23413	24029	24729	25450	26182	26922	27591	28271	29048	29749	30460	31271
31213	32133	33099	34018	35000	36005	37035	38089	39042	40000	41097	42089	43096	44244
7238	7455	7698	7886	8118	8355	8595	8840	9058	9281	9537	9767	10000	10266
31514	31721	32158	32294	32664	32957	33269	33586	33842	34109	34481	34752	35022	35393
2335	2406	2479	2544	2619	2695	2772	2850	2921	2993	3076	3150	3225	3311
27164	27671	28214	28728	29284	29847	30419	31004	31533	32063	32668	33214	33767	34396
12221	12582	12953	13294	13688	14087	14488	14898	15269	15646	16076	16464	16857	17306
10611	10933	11261	11558	11897	12242	12593	12950	13272	13600	13973	14310	14652	15042
15785	16290	16857	17234	17737	18257	18789	19327	19796	20285	20844	21349	21858	22439
25526	26307	27096	27802	28621	29453	30297	31155	31930	32717	33616	34427	35250	36188
5144	5302	5455	5598	5765	5933	6102	6274	6431	6590	6771	6934	7099	7289
25790	26597	27393	28076	28915	29762	30616	31479	32258	33057	33966	34785	35616	36564
30347	30469	30665	30945	31102	31267	31452	31650	31827	31984	32166	32331	32496	32679
27112	27231	27395	27609	27772	27925	28088	28261	28417	28561	28723	28870	29016	29180
404430	413817	423850	432702	442897	453101	463534	474168	483728	493408	504510	514473	524569	536134

South Okanagan Load Forecast (Summer), kVA

South Okanagan								Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
RGA T3	14028	16368	22531	14244	13560	16776	13296	16971	17145	17306	17564	17668	17883	18036
OKF T1	11384	8639	11657	11400	6566	8719	7371	8405	8557	8594	8847	8662	8888	8970
WEB T1	5293	5283	5283	5630	8346	6218	8878	8560	8882	8999	9096	9235	9238	9362
AWA T1	3526	3086	3527	4032	4032	4019	4201	4612	4712	4763	4803	4882	4905	4957
KAL T1	2793	2738	3509	3727	3891	4292	3859	4999	5072	5540	5601	6266	6321	6382
SUM T2	11330	11203	12849	12744	12527	13591	12541	13614	13814	13998	14153	14294	14419	14558
WAT T1	8608	8752	13014	18373	16927	17663	16732	16978	17227	17457	17650	17825	17982	18155
WES T1/T2	17056	16864	16992	17824	18870	19238	19146	19810	20101	20369	20595	20799	20982	21184
TRC T1	5224	4949	5356	5326	5307	5594	5623	6398	6471	6370	6564	6594	6686	6733
PIN T1	5820	7771	7935	8045	6935	7283	6974	7914	8030	8137	8227	8309	8382	8463
PIN T2	10268	10404	13360	10104	10043	10742	9824	12974	13097	13292	13446	13625	13709	13835
OSO T1	12554	12760	13662	13200	6272	7870	7840	7953	8070	7931	8031	8115	8423	8272
OSO T2	7523	7234	7500	9130	9002	8510	7870	6820	6920	7012	7090	7160	7223	7293
NKM T1	0	0	0	0	8673	9701	9247	14196	14899	15593	16228	16350	16545	16700
KER T1	9953	9857	10981	10691	10509	10915	10537	11803	12003	12298	12362	12565	12594	12734
HED T1	1414	1231	1703	2100	1663	1637	1707	2221	2238	2223	2193	2248	2296	2307
OLI T1	6616	6660	9158	6890	8805	7207	7006	7322	7429	7528	7611	7688	7755	7829
PRI T4	11755	11755	12490	13000	13170	12846	12648	18071	18192	18259	18249	18512	18841	18962
HUT T4/5/6	10448	10496	10896	11440	10272	9536	9419	9557	9698	9827	9936	10034	10122	10220
HUT T8	13673	13775	18860	6692	6948	6960	7108	7212	7318	7416	7498	7572	7639	7713
Totals	169266	169825	201263	184592	182318	189317	181827	206391	209875	212913	215744	218403	220834	222666

South Okanagan Load Forecast (Summer), kVA

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
18184	18345	18492	18635	18783	18934	19086	19236	19370	19502	19651	19783	19915	20062
9038	9119	9167	9258	9332	9404	9479	9551	9621	9686	9760	9825	9890	9964
9442	9523	9603	9665	9750	9828	9907	9984	10053	10122	10200	10268	10336	10413
4997	5040	5085	5120	5162	5204	5245	5287	5323	5360	5401	5437	5473	5514
6437	6491	6546	6594	6648	6701	6755	6808	6855	6902	6955	7001	7048	7100
14683	14807	14931	15040	15163	15285	15407	15528	15636	15743	15863	15970	16076	16195
18310	18465	18619	18756	18909	19062	19213	19365	19499	19633	19783	19915	20048	20196
21365	21546	21726	21885	22064	22242	22419	22596	22752	22908	23083	23238	23393	23566
6773	6848	6902	6955	7008	7064	7123	7178	7228	7277	7333	7382	7431	7486
8535	8607	8679	8743	8814	8885	8956	9027	9089	9151	9221	9283	9345	9414
13960	14082	14202	14300	14417	14535	14652	14767	14868	14970	15085	15186	15287	15400
8339	8413	8486	8550	8616	8685	8756	8825	8886	8946	9015	9075	9136	9203
7355	7418	7480	7534	7596	7657	7718	7779	7833	7887	7947	8000	8053	8113
16838	16974	17115	17248	17387	17526	17665	17805	17929	18051	18189	18311	18433	18569
12860	12960	13074	13160	13272	13381	13486	13592	13685	13780	13886	13979	14071	14176
2316	2333	2360	2380	2396	2414	2434	2454	2471	2487	2506	2523	2540	2559
7896	7963	8030	8089	8155	8220	8286	8351	8409	8467	8531	8589	8646	8710
19082	19229	19417	19576	19720	19874	20034	20197	20337	20473	20629	20769	20907	21062
10308	10395	10481	10558	10645	10730	10816	10901	10977	11052	11136	11211	11286	11369
7779	7844	7910	7968	8033	8098	8162	8226	8283	8340	8404	8460	8517	8580
224498	226402	228305	230013	231868	233729	235597	237457	239104	240739	242577	244206	245830	247651

Kootenay Load Forecast (Summer), kVA

Kootenay								Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
KAS T1	5500	6133	5514	4860	3444	3232	5090	4694	4579	4533	4696	4567	4668	4659
COF T3	3140	4313	3643	4399	2675	4445	4500	4907	4911	4951	4947	5006	5002	5018
CRA T5	1738	3016	0	0	3145	3200	2700	3677	3636	3580	3708	3770	3717	3722
CRE T1	10307	7495	8164	7762	7793	7611	7800	8491	8680	8863	8877	8910	8866	8936
CRE T2	6700	7313	8973	5301	6509	6262	6500	9227	9226	9412	9404	9435	9450	9489
AAL T2	1400	1442	8277	9021	8054	8404	8600	8926	8581	8148	8261	8425	8569	8489
VAL T1	2508	2709	1730	1853	1846	1962	2000	2065	2076	2086	2095	2103	2109	2117
VAL T2	3853	4025	3952	4057	5053	5296	5349	5402	5432	5459	5481	5501	5519	5538
PAS T1	2351	2000	1763	2736	1440	1506	2050	2631	2629	2501	2649	2798	2672	2679
PLA T1	5733	5992	7312	8340	5285	5755	6000	6256	6205	6151	6184	6201	6272	6271
TAR T1	2880	2400	2609	2880	3024	2873	3360	3000	3000	3000	3000	3000	3000	3000
COT T1	112	73	78	116	209	233	165	262	263	264	266	267	267	268
SAL T1	4104	4320	4896	4854	4485	4705	4800	5251	5208	5194	5219	5249	5285	5289
HER T1	178	133	133	1216	1066	648	700	1077	1082	1088	1092	1096	1100	1104
FRU T1	4244	3648	4042	5175	4414	4457	4600	4292	4261	4131	4187	4235	4271	4263
YMR T1	583	563	685	768	672	583	750	763	767	770	774	776	779	782
CAS T1	11888	9806	12481	12963	12750	8999	8900	8870	8807	8927	9131	9103	9072	9107
BLU T1	5583	5437	6098	6542	6566	5241	5960	5683	5707	5736	5751	5765	5795	5814
OOT T1	0	0	0	0	0	4846	4980	5042	5058	5070	5075	5096	5128	5141
BEP T1	6500	6500	7568	8174	7070	7760	7900	10137	8560	8522	8586	7735	7769	7780
GLM T1	8400	8500	8500	8628	10377	9327	10000	10532	12676	12947	12995	12906	12910	13029
STC T1	5838	3045	5320	5400	3241	6061	6061	5275	5273	5262	5637	5562	5465	5499
CSC T1	4204	4799	4640	5200	3762	4232	4400	5031	4991	4933	4985	5063	5059	5061
Totals	102722	99263	109334	112711	102880	107638	113165	121490	121609	121531	123000	122567	122747	123057

Kootenay Load Forecast (Summer), kVA

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
4672	4698	4697	4721	4732	4746	4761	4773	4787	4798	4812	4824	4836	4849
5036	5051	5071	5081	5097	5112	5128	5143	5155	5169	5183	5196	5209	5223
3737	3768	3779	3778	3790	3804	3817	3827	3836	3846	3857	3867	3876	3886
8982	9002	9025	9043	9078	9106	9131	9157	9180	9204	9230	9253	9275	9301
9535	9555	9583	9609	9639	9670	9696	9724	9749	9774	9802	9826	9850	9877
8464	8525	8576	8602	8607	8631	8664	8692	8712	8731	8757	8780	8801	8825
2124	2130	2137	2143	2149	2155	2162	2168	2174	2179	2185	2191	2196	2202
5556	5573	5590	5606	5622	5639	5656	5672	5687	5701	5717	5731	5745	5761
2687	2724	2738	2724	2735	2746	2758	2764	2769	2776	2785	2792	2799	2806
6280	6303	6325	6347	6361	6379	6399	6419	6435	6451	6469	6485	6501	6519
3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
269	270	271	272	272	273	274	275	276	276	277	278	278	279
5301	5320	5340	5355	5368	5384	5401	5417	5431	5444	5459	5473	5487	5502
1107	1111	1114	1117	1120	1124	1127	1130	1133	1136	1139	1142	1145	1148
4261	4285	4304	4316	4324	4336	4351	4364	4375	4385	4398	4409	4420	4432
784	787	789	791	794	796	798	801	803	805	807	809	811	813
9161	9205	9217	9235	9267	9299	9326	9350	9374	9399	9426	9449	9472	9498
5831	5848	5866	5884	5901	5918	5936	5953	5968	5983	6000	6015	6030	6046
5154	5169	5187	5202	5217	5232	5247	5263	5277	5290	5305	5318	5331	5345
8885	8921	8952	8975	8999	9026	9054	9080	9103	9126	9152	9175	9197	9222
13091	13114	13134	13173	13225	13264	13299	13336	13372	13407	13444	13477	13510	13547
5541	5596	5586	5587	5611	5634	5652	5664	5677	5694	5710	5724	5737	5753
5072	5098	5119	5128	5141	5157	5174	5189	5201	5214	5229	5242	5255	5269
124530	125052	125400	125689	126051	126431	126811	127161	127473	127789	128144	128455	128761	129104

Note: Historical totals include decommissioned substations (not shown).

Boundary Load Forecast (Summer), kVA

Boundary	2004	2005	2006	2007	2008	2009	2010	Year 0 2011	Year 1 2012	Year 2 2013	Year 3 2014	Year 4 2015	Year 5 2016	Year 6 2017
CHR T1	3515	3596	4077	4061	3873	4255	4366	4444	4517	4586	4643	4695	4742	4794
RUC T1	9244	8791	7920	8074	5474	6215	6600	6502	6664	6842	6865	7013	7020	7113
RUC T2	7986	8310	7650	8306	6839	3913	8380	8411	8662	8806	8857	8967	9055	9170
GFT T3	2768	3591	4587	5056	6432	6566	6600	7154	7272	7382	7475	7558	7634	7717
KET T1/T2	0	0	0	0	3784	4638	3400	5889	5738	5523	5225	5273	5736	5688
Totals	33748	34496	34285	35756	26402	25587	29346	32399	32854	33138	33065	33507	34187	34482

Year 7 2018	Year 8 2019	Year 9 2020	Year 10 2021	Year 11 2022	Year 12 2023	Year 13 2024	Year 14 2025	Year 15 2026	Year 16 2027	Year 17 2028	Year 18 2029	Year 19 2030	Year 20 2031
4840	4886	4932	4973	5019	5065	5111	5156	5197	5237	5282	5322	5362	5407
7191	7253	7328	7381	7452	7521	7588	7656	7715	7776	7843	7902	7962	8028
9255	9335	9426	9505	9595	9681	9767	9855	9932	10009	10096	10172	10249	10335
7792	7866	7940	8006	8080	8154	8227	8301	8366	8431	8504	8568	8633	8705
5662	5682	5773	5868	5892	5933	5988	6051	6101	6142	6194	6243	6291	6343
34739	35023	35399	35733	36038	36354	36682	37019	37311	37595	37919	38208	38496	38819

Note: `Historical totals include decommissioned substations (not shown).

228.2 Please describe any clear trends in the relationship between apparent power (KVA), the number of customer accounts, population and the energy sales (GWh) for the three geographic regions serviced by FortisBC (Okanagan, Kootenay, and Boundary regions) from 1990 to 2010.

Response:

As discussed in the response to BCUC IR1 Q228.1, FortisBC does not track substation energy sales (GWh) or the population served by the substation. With respect to customer account numbers by substation supply point, external factors preclude drawing any conclusions from customer count increases or decreases. The reason for this is that the electrical system is dynamic – since 1990, FortisBC has added over 12 new substations, numerous new substation transformers and numerous new distribution feeders. In many cases, these additions result in the transfer of customers between feeders or substations. For example, a feeder addition might result in offloading of an existing heavily loaded feeder by transferring many customers onto a new feeder. In the past five years, 13 new feeders have been added in the Kelowna area alone. Portions of existing feeders were connected to these new supply points to offload existing substations. These ongoing changes make it impossible to derive any conclusions on load or customer growth on a per-feeder or per-substation basis.

228.2.1 Please also discuss consistency or differences between historical trends (1990 to 2010) to forecasted trends (2011 to 2031).

Response:

Please refer to the response to BCUC IR1 Q228.2.

228.3 For the period 1990 to 2031, please provide linear graphs that summarize the annual percent (%) variation in the number of user accounts, population, energy sales, and apparent power for the Okanagan, Kootenay and Boundary regions. Please provide a copy of the data and graphs in the form of an electronic spreadsheet.

Response:

Please see the responses to BCUC IR1 Q228.1 and Q228.2 above. Graphs summarizing the annual peak variations are found below. The graphs are found in BCUC IR1 Electronic Attachment 228.1.1.

Figure BCUC IR1 228.3a

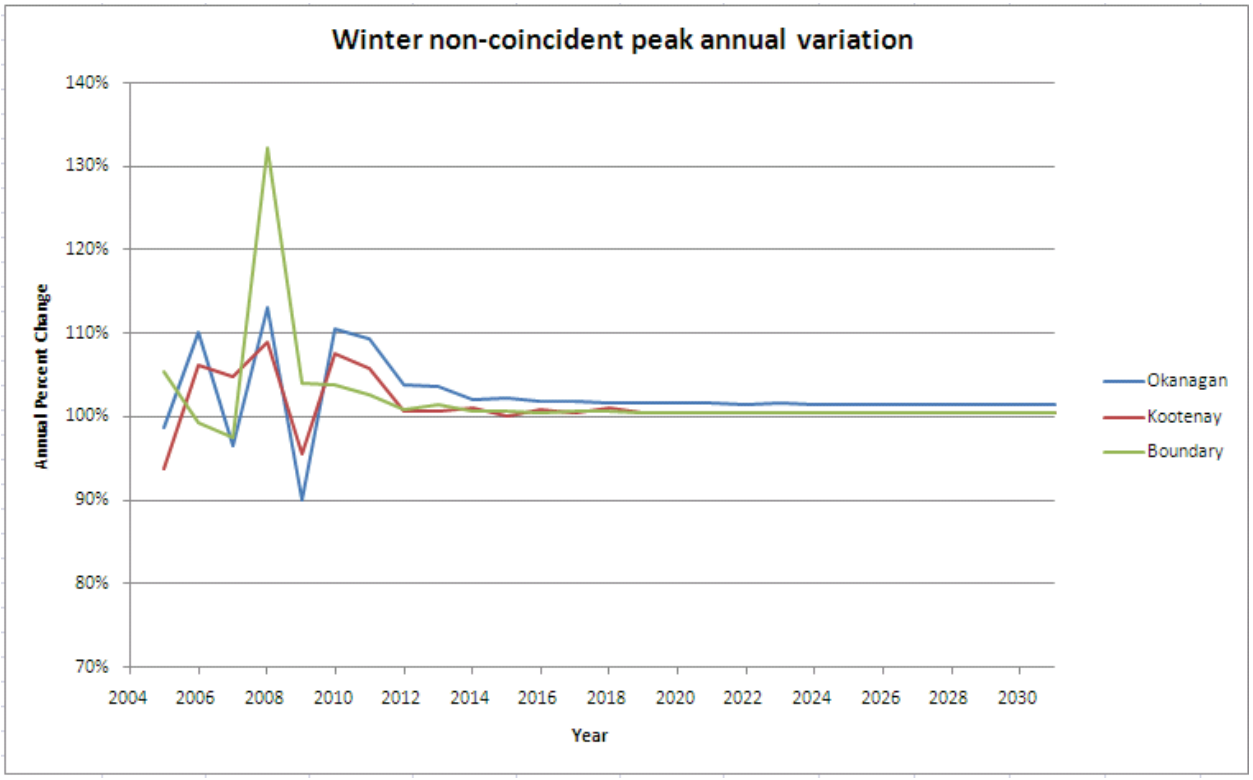
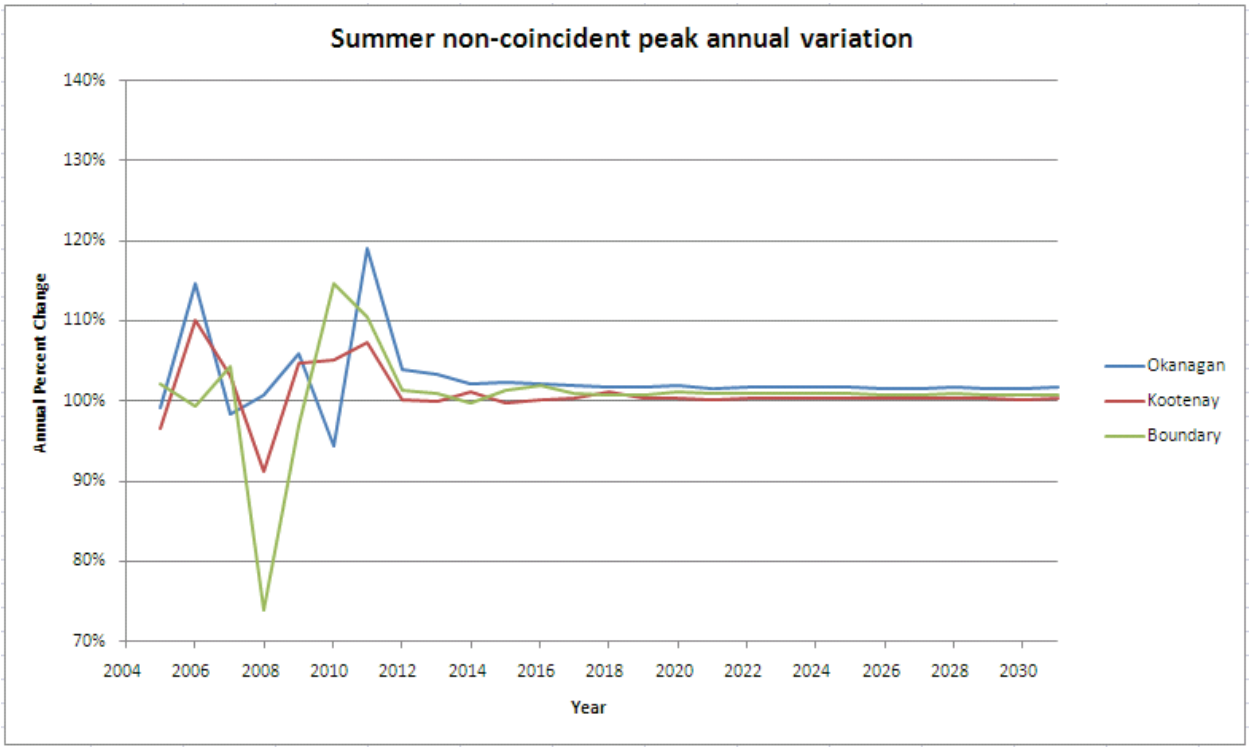


Figure BCUC IR1 228.3b



229.0 Reference: Load Forecasting

Exhibit B-1-1, Long Term Capital Plan, Section 2.1, p. 10; Appendix B, p. 9

Peak Loads

"To this end the Company provides a "1-in-20" load forecast, which produces forecast peak loads that are expected to be higher than the actual peak loads in 19 out of 20 years. Its success rate is therefore expected to be 95 percent. The "1-in-20" winter and summer peak demand forecasts for the period 2011-2040 is included in Appendix B."

229.1 FortisBC uses a peak load forecast that is based on a 5% probability (i.e., 1-in-20 assumption). Please provide a benchmark comparison of the peak load assumption used by other peer group utilities in Canada including BC Hydro.

Response:

Please see the response to BCUC IR1 Q6.1 above.

229.1.1 What financial impact would a peak load forecast based on a 10% probability (1-in-10) have on the FortisBC's Long-Term Capital Plan and customer rates?

Response:

The "1-in-20" forecast was used only for benchmarking purposes, to provide a quantitative assessment of the risk, and as a consistency check against the system load forecast. It has not been used directly to determine the need or timing of specific capital project and the use of a "1-in-10" forecast would not impact either the Long Term Capital Plan or customer rates.

229.2 For the FortisBC service regions during the period 1990 to 2031, please provide graphical and tabular data that summarizes energy demand (MW) for the following: (a) summer peak levels, (b) winter peak levels, (c) 1-in-20 peak levels, (d) annual average. Please provide a copy in the form of an electronic spreadsheet.

Response:

The first table and accompanying graphs summarize the FortisBC system average and seasonal peaks including the 1-in-20 peak levels. The actual and forecast values are provided in MW from 1990 to 2031.

The second table and accompaning graphs display the regional, non-coincident seasonal peaks as recorded by distrubution substation transformers. The totals represent the sum of distrubution transformer yearly seasonal peak values (MVA) in each of the four regions: North Okanagan (NOK), South Okanagan (SOK), Kootenay (KOT), Boundary (BND).

The data and graphs are found in BCUC IR1 Electronic Attachment 228.1.1.

1

Table BCUC IR1 229.2a

Actual and Forecast System Peaks and System 1-in-20 Peaks (MW)

Year	Annual Average (MW)	Winter Peak (MW)	Summer Peak (MW)	1-in-20 Winter (MW)	1-in-20 Summer (MW)
1990	437	623	396		
1991	439	530	400		
1992	443	640	420		
1993	472	600	415		
1994	476	642	469		
1995	479	667	449		
1996	502	651	447		
1997	468	631	446		
1998	471	628	483		
1999	459	548	453		
2000	469	616	473		
2001	483	576	486		
2002	501	555	515		
2003	502	715	523		
2004	516	708	511		
2005	525	675	508		
2006	547	711	548		
2007	538	659	561		
2008	541	746	532		
2009	552	700	553		
2010	531	707	554		
2011	550	715	563	843	652
2012	557	730	575	856	661
2013	565	745	587	869	669
2014	572	758	598	880	678
2015	577	770	609	890	685
2016	579	780	616	895	688
2017	582	789	624	902	692
2018	587	800	632	910	697
2019	591	810	640	918	703
2020	595	821	649	926	708
2021	600	832	657	935	714
2022	605	843	666	943	720
2023	610	854	675	951	726
2024	614	865	684	960	732
2025	619	877	692	969	738
2026	624	888	701	977	744
2027	629	899	710	986	750
2028	634	910	719	995	756
2029	639	922	728	1,004	763
2030	644	933	737	1,013	769
2031	649	944	745	1,022	775

2

Figure BCUC IR1 229.2a

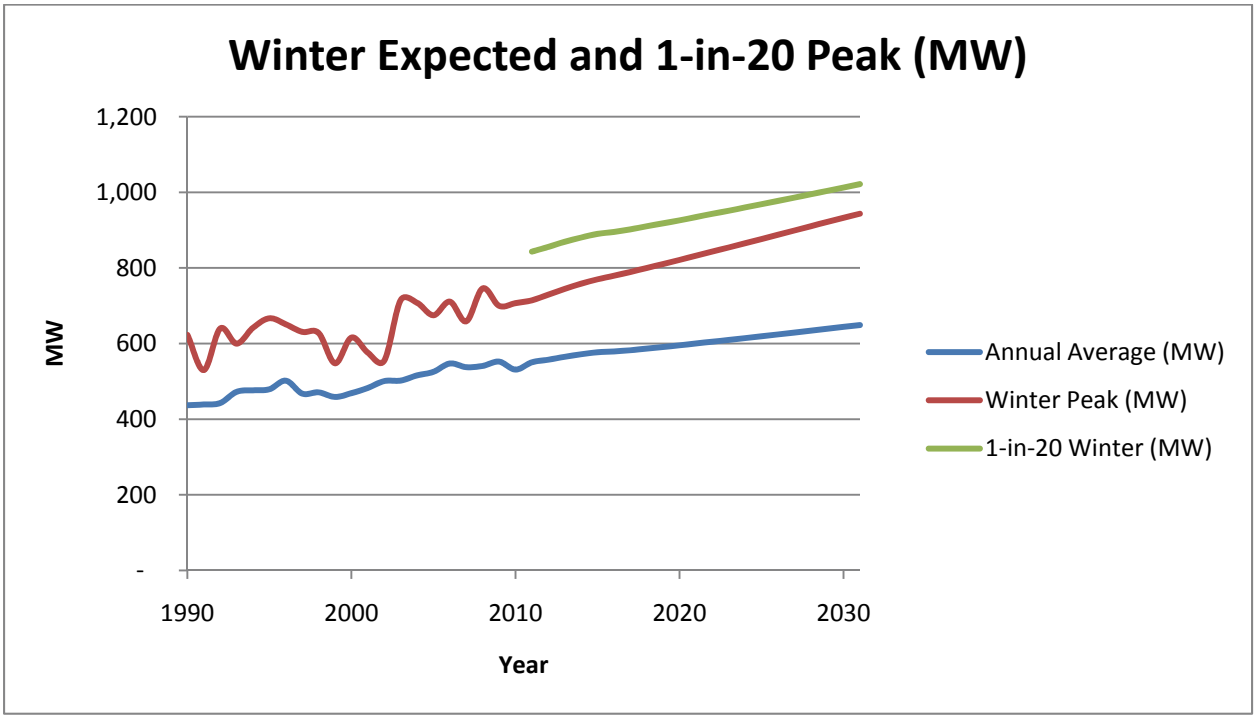


Figure BCUC IR1 229.2b

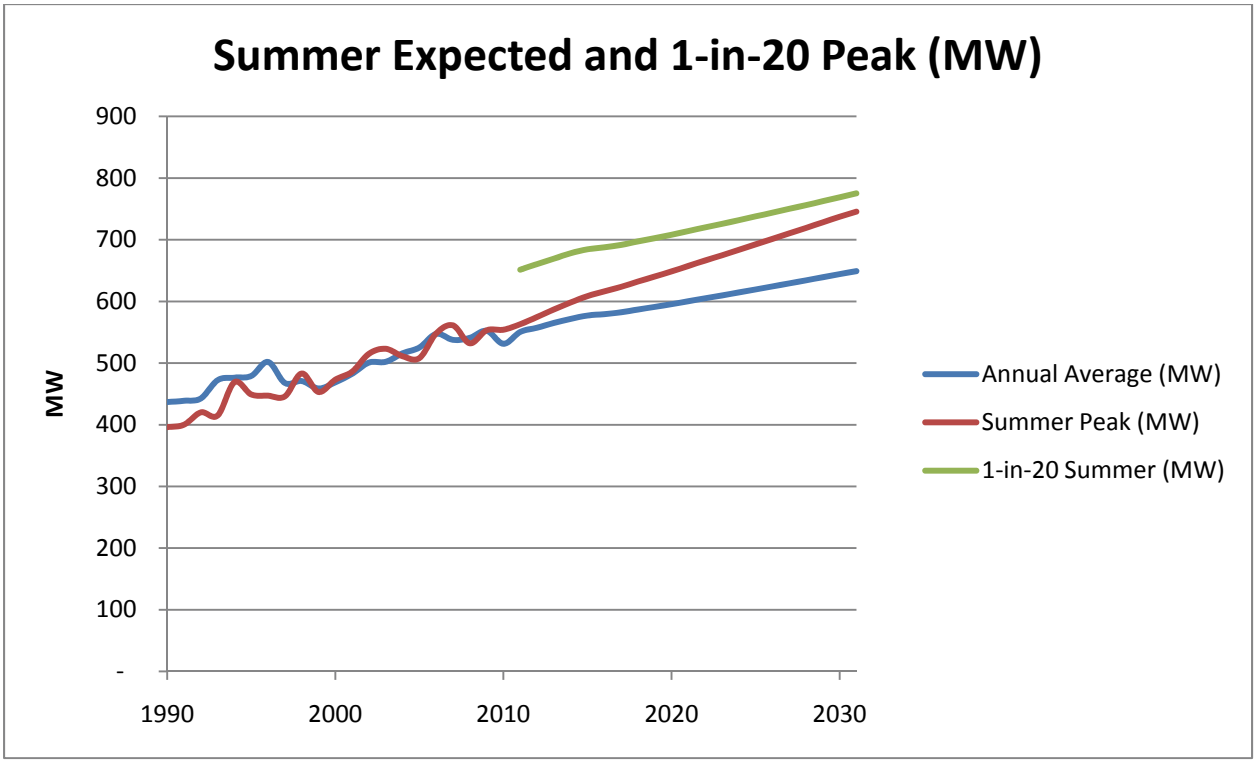


Table BCUC IR1 229.2b

Regional Actual and Forecast Peaks (Sum of Substation Transformer Peaks)

	Winter (kVA)				Summer (kVA)			
	NOK	SOK	KOT	BND	NOK	SOK	KOT	BND
2004	254262	204991	154809	43281	224290	169266	102722	33748
2005	249151	203741	149228	44738	220240	169825	99263	34496
2006	277005	222090	154084	45410	246256	201263	109334	34285
2007	276628	204884	155036	44039	255467	184592	112711	35756
2008	305078	239578	168991	38913	261121	182318	102880	26402
2009	287945	202873	161316	40462	280565	189317	107638	25587
2010	322004	220777	173433	42041	261907	181827	113165	29346
2011	366152	227811	183614	43194	322168	206391	121490	32399
2012	385183	231627	185007	43594	339910	209875	121609	32854
2013	403462	235514	186217	44244	355674	212913	121531	33138
2014	414099	238246	188218	44567	364553	215744	123000	33065
2015	426045	241375	188249	44825	374915	218403	122567	33507
2016	436711	243191	189743	45014	384803	220834	122747	34187
2017	446953	245048	190705	45297	395157	222666	123057	34482
2018	456585	246840	192826	45568	404430	224498	124530	34739
2019	466074	248578	193913	45786	413817	226402	125052	35023
2020	475712	250374	194905	46004	423850	228305	125400	35399
2021	485587	252112	195960	46227	432702	230013	125689	35733
2022	494939	253719	196859	46442	442897	231868	126051	36038
2023	504975	255455	197863	46670	453101	233729	126431	36354
2024	515133	257179	198867	46889	463534	235597	126811	36682
2025	525408	258902	199854	47108	474168	237457	127161	37019
2026	534967	260467	200758	47310	483728	239104	127473	37311
2027	544621	262028	201650	47511	493408	240739	127789	37595
2028	554328	263581	202541	47709	504510	242577	128144	37919
2029	564127	265126	203427	47906	514473	244206	128455	38208
2030	574020	266666	204307	48102	524569	245830	128761	38496
2031	584004	268198	205181	48297	536134	247651	129104	38819

Figure BCUC IR1 229.2b

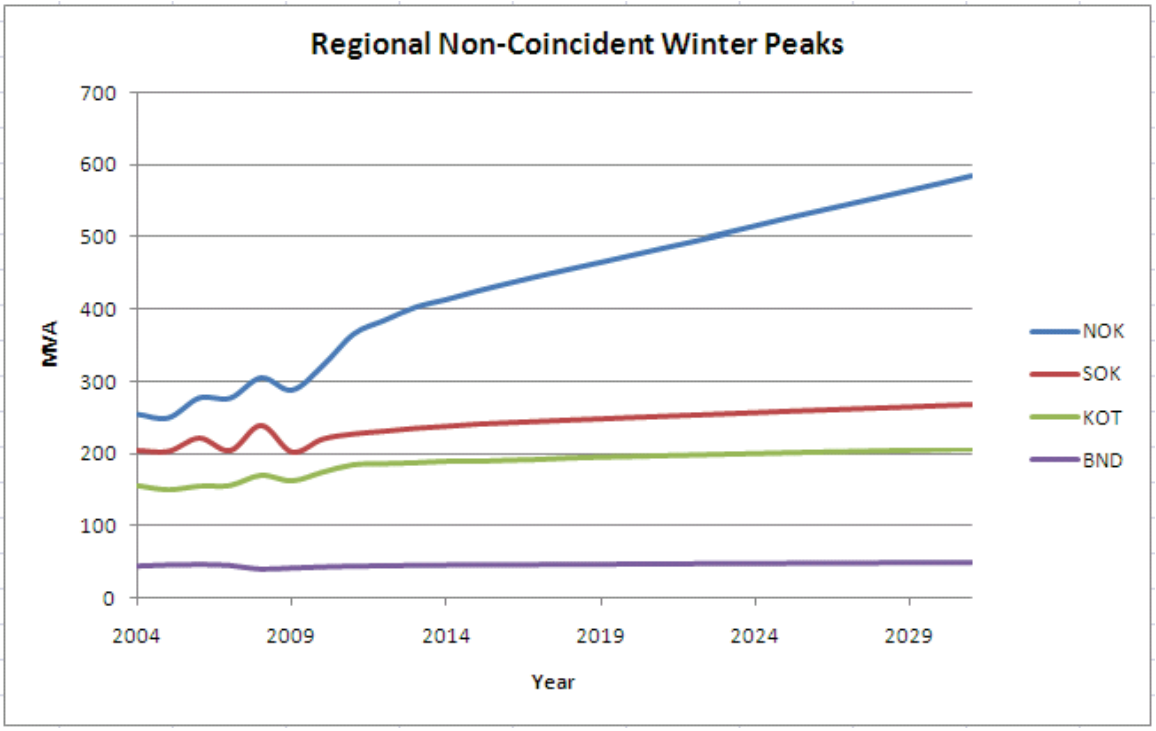
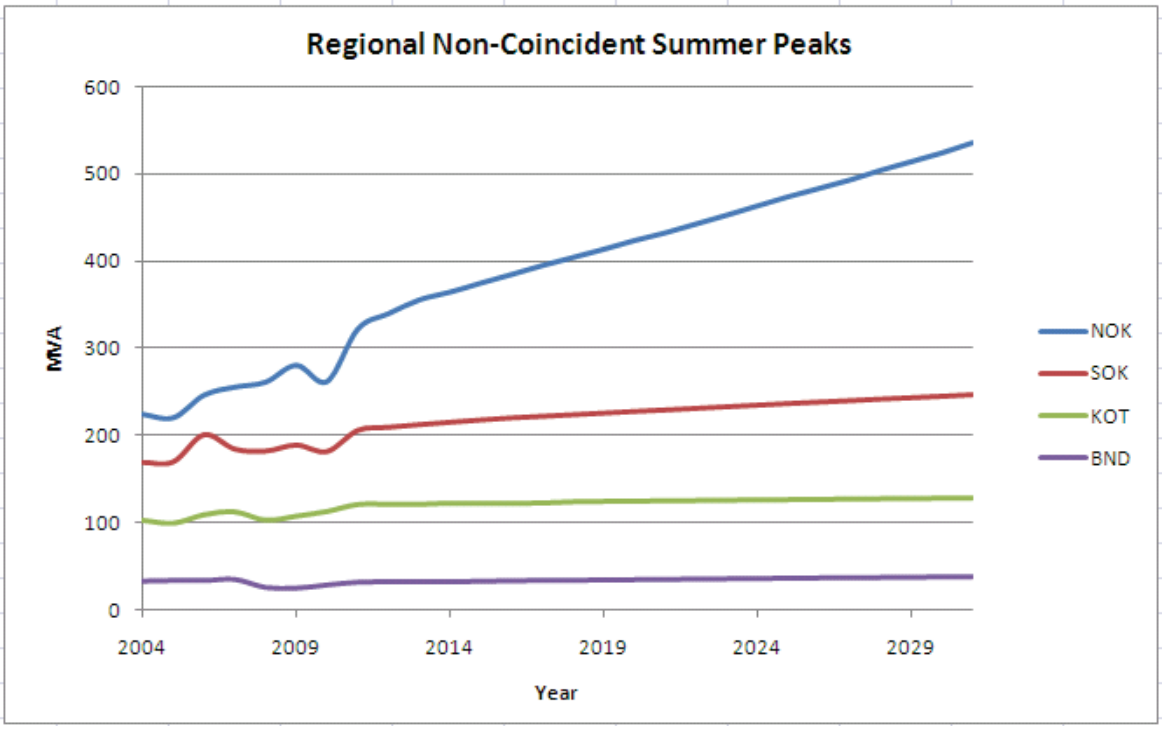


Figure BCUC IR1 229.2c



232.0 Reference: Load Forecast

Exhibit B-1-2, Long Term Resource Plan, Section 1.2.2, p. 3

Line Losses & System Use (Line Losses)

232.1 Please provide a benchmark comparison of Line Losses expressed as percentage of transmission and distribution billed sales of peer group utilities that include Pacific Gas & Electric (PG&E), Sask Power, Manitoba Hydro, Hydro Quebec, and BC Hydro.

Response:

Following is a list of the requested line loss percentages and the reference source.

	Losses in % of Sales	SOURCE
FortisBC	9.7%	FortisBC 2012-2013 Revenue Requirements, Tab 3, p. 2
PG&E	6.3%	PG&E 2010 Annual Report, p. 401.a
SaskPower	9.9%	Independent Review of the SaskPower 2010 Rate Proposal Application, p. 23, Table 3.5
Manitoba Hydro	14.3%	Prospective Cost of Service Study, Manitoba, Hydro, Nov 2009, p. 55
Hydro Quebec	7.7%	Hydro Quebec Strategic Plan 2009-2013, p. 4
BC Hydro	10.0%	BC Hydro 2011 Revenue Requirements, p. 7-5

232.2 Please describe and quantify initiatives undertaken by FortisBC over the past 5 years, or planned over the next 5 years, that have resulted in reduced Line Losses and system use, or that have the potential to reduce such losses and system use.

Response:

No specific initiatives have been undertaken in the past 5 years, nor are any proposed in the next 5 years that are specifically intended to reduce line losses and system use. However, a reduction in system losses has been an ancillary benefit from many recent system upgrade projects. This loss reduction results from either: a) an increase in the supply voltage (resulting in a consequent reduction in current flow and thus associated thermal losses), or b) by the installation of additional transformation capacity which allows a more optimal allocation of load between individual transformers. Following are some examples:

Previous Transmission and Station Projects:

- Kettle Valley Substation project – transferred Boundary-area loads from the 63 kV sub-transmission network onto the 161-kV transmission network and converted portions of the area distribution system from 13 kV to 25 kV.

- Okanagan Transmission Reinforcement project – increased the transmission voltage from 161 kV to 230 kV between Penticton and Oliver and added a parallel 230 kV circuit between Penticton and Vaseux Lake. Please refer also to the response to BCUC IR1 Q1.3 for a quantification of the expected loss reduction.

- Big White Substation project – transferred load in the Big White area from a long 25 kV distribution feeder to a dedicated substation supplied via a new 138 kV transmission line.

- Recreation Transformer Addition – a second transformer was added to the Recreation substation to be operated in parallel with the existing transformer to reduce total transformation losses.

- Ellison, Black Mountain, and Benvoulin substation projects – added distribution transformer capacity in the Kelowna area and allowed a reallocation of distribution load to reduce losses on the existing heavily load substations.

In the 5 year timeframe, the following Transmission and Stations projects are all expected to result in some reduction in system losses. Given the relatively small reduction expected for each project and the fact that load growth increases losses over time, no detailed studies have been conducted to quantify the net loss reduction, if any.

- Grand Forks Transformer Addition

- Kelowna Bulk Transformer Capacity Addition

- 42 Line Meshed Operation (Huth and Oliver)
- Capacitors at Bentley Terminal
- Reconductor 52 Line and 53 Line
- Meshing Kelowna Loop

232.3 Resistance to the flow of electrical current in the distribution and transmission system is not solely responsible for Line Losses. Other causes of line loss typically can include:

i Inaccuracy of wholesale metering
ii Inaccuracy of revenue Meters (calibrations, multipliers, defective, age, sizing, etc.)
iii Energy Thefts
iv Un-Metered Errors and omissions
v Billing System account set-up errors
vi Poor power factor
vii Phase imbalance
viii Improper primary/secondary conductor size
iv Other unaccounted for

232.3.1 For the period 2000 to 2010, please provide a Line Loss report (tabular data) segmented by year and cause of loss.

Response:

FortisBC is unable to provide the requested data as the company has insufficient information to apportion total system losses between the various causes listed in BCUC IR Q232.3. Currently, the Company only has knowledge of the total system losses and these are calculated by subtracting the total energy billed in a given interval from the total energy generated or imported in the same interval. Additional metering infrastructure such as that proposed in the Advanced Metering Initiative project would be required to support the collection of loss data at this granularity.

8. Losses and AMI

8.1 Reference: September 1, 2011 Meeting, Slides #6 and #25

a) AMI is assumed to increase load and reduce losses (by reducing theft). Is the increase in load assumed to be equivalent to the reduction in losses due to AMI or is it assumed the some of these losses will disappear entirely – e.g. theft that is now removed from the system as opposed to translated into actual sales?

Response:

Please see the response to BCUC IR1 Q1.4.