Fort Nelson Long-term Resource Plan

June 2024

BC Hydro
Power smart

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1. Executive Summary

The 2024 Fort Nelson Long-term Resource Plan (**FNLTRP**) is BC Hydro's guide for meeting the future electricity needs of our customers in the Fort Nelson region over a 20-year planning horizon.

The forecasted demand in the Fort Nelson region shows some growth in 2025 and is relatively flat afterwards at about 30 MW onwards through the planning horizon. The Fort Nelson region's balance of electricity supply to electricity demand (also known as a Load Resource Balance) shows sufficient supply through the planning horizon with two existing resources: the natural gas-fired Fort Nelson Generating Station and transmission service via a transmission line from Alberta. BC Hydro plans to invest in maintaining these existing resources throughout the planning horizon to leverage their supply cost-effectiveness.

To achieve long-term policy goals and mitigate risks associated with climate change, the FNLTRP prepares for a low-carbon future to reduce or eliminate greenhouse gas emissions at the Fort Nelson Generating Station at the end of the planning horizon. The FNLTRP demonstrates BC Hydro's leadership in advancing low-carbon electricity resource solutions in a northern climate, strives to gain learning and experience with new technologies, and explores solutions that support First Nations and broader community economic development goals.

Incorporating input from our First Nations consultation, and community and stakeholder engagement, our plan includes the active exploration of two promising technologies in the Fort Nelson area. The first is to advance a geothermal pilot project to confirm the development potential and dependability of this resource. The second is to investigate the technological and economic viability of emerging carbon capture technologies for the Fort Nelson Generating Station. We expect to include the costs for these explorations in a future revenue requirements application, and they will be subject to their own consultation and approval processes.

We will also monitor other technologies, including progress on local production of renewable fuels and watch local industrial activity looking for opportunities in the areas of biomass or carbon sequestration space. We will assess electrification activity in the broader oil and gas sector in the region, including the Horn River and Liard shale gas basins. We will also monitor any advancement of interconnecting northern portions of the Montney region to the BC Hydro integrated system, in case this activity creates opportunities to connect the Fort Nelson region to the integrated system. We will assess the potential savings from demand-side measures. Monitoring will also continue concerning evolving climate policies and regulations, including the Alberta market response and Federal and Provincial legislation.

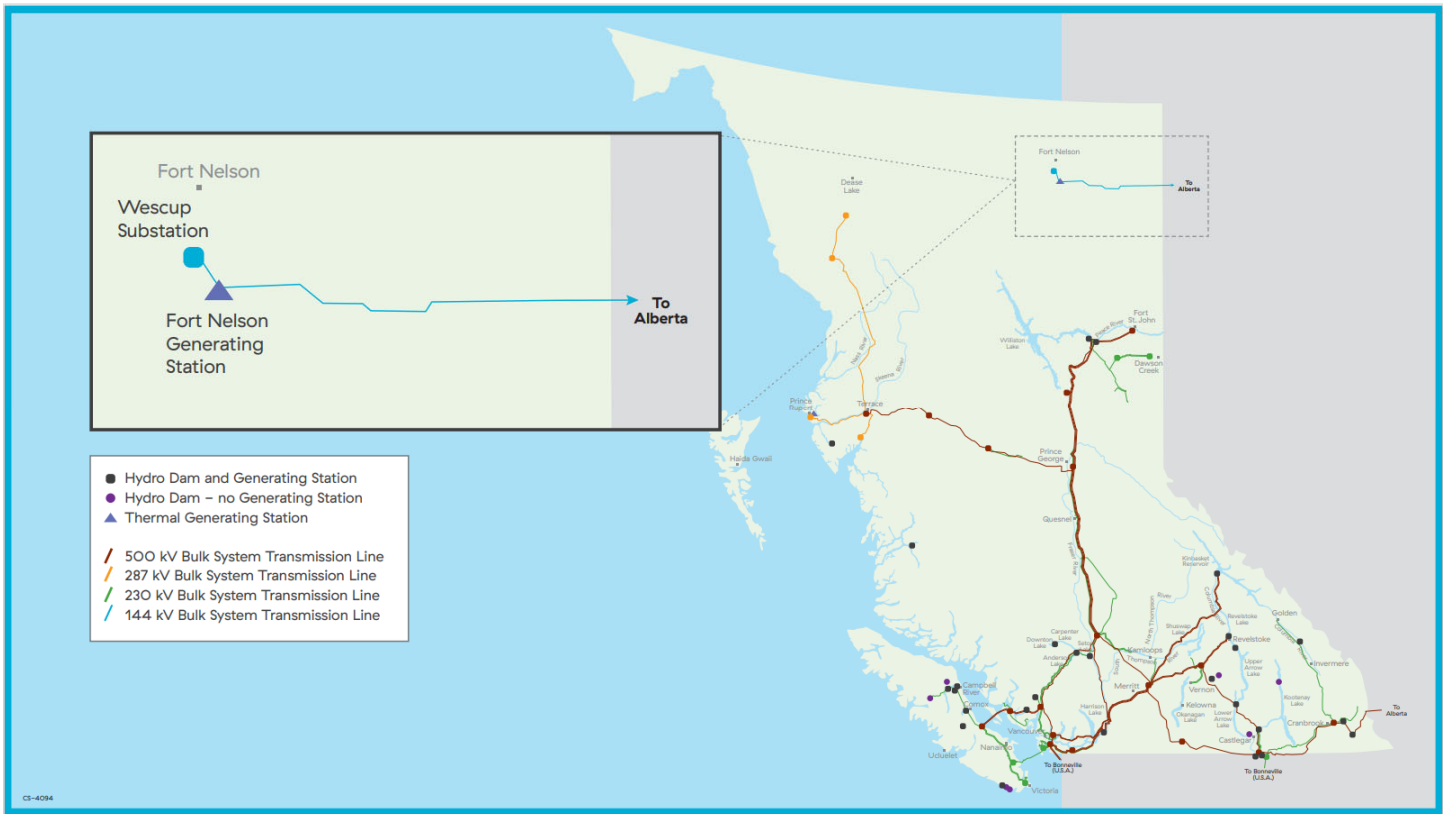
If events continue as expected, we anticipate that our explorations will result in increased intelligence and confidence to inform our next long-term resource plan by 2032. We anticipate that that plan would initiate the decarbonization of the Fort Nelson System. However, we can adjust if anything changes in our monitoring process to signal that we need to advance this timing.

2. Introduction

2.1. The Fort Nelson region is unique to the BC Hydro system

The Fort Nelson region is in the northeast corner of the province, as shown in Figure 1.

Figure 1: The Fort Nelson Region in Northeastern British Columbia



The region is unique to BC Hydro in that it is isolated from the rest of BC Hydro's integrated system but not considered a *non-integrated area* due to its electric connection to the Alberta Interconnected Electric System via a single 144 kV transmission line. The Alberta Interconnected Electric System is operated by the Alberta Electric System Operator.

The Fort Nelson region includes BC Hydro customers in the electrified communities located within the Northern Rockies Regional Municipality and, along the 144 kV transmission corridor linking Fort Nelson to the Alberta system.[1] The largest community is the former Town of Fort Nelson, which has about 3500 customers, comprised of residential, commercial and industrial customers. In addition, there are two First Nations communities within the Fort Nelson region – the Fort Nelson and Prophet River First Nations.

The region has two sources of electricity supply: BC Hydro's Fort Nelson Generating Station and transmission service from the Alberta line interconnection mentioned above. The Fort Nelson Generating Station is the primary

1 The Northern Rockies Regional Municipality was incorporated in 2009 and includes the former Town of Fort Nelson and the former Northern Rockies Regional District.

supply resource, while the transmission service from Alberta provides service when Fort Nelson Generating Station is not operating.

Currently the peak and energy demand in Fort Nelson is about 25 MW and 200 GWh/year, respectively. On a peak demand basis, the breakdown is split roughly 53% large industrial, 41% residential and commercial, and 6% small industrial.

2.2. Where Fort Nelson finds itself today: the planning environment

2.2.1. The legal and regulatory framework

As a public utility, BC Hydro is regulated by the B.C. Utilities Commission (**the Commission**) under the Utilities Commission Act (**UCA**) and is subject to other related laws, including the Clean Energy Act (**the Legal Framework**).

Under the Legal Framework, BC Hydro must submit a long-term resource plan to the Commission in the form and at the times required by the Commission. The Commission may establish a process to review a long-term resource plan and must accept the plan if the Commission determines that carrying out the plan would be in the public interest. While the plan sets a strategic direction, any specific projects that BC Hydro initiates to carry out the plan may be subject to separate consultation and approval processes, and expenditures associated with these projects would be reviewed by the Commission through future regulatory applications such as revenue requirements applications.

2.2.2. We have a service agreement with Alberta

To supply the Fort Nelson region, BC Hydro receives transmission service under the Fort Nelson Demand Transmission Service agreement from the Alberta Electric System Operator. The Alberta Electric System Operator is regulated by the Alberta Utilities Commission, which approves the Fort Nelson Demand Transmission Service agreement as part of the Alberta Electric System Operator's electricity tariff rate schedule. As described in section 4.2, the Fort Nelson Demand Transmission Service agreement provides electricity supply when the primary supply resource, Fort Nelson Generating Station, is not operating. In addition, with the transmission line connecting the Fort Nelson Generating Station to the Alberta electrical grid BC Hydro's subsidiary, Powerex, can market surplus electricity to Alberta.

2.2.3. We're working to advance reconciliation with First Nations

BC Hydro recognizes that relationships with First Nations are critical to operating our system. As a Provincial Crown utility, we play an important role in supporting the broader societal effort of reconciliation. The Fort Nelson Long-term Resource Plan provides the earliest opportunity for engagement with First Nations on how to meet our customers' future electricity needs in the Fort Nelson region. This engagement helps us understand and reflect First Nations' needs, interests, and values in our long-term plan.

The 2024 Fort Nelson Long-term Resource Plan is a strategic plan that guides future project development; therefore, any projects outlined in the FNLTRP are in the early conceptual stages and the specific nature of project

details or impacts may not yet be known or identifiable for the purposes of consultation. Those future projects will be subject to separate consultation and approval processes before proceeding.

2.2.4. Evolving climate change impacts and policies are causing operational and longer-term planning changes

The risk of climate change-driven wildfires that can impact the availability of the transmission line from Alberta is causing us to review the reliability of Fort Nelson Generating Station and emergency response planning. BC Hydro acknowledges the impacts on customers from the record-setting fire season of 2023 and the early 2024 season and has invested in the Fort Nelson Generating Station to better respond to these events in the future. An assessment of the impact the 2024 wildfires have had on Fort Nelson region communities and subsequent recovery is underway at the time of writing. Increasing the region's resilience to wildfire events will continue to be a pivotal part of the asset planning process for both the Fort Nelson Generating Station and the transmission line to Alberta.

We also recognize the risk of climate policies affecting the economic viability of local natural gas producers, which in turn may impact the natural gas supply to the Fort Nelson Generating Station. Ensuring a reliable supply of natural gas to the Fort Nelson Generating Station remains an important part of Fort Nelson Generating Station operations planning. BC Hydro has been engaged with local gas suppliers, processors, and customers in the region to discuss gas supply alternatives.

BC Hydro is taking actions to support Provincial and Federal greenhouse gas emission reduction targets and energy transition to a low-carbon B.C. economy. We're working towards clean and renewable solutions, while keeping rates affordable. Aligning with these efforts, the FNLTRP explores alternatives in the future that would align with future regulations and related efforts and see a reduction in greenhouse gas emissions and/or carbon intensity in Fort Nelson.

The need for better electricity reliability was an overriding theme during consultation and engagement, particularly after the prolonged transmission line outage due to a wildfire event and failures of the Fort Nelson Generating Station in 2023, which took place prior to the 2024 wildfire evacuations. Concerns were raised about inadequate back-up supply, the costs of outages to customers, and the vulnerability of residents during winter outages in this northern climate.

3. The planning process

BC Hydro approached consultation with First Nations and engagement with stakeholders and our customers in two phases during FNLTRP's development. Consultation and engagement were important to ensure the values and interests of the community informed the FNLTRP. We also built the FNLTRP using a process that includes:

- Confirming planning objectives and planning reliability criteria;
- Determining future customer electricity needs by:
  - developing long-term load forecast scenarios for energy and peak demand; and
  - comparing the load forecast scenarios to the existing and committed electricity resources to determine the timing and volume of any new resources, if needed;
- Considering long-term risks and uncertainties; and
- Establishing Near-term Actions.

Issues related to operational maintenance and sustainment of the existing assets, emergency response to any forced or planned outages – though important – are outside the scope of this long-term resource plan.

3.1. How engagement informs the FNLTRP

Engagement and consultation, while developing the FNLTRP, included discussions with the Fort Nelson and Prophet River First Nations, the Northern Rockies Regional Municipality, industrial stakeholders, and the broader public.

- Consultation and engagement were undertaken in two general phases, including gathering input into the FNLTRP in Phase 1 and then gathering feedback on the draft plan in Phase 2.
- During Phase 1, in fall 2023, BC Hydro held six virtual meetings with representatives of two First Nations, the regional municipality, key industrial stakeholders and the broader Fort Nelson region community. Participants were invited to provide their input at the sessions, to fill out an online survey, and to visit the Fort Nelson Long-term Resource Plan website where they can sign up for updates and find out more information.
- Twenty-two people participated in the virtual sessions, and 257 online surveys were completed (just over 6% of the Fort Nelson region). Topics we engaged on included what matters to people about the long-term plan and our planning objectives; what long-term risks and uncertainties should be considered as we develop the FNLTRP; and input on the resource options we are currently looking at to address Fort Nelson Generating Station greenhouse gas emissions.

Our Phase 2 engagement activities, which occurred in Spring 2024, included seven virtual meetings with First Nations and stakeholders, a community meeting, and an online survey. Through these activities, we shared an overview of the FNLTRP, a summary of what we heard in Phase 1 engagement, and how we incorporated this input. In Phase 2, roughly 2% of the Fort Nelson region participated with 80 surveys were completed, and 19 people participated in the virtual and in person sessions. We asked participants for feedback on how we propose to meet Fort Nelson's energy needs. In these discussions and through the survey, we heard that participants:

- Support the FNLTRP. Almost nine out of ten survey respondents expressed support for the FNLTRP, and we heard support in meetings.
- Are interested in a geothermal pilot and the possibility of carbon capture, despite uncertainty about how both could apply to the Fort Nelson region.
- Want to ensure sufficient, reliable capacity to support economic growth, especially with the uncertainties of climate change.
- What we heard from the communities are in callout boxes throughout the FNLTRP. In addition, all public materials can be found on the FNLTRP website at www.bchydro.com/FortNelsonLTRP, including the engagement summary reports from both phases of consultation and engagement, and information on how we considered this input and feedback in the final FNLTRP.

3.2. Planning objectives and criteria guide our plan to ensure long-term reliable supply

3.2.1. Defining planning objectives helps clarify what's important

Providing safe, reliable, and affordable service is foundational to BC Hydro. Advancing reconciliation with First Nations is also an important goal for BC Hydro, and First Nations' interests are considered within all the planning objectives.

Inherent in long-term resource planning to meet future customer needs is an assessment of various alternatives to meet the anticipated need for electricity. These alternatives will come with various benefits and trade-offs. As such, we establish planning objectives to clarify what is important when making choices. The planning objectives for the FNLTRP are aligned with Provincial policy and prudent utility practices. They are:

- Keeping costs low for customers;
- Reducing greenhouse gas emissions;
- Limiting land and water impacts; and
- Supporting local communities' economic development.

Engagement input from the virtual sessions suggested the objectives seemed reasonable to participants for a long-term resource plan. Survey responses showed that keeping costs low ranked highest, followed by supporting local communities' economic development, limiting land and water impacts, and reducing greenhouse gas emissions. Energy security, including resilience to ongoing climate change impacts, was important to participants. There was interest in how to connect the non-serviced or non-integrated communities around Fort Nelson. There was also a desire for BC Hydro to support economic opportunities amongst the First Nations and the broader Fort Nelson region community, which has been incorporated into the FNLTRP in the Near-term Actions.

3.2.2. Planning criteria are established to ensure adequate resources are available to meet future demand

BC Hydro uses planning criteria in developing the FNLTRP to ensure Fort Nelson has a reliable electrical system, including adequate generating capability (energy and capacity) and adequate transmission capability to meet customer demand. These planning criteria reflect best electric utility practices and incorporate information about the performance of our electrical system.

The FNLTRP provides forecasted load in the Fort Nelson area and also information on how BC Hydro expects to meet the load from fiscal 2028 (the 1st year of the long-term planning horizon) to fiscal 2043 (the last year of the planning horizon).[2] The first three years are considered as the operational window to manage the supply and uncertainties.

The primary reliability planning criterion applied to Fort Nelson is based on the largest single contingency standard, known as Transmission System Planning Performance Requirements (TPL 001-4). In 2018, the Commission adopted the TPL 001-4 transmission planning criterion created by the North American Electric Reliability Corporation (NERC) as one of British Columbia's Mandatory Reliability Standards. This planning standard applies to the Fort Nelson region.[3,4] Put simply, this planning criterion requires sufficient resources be available to meet the area load with the single largest element of the electricity system (either Fort Nelson Generating Station or transmission line to Alberta) out of service. Using the current configuration in Fort Nelson to comply with the planning criteria, the following conditions need to be satisfied:

- When any generator is out of service, the remaining generating unit(s) (if any) and transmission line to Alberta need to be adequate to supply the load; and
- When the transmission line to Alberta is out of service, the local generation resource needs to be adequate to supply the load.

For the FNLTRP, any future supply options examined will be required to meet these generation and transmission planning criteria.

2 The time period from year zero through year three are considered the operational planning horizon, distinct from the long-term planning horizon which spans years 4 through twenty.
3 BCUC Order No. R-27-18, dated June 28, 2018, approved NERC Standard TPL 001-4 -- Transmission System Planning Performance Requirements as one of the Mandatory Reliability Standards (MRS) in British Columbia: https://www.ordersdecisions.bcuc.com/bcuc/orders/en/item/312044/index.do?q=R-27-18
4 NERC Standard TPL001-4: https://www.nerc.com/pa/Stand/Reliability%20Standards/TPL-001-4.pdf

4. Load Resource Balances for Fort Nelson region show sufficient supply over the planning horizon

A Load Resource Balance compares forecasted customer electricity demand and the resources available to meet that demand over the planning horizon, using the planning criteria outlined in the previous section. Put simply, it represents the supply-demand balance for electricity. When only existing and committed resources are included, the Load Resource Balance shows the timing and volume of additional resources required to meet customer demand, if any.[5]

Load Resource Balances are developed for both energy and capacity. An energy Load Resource Balance addresses our customers' annual electricity needs (expressed as giga-watt hours per year, GWh/year). A capacity Load Resource Balance addresses our customers' peak electricity use at any point in time, typically occurring during the winter period (expressed as megawatts, MW). The first step in developing Load Resource Balances is to establish demand through load forecast scenarios.

4.1. The Fort Nelson region Load Forecast Scenarios

BC Hydro develops load forecast scenarios for both energy and peak (capacity) demand. We use the April 2023 Reference Load Forecast Scenarios of the 20-year energy and peak demand forecasts for the FNLTRP.[6] A high-load scenario was developed for peak demand only (High Load Forecast Scenario) because the existing and committed electricity supply resources (Fort Nelson Generating Station and a transmission service from Alberta) are constrained by capacity, not energy. Any decrease in load will continue to be met with the existing supply options. Demand-side measures are not counted/considered in the April 2023 Reference Load Forecast Scenario, as the demand-side measure savings have historically been relatively small in Fort Nelson and therefore would likely not be material to the Load Forecast Scenarios.

4.1.1. Energy Load Forecast Scenario

An energy load forecast scenario is developed as the sum of the forecast for each major customer sectors, including the residential, commercial, and industrial sectors.

- The forecast for the residential sector is the product of the customer accounts and the average use per account. The account projection and the average use per account projection are based on a trend analysis of historical billing data.
- The forecast for the commercial and light industrial sector is developed with a regression model involving historical sales and employment where the history and forecast of employment come from the Conference Board of Canada Economic Forecast.
- The forecast for the industrial sector is developed on an account-by-account basis.

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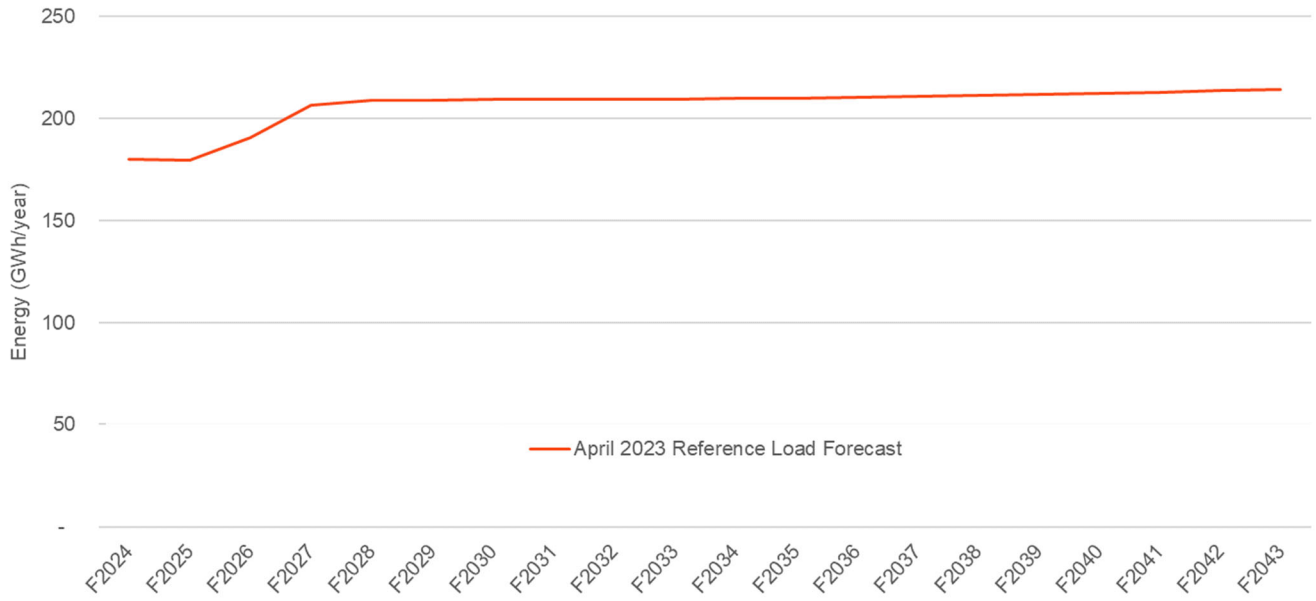
5 Existing resources are resources that are currently operating and are expected to continue to operate into, if not to the end of, the planning horizon. Committed resources are those that have received the necessary internal authorizations to proceed to implementation and any required regulatory approvals and are expected to begin operating during the planning horizon.

6 Reference Load Forecast Scenario refers to mid-level load forecast senario.

- The forecasts for street lighting customers, irrigation customers and BC Hydro's own use within Fort Nelson are developed based on a trend analysis.

The April 2023 Reference Load Forecast Scenario for energy for the Fort Nelson region is shown in Figure 2.

Figure 2: Fort Nelson Region April 2023 Reference Load Forecast Scenario for Energy



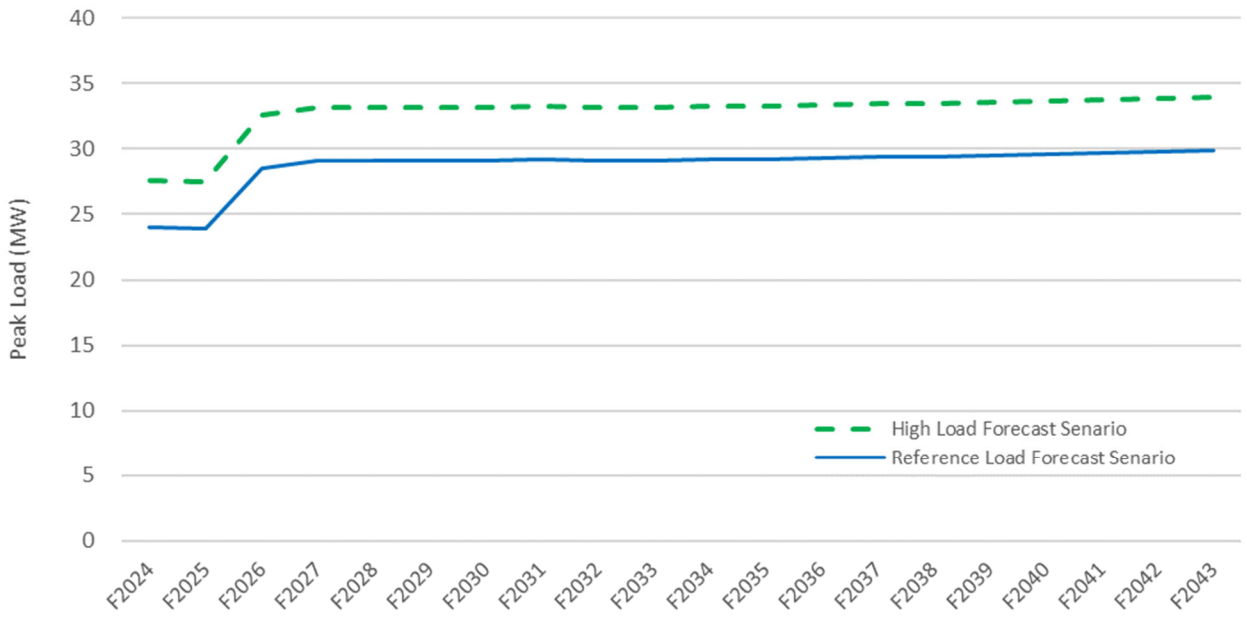
As shown above, the energy demand in the Fort Nelson region is forecast to be below 220 GWh/year until at least fiscal 2043. There is an expected energy growth from fiscal 2025 to fiscal 2027, which is driven by an increase in the demand for electricity from the wood products segment. The April 2023 Reference Load Forecast Scenario details are provided in Appendix A.

4.1.2. Peak Demand Load Forecast Scenarios

To create a peak demand load forecast, BC Hydro takes the sum of the base load and the industrial sector loads. The base load, consisting of residential, commercial, and some minor load from street lighting, irrigation, and BC Hydro's own use, is developed using a trend analysis based on historical data. The industrial sector peak forecast is developed on an account-by-account basis.

Figure 3 presents the April 2023 Peak Demand Reference Load Forecast Scenario and High Load Forecast Scenario for the Fort Nelson region.

Figure 3: Fort Nelson Region April 2023 Reference and High Load Forecast Scenarios for Peak Demand



The Reference Load Forecast Scenario reaches 30 MW by fiscal 2043, with the High Load Forecast Scenario to be 34 MW in fiscal 2043. There are minor differences between the Reference and High Load Forecast Scenarios due to limited additional industrial activity planned in the region over the period of fiscal 2024 to fiscal 2043.

- From fiscal 2025 to fiscal 2026, there are:
  - an expected 5 MW load growth for the Reference Load Forecast Scenario, driven by an increase in the demand for electricity from the wood product segment; and
  - an expected 6 MW load growth for the High Load Forecast Scenario, driven by a higher forestry-sector load growth.
- From fiscal 2026 to fiscal 2043, the load in the Fort Nelson region remains relatively flat under both load scenarios.

We will continue to monitor oil and gas development activity in the Horn River basin and the adjacent Liard basin, which encompass a large geographic area generally extending north and east of the former Town of Fort Nelson. The FNLTRP does not include load scenarios associated with industrial electrification in the Horn River basin in the absence of likely development of the gas resources.

During Phase 1 and Phase 2 consultation and engagement, there were several questions about BC Hydro's load forecast scenarios, including comments about how electrification and the possibility of economic development were being reflected. Some participants expressed concern that BC Hydro would be able to supply enough electricity if economic development were to occur quickly. BC Hydro shared that we do not expect significant impacts from electric vehicle charging but we will monitor their effects.

4.2. BC Hydro's existing and committed resources in the Fort Nelson region

Existing and committed resources are quantified so that they can be compared to the load forecasts, which allows BC Hydro to determine the timing and volume of any new resources, if needed in the future.

4.2.1. Fort Nelson's existing resources

Existing resources are those currently operating and expected to continue operating into, if not to the end of, the planning horizon. For Fort Nelson, these are the Fort Nelson Generating Station and the transmission supply from Alberta subject to the Fort Nelson Demand Transmission Service Agreement with the Alberta Electric System Operator. In addition, demand-side measures provide energy savings.

The Fort Nelson Generating Station

The Fort Nelson Generating Station is a natural gas-fired facility and was first commissioned in 1999. Fort Nelson Generating Station completed a major upgrade in 2012 to increase the generating capacity from 47 MW to 73 MW. These upgrades also enabled the Fort Nelson Generating Station to run in a combined cycle through the addition of a steam cycle to improve overall efficiency and a duct burner to increase the sustainable maximum power output.[7] This upgrade also reduced greenhouse gasses from 481 tCO_2/GWh to 444 tCO_2/GWh on average. In December 2021, BC Hydro completed another upgrade at the facility to replace the gas turbine.

Fort Nelson Generating Station consists of two generating units, Generator 1 is a gas turbine generator with 44 MW dependable generation capacity and Generator 2 is a steam turbine generator with an additional 26 MW dependable generation capacity. The steam turbine generator uses waste heat from the gas turbine generator and cannot operate independently.

To align with our planning objectives of keeping costs low for customers, BC Hydro will continue investing in the maintenance and operation of the Fort Nelson Generating Station before it reaches end-of-life, and to take advantage of the relatively low-cost power it provides.

Transmission supply from Alberta

Transmission supply from Alberta is provided by the Alberta Electric System Operator to BC Hydro under the terms of the Fort Nelson Demand Transmission Service Agreement, and through a 144 kV transmission line connected to the Alberta Interconnected Electric System. The 144 kV transmission line is 209 km long from the Fort Nelson Generating Station to the Rainbow Lake substation in Alberta. It was constructed in 1991 with wood poles and has an expected average pole lifespan of 40 to 50 years. The 2023 wildfires damaged multiple structures of the transmission line on both sides of the B.C. and Alberta border, which were subsequently repaired. However, fires in 2024 again damaged these lines, and also forced the evacuation of communities in the region. At the time of writing, repairs are underway and the Fort Nelson Generating Station has returned to service.

7 The term combined cycle refers to a system that incorporates a gas turbine, a steam turbine, a heat recovery steam generator where the heat of the exhaust gases is used to produce steam and one or more electric generators. The shaft power from the gas turbine and that developed by the steam turbine both run the generator(s) that produce electric power.

The Fort Nelson Demand Transmission Service agreement between BC Hydro and Alberta Electric System Operator provides up to 38.5 MW of supply capacity to Fort Nelson. The Fort Nelson Demand Transmission Service agreement is available to BC Hydro at all times.[8] Under this agreement, BC Hydro purchases the energy from the Alberta Electric System Operator electricity market at market-based rates to serve the Fort Nelson region load when the Fort Nelson Generating Station is not operating.

Demand-side measures

Demand-side measures programs available for customers in the integrated system are also available to Fort Nelson customers, including programs for Indigenous and low-income customers. In recent years, residential and commercial customers in Fort Nelson have participated in demand-side measures programs, and we expect continued participation from Fort Nelson customers in the future. Demand-side measures savings have been relatively small and would not be material to the Load Resource Balances. New incremental energy savings from participation in demand-side measures programs in fiscal 2023 totaled approximately 80 MWh.

4.2.2. Fort Nelson's committed resources

Committed resources are those that have received the necessary internal authorizations to proceed to implementation and any required regulatory approvals and are expected to begin operating during the planning horizon. There are no committed supply-side resources for the Fort Nelson region.

4.3. Resulting Load Resource Balances

By comparing the existing supply resources described above to the future electricity needs of our customers as outlined by both the Reference and High Load Forecast Scenarios, we establish if and when we will need additional energy and capacity resources.

Fort Nelson Generating Station can provide up to approximately 480 GWh/year of energy. With the forecasted energy demand for the Fort Nelson area load of less than 220 GWh/year as shown in Figure 2, previously, there is an estimated energy surplus of approximately 260 GWh/year based on the April 2023 Reference Load Forecast. Therefore, the existing energy resources are expected to be sufficient to meet Fort Nelson's load demand throughout the planning horizon.

Figure 4 displays the Capacity Load Resource Balance, considering both the available supplies from the Fort Nelson Generating Station and the transmission line from Alberta.

8 Firm service, non-interruptible.

Figure 4: Fort Nelson Capacity Load Resource Balance

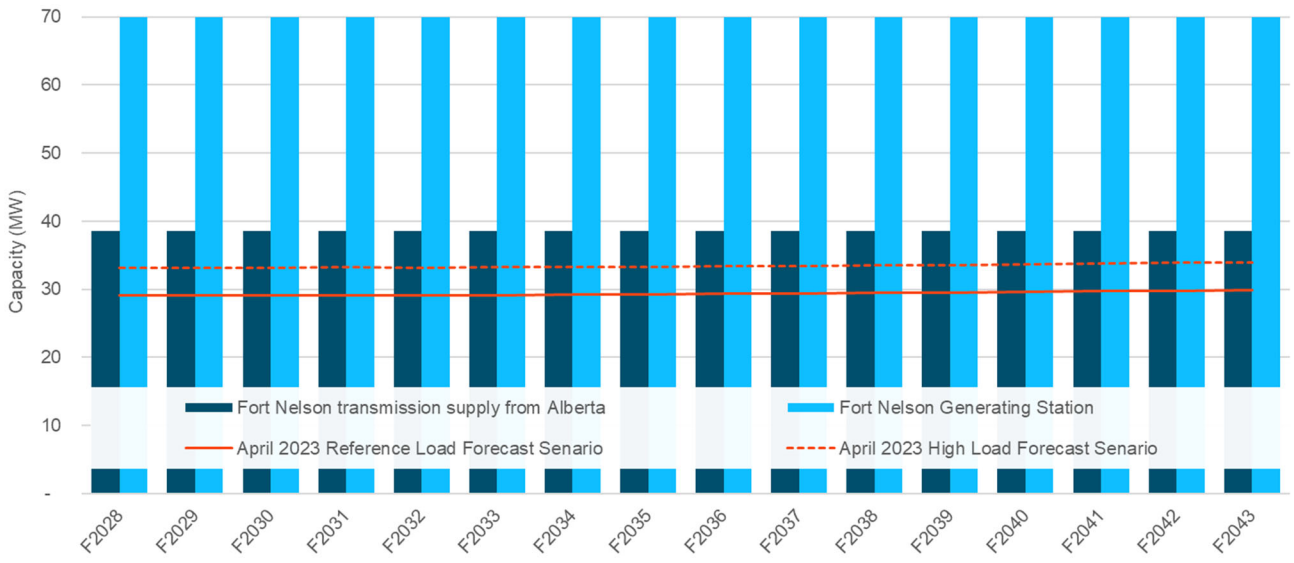


Figure 4 demonstrates that, under both the Reference Load Forecast Scenario and the High Load Forecast Scenario, the load in the Fort Nelson region will not exceed the 38.5 MW capacity provided by the current Fort Nelson Demand Transmission Service Agreement with the Alberta Electric System Operator. Therefore, the existing capacity resources are expected to be sufficient to meet Fort Nelson's load requirement before fiscal 2043 under our largest single contingency reliability planning criterion.

The Capacity Load Resource Balance details are provided in Appendix B.

Engagement input suggested consistent, reliable supply with sufficient backup power as a primary consideration, along with climate change impacts and wildfire damage to infrastructure. Other uncertainties to be considered included the potential for industrial growth, particularly in the oil and gas sector; the role BC Hydro will play; and the impacts on increasing costs to customers, including related costs of living.

5. Preparing for a low carbon future

Although the Load Resource Balances show sufficient supply over the planning horizon (and therefore no identified need to invest in additional resources), there are steps we're taking to prepare for a low carbon future.

The global energy transition towards clean and renewable sources of energy is underway. The pace of that transition and the policies that will chart the path could change rapidly. Climate policies are advancing to limit the use or availability of natural gas-fueled generation resources that produce greenhouse gas emissions. In the future, this may create restrictions in how we can use the Fort Nelson Generation Station. For instance, the proposed Federal Clean Electricity Regulations could potentially affect the availability of the Fort Nelson Generating Station.[9] In its April 2022 budget announcement, the Federal Government committed to achieving a net-zero electricity system by 2035. Draft Clean Electricity Regulations were released in summer 2023. These are now undergoing review and consultation, and final Regulations are expected in 2024. As future policy and regulations remain uncertain, the FNLTRP will show a scenario where the Clean Electricity Regulations are enacted as currently drafted; however, this is just one example of regulation or policy that could impact the resource supply options in the Fort Nelson region.

Additionally, BC Hydro's is taking a leading role in supporting the Provincial energy transition to use clean electricity. While we have sufficient resources to meet the Fort Nelson region's electricity needs, we are also preparing for a low-carbon future, whether driven internally through our corporate goals or externally through government policy or regulation. As such, preparing for this low-carbon future is a focus of this long-term resource plan, as it is the most pressing uncertainty facing Fort Nelson's long-term supply.

5.1. Fort Nelson Generating Station operations under the proposed Clean Electricity Regulations

The proposed Federal Clean Electricity Regulations would require all fossil-fueled generation units above 25 MW to meet one of the following criteria by 2035, or be retired:

- Reduce emission intensity below 30 tonnes per GWh of generation, potentially using renewable fuels rather than conventional natural gas (for context, Fort Nelson Generating Station emitted approximately 444 tonnes per GWh on average over the last five years);
- Install carbon capture and sequestration equipment; and/or
- Limit operations to only up to 450 hours per year and up to 150 kilotonnes of CO2 emission in a calendar year; however, operation during emergencies is not included in the 450-hour limit (for context, Fort Nelson Generating Station operated approximately 7300 hours per year on average over the last five years).

9 The proposed Federal Clean Energy Electricity Regulations can be found here: Clean Electricity Regulations - Canada.ca. For illustrative and explanatory purposes in this document, BC Hydro assumes that the Clean Electricity Regulations apply to BC Hydro.

While the proposed regulation would come into effect federally in 2035, it could apply to the Fort Nelson Generation at the end of the planning horizon (2042).[10] The Fort Nelson Generating Station, as it is currently configured, cannot meet the emission standard prescribed by the proposed Clean Electricity Regulations and therefore could not be used as a primary electricity supply resource.

5.2. Supply-side Resource Options in Fort Nelson under the proposed Clean Energy Regulation

We expect the Fort Nelson Generating Station to be operational up until 2042. We also expect the interconnection to Alberta and the Fort Nelson Demand Transmission Service continue to be in place to provide a dependable source of power beyond 2042. However, by 2042, we want to have in place either an alternative source of primary power to the Fort Nelson Generating Station or a solution to address the related greenhouse gas emissions from the facility.

We assessed the supply options that could be available in Fort Nelson by 2042. This assessment sought to:

- Evaluate and prioritize resource options in terms of their alignment with our planning objectives;
- Characterize the lead times for resource options. Lead times for the development of new resource options are key to determining the schedule by which BC Hydro must make investment decisions on an optimal supply option prior to 2042; and
- Characterize the key uncertainties and risks associated with the resource options in terms of technological maturity and barriers to the successful development of these resources if they were to be advanced. The nature of these uncertainties and risks will inform an appropriate action plan to gain relevant insights about the resource options and to reduce future development risks.

Resource options with sufficient alignment with our planning objectives will then be considered deserving of greater effort to investigate. We combine this information with additional assessments about lead times and uncertainty. This aids in determining where further investigation could be advanced for the purposes of making an informed future decision on which supply option should be pursued in 2042. Engagement results also inform our assessment and consideration of the resource options.

Our analysis indicates there isn't a preferred supply path: all involving trade-offs among our planning objectives and having costs and degrees of technological and market uncertainty.

As the various resource options have lead times as long as approximately 10 years, we have until about 2032 to decide about the electricity supply solution in Fort Nelson. Before 2032, we can gather better intelligence and further information to inform the selection of the preferred supply alternative(s), and then bring forward the chosen supply option(s) in a new long-term resource plan.

10 The draft Clean Electricity Regulation includes a provision to allow operation of some thermal generation beyond 2035 to the end of life. BC Hydro understands the life of Fort Nelson Generating Station to extend to 2042.

5.3. Assessment of supply options

Information related to resource options relative to our objectives, community engagement, and the technology's commercial readiness will be important when we ultimately make resource selections.

In the tables below, we lay out our assessment of each resource option. We outline information about each resource type and provide actions that may be needed to acquire relevant information to inform our future decisions. Where applicable, commentary is provided from our early engagement results as we gathered input into the FNLTRP.

The tables are designed to outline what we know, and where learning more could help us make a future decision. Near-term Actions indicate where we believe taking steps between now and 2032 are required to confront uncertainties around the viability, performance, or cost of a promising resource option. Projects that BC Hydro launches to carry out the Near-term Actions will have their own consultation and approval processes, and BC Hydro expenditures will be outlined in future BC Hydro revenue requirements applications. In addition to these steps, BC Hydro will also seek to expand our knowledge base through monitoring, assessments, and openness to collaborative opportunities, which will not be covered by a specific Near-term Action and will instead be included in BC Hydro day-to-day business.

5.3.1. Geothermal

Geothermal resources convert thermal energy in steam or hot water from deep underground reservoirs into electricity from above-ground turbines. The development of these resources depends on identifying hot fluids in permeable subsurface structures, drilling wells into these reservoirs, collecting the hot fluids at the surface, utilizing the heat energy in these fluids to drive a turbine, and returning the cooled fluids to the reservoir.

Areas around Fort Nelson have the potential for geothermal development, and the Fort Nelson First Nation is in the process of undertaking foundational exploratory research and studies for their Tu-Deh-Kah geothermal project.

Table 1 provides the geothermal resource assessment compared with the planning objectives and other characteristics.

Table 1: Resource characteristics of geothermal

Geothermal				
	Keep costs low[11]	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
Planning objectives	$90-180 / MWh, with wide range depending on site-specific uncertainties of capital cost.	Potentially 0 GHG, uncertainty about co-produced natural gas from geothermal wells.	Impact primarily from new ~10 km line to connect geothermal to Fort Nelson grid.	Enables new revenues for industrial co-development using surplus heat. Opportunities for local ownership and involvement in clean energy generation.
Lead time	~ 7 years for greenfield infrastructure.			
Technical maturity	Fully mature technologies with many similar facilities in operation around the world, although novel in Canada.			
Level of development risk	These options may not be available for development. Geothermal viability depends on proving the availability of geothermal resources, which is currently underway. Size of geothermal potential in terms of MW is dependent on further exploration and evaluation of geothermal reservoir. There is high confidence that ~10 MW is achievable, but additional geothermal resources up to ~50 MW require further study.			

Engagement input from the virtual sessions and the survey suggests geothermal resources as one of the leading choices with support amongst the communities for continued exploration. Phase 2 engagement showed support for a pilot program with a geothermal project in the region. Some reasons from the survey for geothermal included it being locally available and providing community and environmental benefits, with a few survey respondents expressing concerns about its cost and feasibility.

After completing this early assessment, we believe active exploration is warranted related to local geothermal resources. A decision on advancing geothermal resource development should be informed by further investigations into:

- the technical viability of developing low-emission geothermal power considering the high proportion of natural gas contained in the geothermal reservoir;
- the local capability of geothermal generation to provide dependable generation and grid support services in islanded mode; and
- the total resource potential of the geothermal reservoir to power some or even all the Fort Nelson load and provide a complete replacement alternative to the Fort Nelson Generating Station in 2042.

11 Cost refers to the levelized cost of energy, which is the break-even cost to generate the electricity over the life of a generation asset.

We will undertake a Near-term Action related to this resource. It will focus on collaboration with Independent Power Producer and Fort Nelson First Nation proponents of the Tu-Deh-Kah geothermal project to advance a pilot project that will confirm the performance and total potential of the local geothermal resources by 2032. As appropriate, we will engage early with the First Nations and the public that may be potentially affected.

5.3.2. Carbon capture and sequestration (CCS)

Carbon capture and sequestration is a process in which a relatively pure stream of carbon dioxide from industrial sources is separated, treated, and transported to a storage location, generally deep underground in geological formations. Carbon capture is the trapping of the carbon emissions after they have been emitted but before they enter the atmosphere. Carbon sequestration is the long-term storage of captured carbon in geological reservoirs.

Table 2 provides the carbon capture and sequestration assessment compared with the planning objectives and other characteristics.

Table 2: Resource characterization of carbon capture and sequestration

Carbon capture and sequestration				
	Keep costs low	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
Planning objectives	$100 – 400 / MWh after accounting for costs and avoided GHG tax from existing Fort Nelson Generating facility. Costs are highly uncertain in the 2042 timeframe.	Potentially 0, but likely ~10% leakage from flue gas represents ~10 kT of GHG per year.	The land impact from new surface pipe (linear asset) to move compressed CO_2 to the sequestration site. Potential elimination of any surface impacts if carbon can be utilized rather than stored.	Some potential for collaboration with gas producers and processors to create a cluster of low GHG natural gas suppliers.
Lead time	Range of ~4-8 years depending on engineering for existing Fort Nelson Generating facility and development sequestration infrastructure.			
Technical maturity	Emerging Technologies. One commercial approach to capture of flue gases available today, but novel approaches are under development.			
Level of development risk	Primary risk is viability of geological storage. Fort Nelson saline aquifers are promising but unproven. Costs and risks can be reduced if cluster of GHG storage activities can share common infrastructure.			

Engagement input from the virtual sessions and the survey suggests support for continued exploration of carbon capture and sequestration. In Phase 1 engagement, there was a suggestion that opportunities for carbon capture and utilization also be explored.[12] Some reasons in the survey for carbon capture and sequestration suggested that it is locally available, uses existing infrastructure, and is reliable and practical. A few survey respondents raised concerns about cost and prudency with exploring such an unknown technology.

12 Carbon utilization involves converting carbon dioxide captured from industrial or atmospheric sources into value-added products.

After completing this early assessment, we believe active exploration is warranted related to the technology challenges and economics of integrating carbon capture technologies applied to the existing Fort Nelson Generating Station.

Carbon capture of post-combustion emissions from a natural gas-fueled power plant is the obvious first step towards developing a carbon capture and sequestration solution. While the development of carbon capture technologies is of interest to large emitters all over the world, the application of these emerging technologies to flexible thermal generation facilities like the Fort Nelson Generating Station is a question that can only be addressed based on a detailed understanding of the context and operations of Fort Nelson Generating Station. In particular:

- What forward-looking carbon capture technology is appropriate to the operating regime of the Fort Nelson Generating Station in the 2040 timeframe?
- What scale of carbon capture equipment is appropriate to meet potential new regulations (such as the Federal Clean Electricity Regulations) in the future timeframe this will be developed?
- What costs and performance characteristics are expected when incorporating carbon capture into an existing facility?

The Near-term Action related to this resource will be to actively explore the options and approaches to incorporating forward-looking carbon capture technologies into the Fort Nelson Generating Station. The results of these explorations will yield engineering and feasibility studies that form a detailed implementation plan for installing carbon capture technologies. As appropriate, we will engage early with First Nations and the public that may be potentially affected.

In addition to this Near-term Action, BC Hydro will monitor and engage with gas producers and processors in Fort Nelson to assess the viability of shared infrastructure for future sequestration or utilization of captured carbon.

5.3.3. Renewable natural gas (RNG) and hydrogen

Renewable natural gas is a pipeline-quality gas interchangeable with conventional natural gas. Generally, renewable natural gas is a biogas or a gaseous product of the decomposition of organic matter that has been processed to purity standards. Hydrogen can also be incorporated into existing pipeline and turbine infrastructure within some tolerance limits as a zero-emission alternative to conventional natural gas, or hydrogen can be used as feedstock to produce synthetic natural gas.[13] RNG or hydrogen will be considered a potential clean energy alternative to conventional natural gas that can be utilized within the existing Fort Nelson Generating Station.

Table 3 provides the assessment of the use of renewable natural gas or hydrogen compared with the planning objectives and other characteristics.

13 Specifically, “Green Hydrogen” produced from clean electricity through an electrolytic process, or produced from conventional natural gas through a steam methane reformation process that includes sequestration of any resultant carbon emissions, can be considered as a clean fuel in combustion turbines.

Table 3: Resource characterization of renewable natural gas

Switch to Renewable Natural Gas or Hydrogen				
	Keep costs low	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
Planning objectives	$80 – 200 / MWh after accounting for the costs of fuel, upgrading the existing Fort Nelson Generating Station to use alternative fuels, and avoiding the carbon tax. There is a high degree of uncertainty depending on fuel availability and cost.	0 GHG	Variable impacts depend on the source. Conversion of local wood or waste biomass into RNG will have land impacts, while delivery of remote sources may involve transport-related impacts.	Uncertain and will depend on the source of RNG or hydrogen.
Lead time	~5-7 years for the development of new sources of RNG based on organic wastes and biomass.			
Technical maturity	There is a range of maturity levels. Local source technologies are in the relatively early stages. Remote sources using the digestion of organic wastes are mature. Modes of production, transport and storage of green hydrogen is also at a range of maturity levels.			
Level of development risk	A pathway for local production of RNG may be unavailable, as it likely depends on technology for the conversion of woody biomass resources that is still at the early stages of technical development. Depending on the evolution of the RNG market in B.C., Fort Nelson Generating Station may not have delivery and storage mechanisms to access remote sources.			

Engagement input from the virtual sessions and the survey suggests support for continued exploration of renewable natural gas. Expressed reasons in the survey for renewable fuels included that they use existing infrastructure, are reliable and practical, and provide environmental benefits.

After completing this early assessment, we believe further monitoring is warranted related to using renewable natural gas or hydrogen at the Fort Nelson Generating Station. The trajectory of the renewable natural gas and hydrogen markets in B.C. are at a turning point. Whether the supply of renewable natural gas/hydrogen within B.C. grows rapidly with many new sources being developed or much of the growth of new sources happens in lower-cost jurisdictions with delivery to B.C. will influence the technical and financial viability of these clean fuels supplied to Fort Nelson.

We will continue to monitor the continental renewable natural gas and hydrogen supply markets, as well as local trends on the cost of delivering clean fuels at sufficient volumes to Fort Nelson. With further information related to likely supply pathways and delivery costs to Fort Nelson, we expect to be prepared to make an informed decision on renewable natural gas and hydrogen by 2032.

5.3.4. Biomass

Wood-based biomass electricity is generated from the combustion or gasification of woody organic materials – standing timber, pulp, logs, roadside debris, or sawmill wood waste, with the heat being used to drive a steam turbine and, in turn, a generator.

Table 4 provides the biomass resource assessment compared with the planning objectives and other characteristics.

Table 4: Resource characterization of biomass

Biomass				
	Keep costs low	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
Planning objectives	$150-200 / MWh, depending on available fuel types and costs.	Potentially 0 or negligible GHG, with uncertainty about GHGs from any cofiring with fossil fuels.	Forest impacts supply fuel to a biomass facility and a new line to connect to the Fort Nelson grid.	Enables industrial co-development of high-value forestry operations that produce waste products for use at biomass facility. Opportunities for local ownership and involvement in clean energy generation.
Lead time	~7 years for greenfield infrastructure			
Technical maturity	Fully mature technologies			
Level of development risk	Biomass resources will not be viable for development. Biomass generation depends on co-development of new large-scale forestry activities, which are not currently committed. The size of biomass potential in terms of MW is dependent on the availability of sufficient wood wastes from forestry activities.			

Engagement input from the virtual sessions and the survey suggests mixed support for the biomass resource. Some reasons in support of biomass included that it is a local resource and would provide community benefits, while some concerns regarding land impacts and insufficient forest sector activity. Phase 2 engagement agreed monitoring this resource option would be valuable.

After completing this early assessment, we believe further monitoring is warranted related to the Biomass resource. There is uncertainty in the potential for a biomass facility fueled by wood wastes to be a catalyst for a resurgence in the local forestry sector and the concomitant development of the local economy. In the absence of a vibrant forestry sector and their necessary waste products, a biomass generation facility in Fort Nelson is not likely to be viable.

We will monitor any proposed or potential forestry sector activities in the region and engage – as opportunities arise - with future regional economic development planning processes to advance interests in a large-scale biomass

facility that may also advance the Fort Nelson region's economic development objectives. With intelligence on the likelihood of a vibrant forestry sector to support a biomass generation facility, we'll be able to make an informed decision on a suitably sized biomass generation facility by 2032.

5.3.5. New transmission to connect Fort Nelson to BC Hydro's integrated grid

Connecting Fort Nelson to BC Hydro's integrated system would mean building a new long (approximately 350 km) transmission line between the BC Hydro's existing integrated system in the Peace Region to Fort Nelson.

Table 5 provides the assessment of new transmission connection to the BC Hydro grid compared with the planning objectives and other characteristics.

Table 5: Resource characterization of connecting to the BC Hydro integrated grid

Connect to BC Hydro integrated grid				
Planning objectives	**Keep costs low**	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
	~$500/MWh, for $1B capital and OMA cost of new line, plus $70/MWh of additional generation resources to serve local load. The cost could be less if a North Montney line is constructed.	0 GHG	Impacts - from 350 km of new line.	Potential to electrify and invigorate gas exploration and development.
Lead time	~10 years, with extensive regulatory, consultation, and assessment requirements			
Technical maturity	Fully mature technologies			
Level of development risk	A new transmission will not be acceptable due to environmental impacts, land availability, or First Nations-protected areas.			

Engagement input from the virtual sessions and the survey suggests some interest for connecting to the BC Hydro integrated system. First Nation's expressed concern about environmental impacts while also expressing interest in economic development opportunities that a line could provide. Some reasons in support of a transmission connection included community economic and environmental benefits, improved reliability, and the ability of connecting some areas not serviced by BC Hydro.

After completing this early assessment, we believe further monitoring is warranted related to new transmission to connect Fort Nelson to the BC Hydro's integrated grid. In particular, the independent development of new transmission that extends the BC Hydro integrated grid from existing facilities from the South Peace region into the gas-producing regions of the North Montney basin could improve the alignment of this option by reducing costs and the environmental impacts of incremental transmission.

We will continue to monitor independent transmission developments to identify opportunities to lessen the cost of incremental transmission expansion to Fort Nelson. With further information on the incremental costs of expanding transmission from the North Montney region to Fort Nelson, we'll be able to make a further assessment by 2032 on this option.

5.3.6. Solar and wind

Solar and wind resources are intermittent resources that convert solar and wind energy into electricity using photovoltaic cells for solar and using the conversion of kinetic energy from moving air.[14] Co-ordinating solar or wind with battery resources to jointly provide firm power is a topic of increasing focus amongst utilities. The quality of the solar and wind resources in the area around Fort Nelson is poor based on a high level scan, resulting in higher unit energy costs for these resource types than would be found in other parts of BC.

Table 6 provides the solar and wind resource assessment compared with the planning objectives and other characteristics.

Table 6: Resource characterization of solar and wind

Solar and Wind (energy only)				
Planning objectives	**Keep costs low**	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
	$150-200 / MWh, although intermittent energy resources cannot provide dependable supply to Fort Nelson. Addition of batteries to provide dependable capacity is cost-prohibitive	0 GHG	Impacts - from transmission lines up to 100 km long to access good quality wind resources.	Opportunities for local ownership and involvement in clean energy generation
Lead time	~7 years			
Technical maturity	Fully mature technologies.			
Level of development risk	Low risk; however, only poor-quality wind and solar resources have been identified within a ~50km radius of the existing grid infrastructure.			

Engagement input from the virtual sessions and the survey suggests general agreement that solar and wind are unlikely options given the quality of resources, their intermittency, and lack of light during high demand periods. A few comments suggested more study in this area may be warranted.

14 In addition to solar and wind, BC Hydro investigated the potential for run of river resources in the Fort Nelson region. BC Hydro was not able to identify any technically viable run of river resources in the Fort Nelson region, and we have not characterized any run of river resource options in this plan.

Information on the poor-quality of the solar and wind resource indicates additional intelligence gathering is not expected to yield much better information. However, we will continue to monitor these resource options, particularly changes in the development costs, new incentive programs for solar and wind projects, and advancements in energy storage technologies.

5.3.7. Simple cycle gas turbine units < 25 MW

The proposed Federal Clean Electricity Regulations would apply to generating units that are 25 MW or greater in size. Fort Nelson could, therefore, replace the existing turbine with two or more simple-cycle gas turbines that are less than 25 MW in size.

Table 7 provides the <25 MW simple-cycle gas turbine units as a resource option assessment compared with the planning objectives and other characteristics.

Table 7: Resource characterization of < 25 MW Simple Cycle Gas Turbines

Simple Cycle Gas Turbines < 25 MW				
Planning objectives	**Keep costs low**	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
	~$150 / MWh with a carbon tax, and uncertainty on the cost of fuel delivered	~100 kt / year	Uses existing infrastructure at Fort Nelson Generating Station	Maintains existing employment at Fort Nelson Generating Station site
Lead time	~3 years, using existing infrastructure			
Technical maturity	Fully mature technologies			
Level of development risk	Leverages existing site and infrastructure			

Engagement input from the virtual sessions focused on options that reduced greenhouse gas emissions. Although small units were not ranked in the top three options, input from survey respondents in Phase 1 engagement suggests favouring the use of natural gas. Respondents noted it was reliable, local, available and may be the best resource for the Fort Nelson region. While not an explicit ask in the Phase 2 survey, the option of continuing to use the Fort Nelson Generating Station as it currently operates was raised by some survey respondents.

The assessment shows that advancing these units is not consistent with BC Hydro's goal to provide clean power by the Fort Nelson Generating Station after its end-of-life. However, smaller units could be considered as a partial solution, and their advancement will be informed by our monitoring and investigations of other options prior to the next long-term resource plan.

5.4. Assessment of demand-side measures (DSM)

Fort Nelson customers have access to demand-side measures programs available to customers in the integrated system and have participated in our programs. Savings from demand-side measures have been relatively small to date; however, there is an opportunity to examine whether additional savings opportunities exist through targeted demand-side measures programs.

Table 8 provides the demand-side measures resources assessment compared with the planning objectives and other characteristics.

Table 8: Resource characterization of demand-side measures

Demand-side measures				
Planning objectives	**Keep costs low**	**Reduce GHG emissions**	**Limit land/water impacts**	**Support economic development**
	DSM is typically a lower-cost resource, although there can be a range of costs by program	0 GHG	Negligible	DSM programs will reduce customer bills and improve the affordability of energy in the region
Lead time	~2 years to design and launch new programs, with several years of increasing customer program uptake to reach full program potential			
Technical maturity	Fully mature technologies			
Level of development risk	Low			

Although demand-side measures are aligned with our planning objectives, the specific conservation opportunities for Fort Nelson customers have not yet been examined. We will assess the demand-side measures potential in the Fort Nelson area before selecting resources as part of a future long-term resource plan to better understand the savings potential and to inform potential resource portfolios to replace the Fort Nelson Generating Station.

6. Near-term Actions

While BC Hydro can meet the loads in the Fort Nelson region (based on the April 2023 Reference Load Forecast Scenario discussed in section 4, above) with the two existing resources during the planning horizon, BC Hydro is preparing for a future with reduced greenhouse gas emissions that would see the Fort Nelson region powered primarily by clean energy resources. A number of activities are required to research, assess and monitor the resource options available to inform future resource for the next long-term resource plan, expected no later than 2032.

We will undertake two Near-term Actions, as outlined in Table 9, which are the active investigation of two resource options and will benefit from additional testing through research or experimentation.

Table 9: Near-term Actions

Near-term Action	Description
Support the advancement of a geothermal pilot project	2024 and onwards: Monitor geothermal independent power producer's progress towards a workable technical solution to the problem of natural gas in the reservoir. 2025 to 2032: Pilot geothermal generation of up to 10 MW to confirm: • Viability and sustainability of geothermal resource for long-term operation with minimal greenhouse gas emissions. • Grid support functions of geothermal generation in islanded mode. • Cost-effectiveness of geothermal resources in Fort Nelson context. 2030 to 2032: Evaluate total sustainable geothermal generation potential from the Clarke Lake reservoir. As appropriate, we will engage early with First Nations and the public that may be potentially affected.
Investigate the potential use of carbon capture technology at Fort Nelson Generating Station	2024: Conduct literature review and assessments of carbon capture approaches for combined cycle gas-turbine facilities. 2025: Conduct Engineering and Feasibility studies to determine appropriate scale and approach to carbon capture at the Fort Nelson Generating Station. 2026 to 2031: Investigate what would be required, and if favourable, advance a pilot for carbon capture technology (possibly at a sub-scale level) at the Fort Nelson Generating Station. As appropriate, we will engage early with First Nations and the public that may be potentially affected.

Pursuing these investigations will ultimately allow us to make more informed decisions by 2032. Expenditures for the two Near-term Actions are expected to be included in future BC Hydro revenue requirements applications.

In addition to the two Near-term Actions listed above, the assessment of the resource options outlined in Section 5 show monitoring will continue in the areas of:

- biomass,
- renewable natural gas and hydrogen,
- transmission connections,
- carbon capture, sequestration and utilization initiatives,
- and additional renewable resources (e.g., solar, wind, etc.).

We'll also assess demand-side measures prior to the next Fort Nelson long-term resource plan.

Appendices

Appendix A

April 2023 Fort Nelson Load Forecast Scenarios for energy and peak demand

Fiscal year	Reference Load Forecast energy demand (GWh)[15]	Reference Load Forecast peak demand (MW)[16]	High Load Forecast peak demand (MW)
F2024	180	24	28
F2025	180	24	27
F2026	191	29	33
F2027	207	29	33
F2028	209	29	33
F2029	209	29	33
F2030	209	29	33
F2031	210	29	33
F2032	209	29	33
F2033	210	29	33
F2034	210	29	33
F2035	210	29	33
F2036	211	29	33
F2037	211	29	33
F2038	211	29	34
F2039	212	30	34
F2040	212	30	34
F2041	213	30	34
F2042	214	30	34
F2043	214	30	34

15 **Energy demand (GWh)**
The energy demand forecast captures the total consumption of energy (or sales) in a given year.
16 **Peak demand (MW)**
The peak demand forecast estimates the highest consumption of electricity in a one-hour period over the course of a year.

Appendix B

Capacity Load Resource Balance Before Planned Resources

(MW)		F2024	F2025	F2026	F2027	F2028	F2029	F2030	F2031	F2032	F2033	F2034	F2035	F2036	F2037	F2038	F2039	F2040	F2041	F2042	F2043
Existing and Committed Heritage Resources																					
Fort Nelson Generating Station	(a)	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Existing and Committed Electricity Purchase Agreements	(b)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Regional Supply Capacity	(c) = a+b	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Transmission Capacity	(d)	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
Demand – Total Net Requirement for Fort Nelson																					
April 2023 Reference Load Forecast	(e)	24	24	29	29	29	29	29	29	29	29	29	29	29	29	29	30	30	30	30	30
Existing and Committed Demand-side Measures	(f)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Regional Surplus Supply	**(g) = c+d-e+f**	**84**	**85**	**80**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**
Sensitivities																					
April 2023 High Load Forecast	(h)	28	27	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	34
Regional Surplus Supply based on High Load	(i) = e+d-h+f	81	81	76	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75