Date: February 8, 2022
CLIFF: 115750

MINISTRY OF ENERGY, MINES AND LOW CARBON INNOVATION

BRIEFING NOTE FOR INFORMATION

PREPARED FOR: Fazil Mihlar, Deputy Minister, Ministry of Energy, Mines and Low Carbon Innovation

ISSUE: Electrification meeting with Natural Resources Canada's Deputy Minister John Hannaford

BACKGROUND:

Electrification is an essential part of meeting British Columbia's (BC's) climate objectives. Although BC Hydro has a surplus supply of clean electricity, the ability to transmit the electricity to some customers is constrained, and new electrical infrastructure is required to be able to serve them. However, building transmission infrastructure can be cost prohibitive to BC Hydro and/or potential customers. In addition, proponents that hold Environmental Assessment Certificates for fossil fuel-powered projects, or those that have not yet made a final investment decision (FID) may choose not to proceed if connecting to the BC Hydro grid is too expensive or does not meet their project's timelines.

The importance of industrial electrification is highlighted in a number of federal initiatives:

- Natural Resources Canada's (NRCAN's) Generation Energy Council asserted the importance of producing cleaner oil and gas using clean power.
- The Pan Canadian Framework on Clean Growth and Climate Change (PCF) specifically mentions federal co-funding of transmission projects for the purposes of supporting electrification and avoided carbon emissions from natural gas production.
- The August 2019 Canada – B.C. Memorandum of Understanding on the Electrification of the Natural Gas and Liquefied Natural Gas Sectors.
- In its July 2021 Enhanced Nationally Determined Contribution under the Paris Agreement submission to the United Nations, Canada notes that by reducing pollution from natural resource development and heavy industry, Canada will position itself as a global provider of choice for many of the world's essential goods and will explore a continental approach to address methane emissions from the oil and gas sector.

LNG Canada (LNGC) is currently completing construction of the first two trains (Phase 1) and is expected to make a FID on whether to proceed with the final two trains (Phase 2) in early 2024,
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DISCUSSION:

Currently, the North Coast region is served via a single radial line, with limited generation in the region s.17 that runs from the Williston substation near Prince George to the Skeena substation near Terrace. The Prince George to Terrace Capacitors Project (PGTC) will increase the capacity of the radial transmission system from ~800 megawatts (MW) to ~1,300 MW, an increase of 500 MW or 60%. The federal government has committed to providing up to $96.95 million in grant funding for the PGTC under its Investing in Canada Infrastructure Program. That project is expected to be brought into service by 2027.

The increased capacity provided by PGTC will allow BC Hydro to serve customers that have formally requested service in the North Coast area but is not sufficient to supply an electrified second phase of LNGC's project and further pipeline compression s.17; s.21
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BC Hydro's Electric Tariff sets out the terms and conditions for industrial connections to the grid. As part of the interconnection process, BC Hydro identifies any upgrades to its existing transmission system (known as System Reinforcements) required to supply electricity to a customer's facility. The new customer typically provides a letter of credit (or equivalent form of security) for the value of the system reinforcement, which is drawn down over the first seven to eight years of operations.

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Electrification of the North Coast is essential if BC and Canada are to meet their climate objectives. An investment of $2.5 billion for electrification infrastructure could create some of the lowest emission LNG in the world and support further clean economic development in the region.

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Date: February 18, 2022
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MINISTRY OF ENERGY, MINES AND LOW CARBON INNOVATION

BRIEFING NOTE FOR INFORMATION

PREPARED FOR: Fazil Mihlar, Deputy Minister, Ministry of Energy, Mines and Low Carbon Innovation.

ISSUE: Potential and challenges for electrification in British Columbia

BACKGROUND:

Electricity currently accounts for just under one quarter of energy consumed by end-users[1] in British Columbia (BC). Refined petroleum products (e.g., gasoline, diesel, and fuel oil) account for 47% of consumption, while natural gas accounts for 28%.

BC Hydro has projected potential growth in demand for electricity in their Integrated Resource Plan (IRP), which is currently before the British Columbia Utilities Commission. Even without additional climate change measures, and with Site C, expected load growth is likely to eliminate BC Hydro's surplus by the late 2020s and BC Hydro will need to develop or acquire additional energy as well as build additional transmission capacity. In a scenario contemplating additional electrification measures in the CleanBC Roadmap (Roadmap), BC Hydro projects that demand for electricity could increase 37% by 2040.

DISCUSSION:

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- BC Hydro's surplus, while significant, is only expected to continue until the late 2020s. After it is exhausted, new generation resources will be needed.
- Two-thirds of the peak heating demand is currently served by natural gas. s.13
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The Roadmap includes measures to address the total energy need (e.g., encouraging bus ridership to reduce the need for energy in the transportation sector), the role of natural gas in heating (e.g., a greenhouse gas emissions cap for natural gas utilities), stock turnover (e.g., equipment regulations at the time of sale), and cost (e.g., enhanced energy efficiency planning). Under the

[1] This excludes energy consumed while converting one energy type to another, such as by generating electricity from fossil fuels.

zero emission vehicle targets in the Roadmap, electrifying light duty vehicles could increase electricity consumption s.13
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s.13 . The Clean Transportation Plan will focus on five areas, prioritizing an "efficiency" first approach to reducing emissions in the transportation sector.

BC Hydro has a plan to meet a 37% increase in energy demand, consistent with the Roadmap, by using market energy in the near term and bringing on the equivalent of three and a half times Site C's generation by 2040. BC Hydro would also need to deploy utility-scale batteries to meet peak demand in the lower Mainland. s.13
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Analysis done by Simon Fraser University's School of Sustainable Energy Engineering suggests that replacing all other energy use with electricity could require a tripling or quadrupling of generation in BC by 2050. s.13
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KEY MESSAGES:

- Electricity currently accounts for only one-quarter of energy consumed in BC, s.13
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- BC Hydro, as part of their IRP, is looking at options to build out their system to meet electricity demand resulting from the Province's actions under the Roadmap.
- These plans exhaust BC Hydro's current surplus by the late 2020s and require significant buildout of generation, transmission, and energy storage.
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[2] Mode share measures the use of personal vehicles versus public transit, carpooling, and active transportation such as cycling.

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Attachment: Electrification Backgrounder

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Appendix: Electrification Backgrounder

Electricity's Role in British Columbia's (BC's) Energy Mix Today

According to Statistics Canada's Report on Energy Supply and Demand, electricity accounted for just under one-quarter of energy consumed in BC in 2018. This put it behind refined petroleum products (such as gasoline, diesel, and fuel oil) at 47%, and behind natural gas at 28%. Other fuels accounted for roughly 2% of total demand (see Appendix 1). While replacing other fuels with electricity on a one-for-one basis would require approximately four times the electricity currently generated in BC, there are some energy uses where electricity can be used much more efficiently than fossil fuels, and some sectors where electricity may not be able to substitute effectively for other fuels with current technology.

Transportation is one sector with significant fossil fuel consumption that could be displaced by electricity. Over 90% of all energy consumed in the transportation sector, including nearly all energy consumed by light duty vehicles, comes from refined petroleum products. s.13

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In the residential and commercial sectors, meanwhile, electricity and natural gas each account for roughly half of energy consumption with the bulk of the natural gas used for space and water heating. As in the transportation sector, displacing fossil fuel consumption with electricity requires lower energy use overall. Heat pumps are significantly more energy efficient than even the most efficient oil or gas furnaces, and if 100% of all fossil fuel use[1] in residential and commercial buildings was displaced by electricity, the 35,000 GWh/year of electricity used in 2018 s.13

Industrial energy use is more evenly split between the three fuels, with 34% of energy consumed coming from electricity, 39% from natural gas, and 24% from refined petroleum products. Some end-uses may be particularly well-suited to electrification (e.g., pumps), while others may be more challenging (e.g., applications that require significant heat such as cement production).

Shifting just retail pump sales and space and water heating in homes would require additional generation s.13

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s.13 Roadmap policies focus on equipment regulations at the time of sale, at the earliest feasible date.

[1] This assumes that 100% of fossil fuels are used for space and water heating and that no baseboards or conventional water heaters were used when natural gas or oil equipment was replaced. Additional energy would be needed if lower-efficiency heating equipment were used.

Additional buildout of the system would also be needed: FortisBC has used the example of the December 2021 cold snap, in which it provided twice as much natural gas energy during the system peak as BC Hydro. In an electrified system, this additional peak demand would need to be met through a combination of dependable capacity, energy efficiency (e.g., existing cold climate heat pumps that function even in the cold), non-electric backup (e.g., hybrid electric-renewable gas heat pumps), peak displacement programs (e.g., industrial loads), and improved transmission infrastructure, s.13

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Expectations for Growth in Electricity Demand

Even in the absence of further action, demand for electricity is expected to increase. In the reference case in BC Hydro's Integrated Resource Plan (IRP), BC Hydro anticipates that its customers' electricity demand will increase 17% by 2030 and 24% by 2035 before energy conservation measures. Under this projection, BC Hydro's surplus would end in 2028. BC Hydro plans to meet this roughly 25% increase in demand with a mix of: enhanced energy efficiency offerings; renewing existing electricity purchase agreements; and, when these are no longer enough to meet domestic demand, the development of future resources beginning in 2030. In this scenario, BC Hydro would also increase the capacity of transmission serving the South Coast by roughly 20% to ensure that it can reliably deliver enough energy to meet demand on the coldest day of the year.

Additional electrification will require BC Hydro to bring additional resources online, on a shorter timeframe. BC Hydro has developed an accelerated electrification scenario, and Navius has done energy modeling for Climate Action Secretariat (CAS), which both show how demand for electricity might evolve as BC implements the CleanBC Roadmap. These scenarios show demand for electricity, after additional demand-side measures by BC Hydro, increasing between s.13

In its plan to meet load growth in higher electrification scenarios, BC Hydro would rely on market energy through much of the coming decade before bringing on new future resources as early as 2027. By the early 2030s, enough new resources would be needed to generate roughly twice as much energy as Site C, and by the end of the decade the energy need would increase to roughly three and a half times as much as Site C generation. Finally, BC Hydro would pursue utility-scale batteries to meet peak demand in the South Coast in addition to the transmission resources considered in the reference case. s.13

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Additional Electrification Potential

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Taco Niet, an engineering professor with Simon Fraser University's School of Sustainable Energy Engineering, recently claimed that modelling his research group has done forecasts that BC would need to triple or quadruple its generation in order to replace all fossil fuel consumption with electricity by 2020. s.13

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Appendix 1: Current Energy Demand in BC

According to Statistics Canada's Report on Energy Supply and Demand, electricity accounted for just under 25% of energy consumed in BC in 2018. This put it behind refined petroleum products (such as gasoline, diesel, and fuel oil) at 47% and behind Natural Gas at 28%. Other fuels accounted for roughly 2% of total demand. However, consumption varies significantly by sector. Over 90% of all energy consumed in the transportation sector, including nearly all energy consumed by light duty vehicles, comes from refined petroleum products. In the residential and commercial sectors, meanwhile, electricity and natural gas each account for roughly half of energy consumption with the bulk of the natural gas used for space and water heating. Industrial energy use is more evenly split between the three fuels, with 34% of energy consumed coming from electricity, 39% from natural gas, and 24% from refined petroleum products.

Figure 1: Total Energy Use and Fuel Shares in BC, 2018

Sector	Total Energy Use (GWh-equivalent)	Electricity Share	Natural Gas Share	Refined Petroleum Products Share
Total End-Use	272,532	23%	28%	47%
Industry	75,057	34%	39%	24%
Transportation	111,375	1%	7%	92%
Retail Pump Sales	59,621	0%	0%	100%
Residential	41,494	47%	52%	0%
Commercial	32,899	48%	40%	10%

While replacing other fuels with electricity on a one-for-one basis would require approximately four times the electricity currently generated in BC, there are some energy uses where electricity can be used much more efficiently than fossil fuels. s.13
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s.13 . Heat pumps are also significantly more energy efficient – with effective energy efficiency of over 100% - than even the most efficient oil or gas furnaces, s.13
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[c] This assumes that 100% of fossil fuels are used for space and water heating and that no baseboards or conventional water heaters were used when natural gas or oil equipment was replaced.

Appendix 2: Key Load Forecasts

In an accelerated electrification scenario, which is indicative of how demand might evolve as BC pursues the Roadmap, BC Hydro projects that demand could increase to 78,510 GWh/year by 2030 (fiscal 2031), 82,390 GWh/year by 2035 (fiscal 2036), and 87,532 GWh/year by 2040 (fiscal 2041)– a nearly 50% increase. In its plan to meet load growth in this scenario, BC Hydro would rely on market energy through much of the coming decade before bringing on new future resources as early as 2027. By the early 2030s, enough new resources would be needed to generate roughly twice as much energy as Site C, and by the end of the decade the energy need would increase to roughly three and a half times as much as Site C generation. Finally, BC Hydro would pursue utility-scale batteries to meet peak demand in the South Coast in addition to the additional transmission resources considered in the reference case.

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Appendix 3: BC Hydro Supply Options

BC Hydro provided the following chart showing the cost and availability of various energy resources at the fifth meeting of its IRP Technical Advisory Committee on July 29, 2020. This chart shows significant relatively low-cost onshore wind and solar, plus significant higher-cost offshore wind potential and more limited and higher-cost potential in other resource types. This chart does not include transmission costs or the costs of storing and integrating these variable energy sources.

Figure 2: Summary of Energy Resources identified by BC Hydro