PEMBINA institute

Energy Supply and Demand in 2030

Modelling details for *First Nation Leadership in B.C.'s Clean Energy Future*

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The Pembina Institute reviewed modelling performed by BC Hydro and Navius Research that forecast electricity demand in scenarios where B.C. achieves its 2030 GHG emissions reduction target of 40% below 2007 levels. Using the results from these sources, we identified a range of values for the energy load resource balance (ELRB), which represents the gap between the estimated quantity of energy resources available to supply electricity and the estimated demand for electricity in 2030.

Model comparisons

For BC Hydro, we reviewed the draft 2021 Integrated Resource Plan (IRP).[1,2] We also reviewed the most recent load forecasts[3] from FortisBC Electric's 2021 Long Term Electric Resource Plan (LTERP), as well as the Canada Energy Regulator's (CER) latest projections for electricity generation.

While both BC Hydro and FortisBC Electric incorporate a wide range of possible outcomes in their resource planning, we use only the reference load forecasts[4] and two key high-load scenarios to illustrate the ELRB range. Resource planning materials from both utilities are publicly available.

The BC Hydro and FortisBC Electric net load forecasts used here are calculated net of existing demand-side management (DSM) programs and assume these programs continue in the future. They also include net metering and the renewal of Electricity Purchase Agreements (EPA) by BC Hydro. However, they do not include potential new DSM programs being explored by either

[1] BC Hydro and Power Authority, *Draft 2021 Integrated Resource Plan.* https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/draft-integrated-resource-plan.pdf

[2] We use F2031 values in our calculations, as BC Hydro's fiscal year ends in March. Therefore, F2031 reflects electricity generation needs from April 2030 – March 2031.

[3] Load forecast refers to the projected energy needed to meet demand in a modelling scenario.

[4] The reference load forecast represents a business-as-usual scenario for the load forecast.

utility. Based on estimations derived from the sources noted above, the final range for the 2030 ELRB is 2.9 to 19.1 TWh.

Utility modelling

Reference load forecasts

BC Hydro's net reference load forecast is 64.7 TWh[5] and has an ELRB of 2.6 TWh, while FortisBC Electric has a net reference load forecast of approximately 3.9 TWh and ELRB of approximately 0.3 TWh.[6] The combined 2030 ELRB of both utilities is 2.9 TWh.

High load forecasts

The high end of the 2030 ELRB range is derived from the highest point of the uncertainty curve in BC Hydro's load forecasting,[7] combined with highest value modelled for 2030 generation by Guidehouse for FortisBC's 2021 LTERP.[8] Together, they represent the highest possible load forecast that is available to us for the utilities. BC Hydro's modelling shows a load forecast of approximately 82 TWh in 2030, which, net of EPA renewals, is 79.3 TWh. FortisBC Electric's upper bound scenario projects approximately 1.7 TWh of additional electricity above its reference load forecast of 3.9 TWh, for a total of 5.6 TWh. Together, the BC Hydro and FortisBC Electric totals provide a combined 2030 net load forecast of 84.9 TWh and an ELRB of 19.1 TWh.

We also include an "accelerated scenario" in our range to leverage some of the modelling by both utilities on electrification and the achievement of CleanBC policies and targets. For BC Hydro, we use the highest load forecast scenario detailed in BC Hydro's Accelerated Scenario Contingency Resource Plan.[9] This scenario assumes the achievement of the 2025, 2030 and 2040 CleanBC emission reduction targets, but does not presently include 100% electrification of potential mining and LNG customers.[10] This scenario provides precise data points on BC Hydro's role in achieving CleanBC's targets and serves as a useful comparison to the reference load forecast and the upper bound of uncertainty scenario.

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[5] BC Hydro, *Draft 2021 Integrated Resource Plan,* 82.

[6] FortisBC, "Resource Planning Advisory Group (RPAG) Meeting," presentation, June 15, 2021, 29. https://www.cdn.fortisbc.com/libraries/docs/default-source/about-us-documents/rpag-meeting-june-2021.pdf

[7] BC Hydro, *Draft 2021 Integrated Resource Plan,* 12.

[8] FortisBC, "Resource Planning Advisory Group (RPAG) Meeting," 37.

[9] BC Hydro, *Draft 2021 Integrated Resource Plan*, 97.

[10] The modelling by BC Hydro associated with mining and LNG will be included in the final version of the 2021 IRP. The lack of it in this modelling means that our calculations underestimate the load forecast for the accelerated scenarios.

For 2030, this scenario has a net load forecast of 72.4 TWh. For FortisBC Electric, we use the same Guidehouse modelling in its 2021 LTERP[11] — specifically, the "deep electrification" scenario, which, among other things, simulates significant growth in provincial electrification and the implementation of B.C.'s Zero-Emission Vehicles Act. While not a perfect match, it is most comparable to the BC Hydro Accelerated Scenario. This scenario projects approximately 0.4 TWh of incremental load above FortisBC Electric's net reference load forecast of 3.9 TWh, for a total of 4.3 TWh. Together, both sources of modelling provide a 2030 net load forecast of 76.7 TWh and an ELRB of 10.9 TWh.

Canada Energy Regulator

CER's reference forecast in its Energy Futures 2020 report[12] projected 87.9 TWh of total generation in 2030. We omit biomass co-generation in order to remain consistent with the Navius modelling, yielding an adjusted total of 84.0 TWh and a 2030 ELRB of 4.0 TWh.

Navius Research

We reviewed modelling performed by Navius Research that identifies different means by which B.C. can achieve its 2030, 2040 and 2050 emissions reduction goals. The model's reference case scenario projected 92.8 TWh of total electricity generation in 2030. The ELRB calculated from this projection is approximately 12.7 TWh. The Navius Research model does not specify whether the new energy required to meet demand in 2030 will come from additional domestic generation or from increases in electricity imports.

Other electricity generation

To estimate the remaining electricity generation across the province that is not fulfilled by either BC Hydro or FortisBC, we used historical values from BC Hydro's British Columbia Electrification Impacts Study and FortisBC's 2016 LTERP.[13],[14] These sources show BC Hydro and FortisBC Electric generation in 2015 as 51 and 3.2 TWh, respectively. Taking the difference

[11] FortisBC, "Resource Planning Advisory Group (RPAG) Meeting," 45.

[12] Canada Energy Regulator, *Canada's Energy Future 2020.* https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2020/index.html

[13] BC Hydro and Power Authority, *British Columbia Electrification Impacts Study* (2020), produced by Navius Research. https://www.bchydro.com/content/dam/FBCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/bc-electricfication-impacts-study-draft-for-discussion-20200929-navius.pdf

[14] FortisBC, *2016 Long Term Electric Resource Plan and 2016 Long Term Demand Side Management Plan.* https://www.fortisbc.com/about-us/corporate-information/regulatory-affairs/our-electricity-utility/electric-bcuc-submissions/resource-plans-for-electricity/2016-long-term-electric-resource-plan

between total provincial generation in 2015 (which, after omitting biomass is approximately 65.8 TWh, drawn from the Navius modelling) and the total utility generation of 54.2 TWh in 2015, we find an approximate balance of 11.6 TWh for remaining 2015 provincial generation.[15] While this is a simplified calculation, it serves as a useful benchmark. To avoid overestimating the 2030 ELRB for the CER and Navius generation forecasts, this electricity generation is subtracted from both 2030 generation forecasts, as is the BC Hydro and FortisBC committed resources for 2030. When calculating the ELRB for the combined BC Hydro and FortisBC load forecasts, "other generation" is omitted.

Limitations

Much of the data pre-dates the effect of the COVID-19 pandemic on electricity demand. As an example of how the pandemic could affect forecasts, after accounting for the latest data, the upper uncertainty band for BC Hydro's 2040 forecast was 3% lower than its original 2040 forecast. [16] While we don't have a precise estimate for the error in projected demand for all sources used here, it is possible that a small downward adjustment is needed.

A second limitation is the estimate of non-utility (other) generation, which is based on the data currently available to us. We have assumed a fixed value for this generation over time for illustrative purposes, although realized generation in 2030 will vary depending on a wide variety of socio-economic and environmental factors; for this reason it is difficult to say whether this current value will under- or over-estimate future "other generation".

[15] This includes assets owned by the Columbia Power Corporation, private industrial facilities that generate their own power, and the few municipalities in B.C. that have their own utilities: New Westminster, Grand Forks, Summerland, Penticton and Nelson.

[16] BC Hydro and Power Authority, "2021 Integrated Resource Plan (IRP) Technical Advisory Committee (TAC) Meeting #8," presentation, January 27, 2021, 20. https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/integrated-resource-plans/current-plan/2021-irp-tac-mtg8-20210127-slides.pdf

Summary of results

Table 1. Electricity demand results (TWh)

	Combined BC Hydro and FortisBC Load Forecast			Canada Energy Regulator	Reference Net-Zero Modelling (Navius Research)
	Reference Case	**Accelerated Scenarios**	**Upper Bound of Uncertainty[17]**		
2030 Demand[18]	72.7	82.6	87.6	84.0	92.8
BC Hydro Existing & Committed Resources 2030	(62.2)	(62.2)	(62.2)	(62.2)	(62.2)
Existing DSM	(2.9)	(2.9)	*n/a*	*n/a*	*n/a*
Net Metering	(0.3)	(0.3)	*n/a*	*n/a*	*n/a*
EPA Renewals[19]	(0.9)	(2.7)	(2.7)	(2.7)	(2.7)
FortisBC Electric Existing & Committed Resources 2030	(3.6)	(3.6)	(3.6)	(3.6)	(3.6)
Other Electricity Generation	*n/a*	*n/a*	*n/a*	*(11.6)*	*(11.6)*
2030 Energy Load Resource Balance	**2.9**	**10.9**	**19.1**	**4.0**	**12.7**

[17] Because this demand forecast is graphically represented in BC Hydro's draft IRP, it includes existing DSM and net-metering. However, it does not include EPA Renewals, so we account for that in the energy load resource balance calculation.

[18] In the *Combined BC Hydro and FortisBC Load Forecasts*, the demand value represents only demand relevant to utilities, as it omits "other generation".

[19] The amount of EPA renewals are different under BC Hydro's reference case and accelerated scenarios, based on demand projections. EPA renewals could be slightly underestimated for the Upper Bound of Uncertainty Scenario.