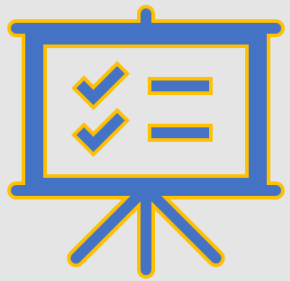
2022 LONG TERM GAS RESOURCE PLAN (LTGRP) DEMAND FORECAST & RENEWABLE SUPPLY SCENARIOS

June 17, 2021

Energy at work FORTIS BC™

Welcome, Introductions & Session Overview

Meeting Objectives



- Inform you about the status of the 2022 LTGRP
- Present and solicit feedback on the demand forecast and renewable supply analysis conducted to date, including:
  - Forecasting methodology
  - Critical uncertainties and renewable supply alternatives used to generate scenarios
  - Draft scenario results
- Provide information to participate in a crowd forecasting activity to generate your own future scenario

Agenda

- Welcome, Introductions & Session Overview **(10 min.)**
- LTGRP Update & Business As Usual Demand Forecast **(10 min.)**
- FortisBC Outlook & Considerations for Renewable Gas Supply **(20 min.)**
- Critical Uncertainties & Renewable Supply Alternatives Modelling **(40 min.)**
- Break **(10 min.)**
- Reference Case Demand Forecast & Alternate Scenarios **(65 min.)**
- Crowd Forecasting Activity Using the Slider Tool **(20 min.)**
- Wrap-up & Next Steps **(5 min.)**

Housekeeping

Please put yourself on **mute** when you're not speaking to reduce background noise.

Please use the **chat** to provide any general feedback or comments as we go through the session.

We ask that you enter your questions in the **Q&A** or wait until the allocated discussion sections to put your **hand up** to ask your question.

The session audio/video will not be recorded; however, the chat history will be saved solely for note-taking purposes. Session notes will be shared with everyone and posted online.

Reminder that the pre-read document provides additional detail on the information summarized during this session.

Ken Ross
Manager, Resource Planning & DSM Reporting

David Bailey
Manager, Customer Energy & Forecasting

Joe Mazza
Vice President, Supply & Resource Development

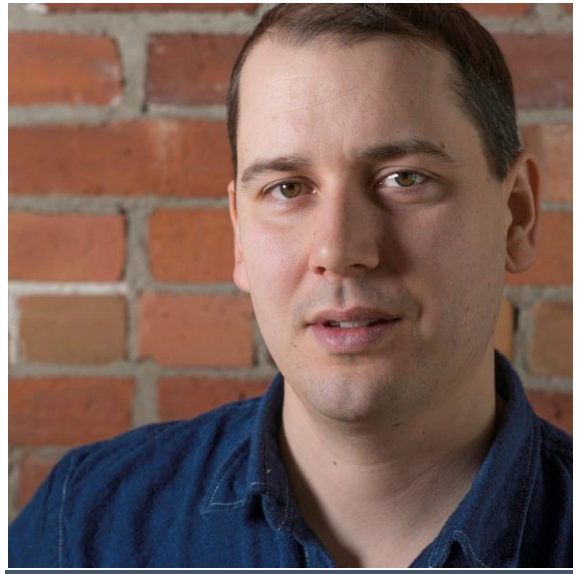
Anda Telman
Manager, Resource Planning

FortisBC Speakers

Energy at work FORTIS BC™

Christine Gustafson
Principal, Harbourgreene Consulting

LTGRP Stakeholder Engagement Facilitator



Chris Pulfer
Principal, Posterity Group

LTGRP Project Director

Dave Shipley
Senior Consultant, Posterity Group

LTGRP Technical Director

Erika Aruja
Consultant, Posterity Group

LTGRP Project Manager

Guest Speakers

Resource Planning Advisory Group (RPAG) Members Registered for this Session

- Avista Utilities
- BC Business Council
- BC Ministry of Energy, Mines & Low Carbon Innovation
- BC Public Interest Advocacy Centre
- BC Sustainable Energy Association
- BC Utilities Commission
- BC Hydro
- Building Owners & Managers Association
- Canadian Biogas Association
- City of Abbotsford
- City of New Westminster
- City of Prince George
- Clean Energy Association of BC
- Commercial Energy Consumers Association of BC
- Community Energy Association
- District of Saanich
- Metro Vancouver
- Midgard Consulting
- MoveUP
- North West Natural
- Pembina Institute
- Roger Bryenton & Associates
- Union of BC Municipalities
- University of Victoria

Introducing Posterity Group

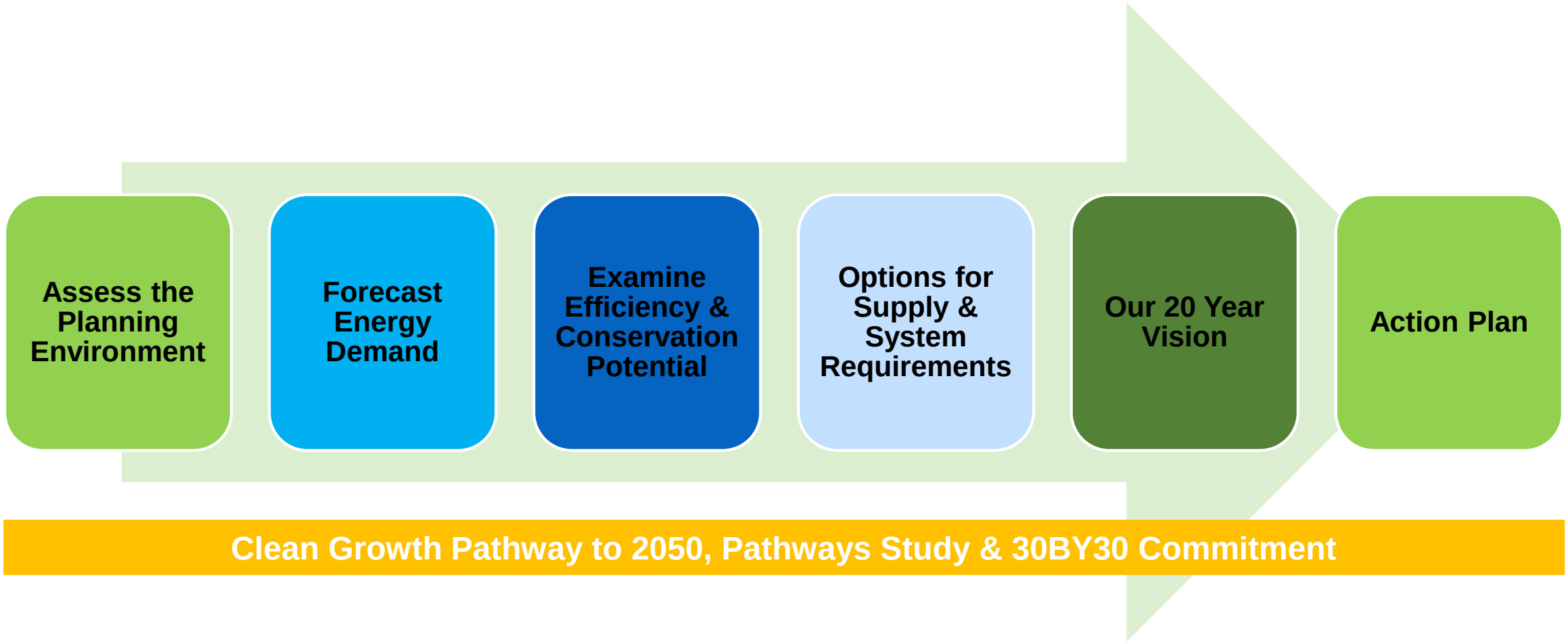
- Posterity Group (PG) is a consulting firm that provides analysis and advice to decision makers on energy efficiency and carbon abatement topics. PG works with utilities, governments and institutions across Canada.
- PG has worked with FEI on previous resource plans and preparing for resource plans between filings.
- PG constructs a model built to meet FEI's needs for the LTGRP to develop the reference case forecast, the scenarios, and peak load analysis.
- PG works closely with FEI to intake data, develop a modelling approach that is robust, and document the LTGRP modelling process.

Safety Reminders

- Ensure you’re comfortable at your workstation
- If you need to, stand-up and stretch
- Take breaks as needed; we also have built a ~10-minute break into the agenda

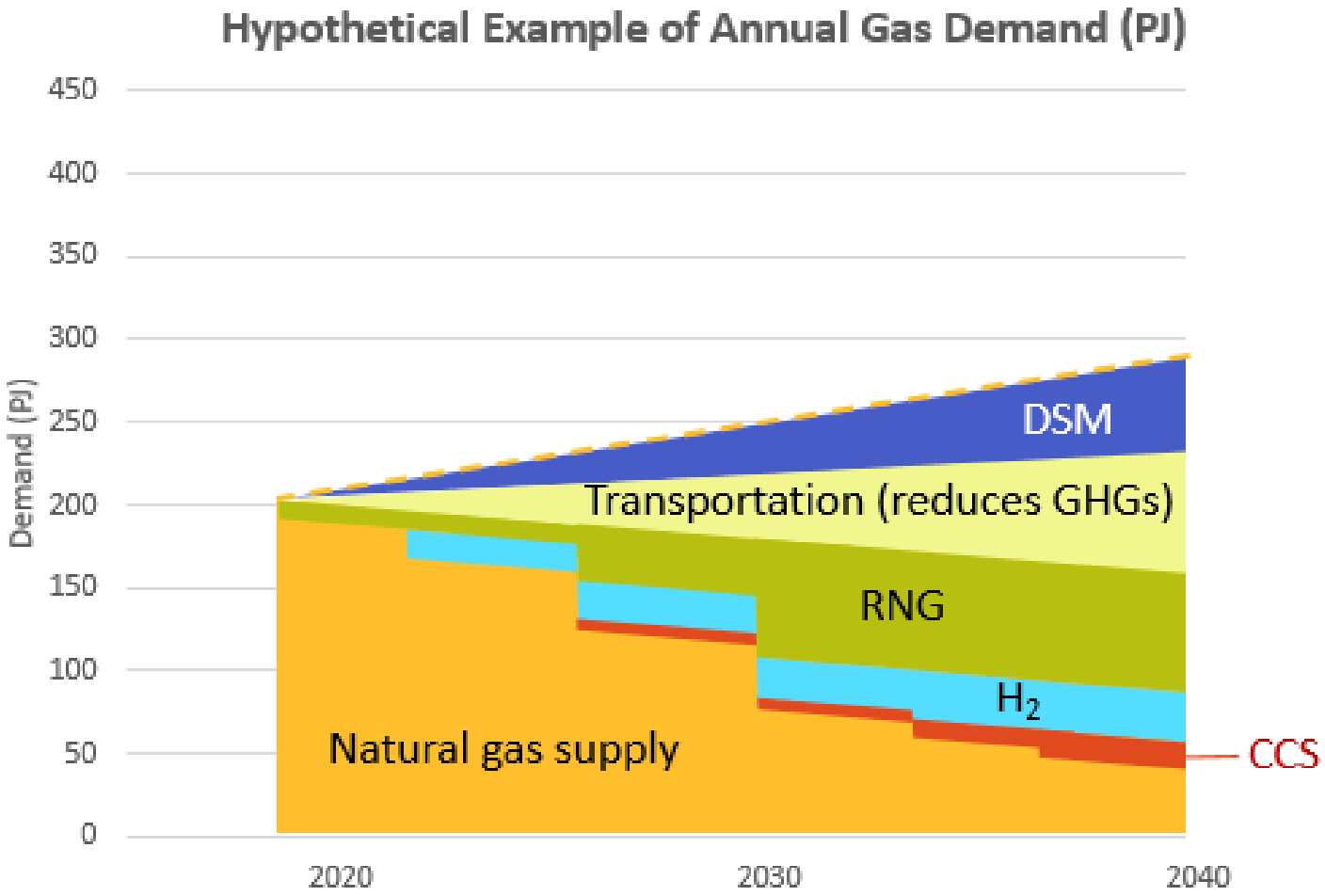
LTGRP Update & Business As Usual Demand Forecast

LTGRP Process Overview



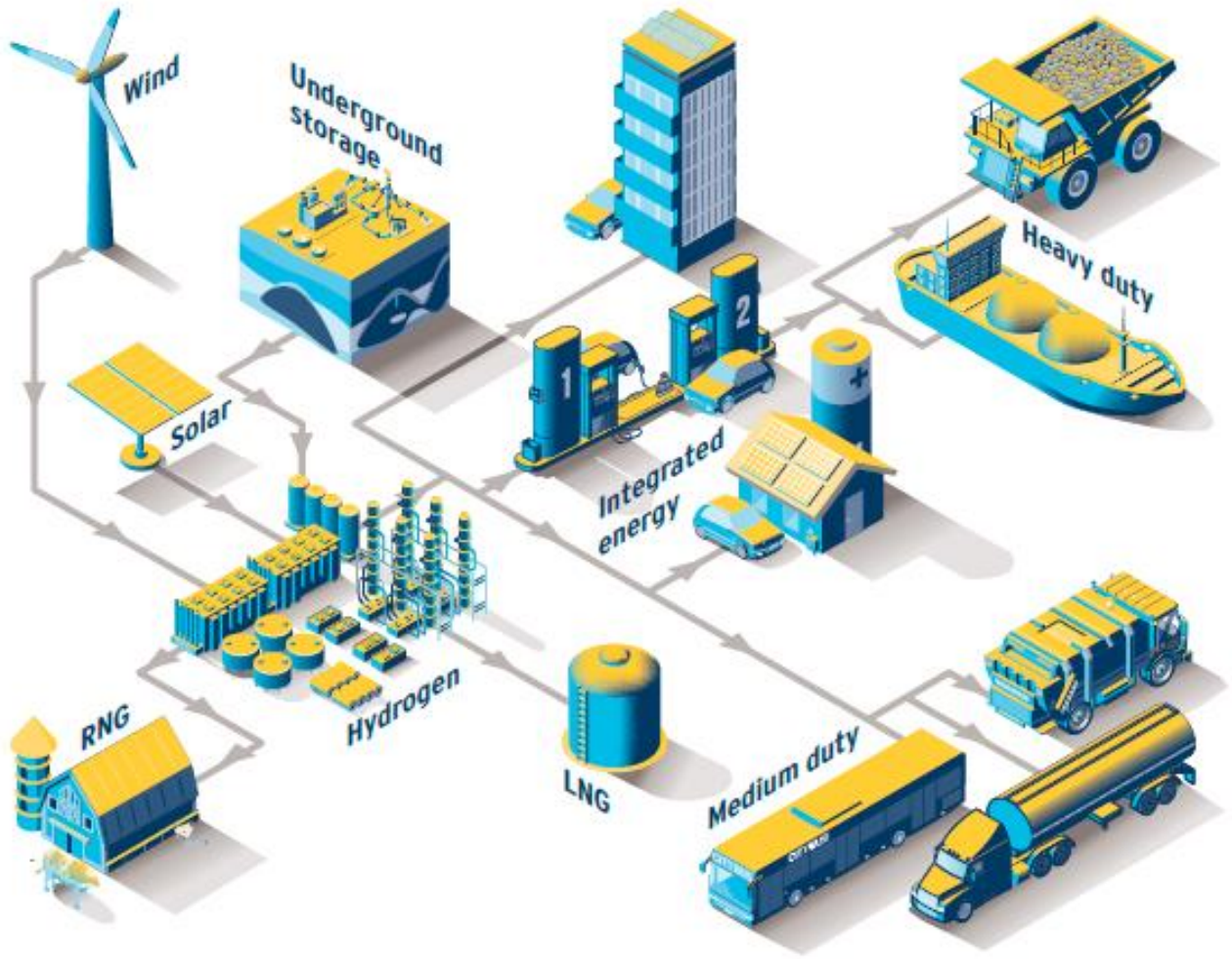
Demand Forecasting: Key Considerations

- Forecast timeline:
  - 2019 – Base Year Actuals
  - 2020-2042 – Forecast Horizon
- Added complexity as we consider demand forecast and how we will supply this demand while still reducing GHG emissions



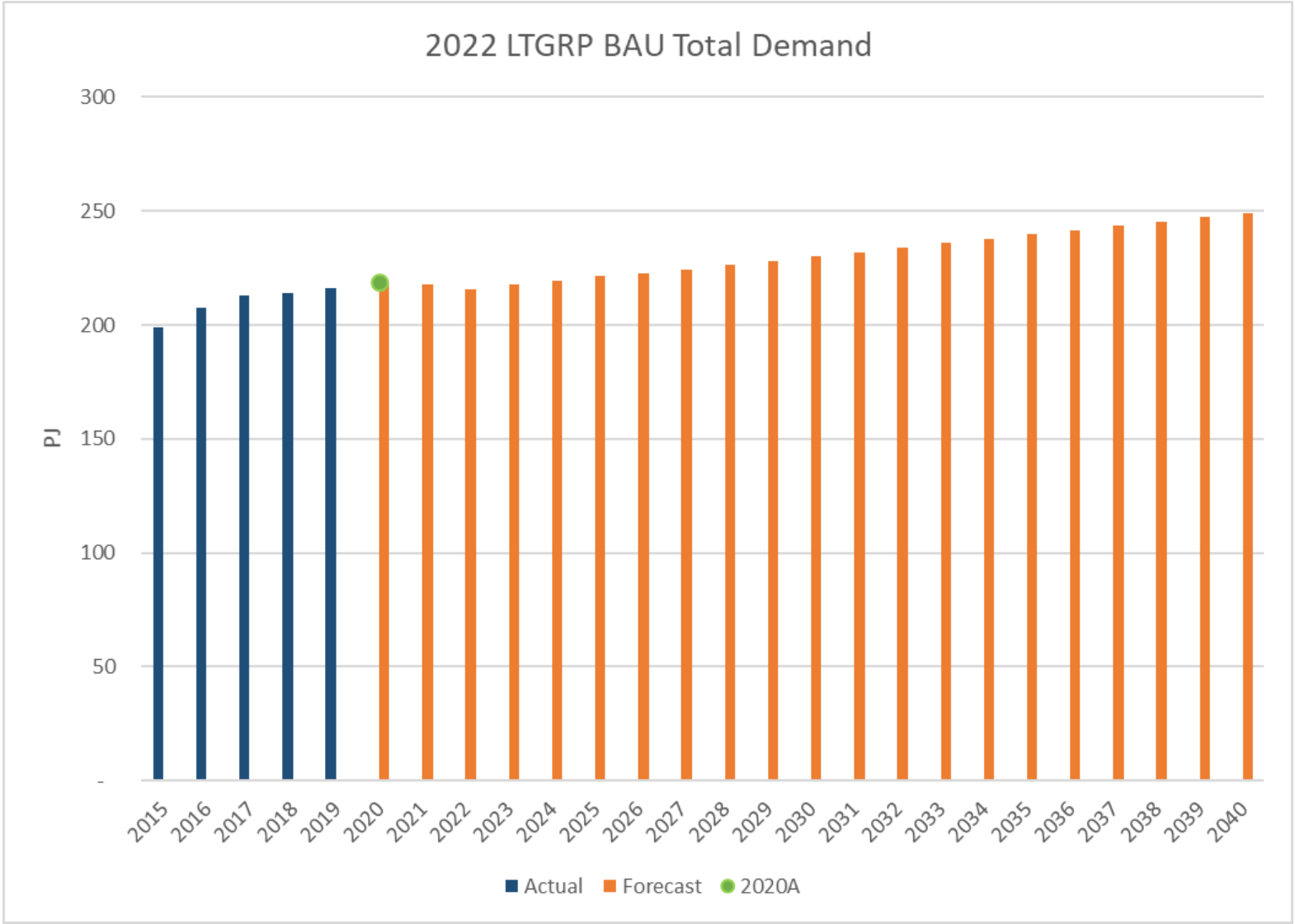
Energy at work FORTIS BC™

A Diversified Energy Future



Energy at work FORTIS BC™

Business As Usual (BAU) Demand Forecast



Energy at work FORTIS BC™

Questions & Discussion

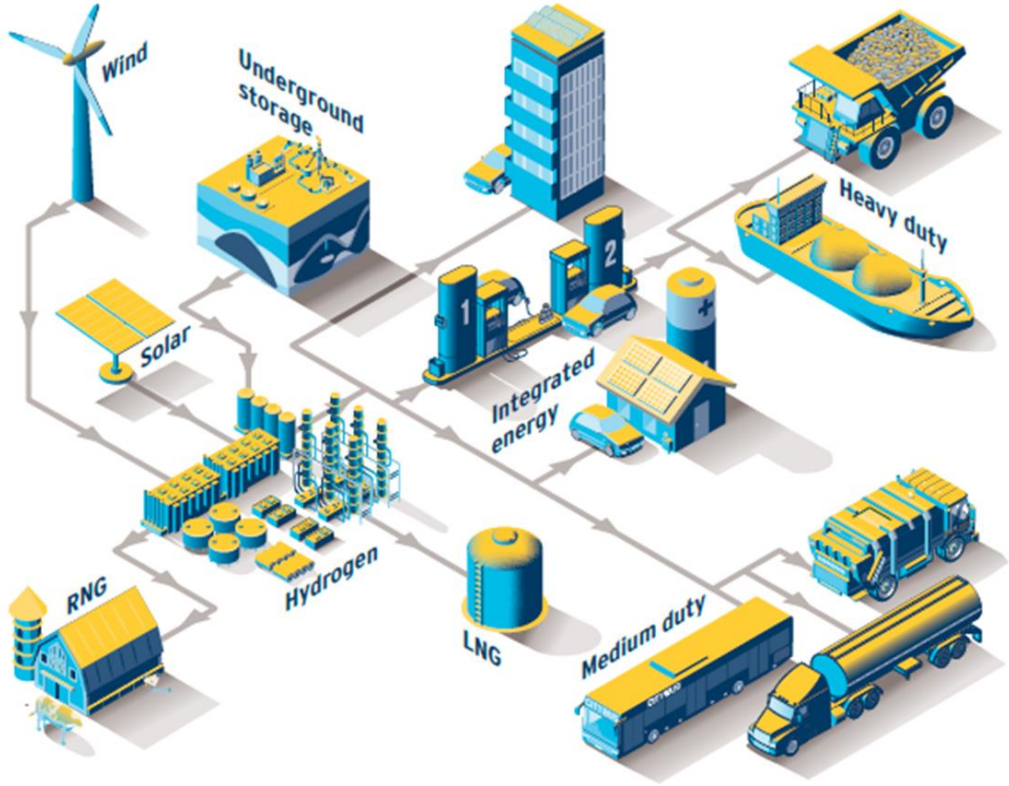
16

FortisBC Outlook & Considerations for Renewable Gas Supply

Energy at work FORTIS BC™

Key Messages on Renewable Gas Supply

- Renewable gas is critical to de-carbonization
- There is a practical, logical and cost-effective pathway
- Innovation is underway
- Resiliency of energy networks is paramount
- FortisBC's renewable gas model to acquire supply from real projects is evolving
- Renewable natural gas (RNG) and hydrogen (H2) are leading technologies
- Maintenance and expansion of gas infrastructure will be required



Energy at work FORTIS BC™

FortisBC's Renewable Supply Pathway

Energy Efficiency

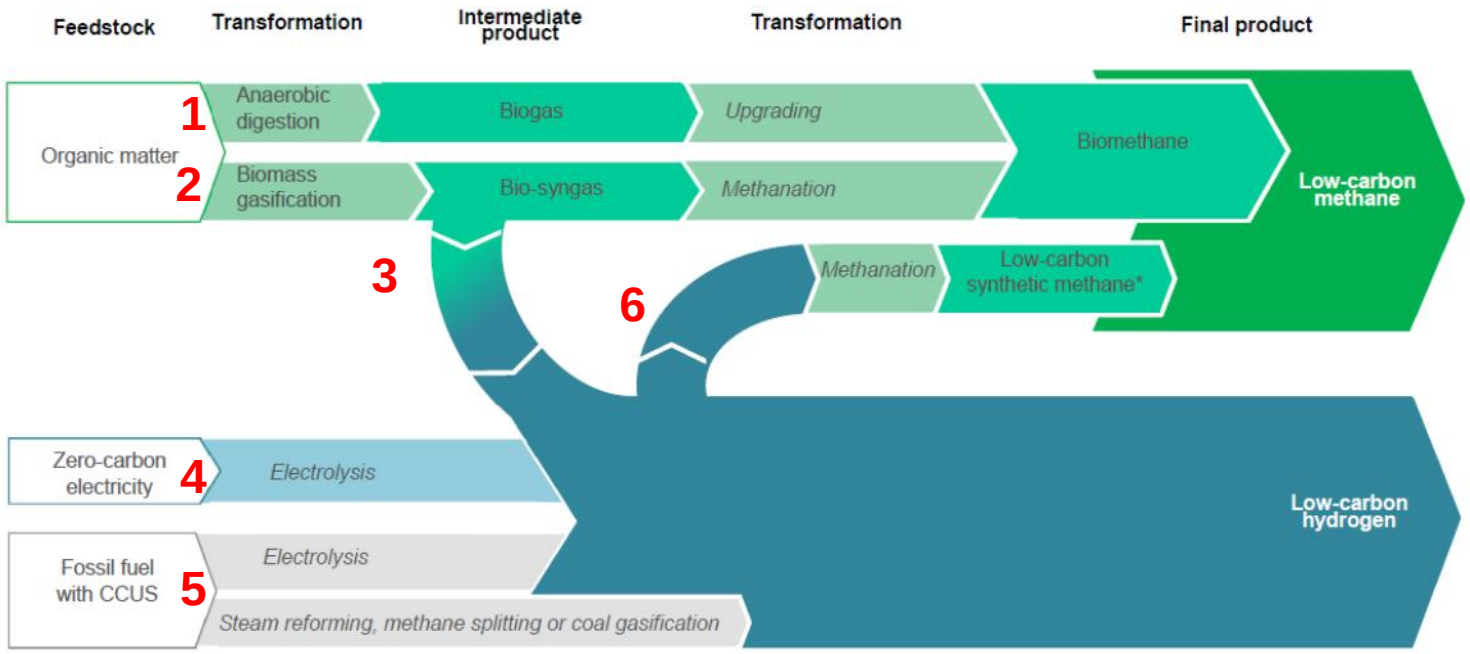
Renewable Gas

Global LNG

Zero &
Low Carbon
Transportation

Energy at work FORTIS BC™

Renewable Gas Supply Pathways



1. **RNG Biomethane** upgraded biogas produced from farm or municipal organic biomass.
2. **RNG Biomethane** upgraded synthesis gas (syngas) produced from wood biomass at mills.
3. **Syngas** onsite fuel to displace mill natural gas can also be upgraded to green hydrogen.
4. **Green Hydrogen** produced via water electrolysis using renewable electricity feedstock.
5. **Blue Hydrogen** reformed from hydrocarbon feedstock with up to 90% carbon sequestered.
6. **Synthetic Methane** processed from green hydrogen (when opportune).

Energy at work FORTIS BC™

On-system Supply

- RNG and H2 can both be acquired on-system and physically moved to our customers for consumption
- Syngas and lignin can be developed and acquired within BC, but would not physically flow on the gas distribution network
- Over time, clean and renewable gas resources produced and transported in BC will grow

Increasing Renewable Gas supply and advancing hydrogen development

Off-system Resources

- Approval to purchase out-of-province RNG – continuing to seek more supply
- Same principals can be applied to carbon reducing energy projects elsewhere

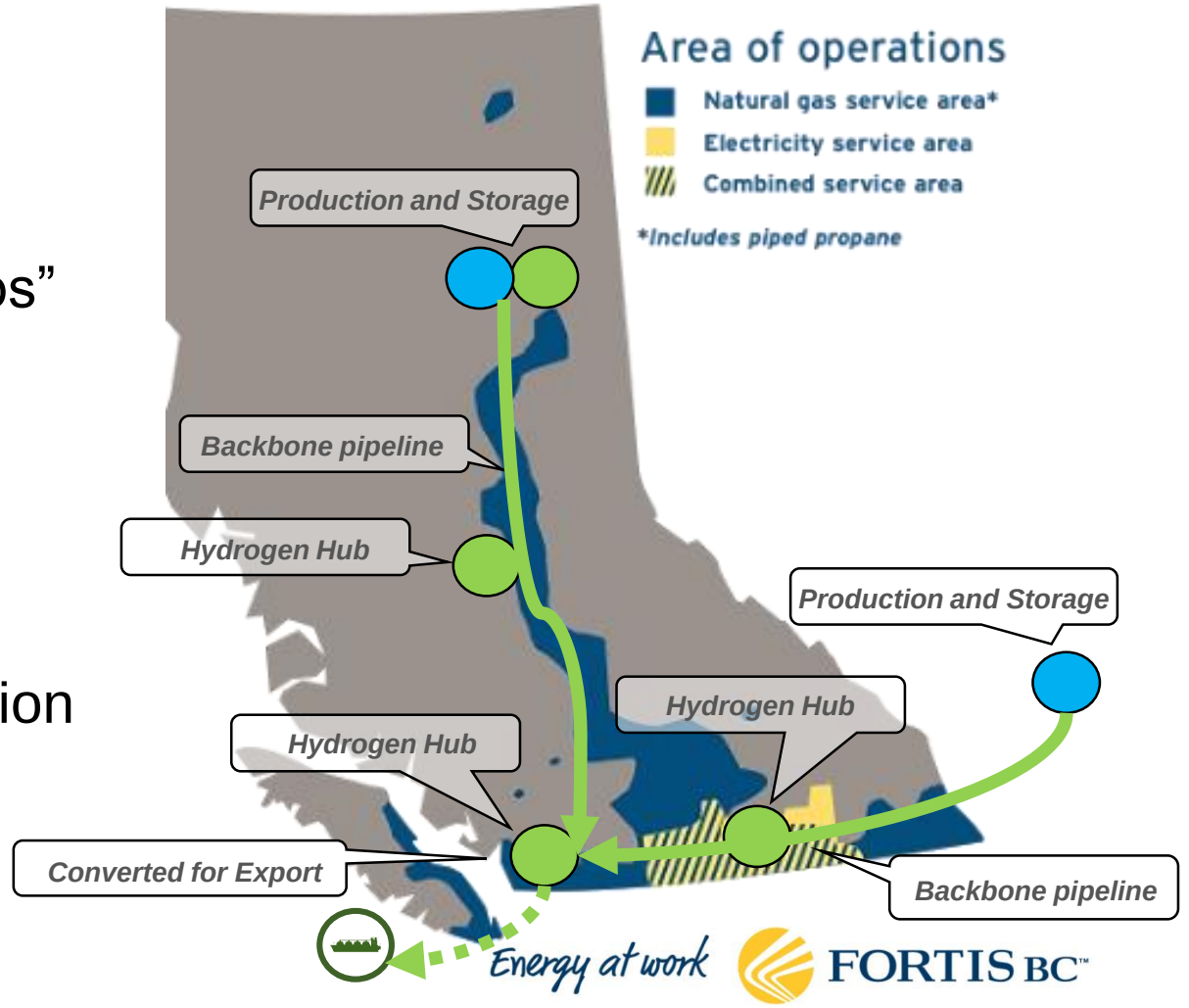
https://www.britannica.com/place/North-America#/media/1/418612/46537

Energy at work FORTIS BC™

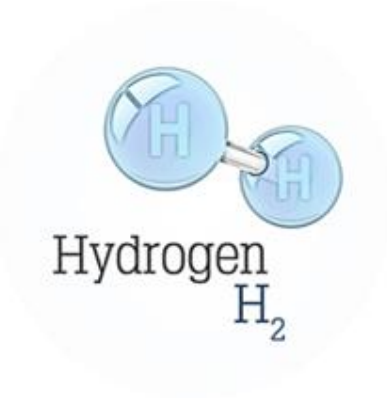
What is Our Vision?

The role of hydrogen & gas infrastructure in a low-carbon BC economy

- Resource and technology agnostic
- Clean alternative to displace natural gas
- Supply/demand nodes or “Hydrogen Hubs”
- Low-carbon backbone system
- Connect producers and consumers
- Marine fueling and offshore demand
- Promote regional gas supply transformation

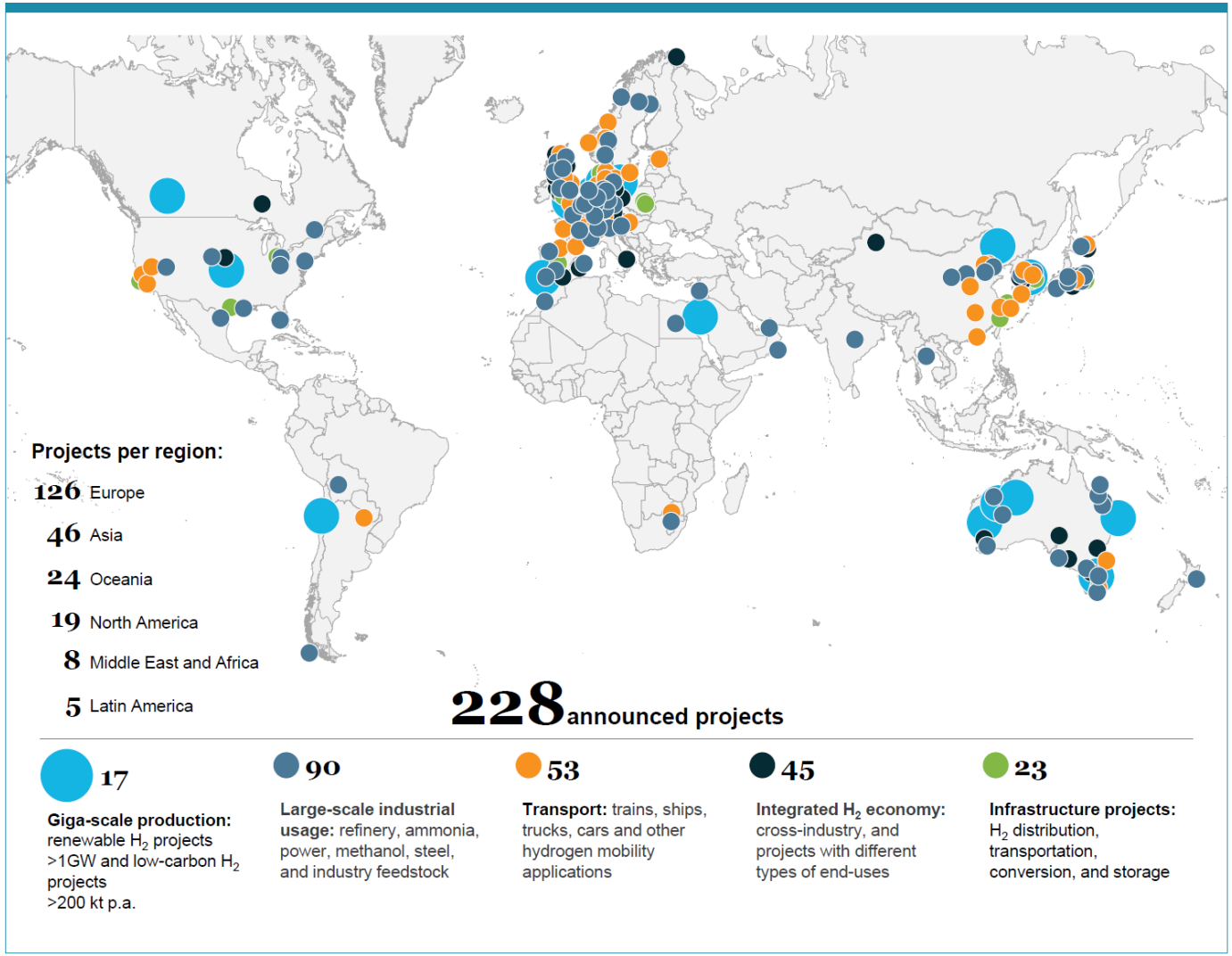


Hydrogen Opportunity



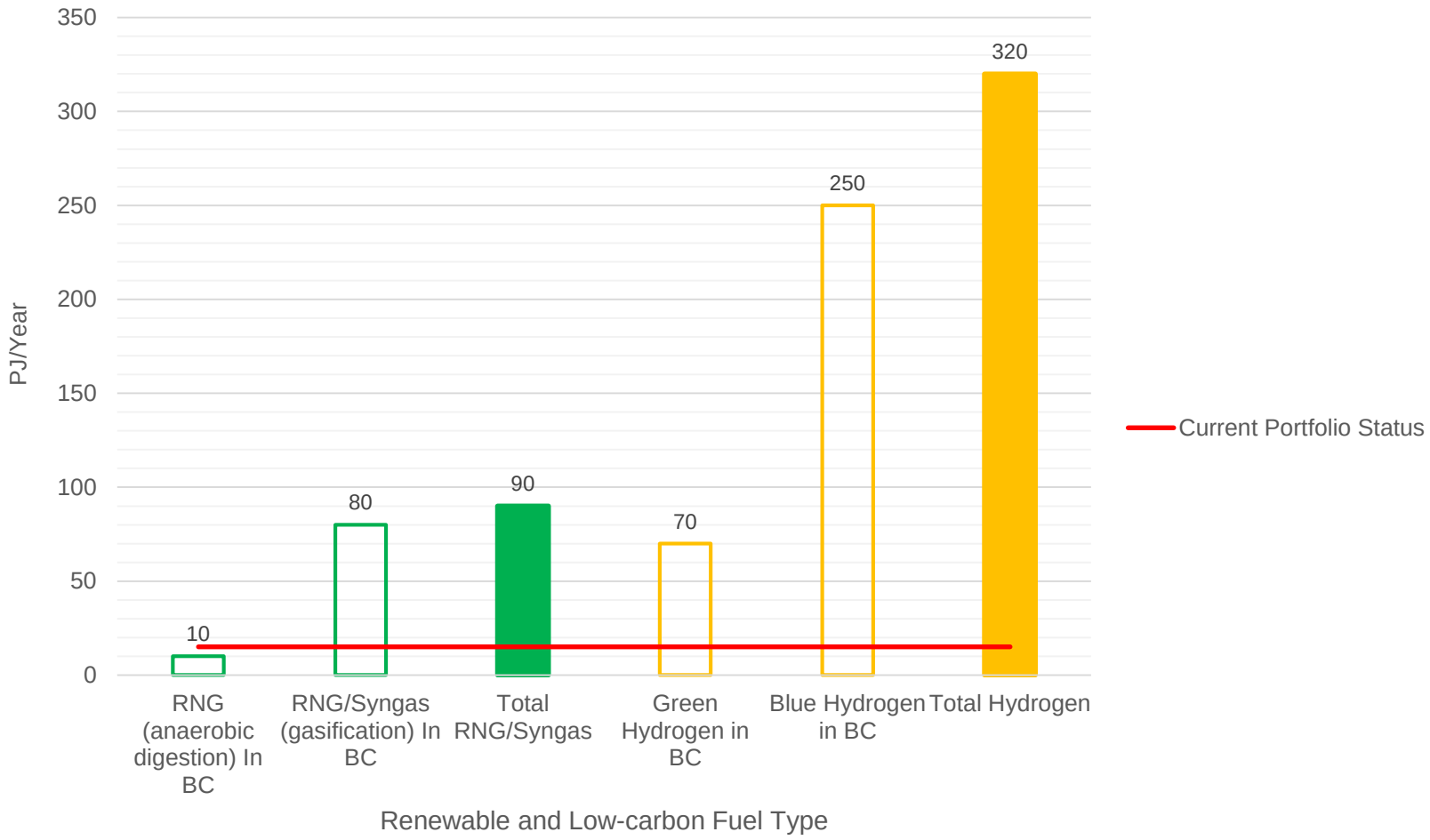
- Hydrogen is versatile and carbon free at point of use
- Multiple commercially available pathways:
  - Distributed in the gas grid at low concentrations
  - Distributed directly to customers that are hydrogen ready, initially large commercial, industrial, power producers
  - Distributed in transportation applications and combusted directly or converted to electricity using fuel cells
- Federal Hydrogen Strategy issued in December 2020
  - https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/environment/hydrogen/NRCan_Hydrogen-Strategy-Canada-na-en-v3.pdf
- BC Hydrogen Study in 2019
  - https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/ministries/zen-bcbn-hydrogen-study-final-v5_executivesummary.pdf
- New opportunities for FortisBC 2025+

Global Hydrogen Projects



Energy at work FORTIS BC™

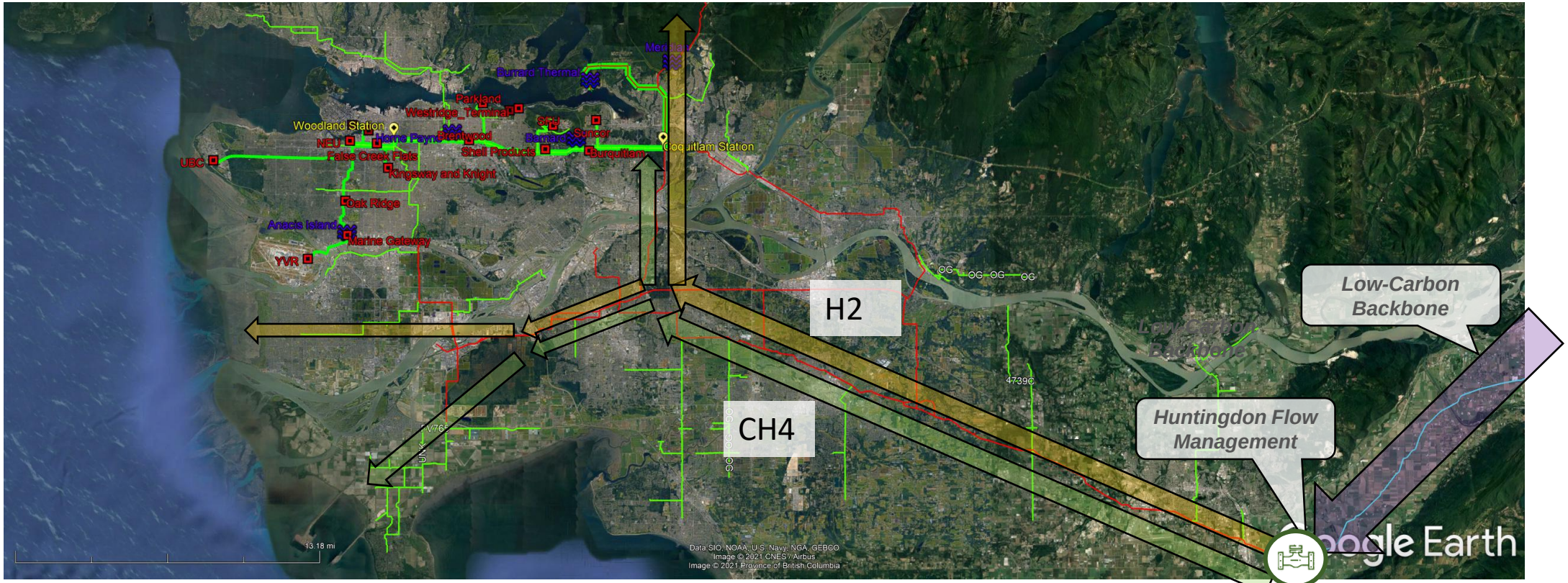
BC Renewable Natural Gas & Hydrogen Potential



1. Hallbar report: B.C. Hydro's forestry feedstock estimation; RNG production potential is estimated to be approx. 50 PJ/year. If Natural Resources Canada's forestry feedstock estimations are used, RNG production potential is estimated to be approx. 90 PJ/year. 2 RNG (anaerobic digestion) In BC max supply potential no tech advancement Hallbar Consulting Report, 3. Syngas (wood) max supply potential with technology advancement Hallbar report, 4. Hydrogen supply potential from BC Hydrogen Study

World Class Opportunity for a BC Hydrogen Hub

- Low-carbon gas would be supplied from the Low-carbon Backbone at Huntingdon-Sumas
- Large volumes would be available to meet export demand



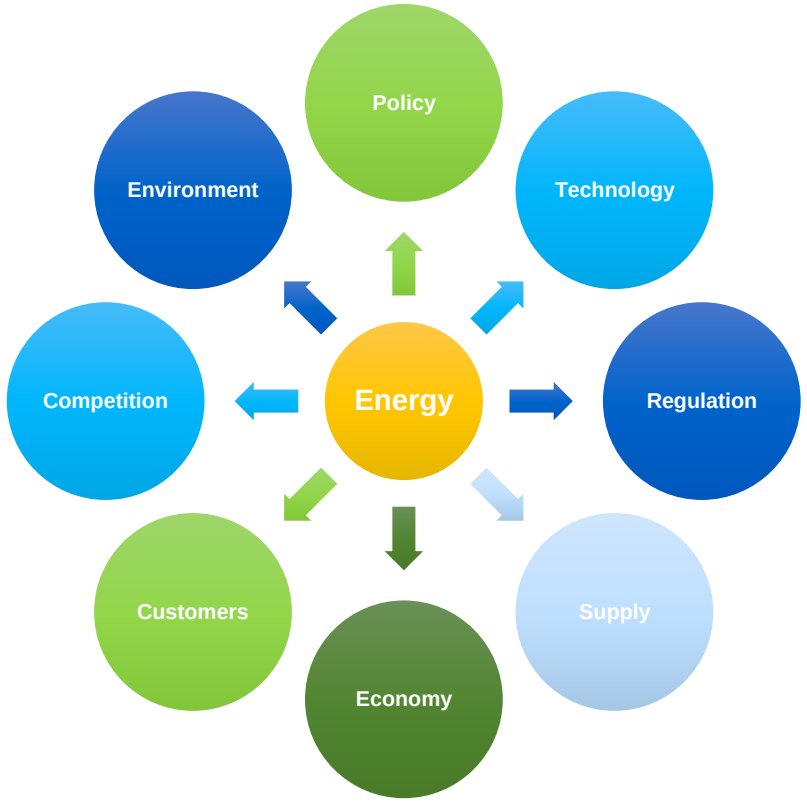
Energy at work FORTIS BC™

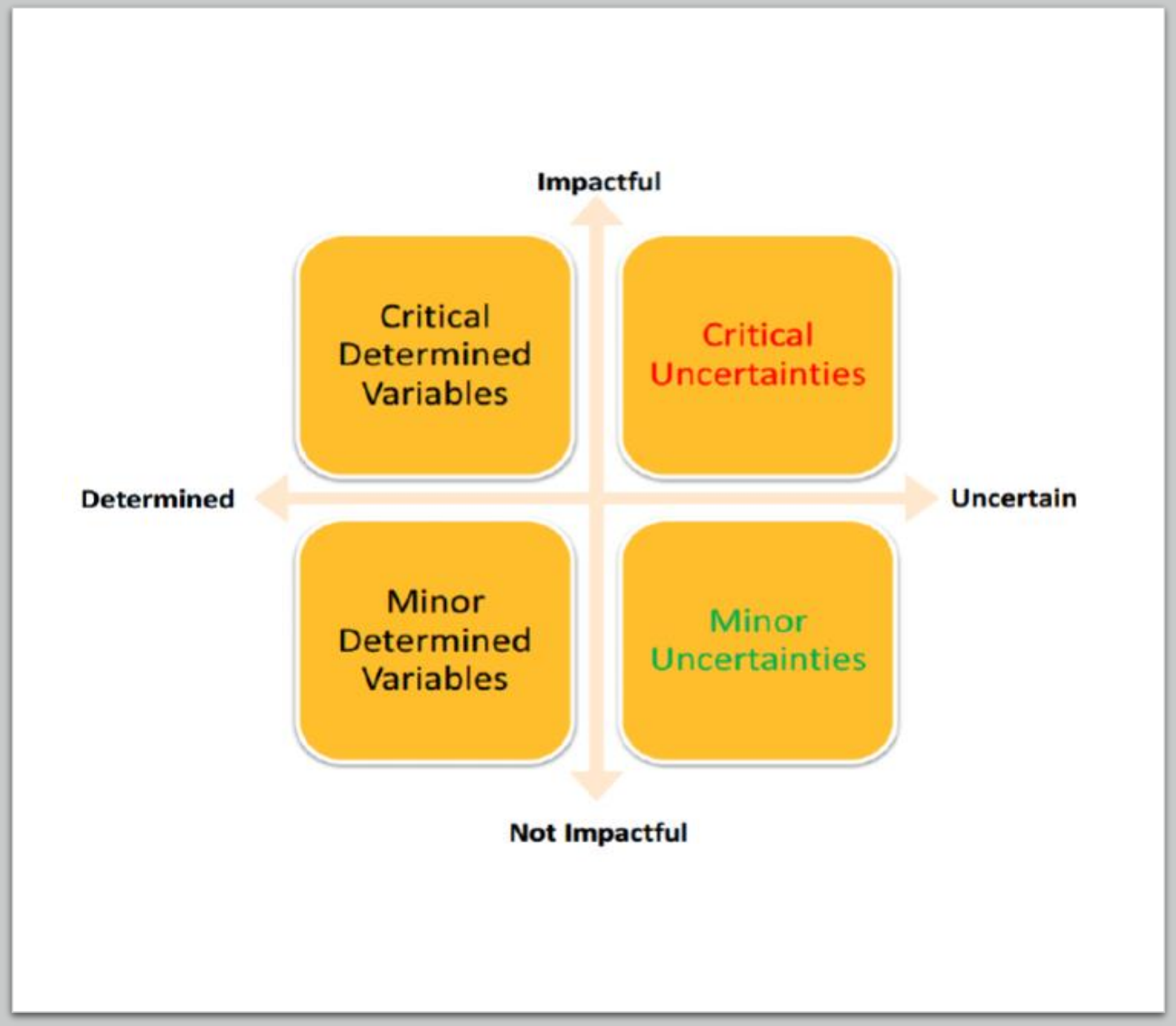
Summary of Renewable Gas Key Messages

Questions & Discussion

Critical Uncertainties (CUs) & Renewable Supply Alternatives (RSAs) Modelling

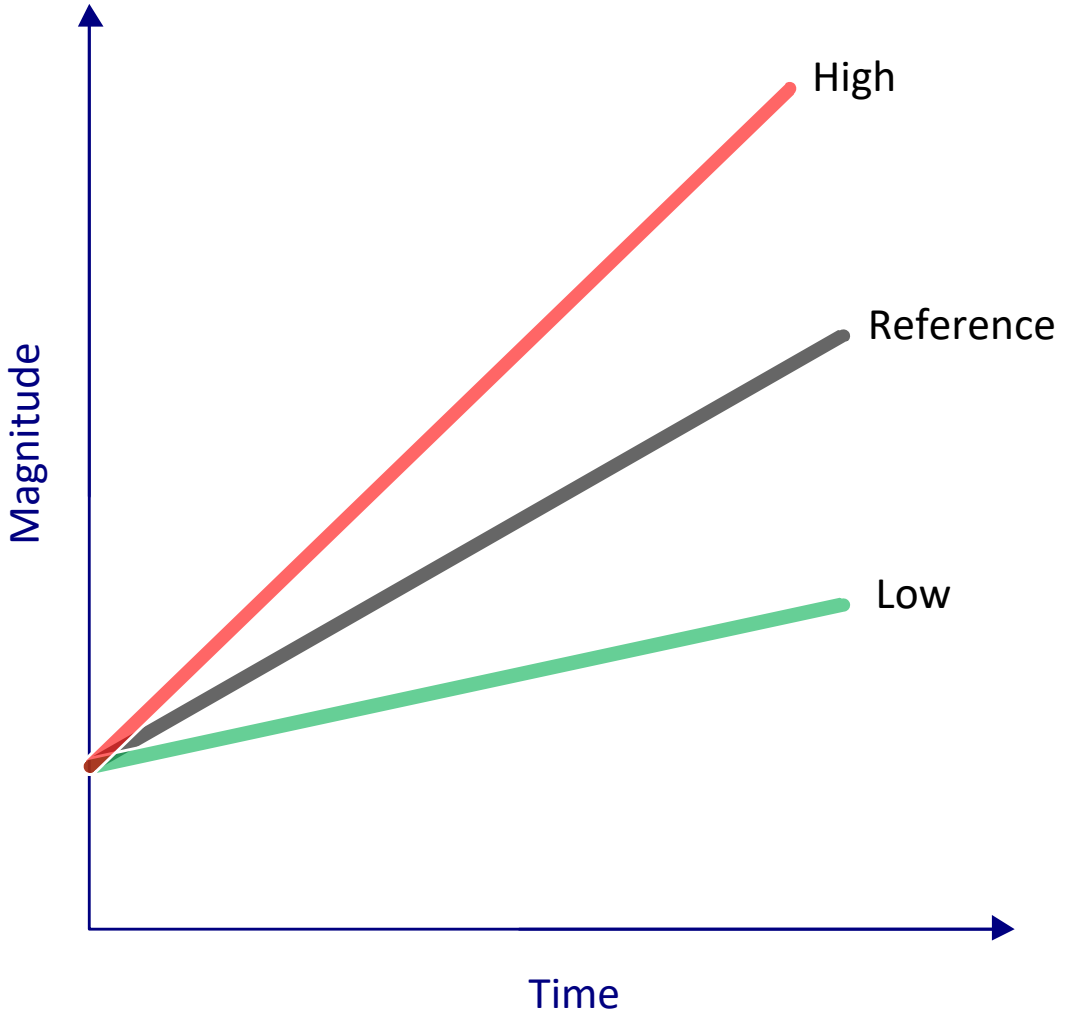
Identifying Critical Uncertainties (CUs) & Renewable Supply Alternatives (RSAs)





Settings for Critical Uncertainties (CUs) & Renewable Supply Alternatives (RSAs)

- Several trajectories, or **settings**, of future possible values are developed for each CU and RSA.
- The various settings capture the uncertainty about the future based on possible conditions.
- The **reference** settings generally reflects what is known and enforced in the market as of 2019. The **high** and **low** are meant to capture maximum and minimum boundaries.
- Scenarios are developed by combining different settings for all the CUs and RSAs.



2022 LTGRP Critical Uncertainties & Renewable Supply Alternatives

Demand Critical Uncertainties: variables that impact the annual load that FEI needs to meet.

Transportation & LNG Export Critical Uncertainties: demand for compressed natural gas (CNG) and liquefied natural gas (LNG) in the natural gas for transportation and power generation. Demand for these fuels impact FEI's system and GHG emissions as CNG and LNG displace fuels with higher carbon intensities.

Renewable Supply Alternatives: variables that impact the supply mix that FEI may use to meet demand while reducing GHG emissions relative to if the demand was met with conventionally sourced natural gas only.

Demand Critical Uncertainties (1/2)

Reference: Pre-read Document Pages 12-16

Critical Uncertainty	Description	Impact
Appliance Standards	Minimum energy performance standards for energy-using appliances.	More stringent standards, demand for natural gas decreases.
Retrofit Code	Estimated impact and timing of a retrofit code based on publicly available information.	Code increases in stringency, demand for natural gas decreases.
New Construction Code	BC Energy Step Code is the relevant building code for new construction. The energy-requirements are applied to relevant building types and end-uses.	Code increases in stringency, demand for natural gas decreases.
Customer Growth	Number of customer accounts by rate class is forecasted by FortisBC. Based on confidence intervals of historical data.	Number of customer accounts increases, demand increases (and vice versa).
Woodfibre LNG	FEI delivers natural gas to the Woodfibre LNG facility through our distribution system. Woodfibre LNG is responsible for securing the natural gas supply, completing the liquefaction, and delivering the LNG to end-use customers. FEI treats this load as a flow-through.	Including Woodfibre LNG increases demand; no impact on GHG emissions.

Demand Critical Uncertainties (2/2)

Reference: Pre-read Document Pages 12-16

Critical Uncertainty	Description	Impact
Carbon Price	BC provincial carbon tax applied to natural gas.	Carbon price increases, demand for natural gas decreases (and vice versa).
Natural Gas Price	Commodity price for traditional natural gas.	Gas price increases, demand for natural gas decreases (and vice versa).
Non-price Driven Fuel Switching	Fuel switching caused by signals other than prices, such as incentives and policies to encourage customers to switch from natural gas to electricity.	As the target for fuel switching increases, demand for natural gas decreases.

Transportation & LNG Export Critical Uncertainties

Reference: Pre-read Document Pages 17-20

Critical Uncertainty	Description	Impact
Natural Gas for Transportation (NGT) Demand	Forecasted demand for compressed natural gas (CNG) and liquefied natural gas (LNG) by the transportation sector.	Increase demand for CNG and LNG increases load while providing GHG mitigation opportunities as CNG replaces diesel and LNG replaces marine bunker fuel.
Liquefied Natural Gas (LNG) Export Demand	Forecasted demand for liquefied natural gas (LNG) exports.	Increase demand for LNG Exports increases load while providing GHG mitigation opportunity when LNG replaces coal.

Renewable Supply Alternatives (1/2)

Reference: Pre-read Document Pages 20-24

Supply Alternatives	Description	Impact
Carbon Capture & Storage (CCS)	A carbon capture system is used to capture carbon at the end-use, from combustion of fossil fuels, or captured directly from the atmosphere. The captured carbon is then sequestered, or stored, underground so it is not emitted.	CCS lowers GHG emissions; no impact on demand.
Syngas & Lignin Supply	Syngas, a biofuel, is a mixture of fuel gases resulting from the thermal decomposition or partial oxidation of more complex organic molecules. The primary fuel gases are carbon monoxide, hydrogen, and methane with some fraction composed of inert gases, primarily carbon dioxide. Lignin, also a biofuel, is a complex organic molecule that provide structure and support to plants, found in significant quantities in wood.	Syngas and lignin lower GHG emissions and contribute to the supply mix to meet annual demand.

Renewable Supply Alternatives: Overview

Reference: Pre-read Document Pages 20-24

Supply Alternatives	Description	Impact
Renewable Natural Gas (RNG) Supply	RNG is biologically derived methane which comes from biogas, a mixture of methane and carbon dioxide produced by the digestion of organic materials by microbes in the absence of oxygen, or through the catalytic reaction of syngas. Biogas or syngas becomes bio-methane when the methane component is concentrated to the point that the resulting gas is functionally equivalent to natural gas.	RNG lowers GHG emissions and contributes to the supply mix to meet annual demand.
Hydrogen (H2) Supply	H2 is an energy-dense fuel that can be produced in several ways. For the LTGRP, we use the conservative assumption that the supply will be from blue hydrogen produced from natural gas through steam methane reforming (SMR) with CCS.	H2 lowers GHG emissions and contributes to the supply mix to meet annual demand.

Questions & Discussion

39

TREATMENT OF OTHER VARIABLES

There are some variables that are uniquely analyzed:

- **Costs for renewable supply alternatives:** These costs will be used to provide a range of supply costs for the load and fuel mix estimated for each scenario.
- **Climate change impacts:** A higher and lower average annual temperature were used to conduct a sensitivity analysis of demand to changing annual heating degree days.
- **Demand-side Management (DSM)**: Although annual demand can decline from DSM programming, this is not considered a CU. The energy savings potential from DSM, estimated by a **Conservation Potential Review (CPR) study**, is layered onto the scenario results when the scenarios are finalized.

Questions & Discussion

Break

Reference Case Demand Forecast & Alternate Scenarios

Purpose of Scenario Planning & Analysis

Scenarios are not designed to predict the future, but rather to consider possible futures. The result is not an accurate picture of tomorrow, but better decisions about the future.

The purpose of developing several, distinct scenarios is to provide a range of futures to support planning. Probabilities are not assigned to the scenarios.

Scenario Development Process

Develop the Base Year

- 2019 is the base year for the 2022 LTGRP
- Customer consumption data is disaggregated into consumption by end-use

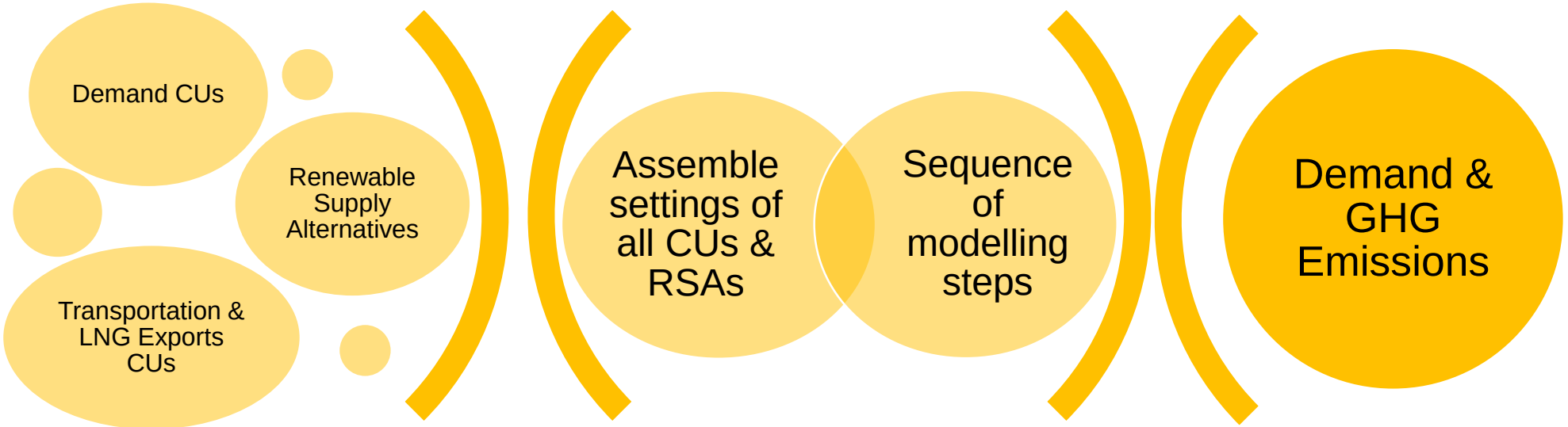
Generate the Reference Case Forecast

- 2020-2042 is the forecast period
- The reference case uses *known* information about expected future conditions to forecast annual demand
- The Reference Case is considered a scenario

Develop Several Scenarios

- Develop scenario narratives, CU and RSA settings
- Model several scenarios of illustrative futures based on combinations of policies and economic conditions

Building Scenarios from Critical Uncertainties



Combinations of CUs and RSAs are established

Modelling conducted by PG

Outputs for every scenario

Presenting Draft Scenario Results

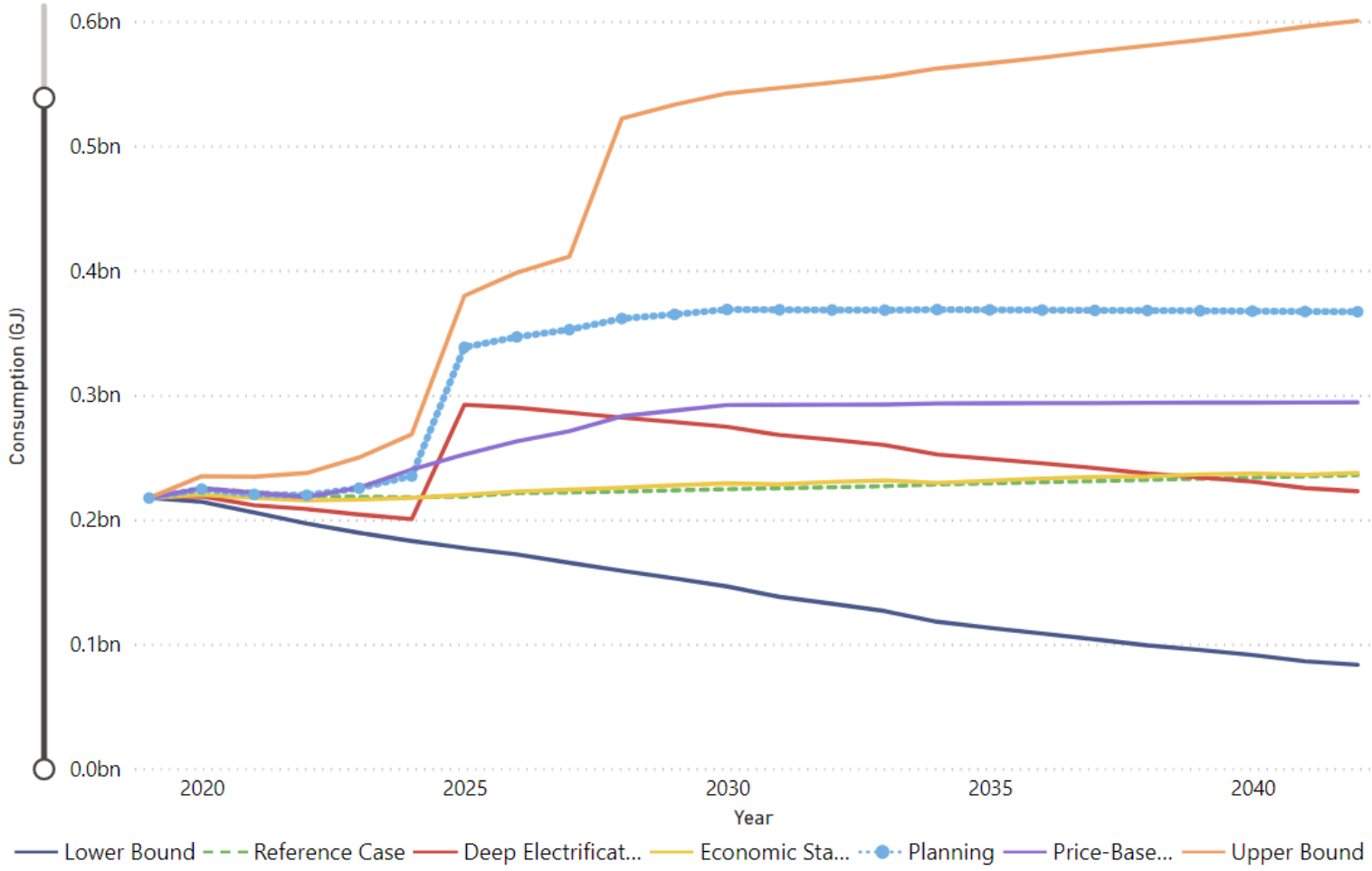
Unless otherwise stated, exhibits of scenario results are for all fuels that could go through FEI pipes. These fuels include:

- Conventional natural gas
- Carbon capture and storage (CCS)
  - Although CCS isn't a "fuel", it's modelled as a gas with a lower emission factor
- Renewable natural gas (RNG)
- Hydrogen
- Compressed natural gas (CNG)
- Liquified natural gas (LNG) (for export and used in BC)
  - Note that the Woodfibre LNG load is included in the demand for conventional natural gas, but the emissions associated with this load and subsequent LNG are excluded.
- Syngas and lignin

2022 LTGRP Scenarios

- FEI has developed the following scenarios:
  - Reference Case
  - Upper Bound
  - Lower Bound
  - Diversified Energy Planning
  - Deep Electrification
  - Price-Based Regulation
  - Economic Stagnation
- An additional scenario will be generated based on the input all of you provide during the crowd forecasting activity using the Slider Tool

Scenario comparison of forecasted demand (GJ)



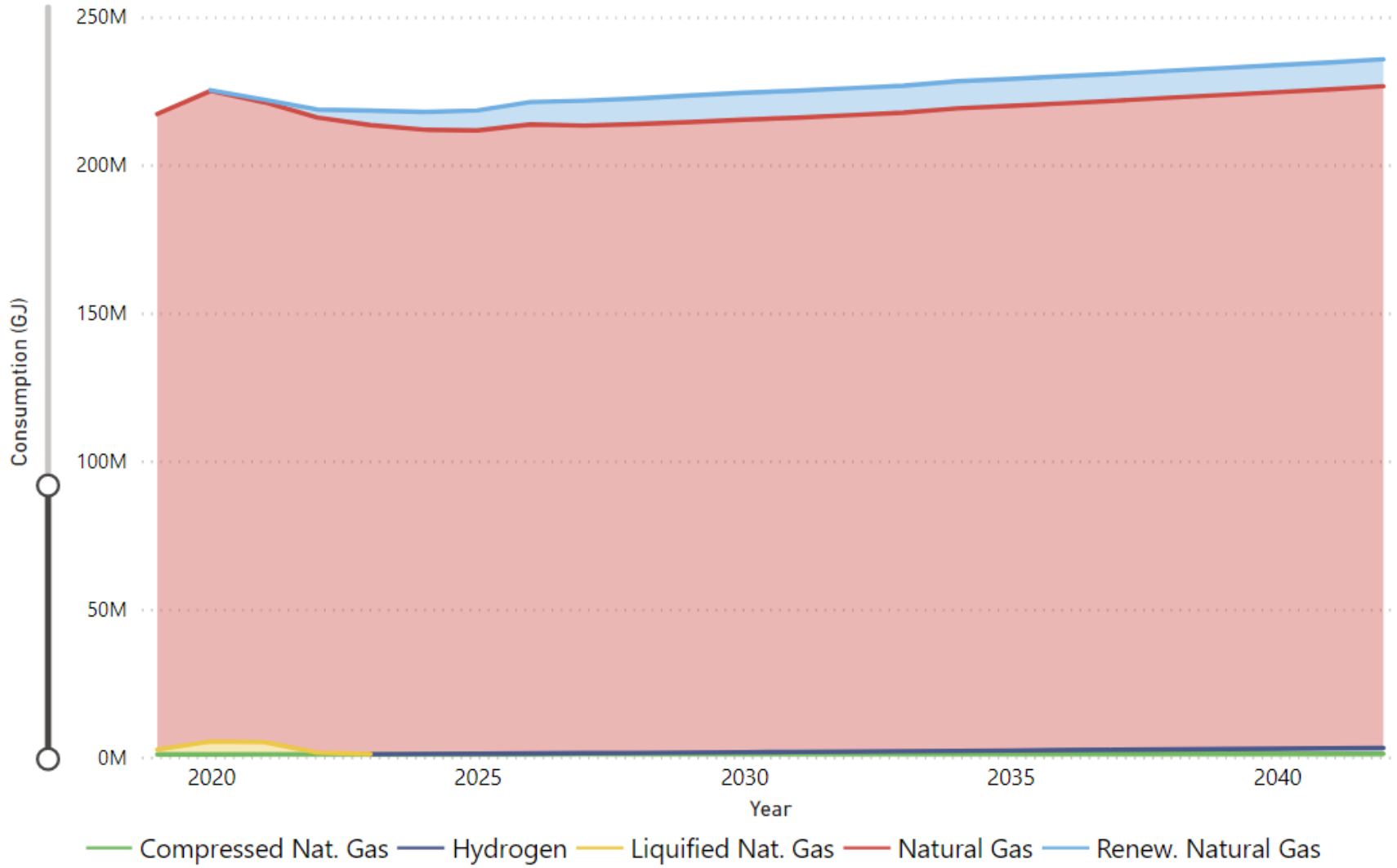
Energy at work FORTIS BC™

Reference Case Scenario

Incorporates expected continuation of current policies and market conditions, including known expected changes in codes, standards, carbon price, changes in building stock, and more.

Critical Uncertainty/ Renewable Supply Alternative	Reference Case Scenario
Appliance Standards	Reference
CCS	Reference
Carbon Price	Reference
Customer Growth	Reference
Fuel Switching	Reference
H2 Supply	Reference
LNG Export Demand	Reference
NGT Demand	Reference
Natural Gas Price	Reference
New Construction Code	Reference
Retrofit Code	Reference
RNG Supply	Reference
Syngas & Lignin Supply	Reference
Woodfibre LNG	Reference

Reference Case Scenario: Demand by Fuel (GJ)



Energy at work FORTIS BC™

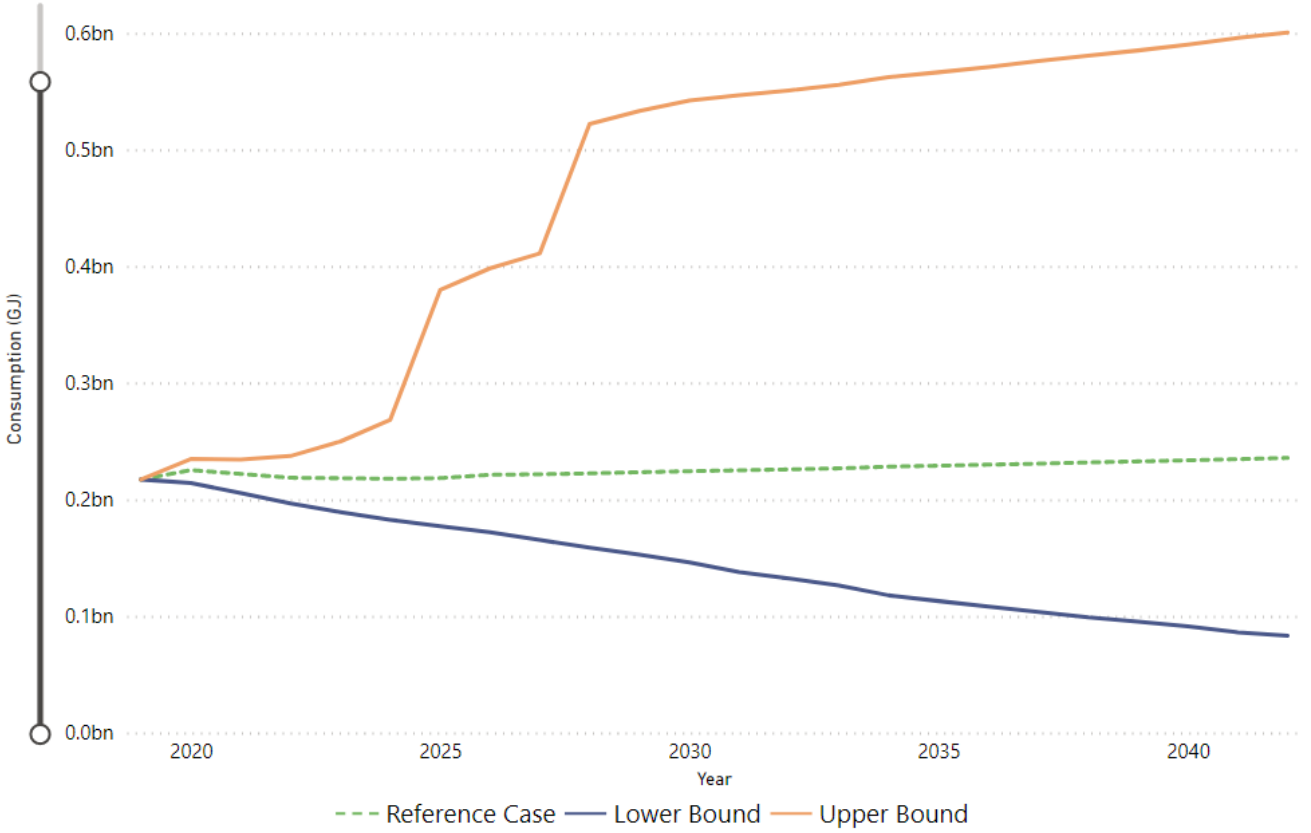
Lower & Upper Bound Scenarios

Do not reflect a single coherent narrative of a future possible world, but rather are the notional upper and lower bound for total volume. These scenarios provide the “jaws” under which the other scenarios fall.

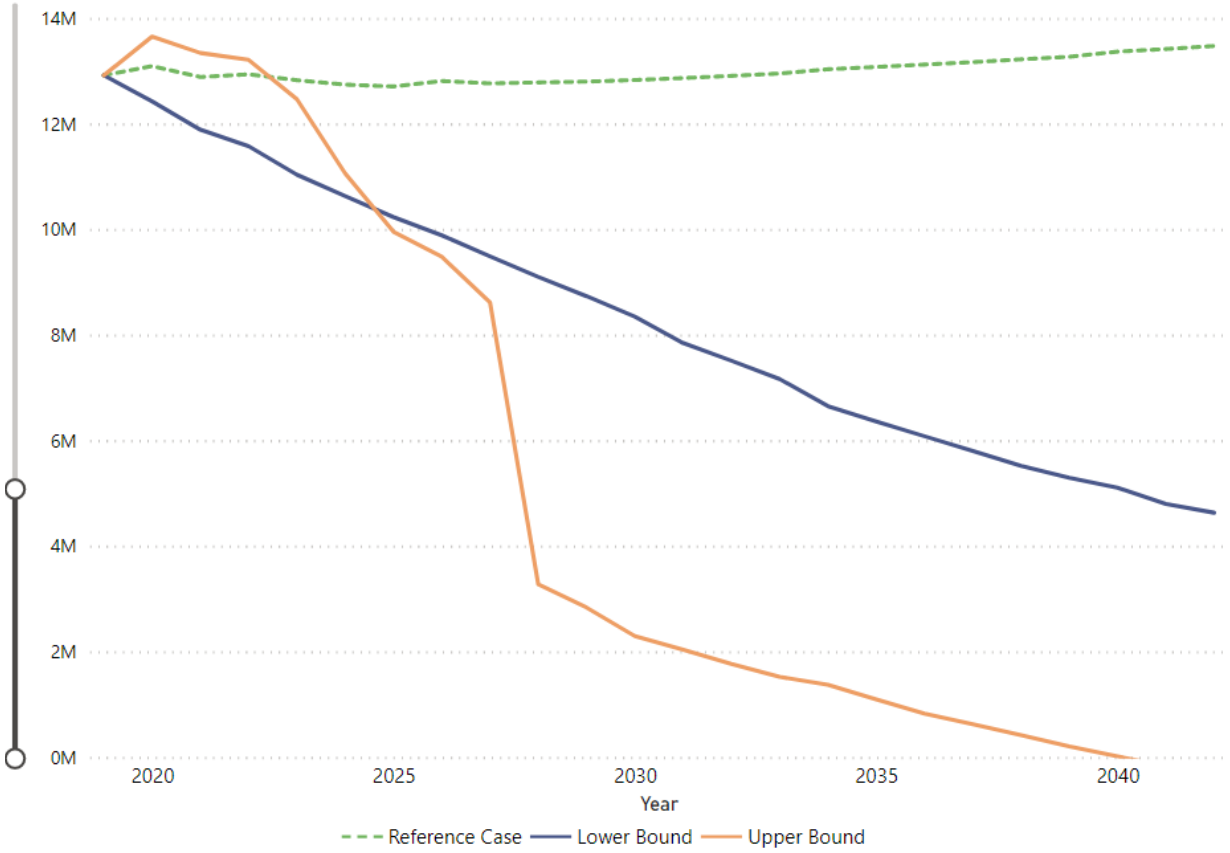
Critical Uncertainty/ Renewable Supply Alternative	Lower Bound Scenario	Upper Bound Scenario
Appliance Standards	Accelerated	Reference
CCS	Reference	High
Carbon Price	High	Low
Customer Growth	Low	High
Fuel Switching	Extensive	Reference
H2 Supply	Low	High
LNG Export Demand	Reference	High
NGT Demand	Low	High
Natural Gas Price	High	Low
New Construction Code	Accelerated	Delayed
Retrofit Code	Accelerated	Reference
RNG Supply	Low	High
Syngas & Lignin Supply	Reference	High
Woodfibre LNG	Reference	Planning

Upper & Lower Bounds

Demand (GJ)



GHG Emissions (t/CO2e)



Energy at work FORTIS BC™

Questions & Discussion

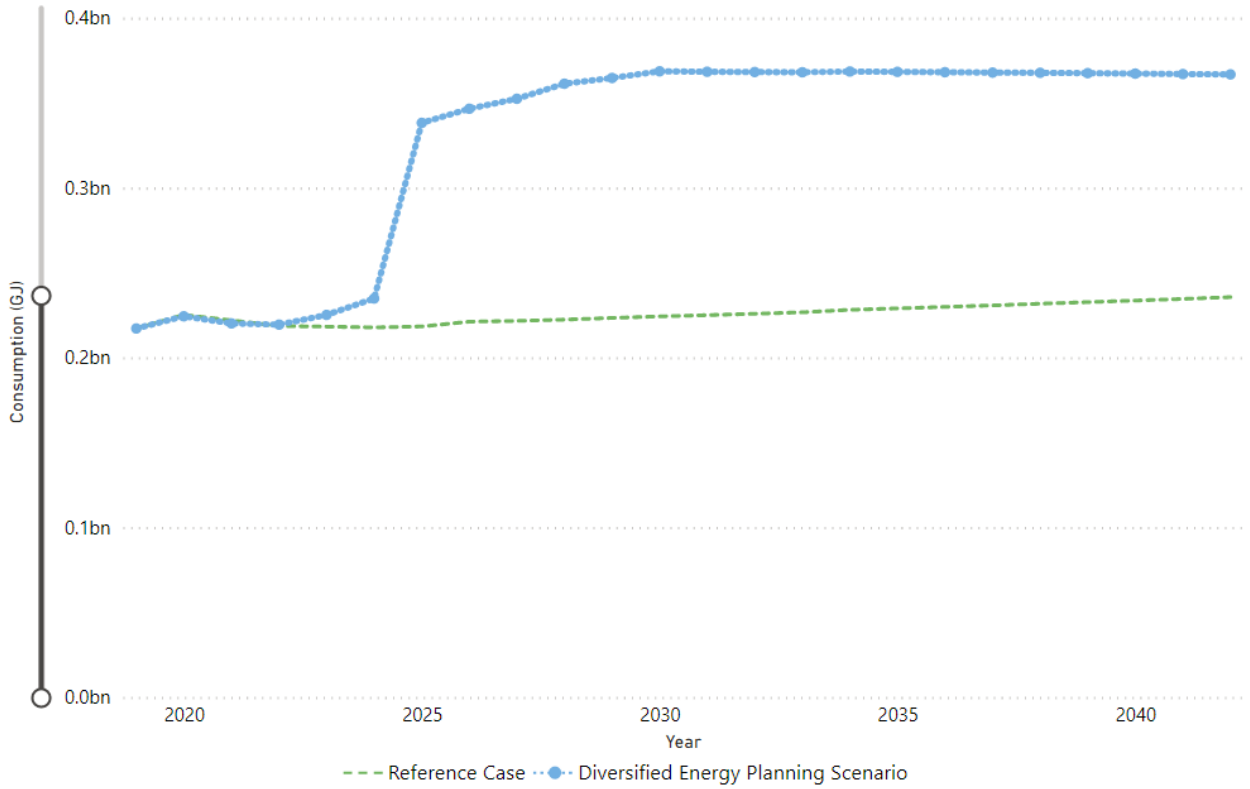
Diversified Energy Planning Scenario

Incorporates expanding electricity use while maintaining the use of the gas distribution system. Emissions reductions are characterized more by de-carbonizing the gas distribution system rather than electrification. This scenario includes expansion of natural gas for transportation while increasingly relying on renewable gas supply. This is the scenario FEI will plan to and incorporates our 30BY30 commitment.

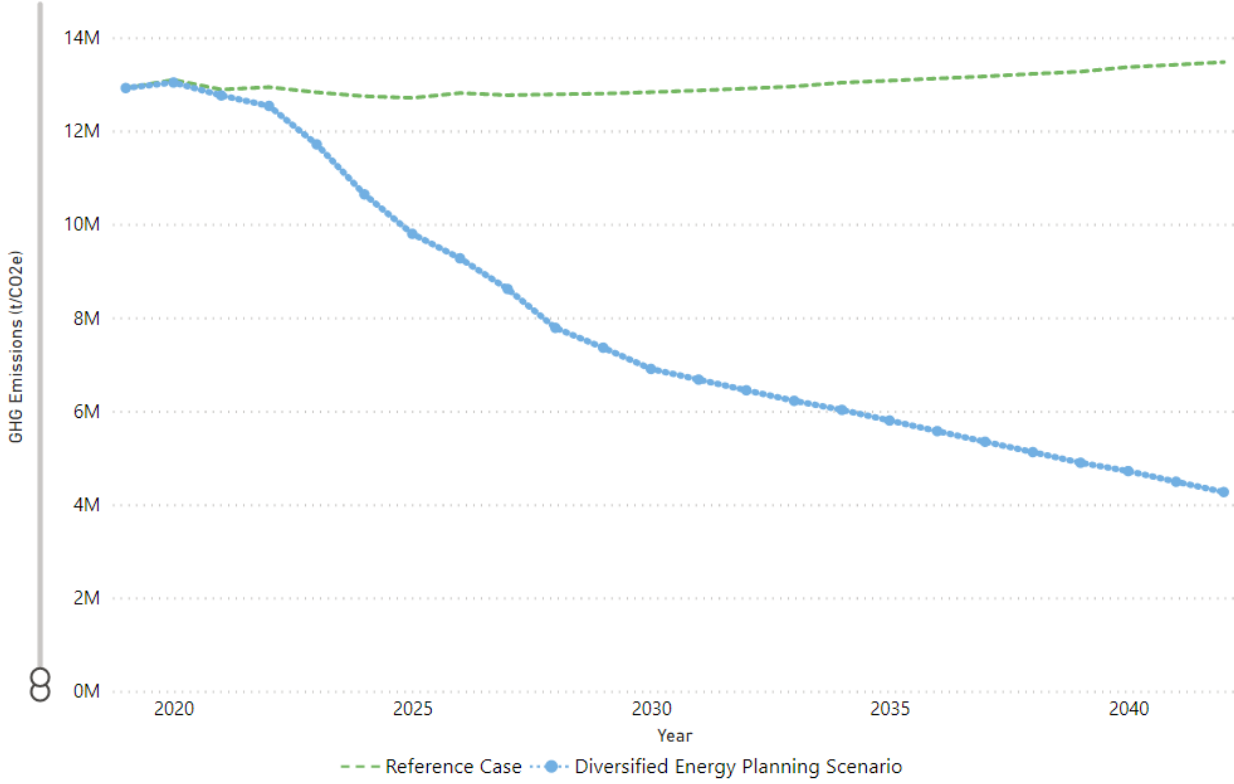
Critical Uncertainty/ Renewable Supply Alternative	Diversified Energy Planning Scenario
Appliance Standards	Reference
CCS	Planning
Carbon Price	Planning
Customer Growth	Reference
Fuel Switching	Moderate
H2 Supply	Planning
LNG Export Demand	Planning
NGT Demand	Planning
Natural Gas Price	Reference
New Construction Code	Reference
Retrofit Code	Reference
RNG Supply	Planning
Syngas & Lignin Supply	Planning
Woodfibre LNG	Planning

Diversified Energy Planning Scenario

Demand(GJ)

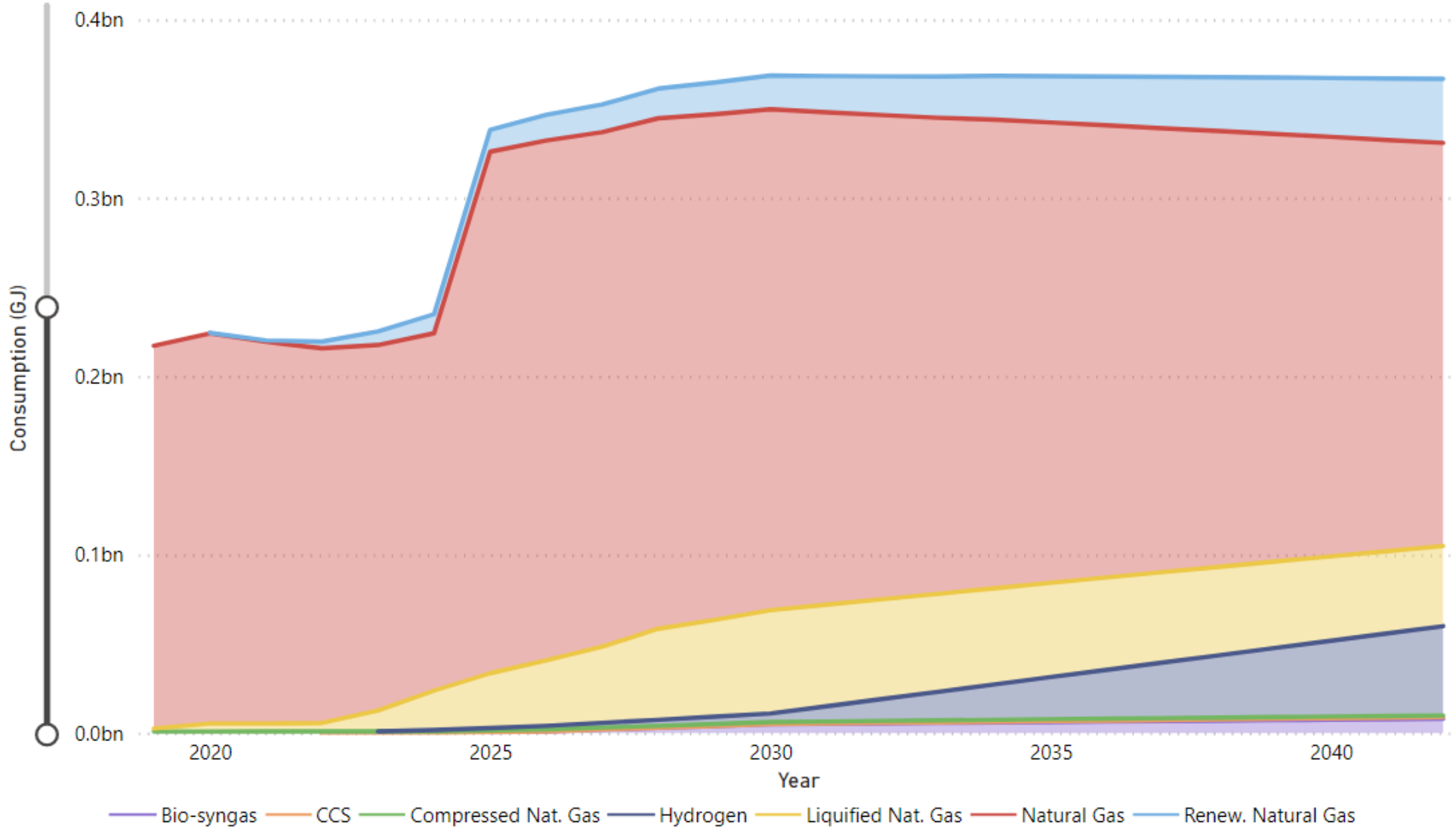


GHG Emissions (t/CO2e)



Energy at work FORTIS BC™

Diversified Energy Planning Scenario: Demand by Fuel (GJ)



Energy at work FORTIS BC™

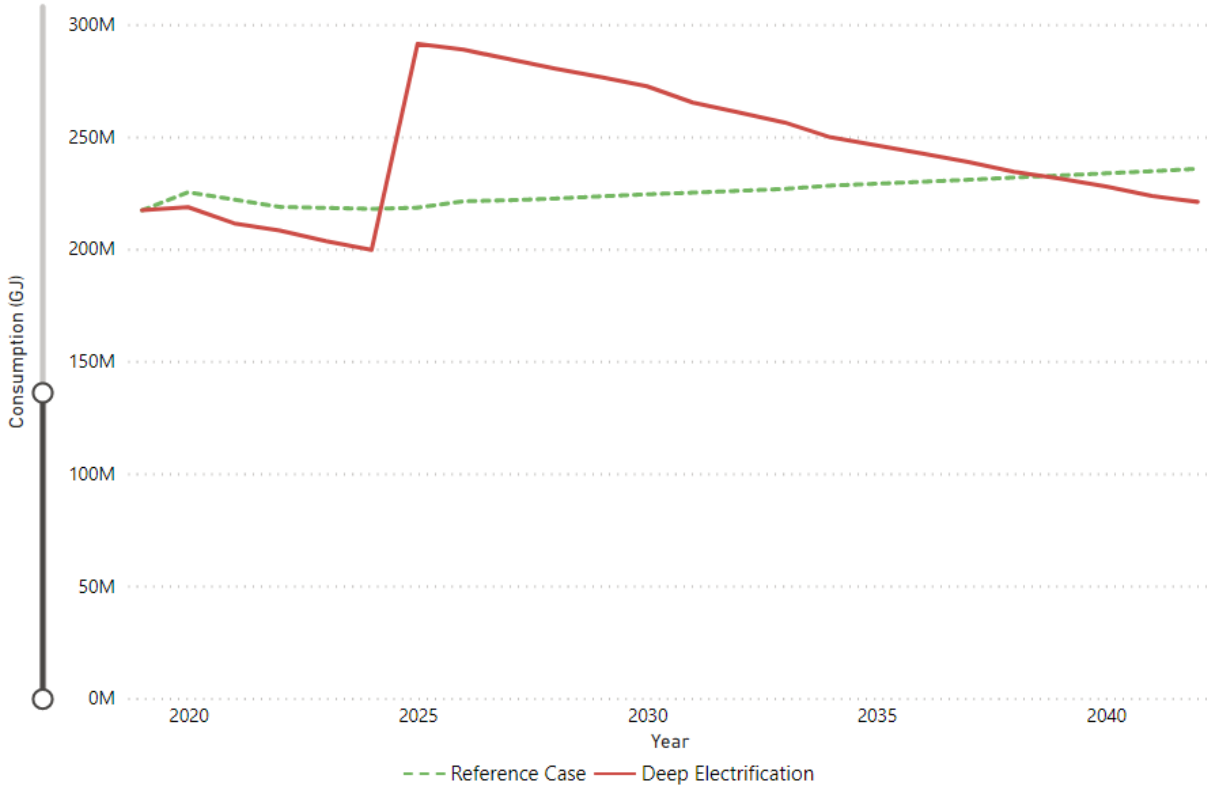
Deep Electrification Scenario

The BC government uses all policy levers to electrify the economy to achieve domestic carbon abatement. The government also promotes CCS for non-electrified sectors. Such policies create constraints for the BC economy and reduce the uptake of NGT solutions and renewable gases. To support economic growth, the government supports LNG exports to other jurisdictions.

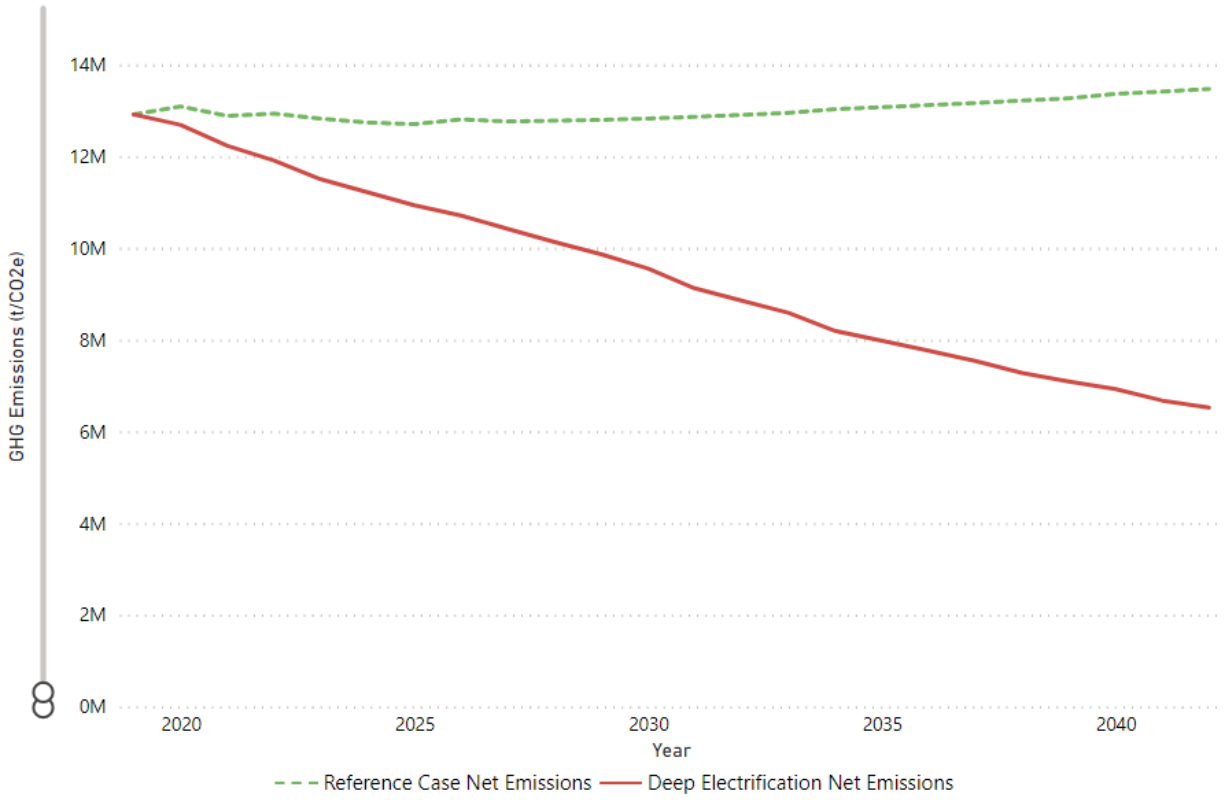
Critical Uncertainty/ Renewable Supply Alternative	Deep Electrification Scenario
Appliance Standards	Accelerated
CCS	High
Carbon Price	Planning
Customer Growth	Low
Fuel Switching	Accelerated
H2 Supply	Low
LNG Export Demand	Planning
NGT Demand	Low
Natural Gas Price	Low
New Construction Code	Accelerated
Retrofit Code	Accelerated
RNG Supply	Low
Syngas and Lignin Supply	Reference
Woodfibre LNG	Planning

Deep Electrification Scenario

Demand (GJ)



GHG Emissions (t/CO2e)



Energy at work FORTIS BC™

Questions & Discussion

59

Economic Stagnation Scenario

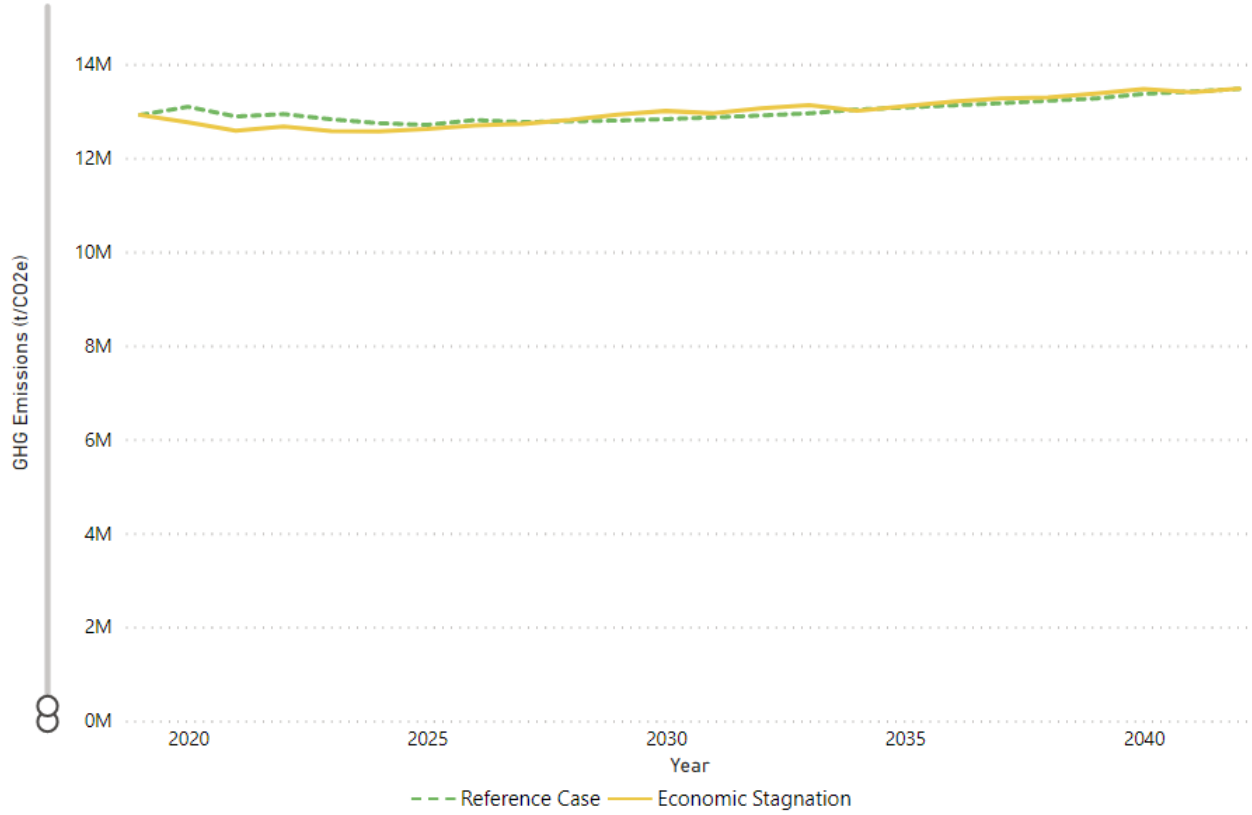
The BC economy experiences lower-than average growth as part of a more sluggish global economy generally over the planning period which reduces excess regional demand for natural gas and keeps BC's gas supply abundant. Global economic performance reinforces trends towards the right of the political spectrum and causes governments to focus on areas other than climate policy. The economic environment has some negative impact on LNG exports and significant negative impact on NGT.

Critical Uncertainty/ Renewable Supply Alternative	Economic Stagnation Scenario
Appliance Standards	Reference
CCS	Reference
Carbon Price	Low
Customer Growth	Low
Fuel Switching	Reference
H2 Supply	Reference
LNG Export Demand	Reference
NGT Demand	Low
Natural Gas Price	Low
New Construction Code	Delayed
Retrofit Code	Reference
RNG Supply	Reference
Syngas and Lignin Supply	Reference
Woodfibre LNG	Reference

Economic Stagnation Scenario

Demand (GJ)

GHG Emissions (t/CO2e)



Energy at work FORTIS BC™

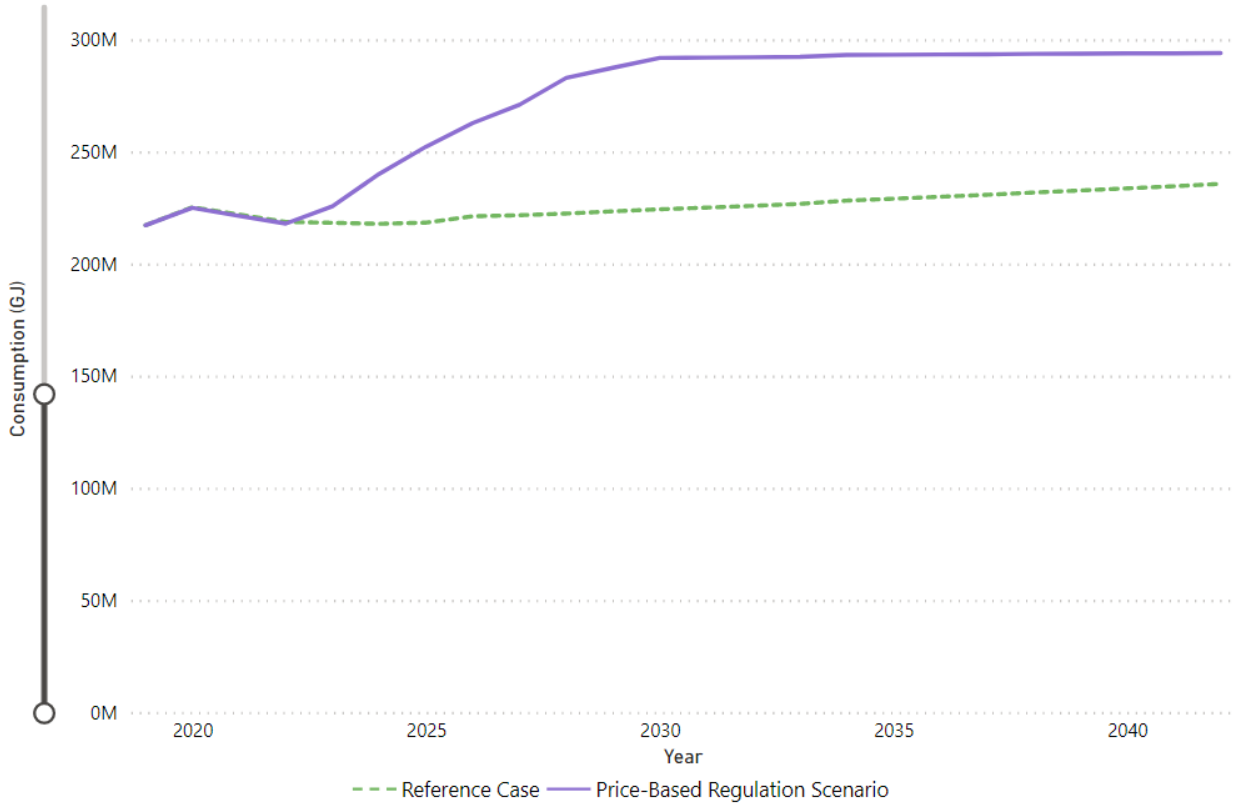
Price-Based Regulation Scenario

The BC government concludes that price signals and more ambitious upstream emissions reductions provide the best solution for carbon abatement and refrains from other forms of regulation. The price signals boost development of renewable gases, CCS, and NGT. Upstream methane emissions regulations increase regional gas commodity costs. The policy environment has limited impacts on economic growth and LNG exports.

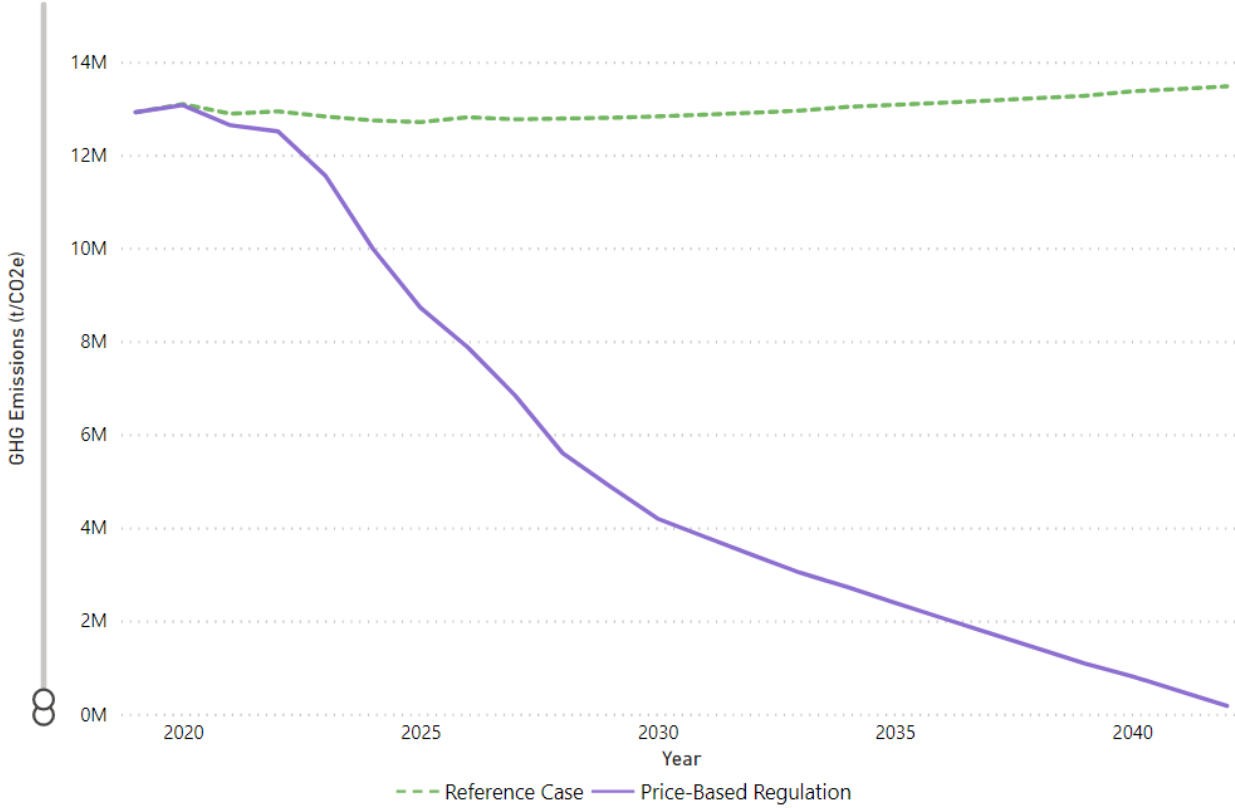
Critical Uncertainty/ Renewable Supply Alternative	Price-Based Regulation Scenario
Appliance Standards	Reference
CCS	High
Carbon Price	High
Customer Growth	Reference
Fuel Switching	Reference
H2 Supply	High
LNG Export Demand	Reference
NGT Demand	High
Natural Gas Price	High
New Construction Code	Reference
Retrofit Code	Reference
RNG Supply	High
Syngas and Lignin Supply	High
Woodfibre LNG	Reference

Price Based Regulation Scenario

Demand (GJ)



GHG Emissions (t/CO2e)

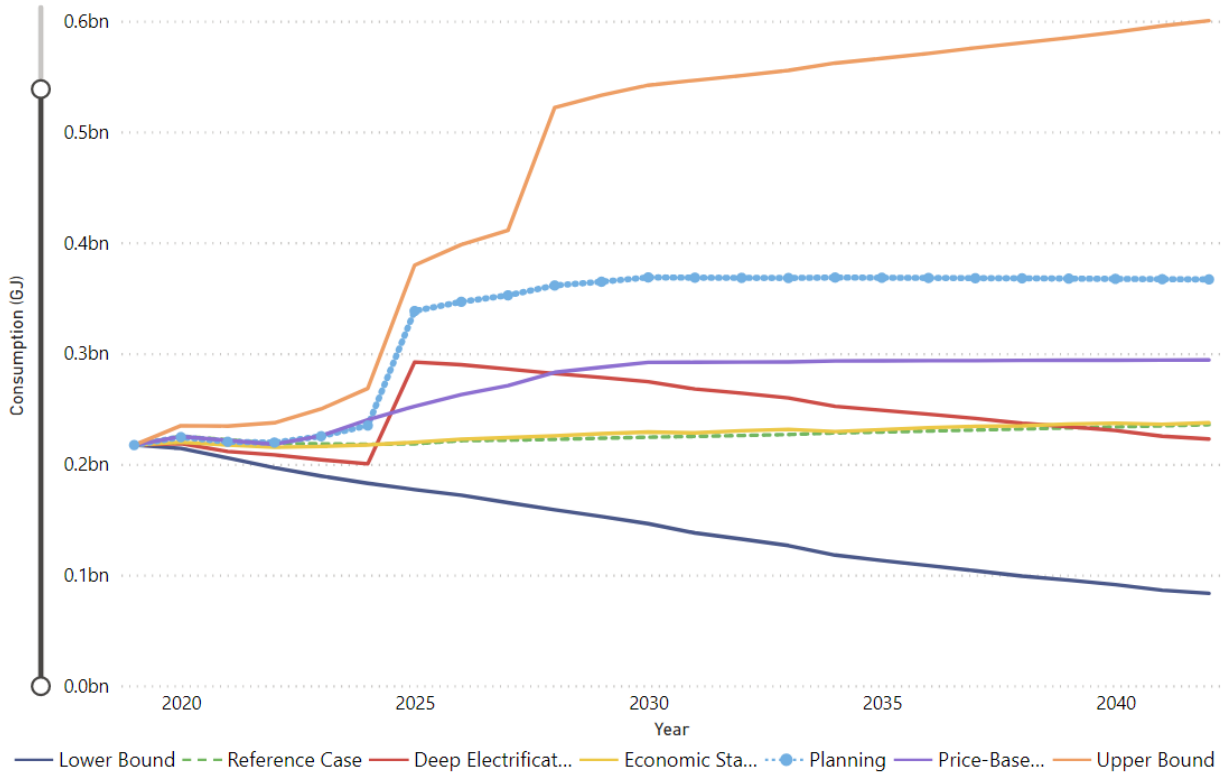


Energy at work FORTIS BC™

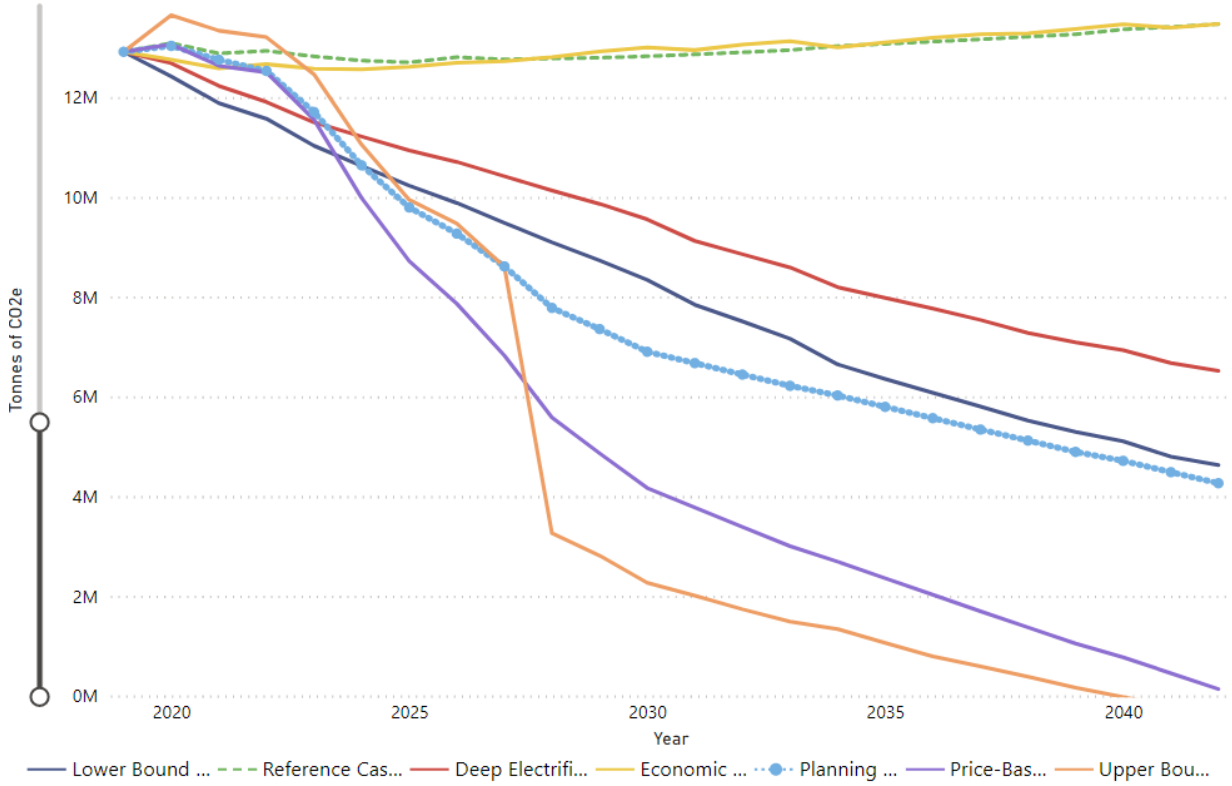
Comparison of All Scenarios

All Scenarios

Demand (GJ)



GHG Emissions (t/COe2)



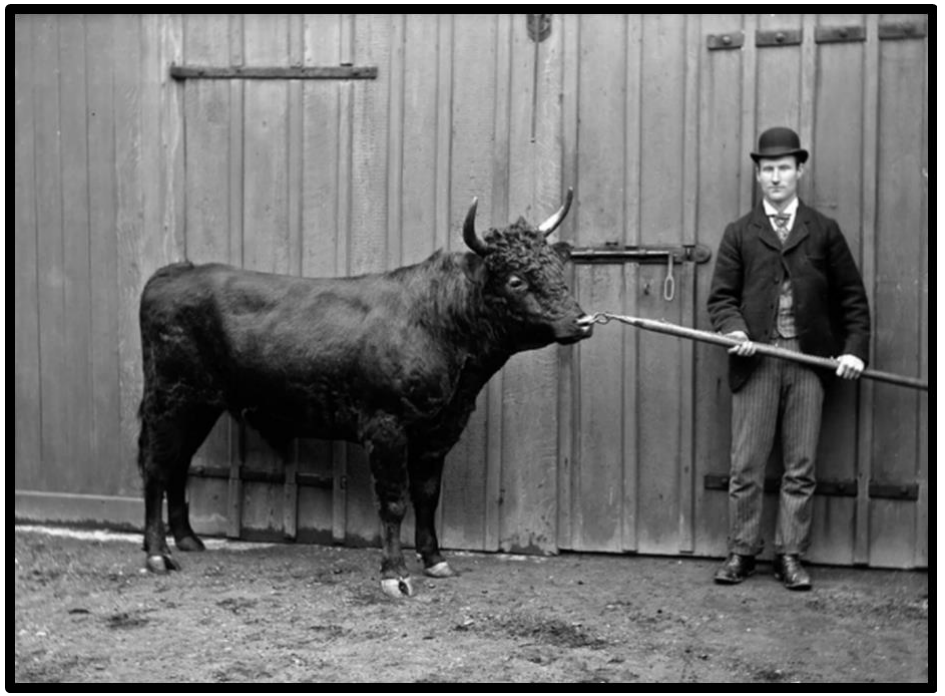
Energy at work FORTIS BC™

Questions & Discussion

Crowd Forecast Activity Using the Slider Tool

Collective Intelligence – The Crowd Forecast

- A brief history of crowd forecasting
  - Sir Francis and the ox
- We have developed a “Slider Tool” to let us do a somewhat more sophisticated “crowd forecast”
- In the Slider Tool application for the LTGRP you will be able to forecast demand, NGT/LNG and supply and observe the impacts on GHGs
- You will receive an email with a link and we’d appreciate all of you giving it a try and submitting your views
- Walkthrough the application



Questions & Discussion

Wrap-up & Next Steps

Energy at work FORTIS BC™

Wrap-up & Next Steps

Thank you for attending today's session, we appreciate your time and input. Additional opportunities to provide feedback will be announced shortly.

The session presentation and notes will be posted online in the next few weeks.

If you have any further feedback or questions, please reach out to the Resource Planning team at **irp@fortisbc.com.**

Please submit your own forecast using the Slider Tool by Friday, June 25th.

Energy at work FORTIS BC™

Thank you

For further information, please contact:

FortisBC Integrated Resource Planning

irp@fortisbc.com

Find FortisBC at:

fortisbc.com

talkingenergy.ca

604-576-7000

Follow us @**fortisbc**