2022 LONG TERM GAS RESOURCE PLAN (LTGRP) SYSTEM PLANNING AND GAS SUPPLY DRAFT RESULTS

December 1, 2021

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Welcome, Acknowledgment, Introduction

FortisBC acknowledges and respects Indigenous People in this place we call Canada, on whose traditional territories we all live, work and play.

FortisBC is committed to Reconciliation with Indigenous Peoples, using our Statement of Indigenous Principles to guide our words and actions.

3

Safety moment

- Prepare an emergency kit for your home and vehicle
- Pack enough supplies for 72 hours
- Store your emergency kit(s) in easily accessible locations
- For a full list of emergency kit items, please visit the Public Safety Canada website at: https://www.getprepared.gc.ca/cnt/kts/bsc-kt-en.aspx

Guiding Principles for FortisBC

Contribute to Province's Decarbonization Goals	Integrated Optimized, and Low-cost GHG Abatement	Support Affordability
Understand and Mitigate Long-Term Impacts to Energy System	Diversified and Collaborative Energy Approach	Strengthen and Reliability and Resiliency

Agenda

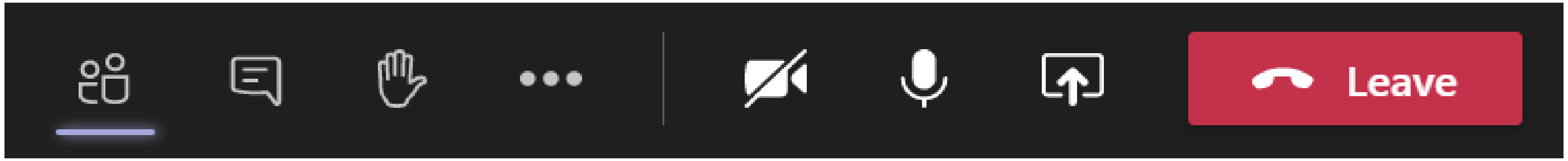
- **Welcome, Acknowledgment, Introduction & Sessions Overview**
  (15 min.)
- **Renewable Gas – Comprehensive Review Filing**
  (30 min.)
- **System Planning**
  (45 min.)
- **Break**
  (10 min.)
- **Gas Supply**
  (60 min.)
- **Infrastructure Transition to Renewables and Resiliency**
  (45 min.)
- **Wrap-up & Next Steps**
  (5 min.)

Session Objectives

1. Report on feedback from previous RPAG session
2. Discuss the Renewable Gas Comprehensive Review
3. Discuss the challenges and opportunities for gas system planning and supply
4. Inform you about the status of the 2022 LTGRP and next steps

Housekeeping

- Video participation is not required – presenters will use video
- When not speaking, please mute yourself to reduce background noise
- We will have scheduled breaks for questions and discussion
- We encourage you to use the hand-up function to indicate you'd like to speak
  - When we call upon you, feel free to un-mute, introduce yourself and speak clearly
  - You may also use the chat functionality to enter comments and questions if you'd prefer
- The session audio/video will not be recorded, however, the chat history will be saved for note-taking purposes
- Session participants should be visible by clicking on the participants icon

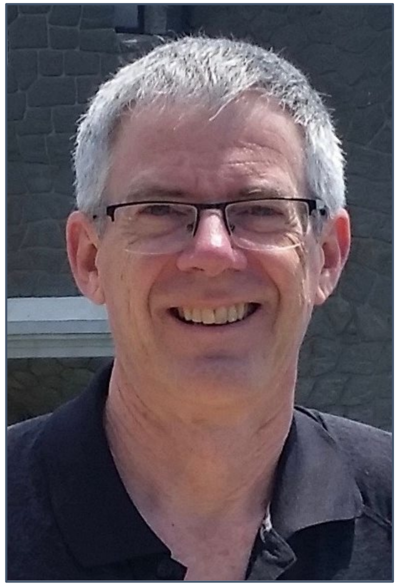


Feedback from November Session - Demand Side Management

- Concern expressed regarding CleanBC Roadmap to 2030 announcement and suggested delaying of the LTGRP:
  - many Roadmap details still to be finalized
  - many aspects of Roadmap already captured in the LTGRP scenarios.
- Recognition that both renewable natural gas and clean electricity are finite resources. Hydrogen offers vast opportunity to supply low carbon energy needs.
- Collaboration will be critical in identifying the right fuel for the right use at the right time.
- Clarification on highest performing DSM measures and other DSM measure details.
- Clarification on the DSM settings used in the scenarios and the alternative spending levels.
- Clarification on the avoided costs used to conduct the DSM cost tests:
  - Modified Total Resource Cost Test (MTRC)
  - avoided cost of renewable/low carbon gas.
- Support for updating the DSM analysis across all fuel supplies.
- Acknowledgment of the critical role of the gas infrastructure in decarbonizing.

Jason Wolfe
Director, Energy Solutions

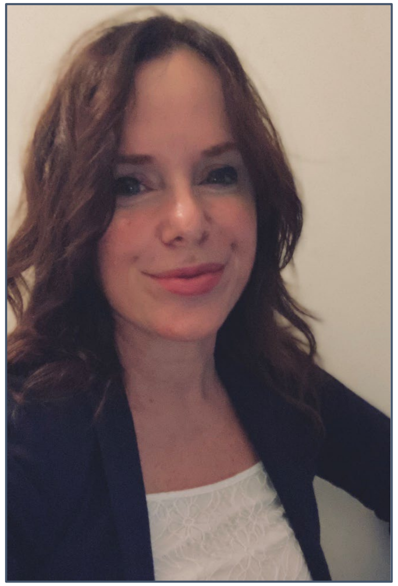
Bea Bains
Manager, Energy Products and Service



Terry Penner
System Capacity Planning Manager

Jordan Cumming
Commercial & Planning Lead, Energy Supply

Jesse Scharf
Energy Supply Market Analyst



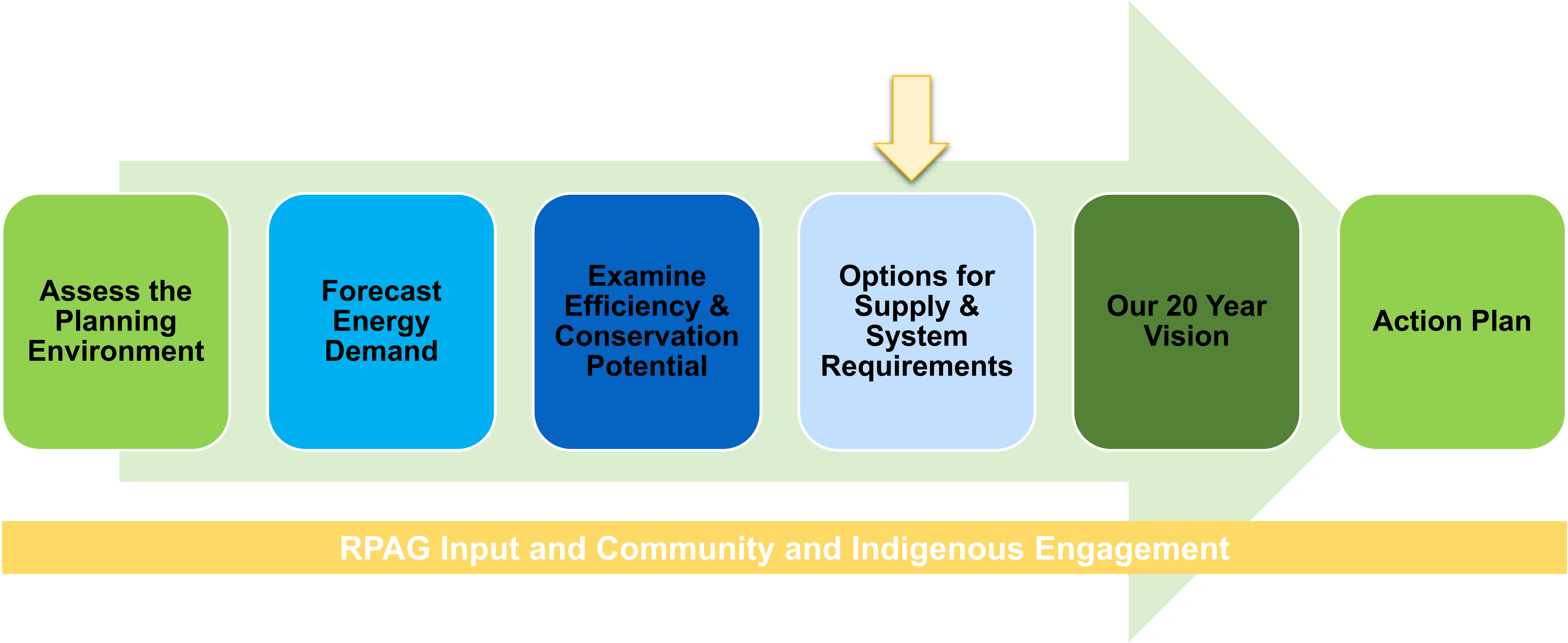
Tania Specogna
Director, Resource Development

FortisBC Speakers

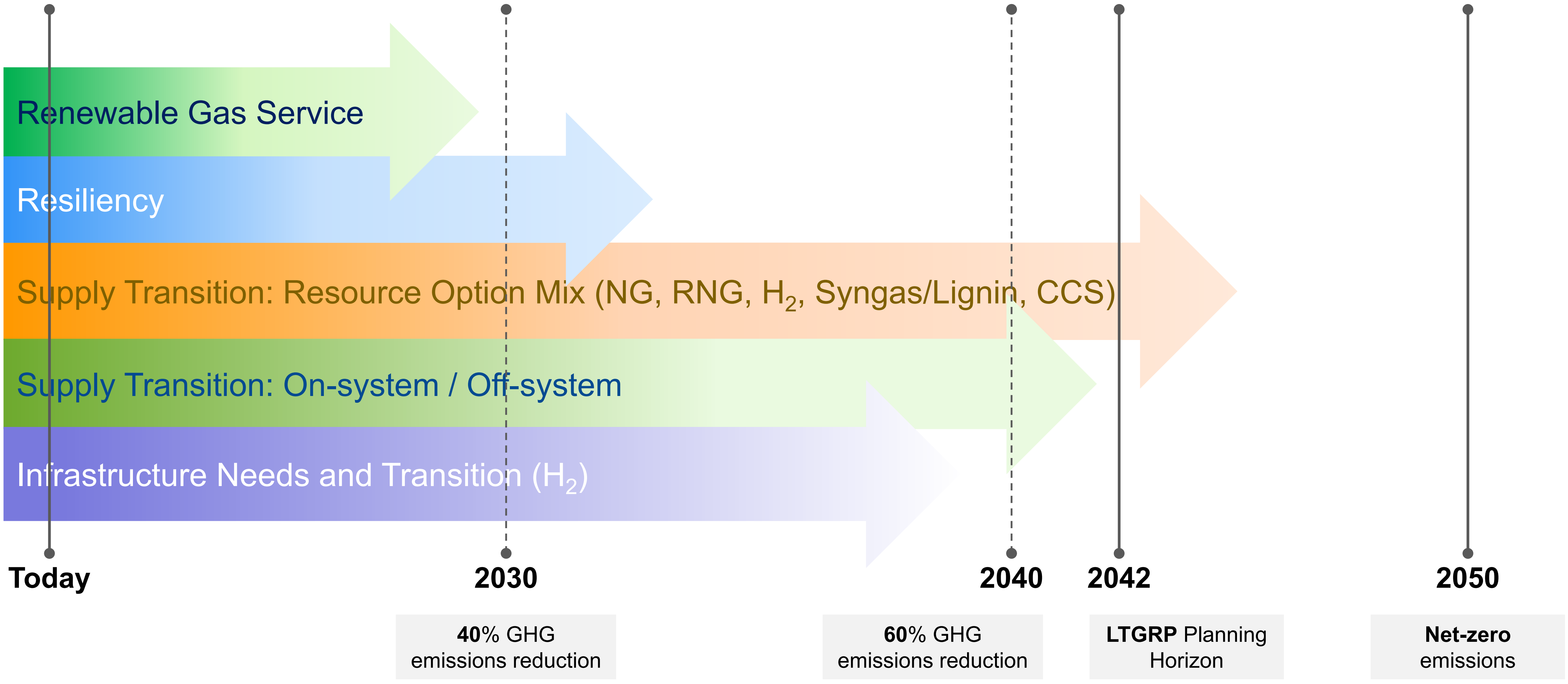
Resource Planning Advisory Group (RPAG) Members Registered for this Session

- Avista Utilities
- BC Business Council
- BC Hydro
- BC Ministry of Energy, Mines & Low Carbon Innovation
- BC Public Interest Advocacy Centre
- BC Sustainable Energy Association
- BC Utilities Commission
- Building Owners & Managers Association
- Canadian Institute of Plumbing and Heating
- City of Burnaby
- City of Kamloops
- City of Prince George
- City of Surrey
- Clean Energy Association of BC
- Commercial Energy Consumers Association of BC
- Community Energy Association
- District of Saanich
- Enbala
- Metro Vancouver
- Midgard Consulting (Representing Residential Consumer Intervener Association)
- MoveUP
- North West Gas Association
- NW Natural
- Northern Alberta Institute of Technology
- Pembina Institute
- Pollution Probe
- Puget Sound Energy
- SFU Renewable Cities
- University of Victoria

Recall the LTGRP Process



Understanding the Transition to Renewable / Low Carbon



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Renewable Gas – Comprehensive Review Filing

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Background and History of Program and Framework

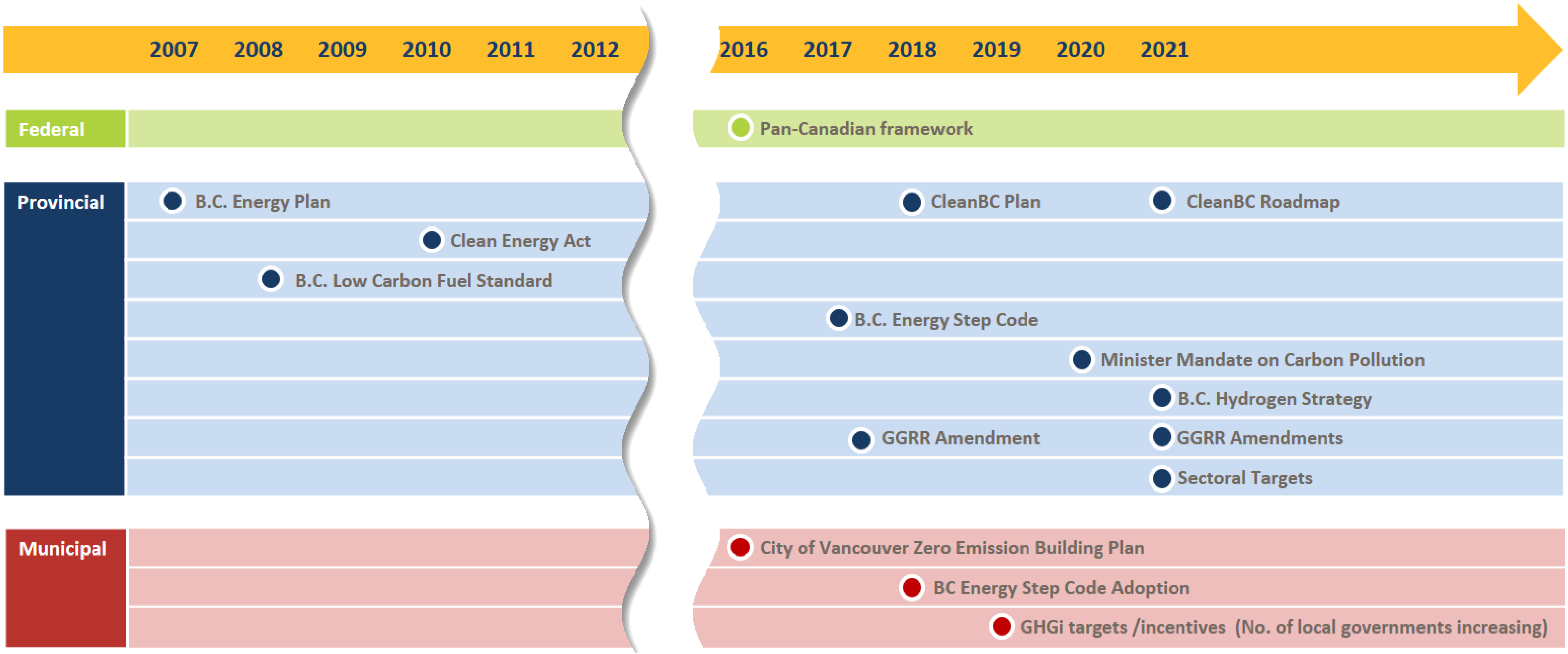
Characteristics	Phase 1 Pilot Program 2010-2013	Phase 2 Permanent Program 2013-	Phase 3 New RG Rate (BERC) 2016 -	Phase 4 GGRR amended to include RG Supply 2017 -	Phase 5 GGRR amended and BERC review 2021-
Volumes and Cost	0.25 PJ/Yr @ $15.28/GJ	1.5 PJ/Yr @ $15.28/GJ	1.5 PJ/Yr @$15.28/GJ	8.9 PJ/Yr @$30/GJ	>31 PJ/Yr @ $31/GJ
Supply Projects	First two projects	Added projects	Continued to add projects	First Out-of-province Supply	Acquisition includes project ownership
Offerings	Customer Program initiated	Expanded Customer Offering	Long Term Contracts Available	No Change	New Proposal
Pricing	BERC = discount to electricity	BERC = discount to electricity	BERC = Market Price	No Change	New Proposal

Scope of Application Review

Operating Environment has Evolved Rapidly

- Operating environment has rapidly evolved since last BERC Rate filing
- Regulations enacted at the Federal, Provincial and Municipal government levels focus on reducing emissions
- Customers are wanting energy choice
- Customer segments have different needs and regulations
- Diversified pathway where utilize both the gas and electric infrastructure is the optimal solutions for BC

All Levels of Government Adopted Policies for Decarbonization



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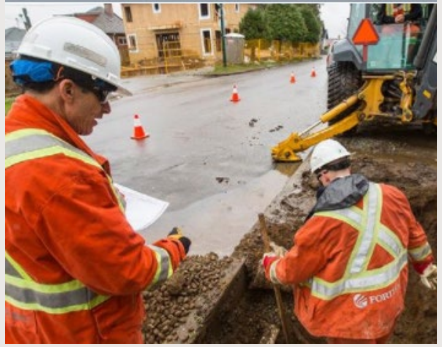
Local Governments Adopted Emissions Reduction Targets in Buildings

Local Governments with GHGi Targets for New Construction

- City of Vancouver
- District of North Vancouver
- City of Burnaby
- City of Richmond
- City of Surrey

Local Governments Providing Incentives for New Construction

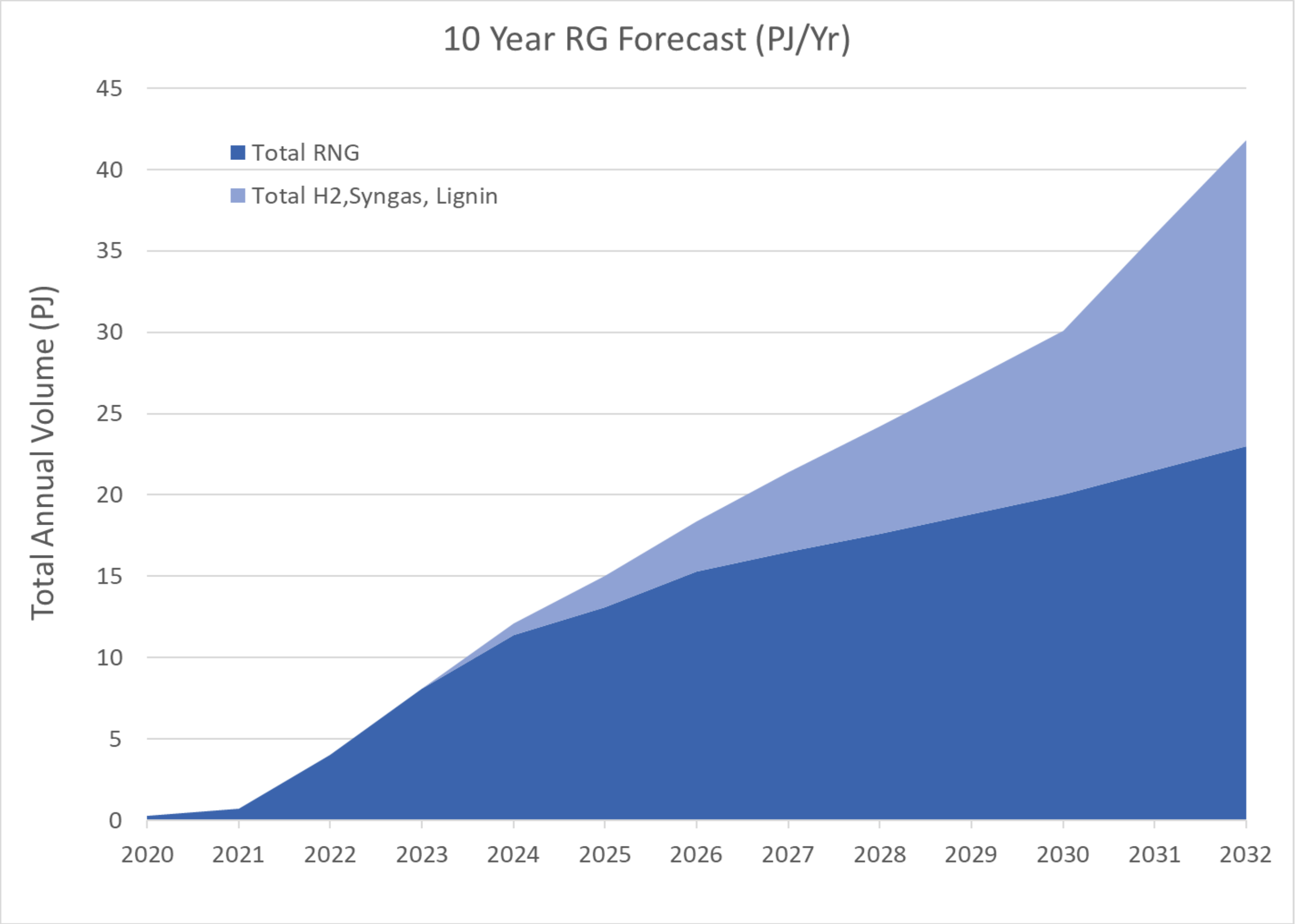


- City of Surrey
- District of Squamish

- Municipalities' decarbonization polices are making it difficult for customers to choose gas in their new development
- Local governments:
  - Adopting greenhouse gas emissions (GHGi) targets in their bylaws/zonings
  - Providing incentives to builders for no gas connection
  - Looking for permanent emissions reduction for the life of the building
- Customers opting for electricity as the easiest path to meet the GHGi targets

10 Year Renewable Gas Supply Forecast

Developed pre-2021 CleanBC Roadmap



- Experience in developing RG projects
- Scale and diversity of supply projects has grown since the program's inception
- Working collaboratively with suppliers in and outside of BC

Proposed RG Service Offerings

New

Decarbonizing existing and new customers' gas supply

All existing sales customers to receive a specified blend of RG targeting 1% in 2024 and increasing over time

New residential gas connection customers to receive 100% RG for the life of their building

Ongoing

Voluntary RG Blends

No change to existing offering*
Blends of 5, 10, 25, 50 or 100 per cent RG

*Except NGV, T-Service and Long Term Contracts

Renewable Gas Program Benefits

- Encourage the efficient use of existing assets for the benefit of all customers
- Responsive to Customer Needs or Requirements
- Responsive to Government Policies
- Price to support uptake in RG offerings to maximize revenue
- Match Supply to Demand

Consultation on Tariff and program design

- **Two Phases:**
  - **First Phase scope:** general awareness and current status of the RG program, RG supply outlook, the development and overarching scope of the Application
  - **Second Phase**: in progress
- **Stakeholders:**
  - Interveners, Customers, Provincial and Local governments, Building Sector – builders/ developers /associations, trades and manufacturers
- **Letters of Support:**
  - To date received 65 letters of support for the Application from a municipality, manufacturer, builders/developers, associations and consultants.

Next Steps: Regulatory Process

December 2021	Mid-January 2022	Late January to February 2022	TBD
File Application with BCUC	**Workshop on Key Elements**	**IRs Round 1**	**Further Regulatory Process**

Questions and Discussion

System Planning

Peak Demand

- Peak Demand Forecasts – Traditional and Theoretical End Use methods
- RNG and H_2 capacity considerations
- Regional forecasts and infrastructure upgrades on FEI systems
    - LNG expansion Woodfibre and Tilbury

Peak Demand

Peak Demand

- Highest demand expected on the system
- Correlated to cold weather
- Does not include seasonal and interruptible customer classes
- Peak demand estimated as the maximum consumption hourly during an unusually cold weather event
- FEI designs systems to ensure delivery of gas to all firm customers in a cold weather event that might occur once in 20 years
- 22 independent weather zone throughout FEI service areas considered in peak planning for system capacity

Peak Demand - Gas Supply vs. System Capacity

Peak Demand - Gas Supply Planning

- Determines supply resources needed to serve customers during a peak day event
- Resources for transportation customers are not included

Peak Demand – System Capacity

- Determines the infrastructure needed to deliver gas to core customers during a peak day or peak hour event
- Infrastructure requirements must also allow delivery of gas to firm transportation customers
- Location of demand within the transmission and distribution system is a significant factor

Peak Demand and Peak Forecast for System Capacity

Peak Demand (base year)

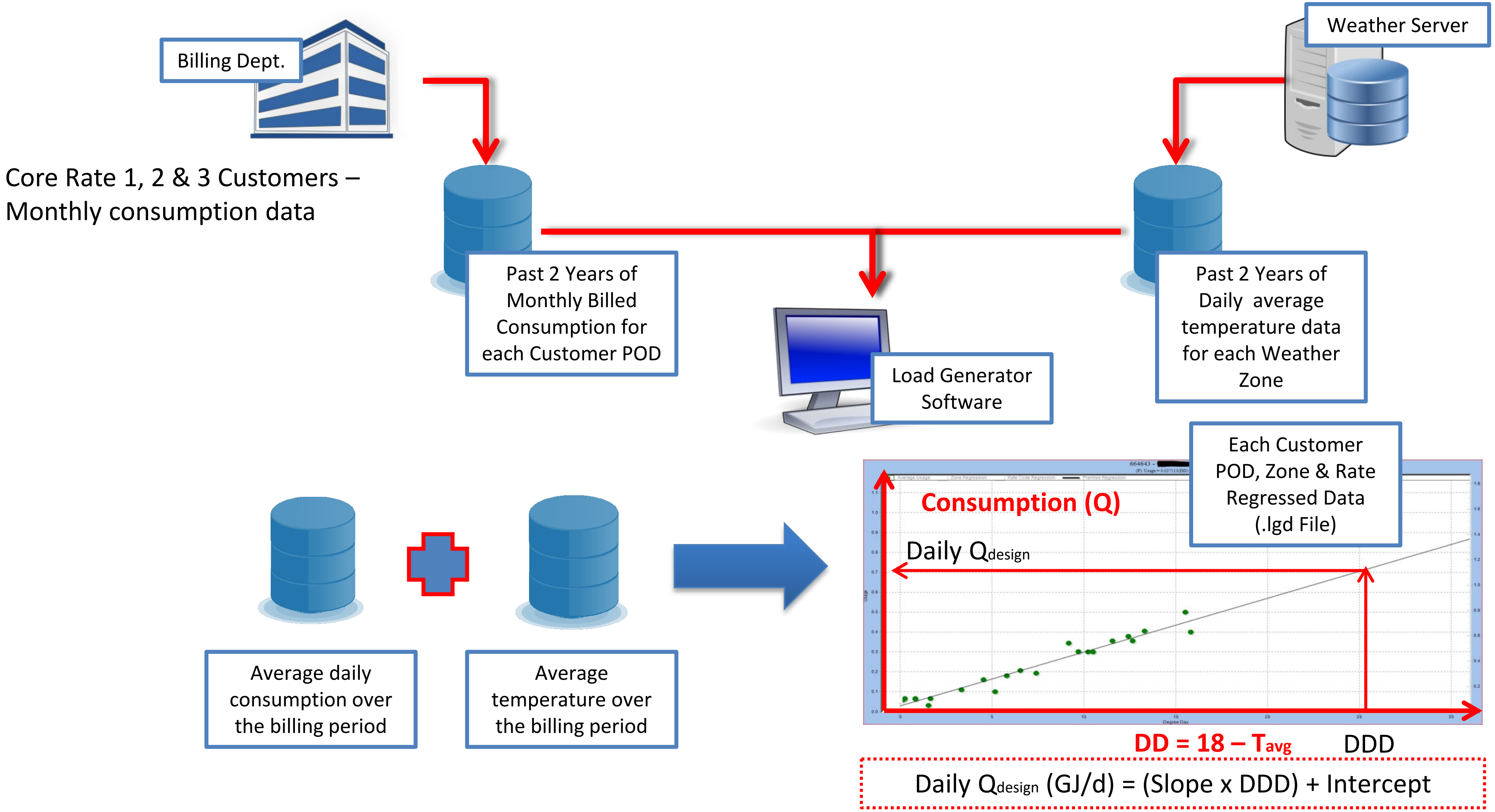
- Peak Demand $=$ UPC_{peak} x Current Accounts $+$ Ind. Demand

Peak Demand Forecast (traditional)

- Peak Demand (year n) $=$ UPC_{peak} x (Current Accounts + $\sum_1^n New\ Accounts$) $+$ Ind. Demand

Values for UPC_{peak}, industrial demand remains constant over the forecast period

How do we derive Peak Hour Load for our Hydraulic Models and Forecasts ?



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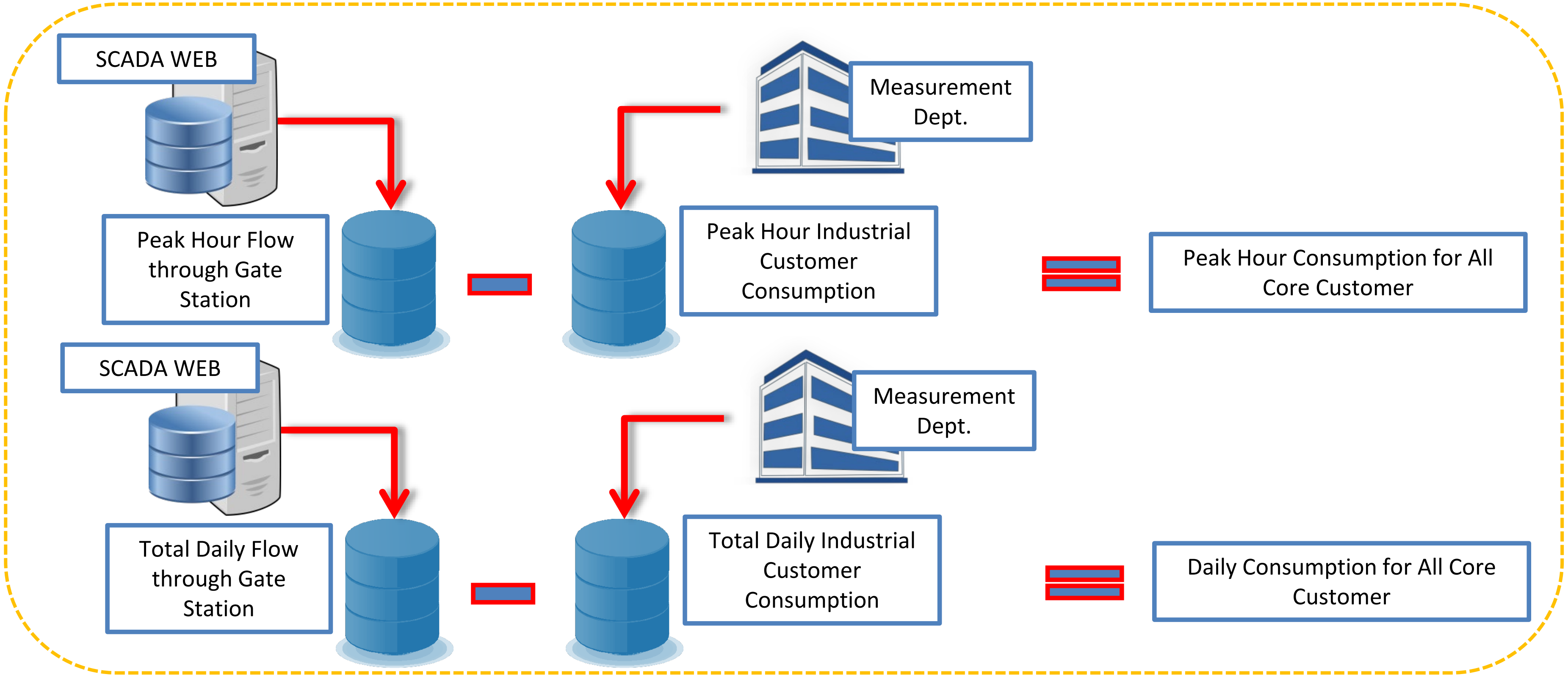
Peak Hour Factor

- Used to convert daily consumption to peak hour consumption for customers with monthly consumption data only. (Rate 1, 2 & 3 Customer)
- Peak Hour typically happen around 7am or 8am

Peak Hourly Factor = Peak Hour Consumption / Daily Consumption



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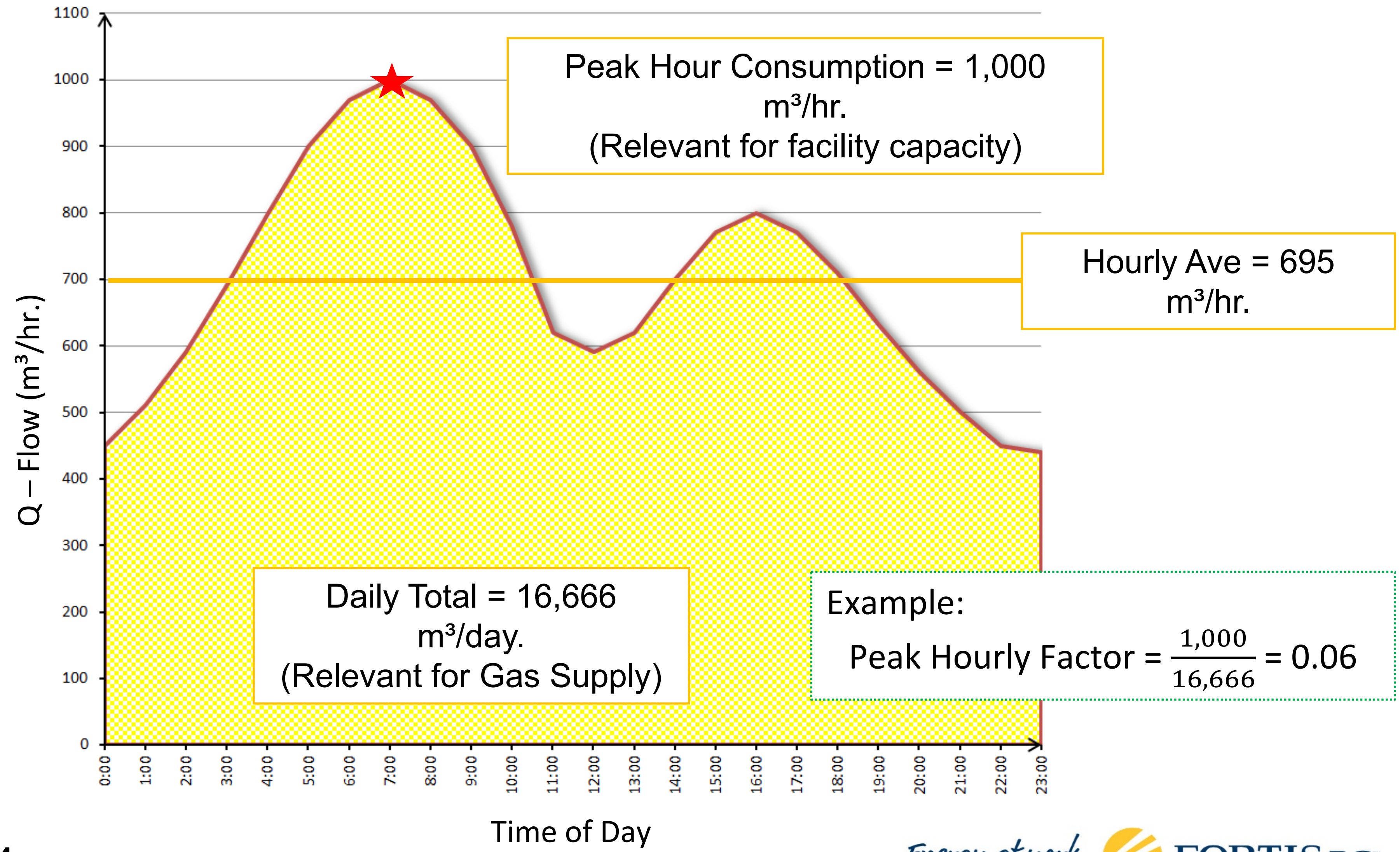
Peak Hour Factor (continued)



Example:

$$\text{Peak Hourly Factor} = \frac{1{,}000}{16{,}666} = 0.06$$

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Peak Demand Method

Peak Hour Use Per Customer (Std m3/hr)

- UPC_{peak}=Daily Q_{Design} x PHF/HV

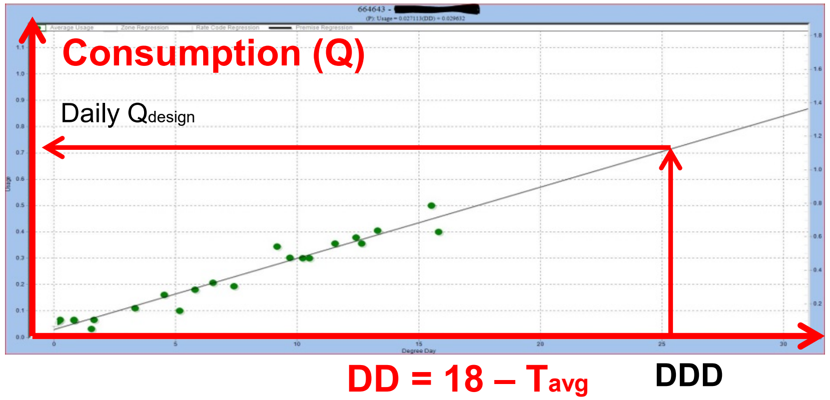
  HV = Heating Value (GJ/std m3)

  Heating value converts energy demand into the equivalent standard volume used for hydraulic modeling

- Average UPC_{peak} values for each region and for each rate class (1,2 & 3) are determined

- Regional UPC_{peak} values are averaged with the results of the previous two years analysis to smooth any atypical changes in UPCpeak that don't sustain year over year

- The resulting 3 year rolling average UPC_{peak} values are used in modeling and forecasting



Daily Q_{design} (GJ/d) = (Slope x DDD) + Intercept

DDD = Design Degree Day

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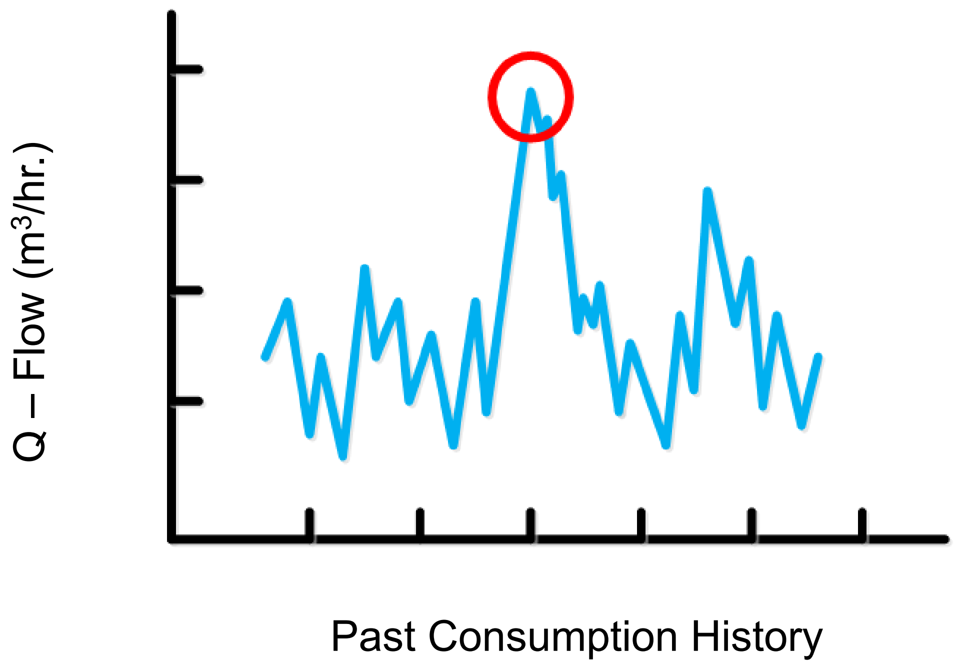
Peak Demand Method

Industrial Customers – Hourly measurement

- For process (non weather sensitive loads) the maximum observed hourly demand is used

- For weather sensitive demand a temperature regressed value is used

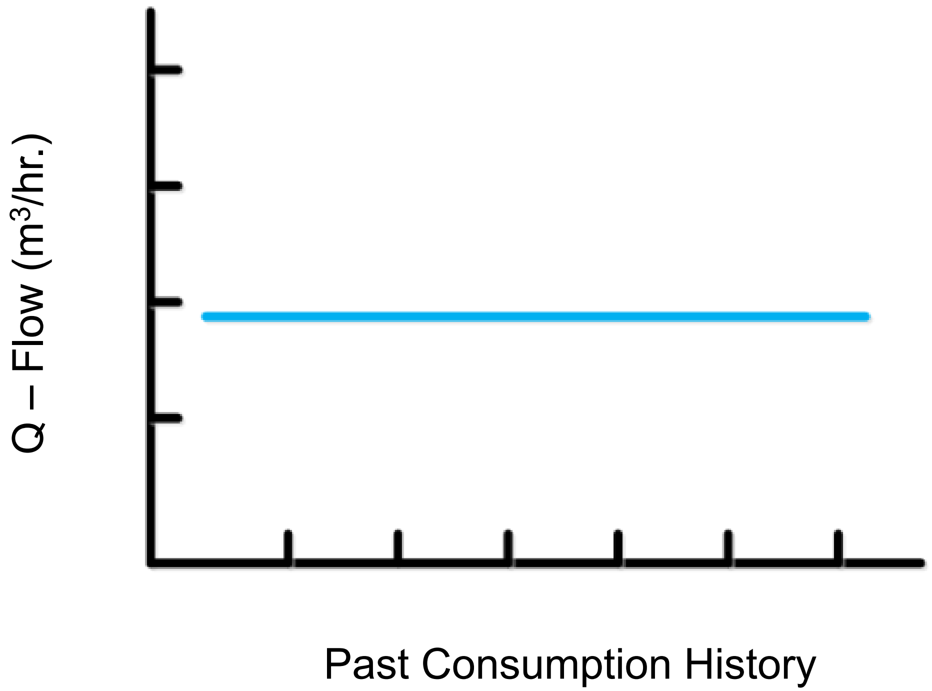
- No peak hour factor is applied



Peak Demand Method

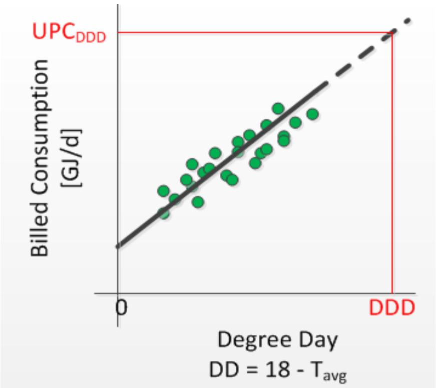
Customers with contract firm– Contract DTQ obligations

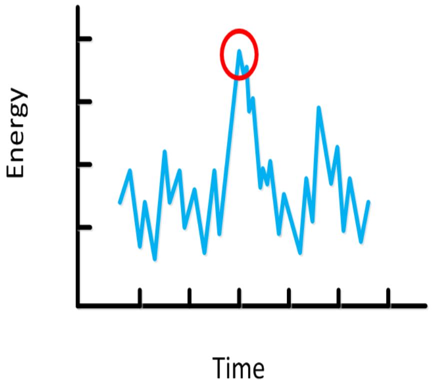
- Large interruptible transportation customers may have a firm contract amount
- These customers are limited to 5% of their firm daily total quantity (DTQ) under peak hour conditions

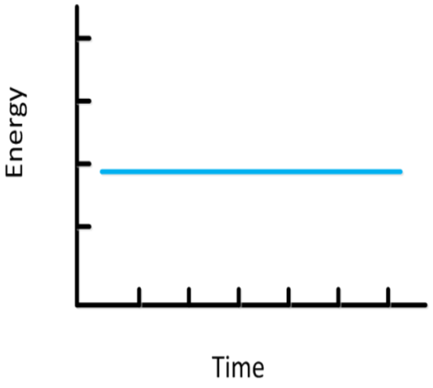


Peak Demand Method

Peak Demand = Demand Rate 1,2,3 + Industrial Maximum Observed + Firm DTQ Contract Obligations







Peak Demand Forecast

Traditionally…

- Base year peak demand for core customers is determined as previously described

- The current UPC_{peak} values are applied new customers over the planning period

  (added peak consumption = $\sum$customer adds x UPC_{peak})

- The current industrial account and firm DTQ contract account numbers are held constant with no increase or decrease in peak consumption

Peak Demand Forecast

Examining alternatives to the traditional method…

- Base year peak demand for core customers is determined as previously described.
- The UPC_{peak} values for existing and new customers core and industrial customers are varied over the planning period.
- UPC_{peak} variations will be derived considering the same end use factors used to determine annual demand in each scenario.
- Industrial accounts will vary in the high and low forecasts.

Peak Demand Forecasts from End-Use Scenarios

Posterity has develop a process linking peak demand forecasts to the end-use scenarios used in the annual forecasting.

- Method relies on applying hours use factors from end-use load shape profiles
- Hour use factors and Days use factors from end use load shapes were applied to sequentially break down:
  - Annual → peak daily consumption
  - Annual → peak hourly consumption
- End-Use Base Year hourly UPC_{peak} for each rate schedule and region were derived.
- Results corrected to design temperatures for each region
- Calibration factors to match FEI's current values of UPC_{peak} were determined

Capacity Impacts of Renewable Gases

Capacity Impacts of Renewable Gases

- The future of gas delivery on FEI system will include renewable gases such as Bio-methane or RNG and Hydrogen or Hydrogen Natural Gas blends
- Delivery will initially be predominantly off-system and over time incorporate larger scale on-system delivery of renewables
- Delivery within the FEI system will include:
  - Hubs with locally produce RNG, H_2 and/or Syngas delivered to local consumers
  - Renewable gases and gas blends delivered through FEI transmission and distribution systems to a broader customer base

Capacity Impacts of Renewable Gases

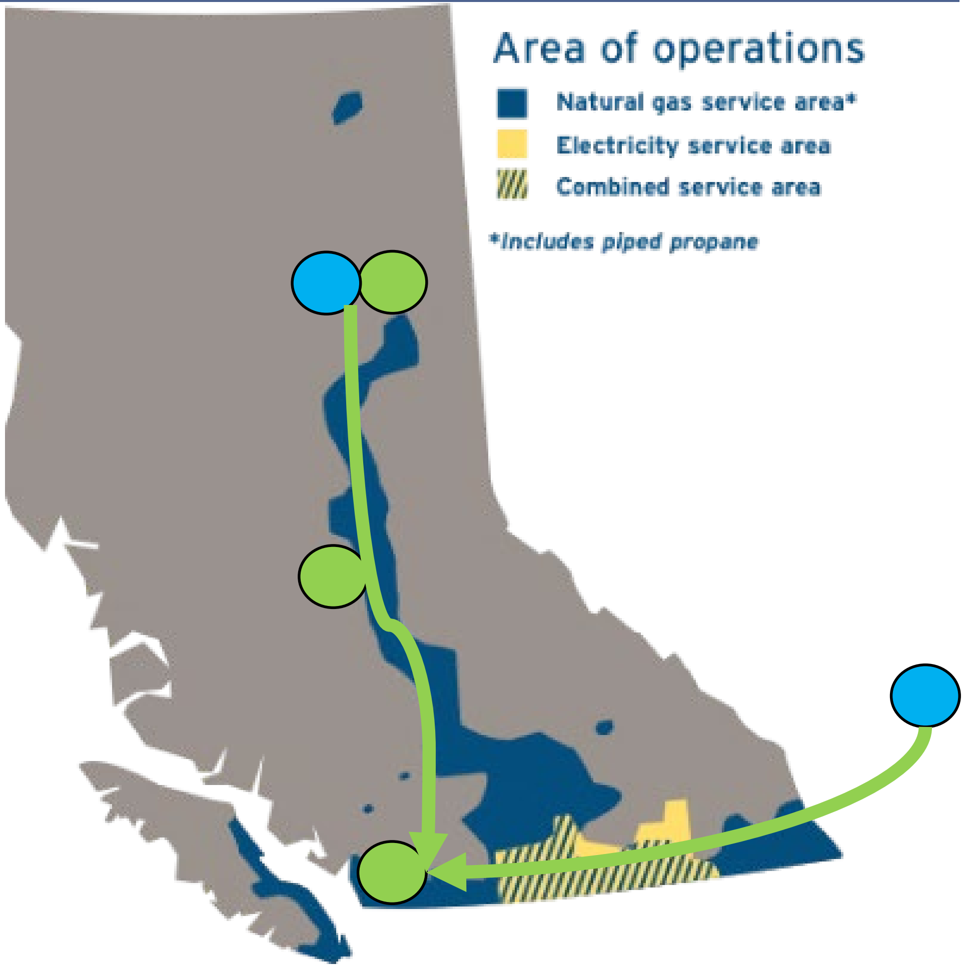
Off-System Delivery of Renewable Gases

- RNG or H_2 acquired off-system and consumed off-system does not alter FEI Capacity Planning or infrastructure requirements
- FEI continues to deliver the same volume of natural gas on the system

Capacity Impacts of Renewable Gases

On-System Delivery of Renewable Gases - RNG

- RNG Hubs within FEI distribution systems often involve some local distribution level system upgrades
- Locally generated supply can incrementally free capacity on upstream transmission system
- RNG delivered into FEI systems from Enbridge or TC Energy will impose the same capacity impacts and upgrade requirements on FEI systems as traditional



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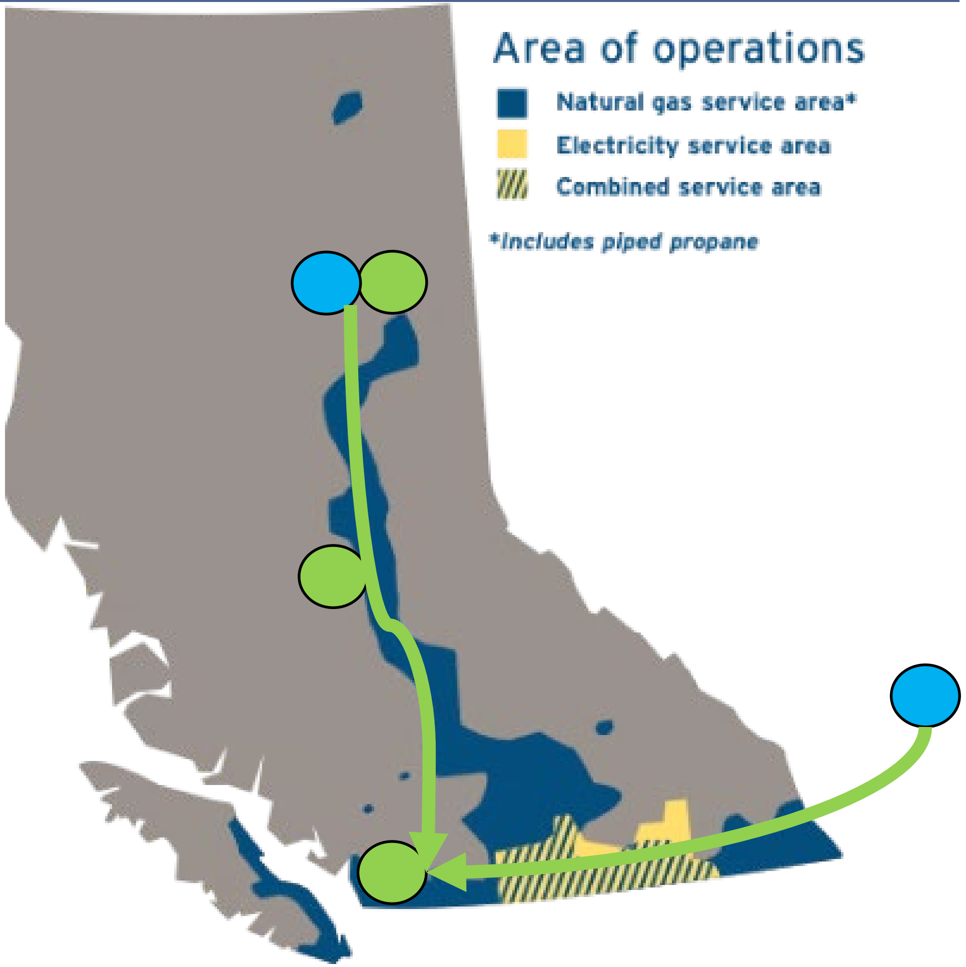
Capacity Impacts of Renewable Gases

On-System Delivery of Renewable Gases – H_2

- H_2 Hubs within FEI distribution systems will also involve some local distribution level system upgrades
- Locally generated H_2 supply can incrementally free capacity on upstream transmission system
- H_2 delivered thru FEI transmission systems from Enbridge or TC Energy or generated at some point along FEI's system will be enabled by future capacity upgrades on FEI's systems



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Capacity Impacts of Renewable Gases

Delivery Of Hydrogen or H_2 / Natural Gas Blends:

- Consider a hypothetical NPS 30 150 mile long pipeline
- Max. Pres 1440 psig, Del. pressure 500 psig, Velocity Constraint 24 m/s
- Energy content: Natural Gas = 38.9 MJ/m^3, H_2 = 12.1 MJ/m3

Pipeline delivery of Natural Gas and Hydrogen

Hydrogen Blend (% By Volume)	Volume Delivery (MMscfd)	Energy Delivery Hydrogen (%)	Energy Delivery Narural Gas (%)	Energy Delivery Total (TJ/d)	Capacity Limiting Constraint
0	871	0	100	960	Delivery Pressure
50	1095	23.8	76.2	791	Delivery Pressure
100	2347	100	0	805	Delivery Pressure*
100	1943	100	0	666	Gas Velocity**

* Gas velocity reaches 51 m/s
** Delivery pressure of 900 psig

Capacity Impacts of Renewable Gases

Delivery Of Hydrogen or H_2 / Natural Gas Blends:

- 100% Hydrogen delivery – Distribution system example, Whistler BC

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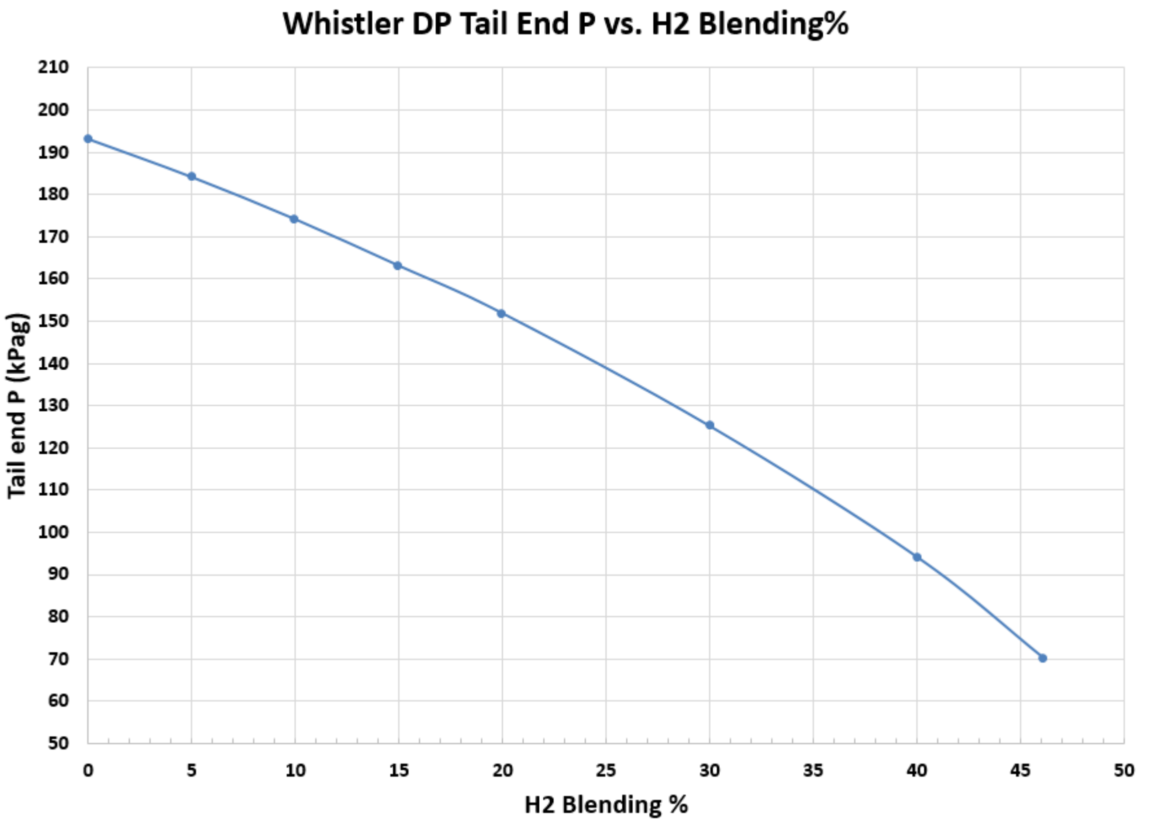
Capacity Impacts of Renewable Gases

Delivery Of Hydrogen or H_2 / Natural Gas Blends:

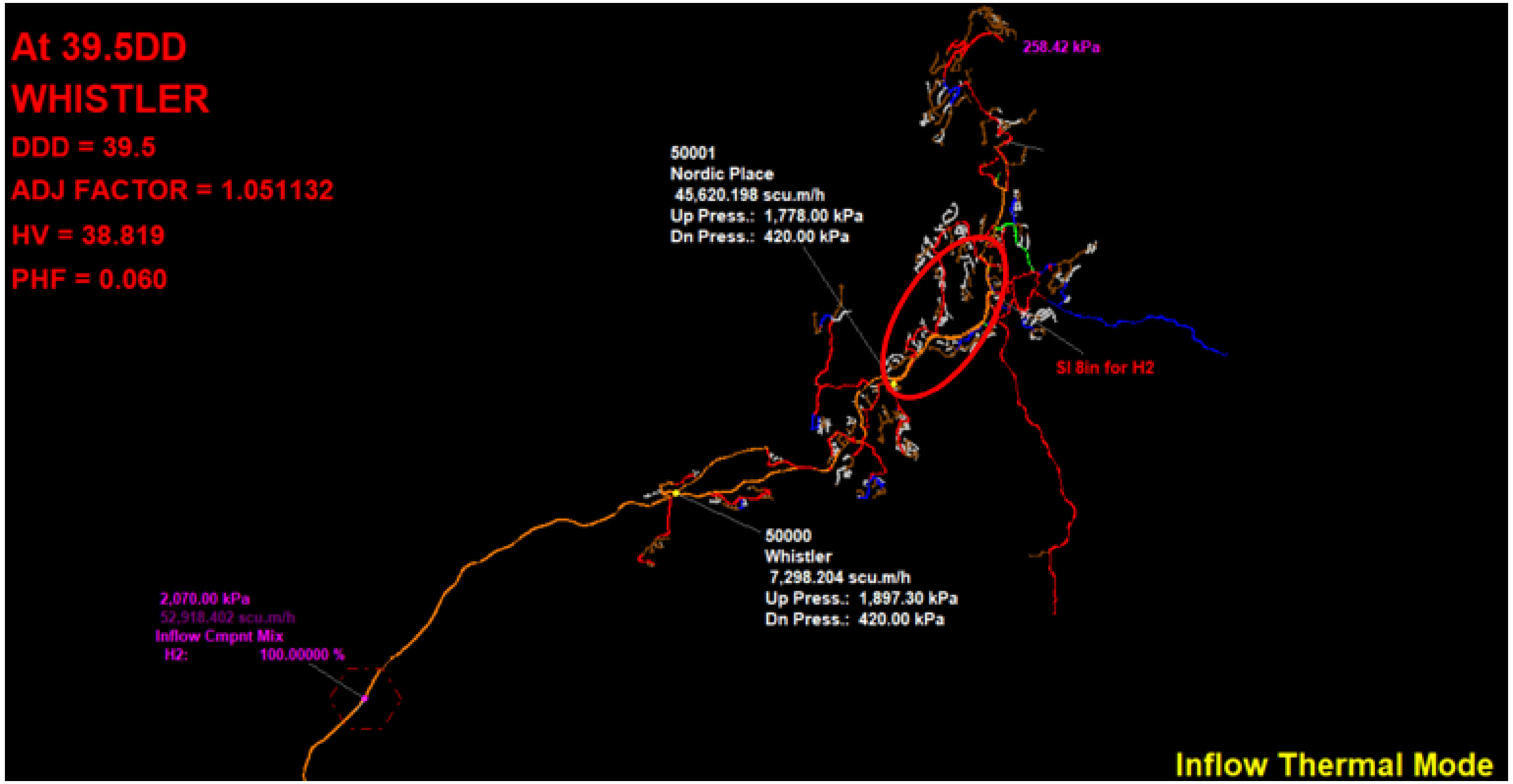
- Example of the existing Whistler distribution system receiving Hydrogen



Capacity Impacts of Renewable Gases

Delivery Of Hydrogen or H_2 / Natural Gas Blends:

- 100% Hydrogen delivery would require ~3300 m of pipeline looping



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Capacity Impacts of Renewable Gases

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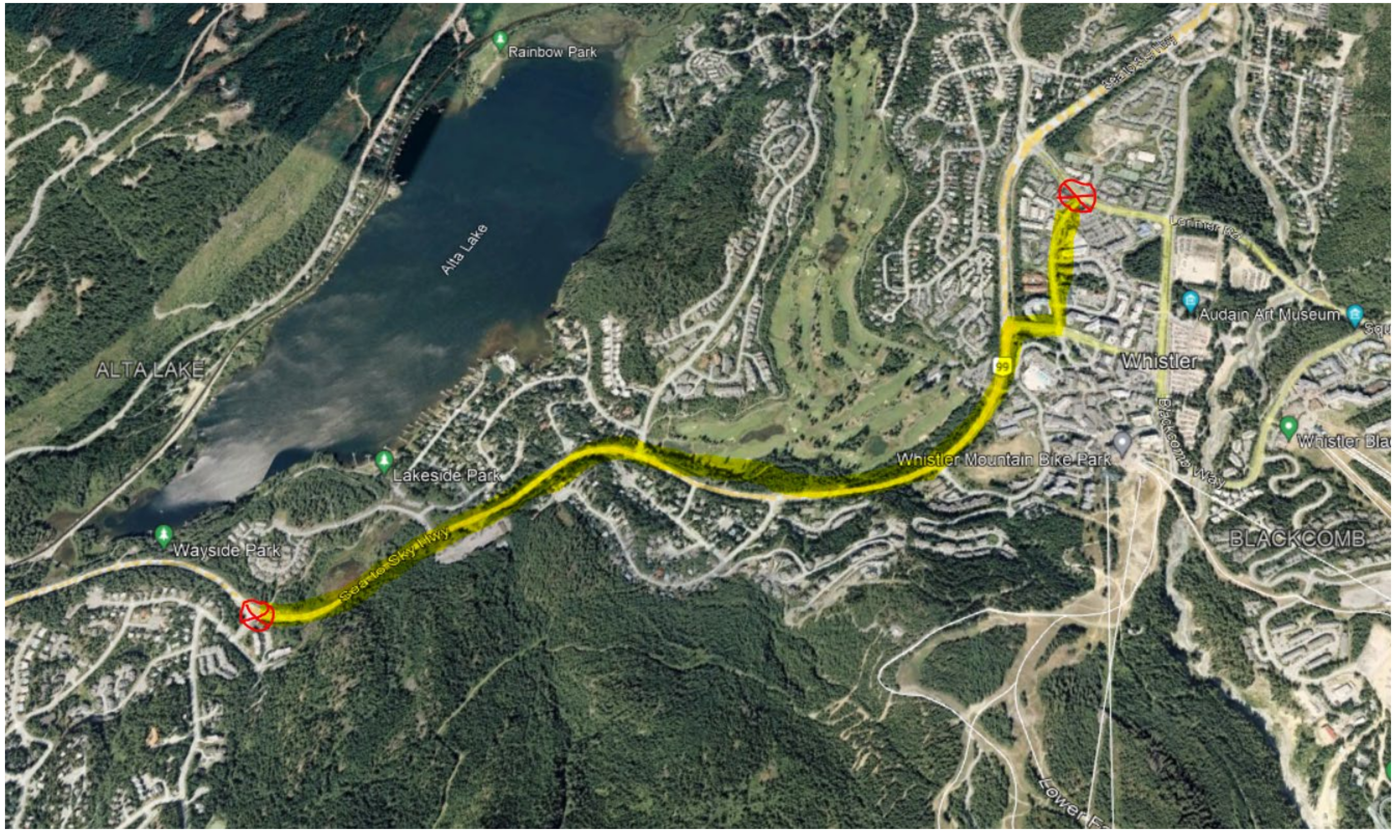


Gas System Reinforcements

Peak Demand ≤ **System Capacity**

Compression

Pipelines

LNG Peaking Storage Facilities

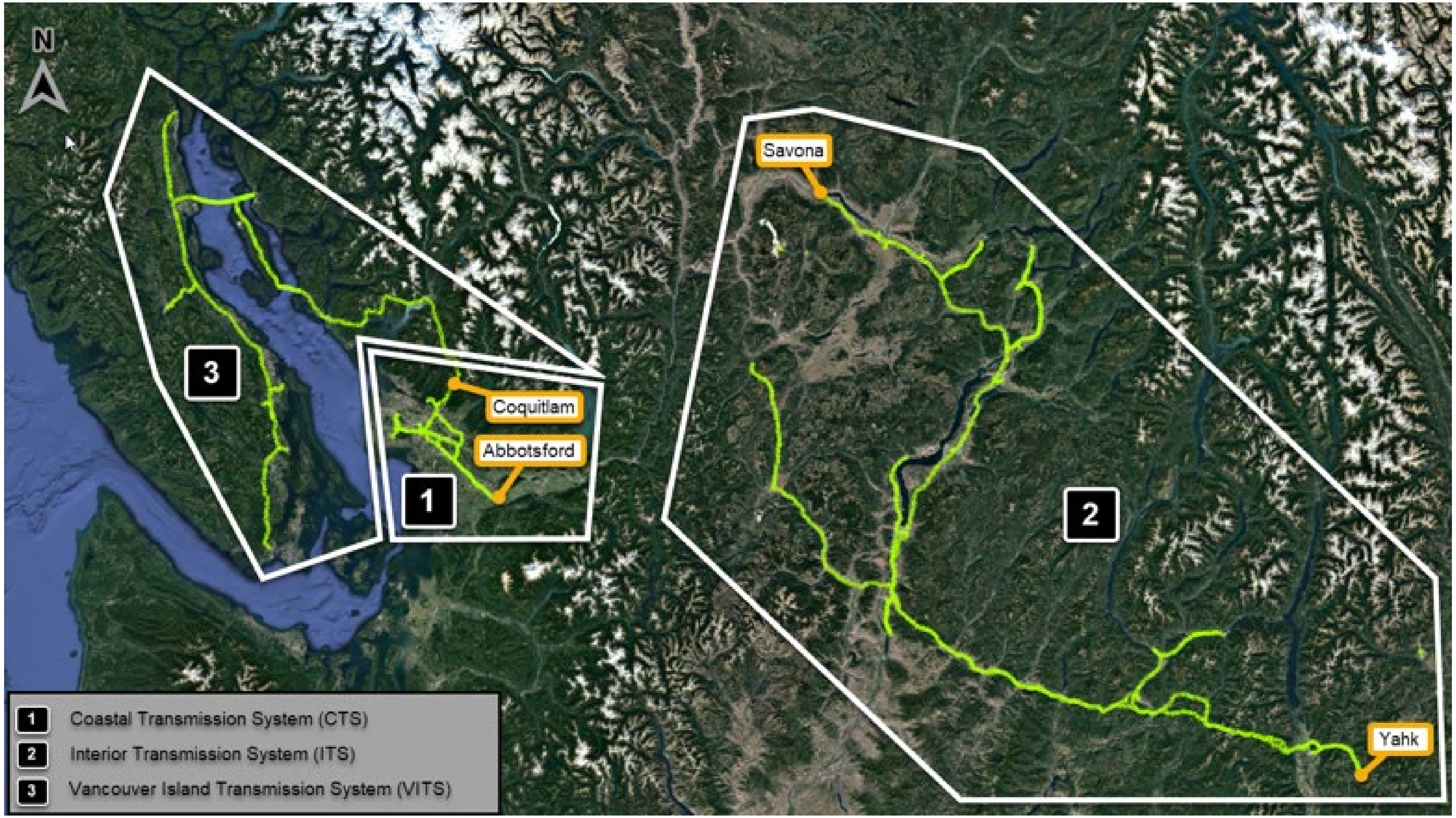
Infrastructure to Meet Peak Demand Forecasts

The following slides will present the infrastructure requirements to meet the regional peak demand

In each region we will:

- Briefly review current infrastructure (schematics)
- Review the system capacity constraint using our current traditional peak forecast
- Review system expansion options

FEI Transmission Systems



VI Transmission System

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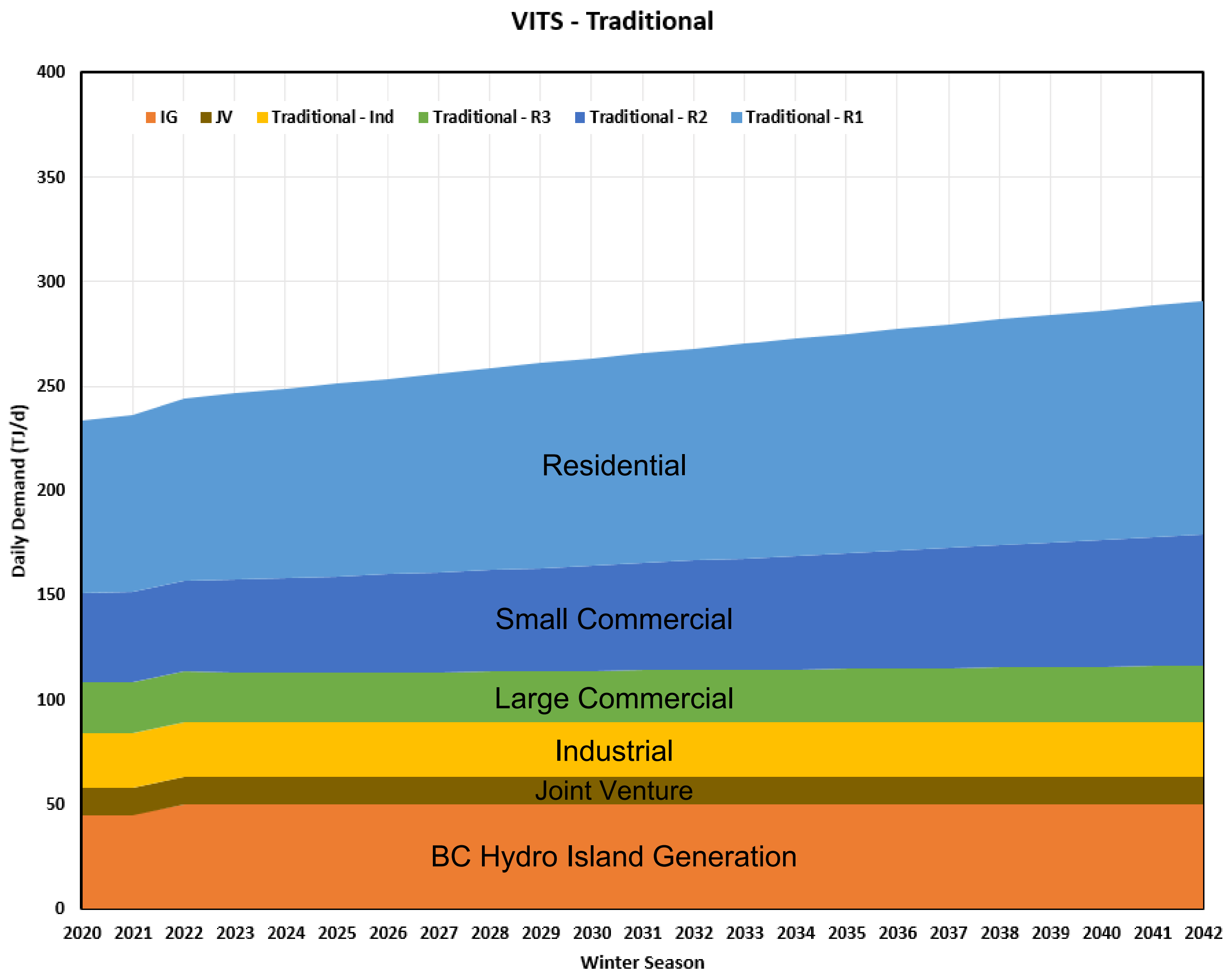
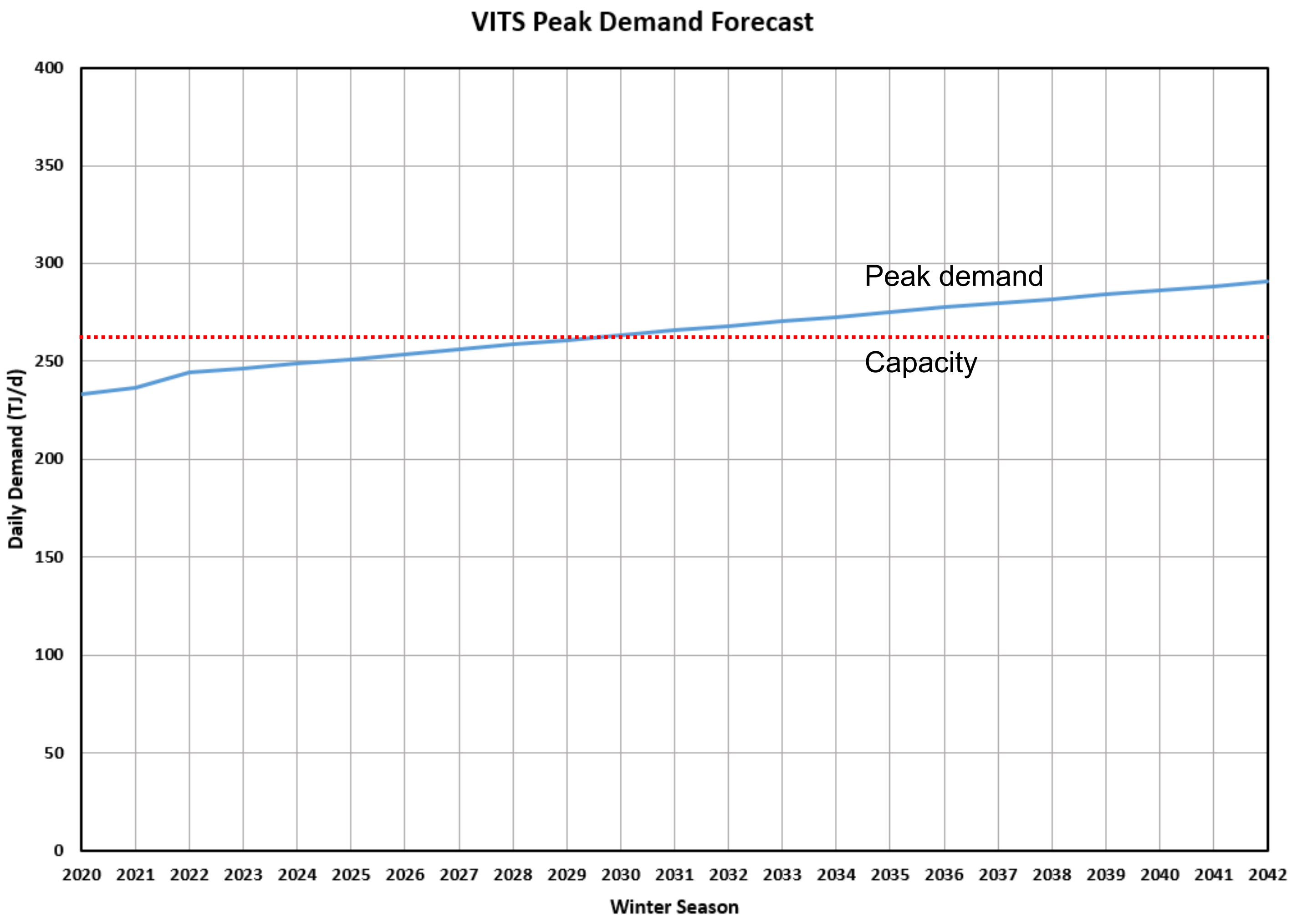
VI Capacity Traditional Peak Forecast



VI Capacity Traditional Peak Forecast



VI Infrastructure to meet Traditional Peak Forecasts

System Expansion Alternatives:

Option 1 – Additional Compression

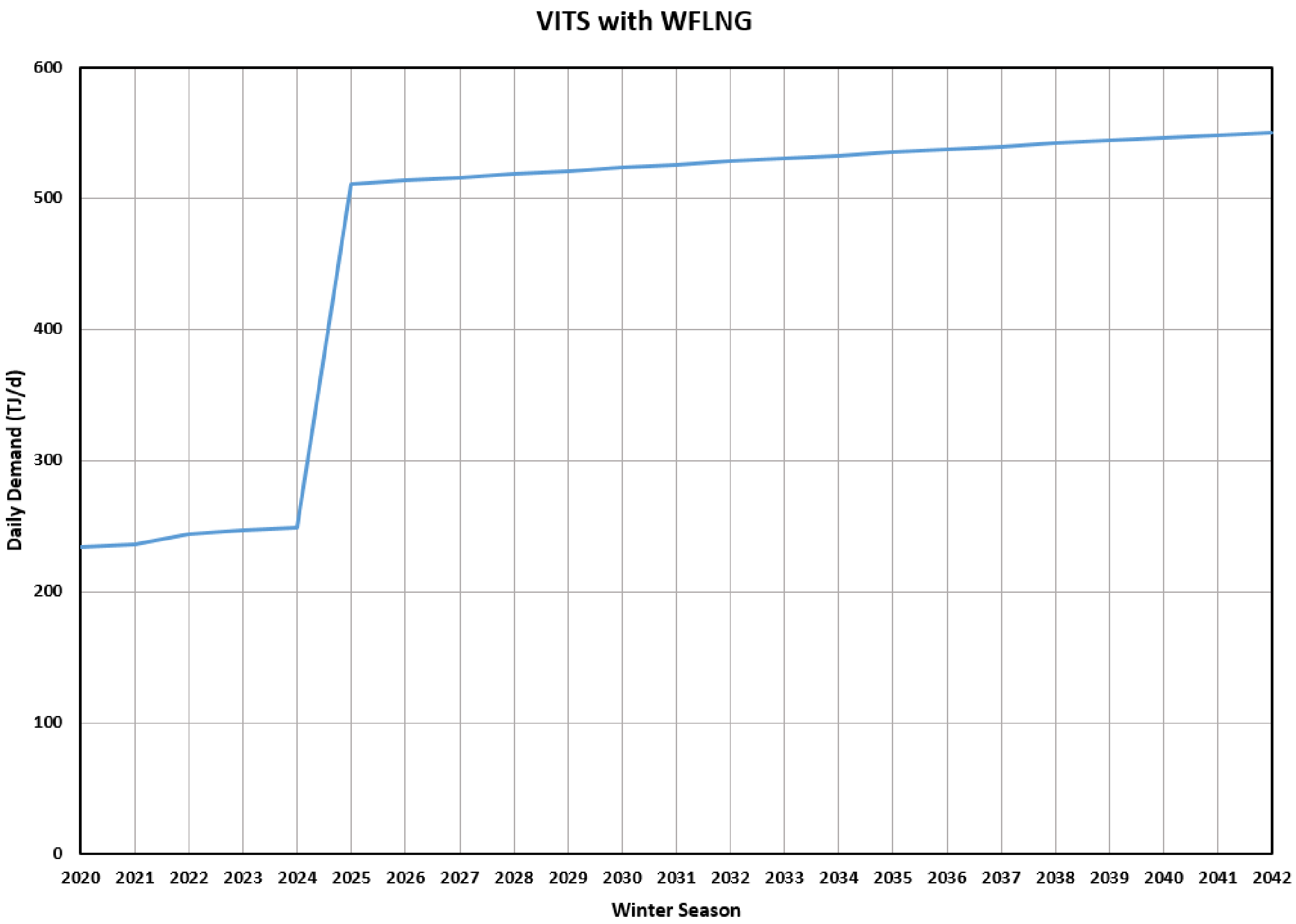
- Construct a new Compressor facility (V2) in the Squamish area beyond 2030 depending on the presence of BC Hydro Island Generation

Option 2 - Additional LNG storage

Key Input – BC Hydro Island Generation peak supply (50 TJ)

- Agreement expires in 2022 - eight years before the expected capacity constraint
- The final form of this agreement could defer the capacity constraint to later in or beyond the 20 year planning horizon

VI Capacity Traditional Peak Forecast with WLNG



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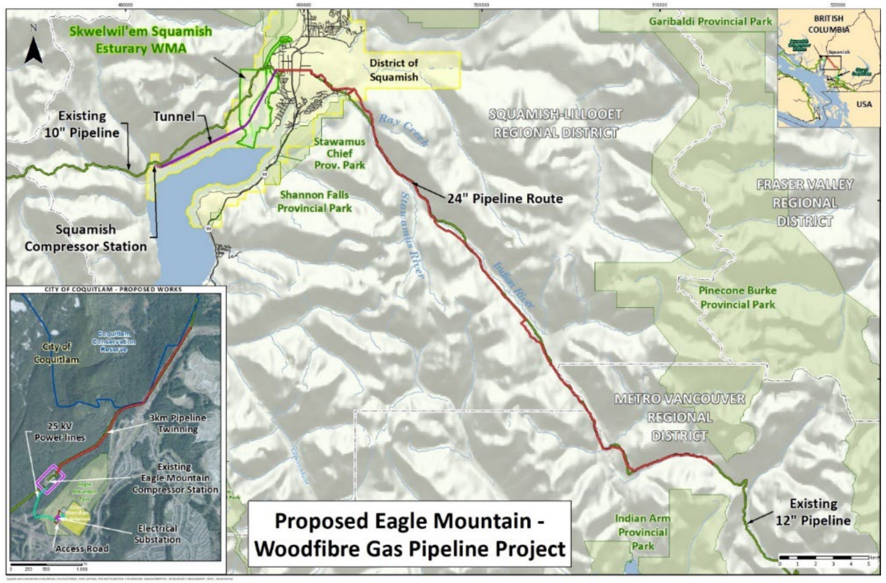
Infrastructure for LNG Expansion

Eagle Mountain – Woodfibre Gas Pipeline (EGP) Project

- Approximately 47 km of NPS 24 pipe from KP0 at the exit of the Coquitlam watershed to proposed Woodfibre LNG site southwest of Squamish, generally paralleling the existing NPS 10
- 9 km tunnel from east side of Squamish Estuary to WFLNG site
- 3 km loop of existing NPS 12 at exit of Coquitlam compressor station
- Compression facilities at existing V1 (Coquitlam) and proposed V2 (WLNG site) stations
- 260 TJ/d (237 MMscfd) firm contract demand



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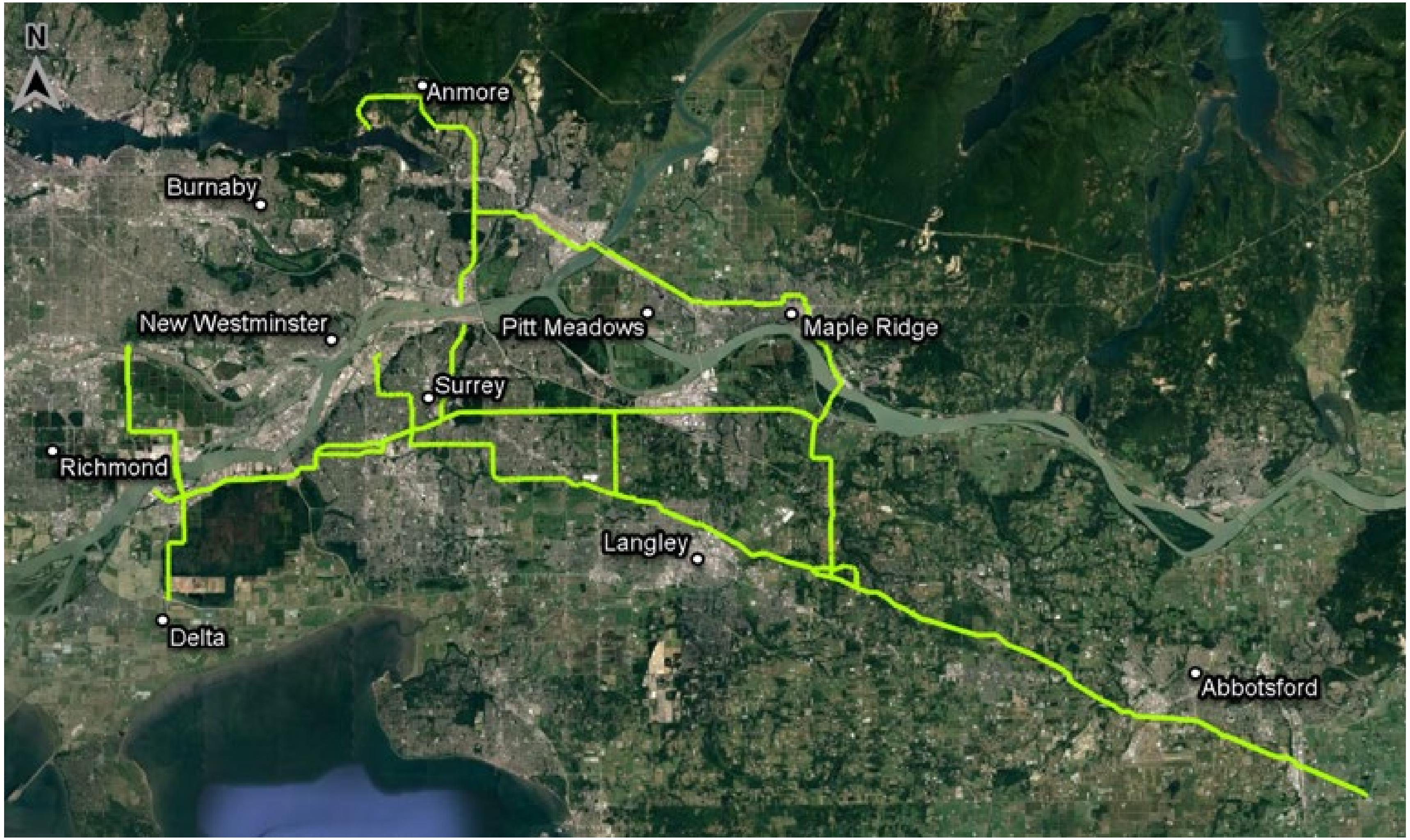
Coastal Transmission System



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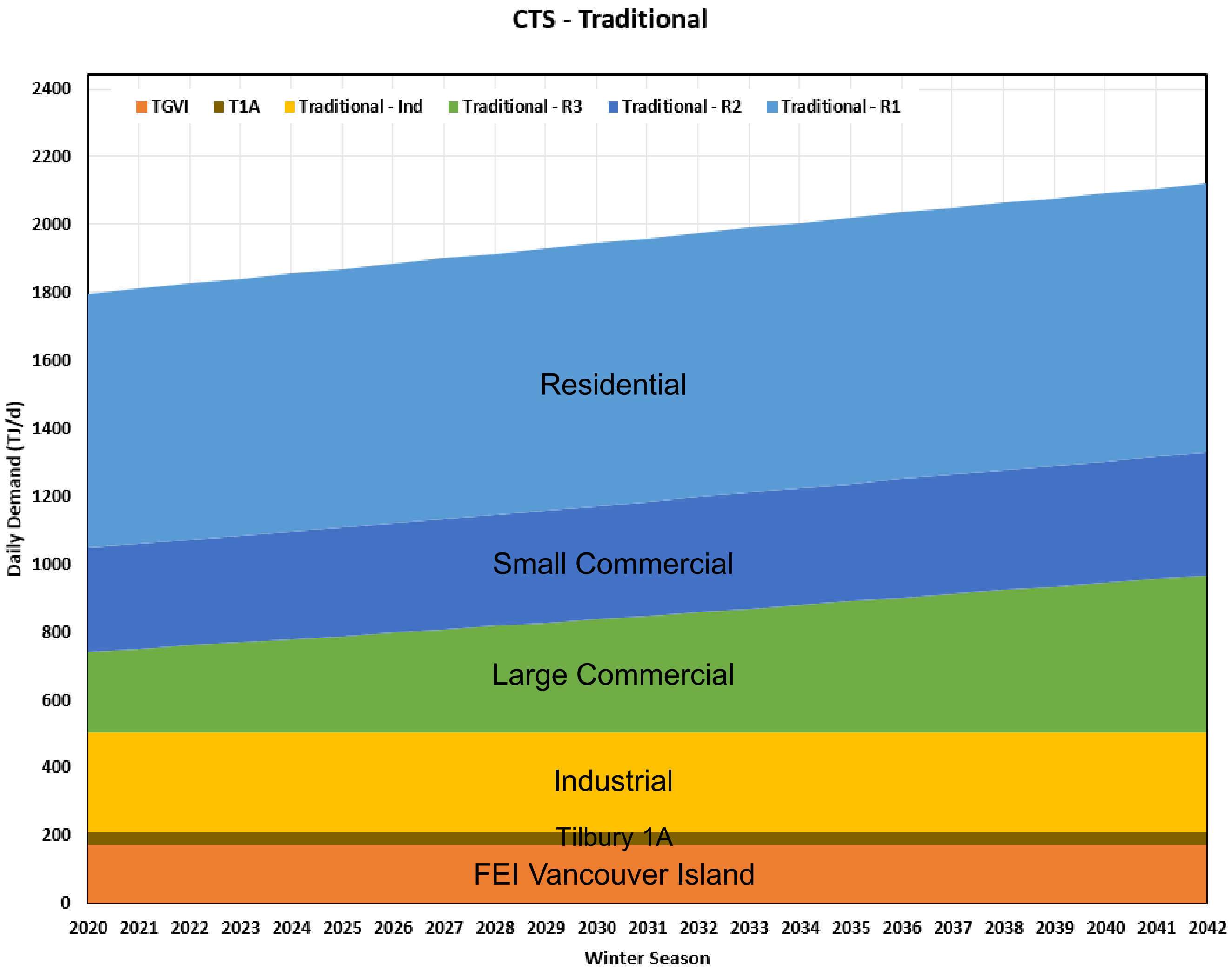
CTS Capacity Traditional Peak Forecast



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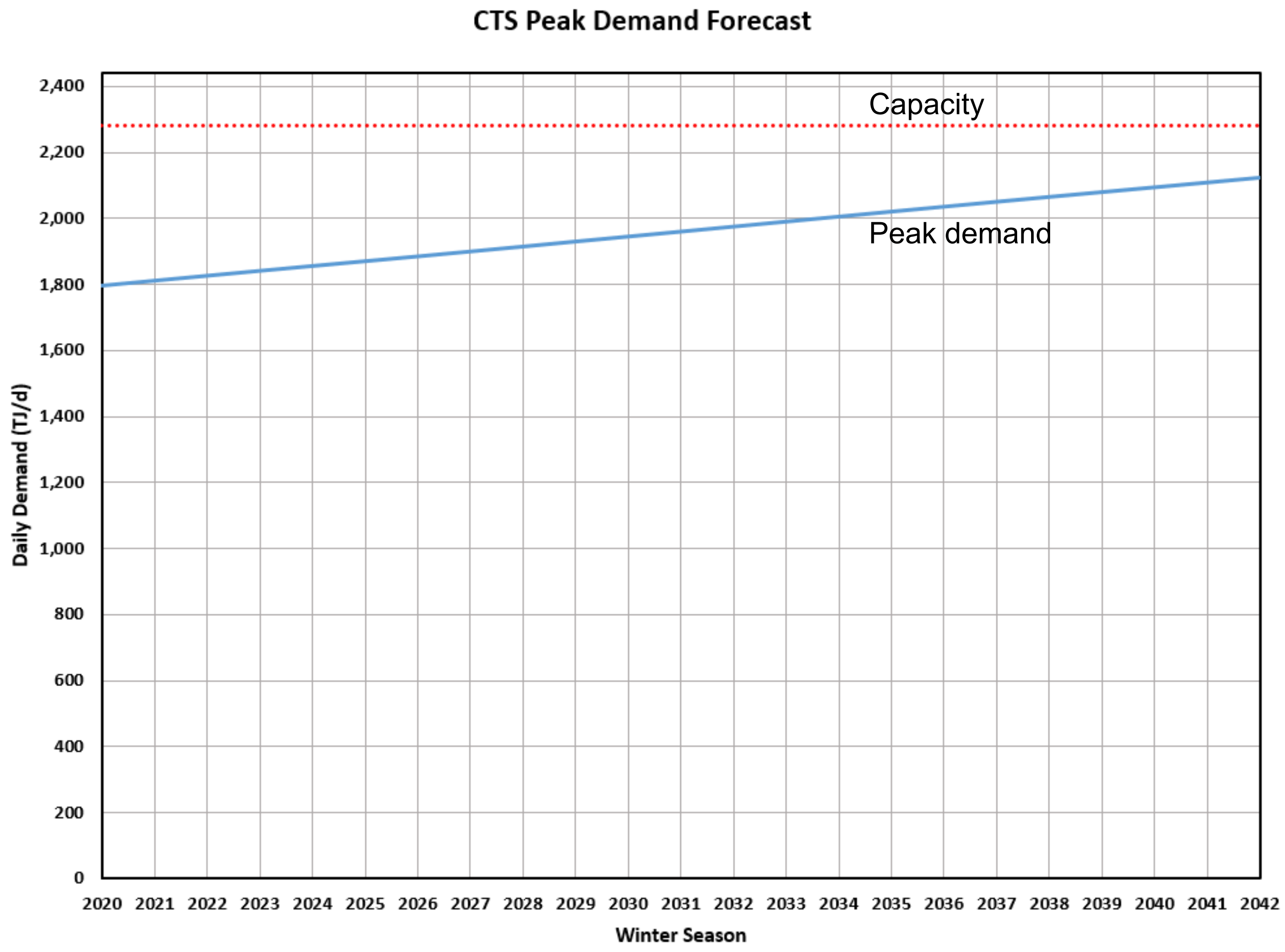
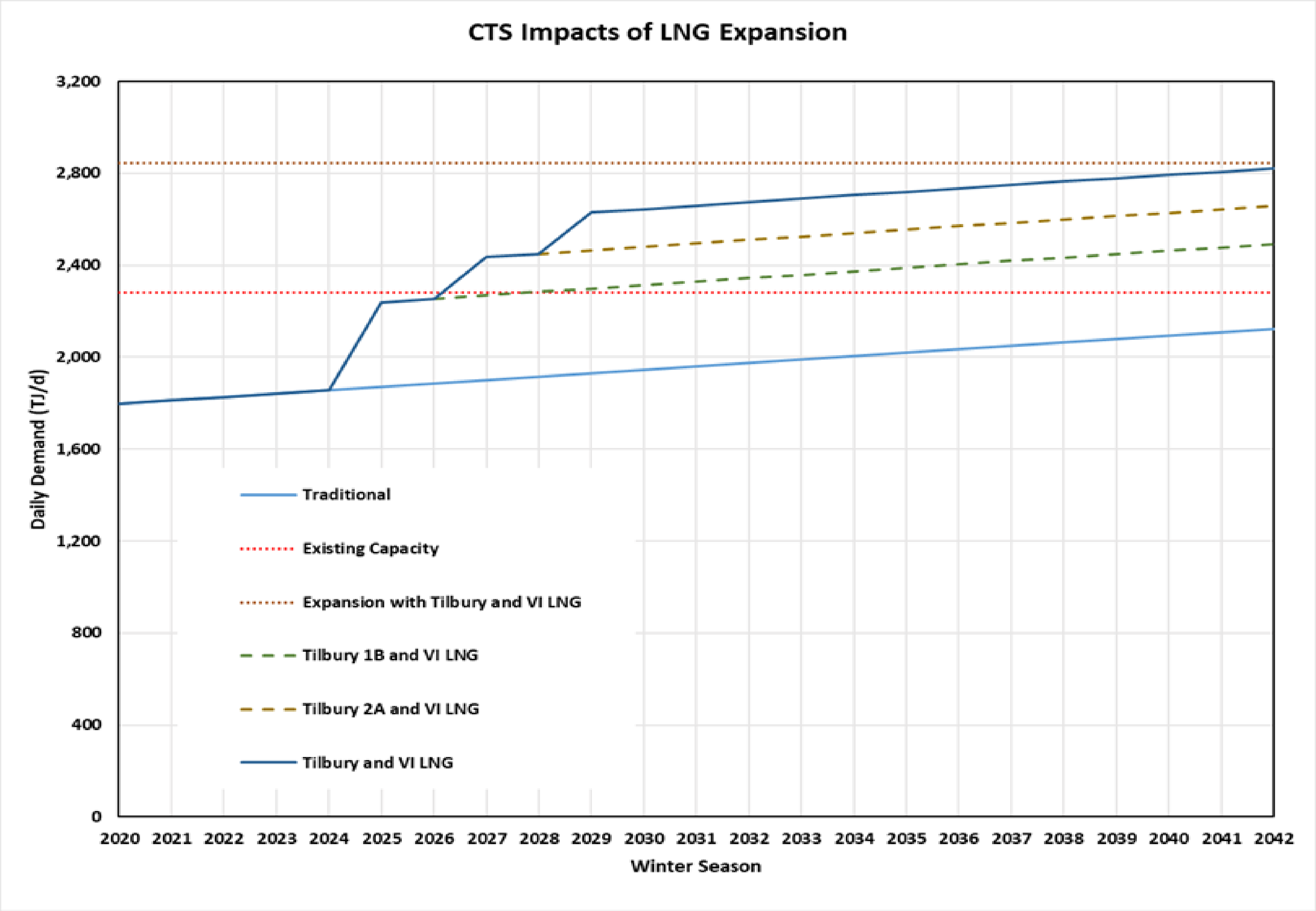
CTS Capacity Traditional Peak Forecast



CTS Traditional Peak Forecast with LNG Impacts
Illustrative examples of LNG expansion



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Infrastructure for LNG Expansion

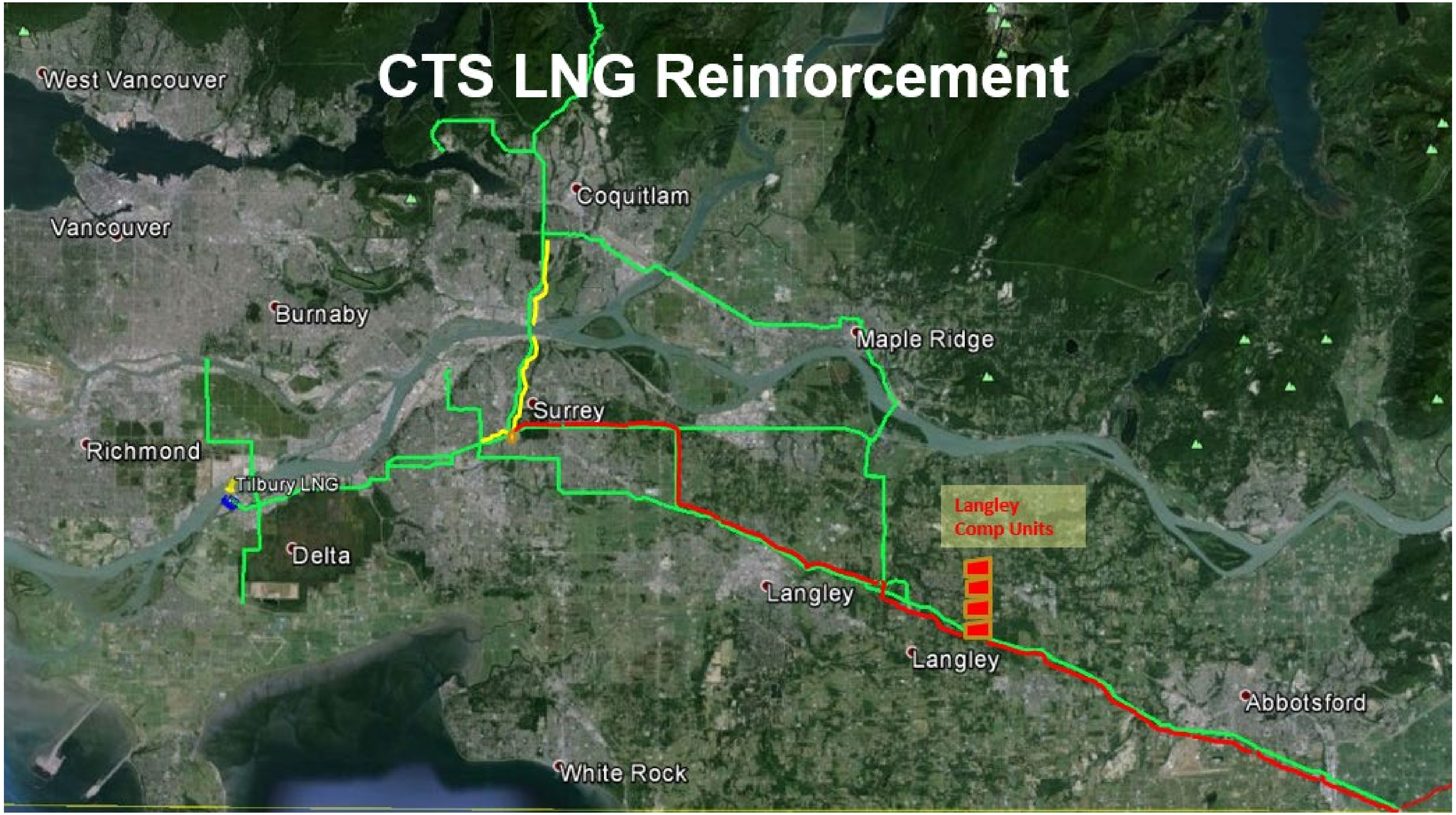
Illustrative examples of LNG expansion

Tilbury

- Supporting additional LNG growth will require some capacity expansion of the CTS system.

CTS Upgrades	LNG Expansion	Timeframe
2 km NPS30 from Tilbury Plant and 30,000 HP Added or 35 km NPS 42 Pipeline Loop	Up to 99 MMscfd additional Liquefaction at Tilbury Plant Up to 237 MMscfd at WLNG	2025 or later
10,000 HP Added or 13 km Pipeline Loop	Up to 250 MMscfd additional Liquefaction at Tilbury Plant Up to 237 MMscfd at WLNG	2027 or later
10,000 HP Added or 6 km Pipeline Loop	Up to 400 MMscfd additional Liquefaction at Tilbury Plant Up to 237 MMscfd at WLNG	2029 or later

CTS LNG Reinforcement



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Interior Transmission System

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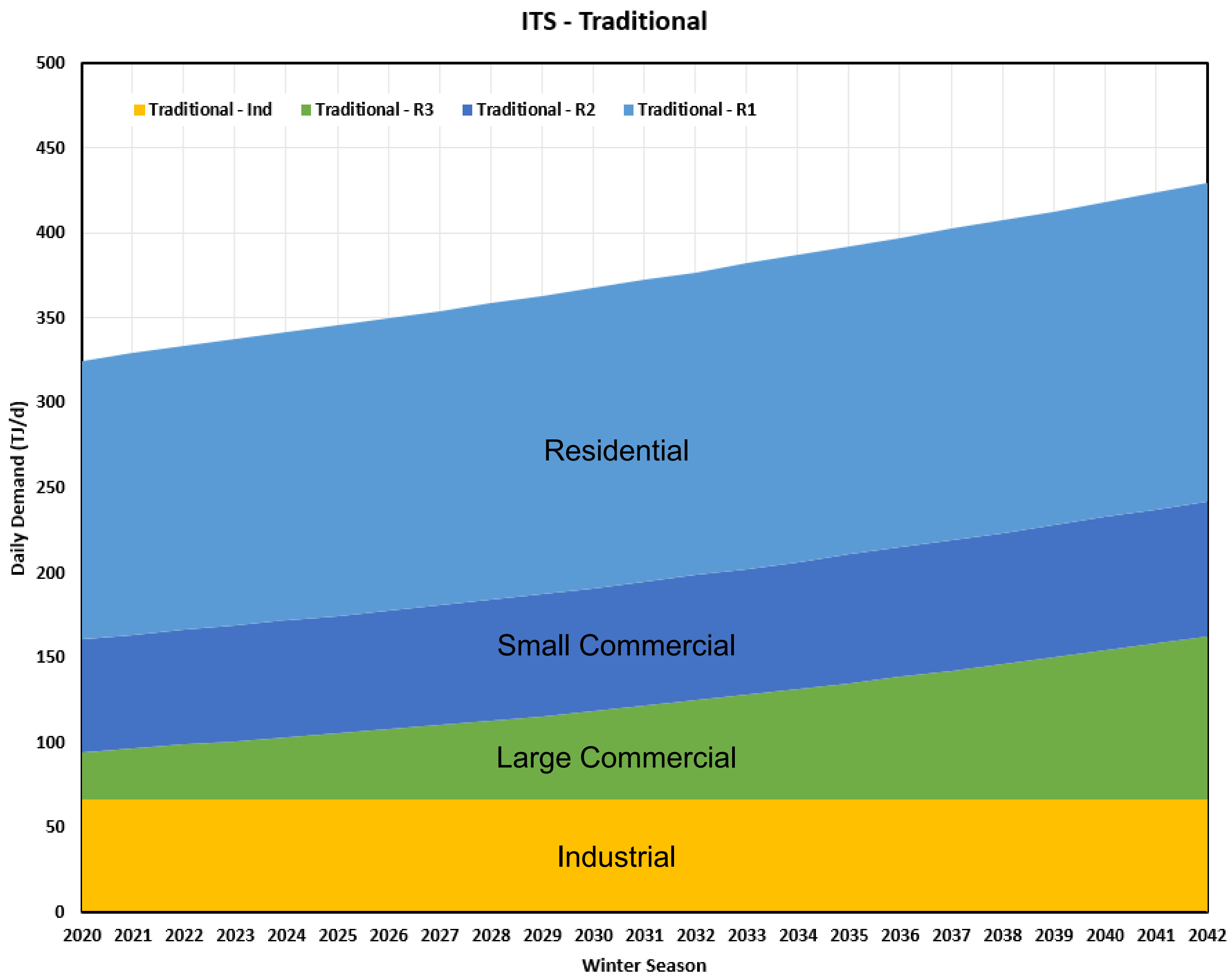
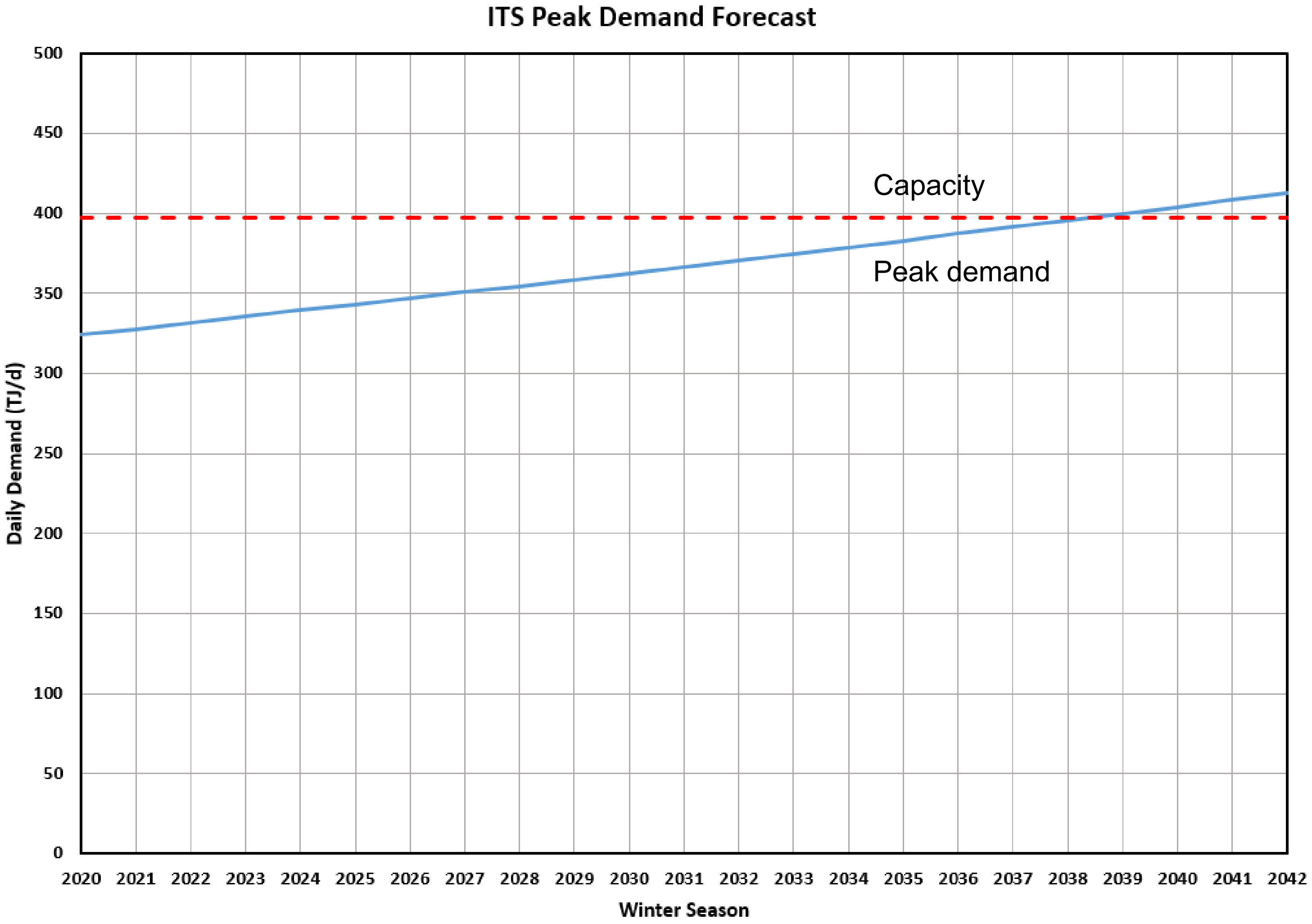
ITS Capacity Constraint Traditional Peak Forecast



ITS Capacity Constraint Traditional Peak Forecast



ITS Infrastructure to meet Traditional Peak Forecast

System Expansion Alternatives:

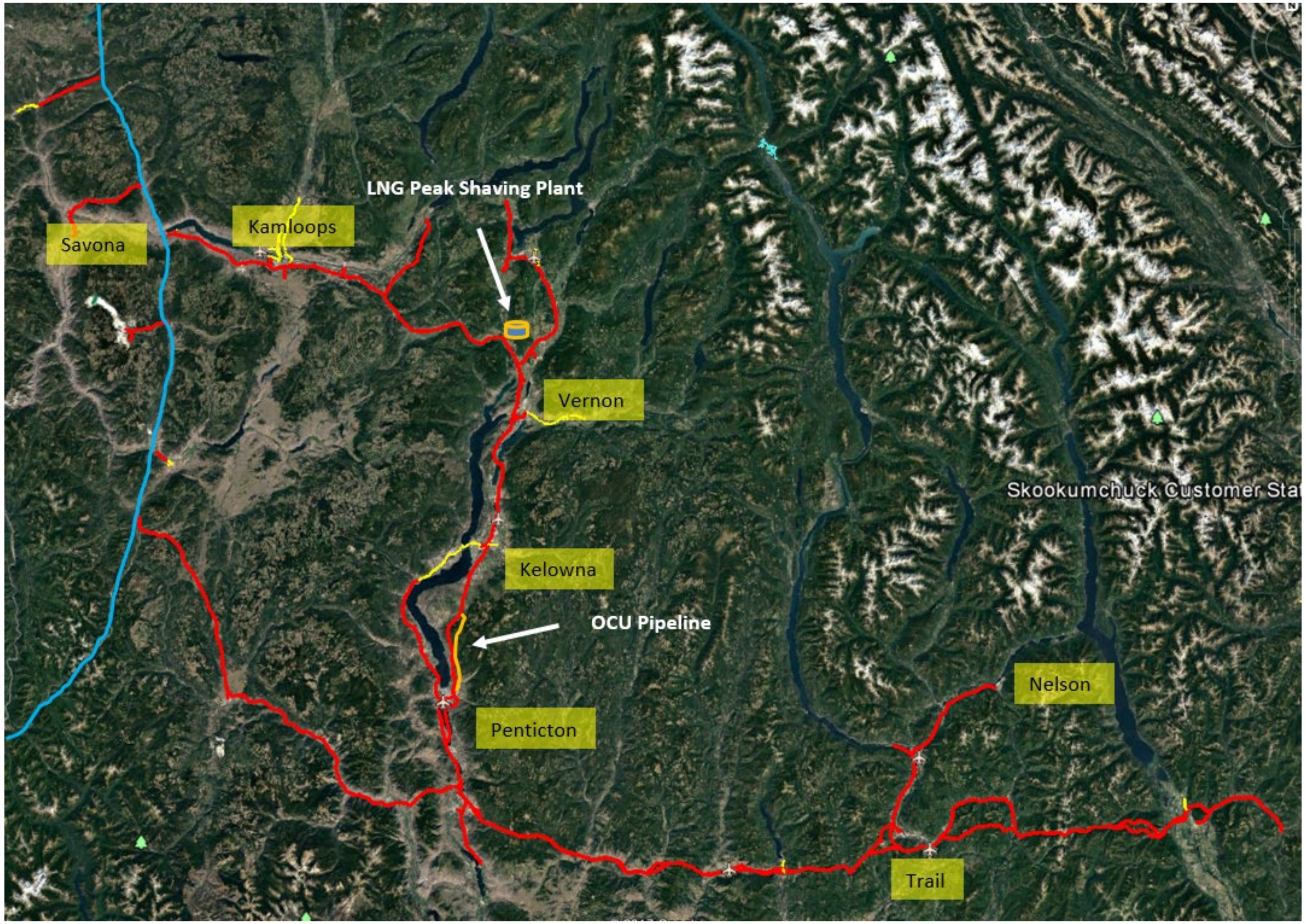
Option 1 – Okanagan Reinforcement - South Loop

- Loop approximately 28 Km of existing NPS12 pipeline with NPS20 pipeline
- Added 1000 HP at Savona Compressor

Option 2 – LNG Peak Shaving Facility

- Approximately 100-150 MMscfd LNG peak Shaving
- Optimum location is near ITS no flow point near Vernon

Okanagan Reinforcement



Questions and Discussion

Break

Gas Supply

Natural Gas Market Forecast and Portfolio Planning

Market Overview

- Short-Term Drivers
- Long-Term Outlook

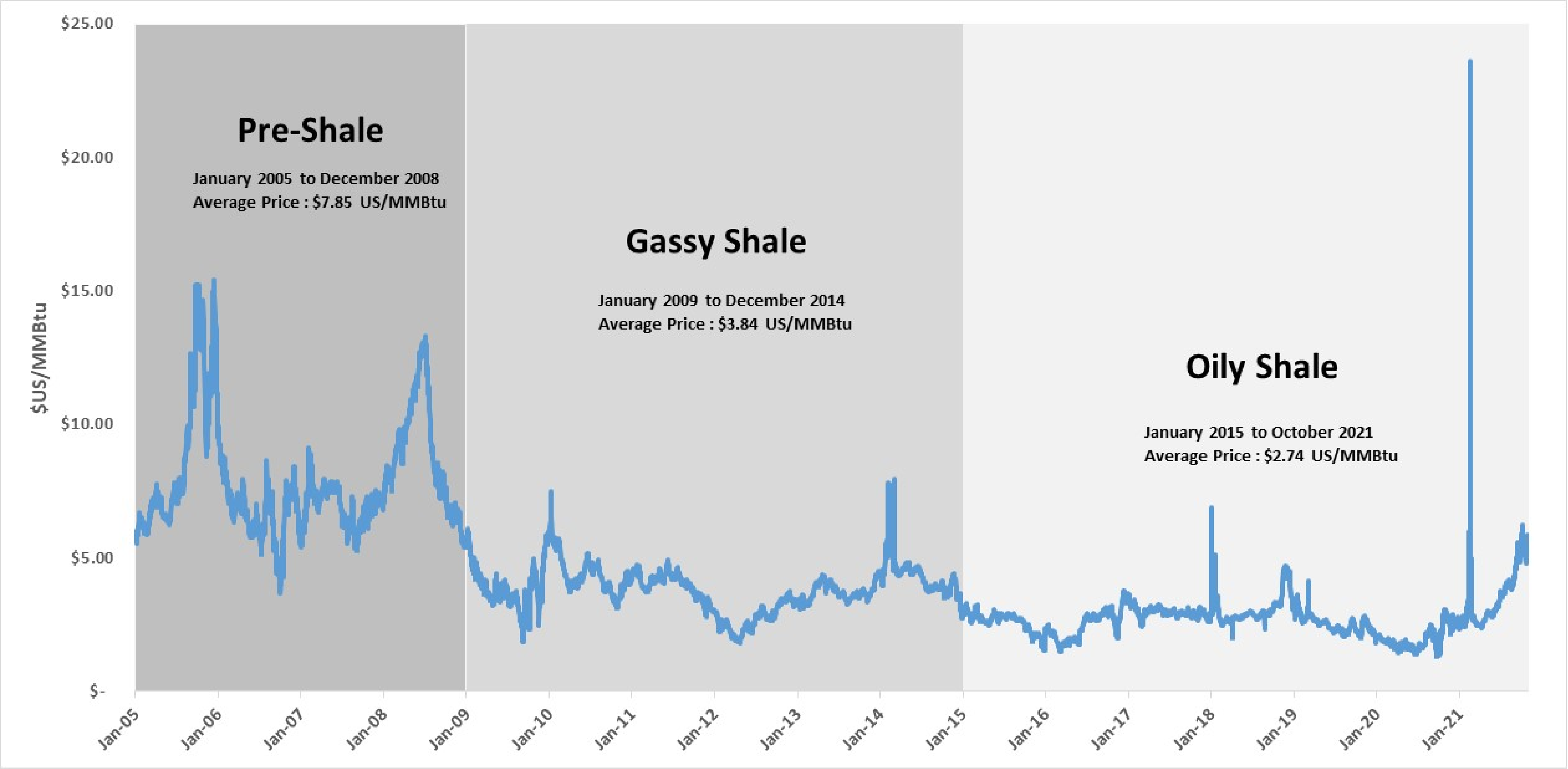
Energy Supply Portfolio

- Portfolio Risks and Management
- Resiliency Considerations
- Incorporating Renewable Natural Gas Supply
- Future Outlook of Portfolio

2022 vs 2017 Gas Supply and Demand

Market Factor	2022 vs 2017	Bcf / day	Impact on Prices
Gas Production	↑	+ 20 Bcf	↓
Residential Demand	→	+ 0.7 Bcf	→
Commercial Demand	→	+ 0.3 Bcf	→
Industrial Demand	↑	+ 2 Bcf	↑
Power Demand	↑	+ 4 Bcf	↑
US LNG Exports	↑	+ 10 Bcf	↑
Gas Prices			↑

Recent Henry Hub prices



Key Factors driving commodity natural gas prices today

- Natural gas production flat in 2021 (92 Bcf/d). Demand outpacing production growth
- Diminished demand elasticity from the electric power sector (between coal and natural gas generation)
- US LNG export capacity at full utilization fuels strong demand
- Over the next few years, associated gas production growth returns as capital discipline eases and crude oil production rises (production to ~100 Bcf/d)

Short-Term – US Demand and Exports

- US demand up 8 Bcf/d in 2024 vs 2020, largely due to exports
- LNG exports up 6 Bcf/d in 2024 vs 2020
- Slightly higher residential, commercial, and industrial demand, slightly lower power sector demand by 2024

Short-Term – Canadian Natural Gas Production

- Steadier production than US, most of production growth within Montney basin
- Canadian gas production increasing through 2024, up 2 Bcf/d compared to 2020
- Montney basin one of the lowest cost gas plays in North America

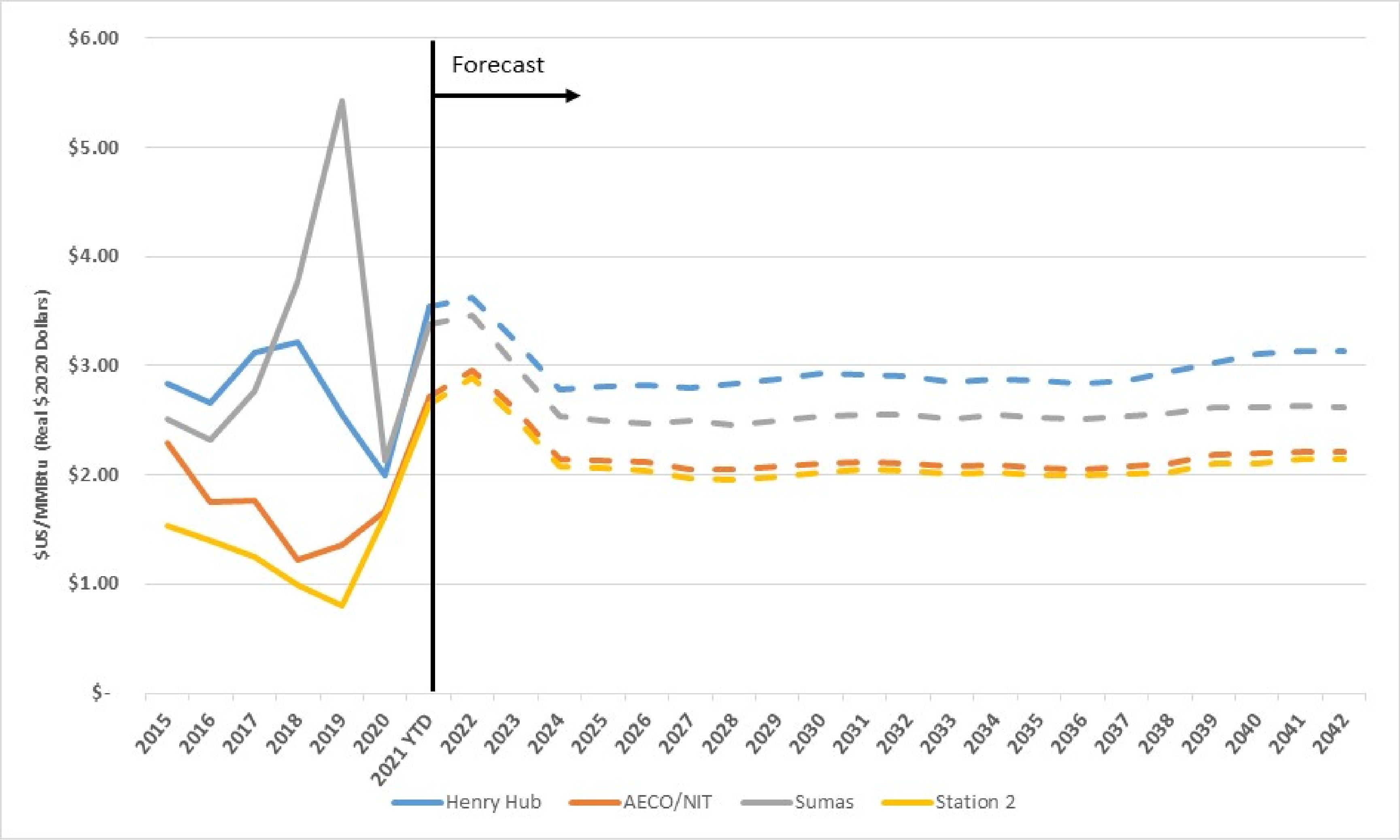
Long-Term Themes

- Demand growth through 2030, mainly due to LNG exports
- Higher associated gas production, forecast Henry Hub below $3.00 (in real $2020) through 2038
- Increased total wind and solar renewable generation for the power sector after 2030, but still need for firm resource requirements

Long-Term – Demand Outlook

- Production (supply) expected to increase as needed to meet demand
- US demand about 95 Bcf/d in 2020, peaking around 111 Bcf/d in 2030, slowly declining afterwards through 2050
- Demand growth primarily due to LNG, power sector main cause for decline after 2030
- Production growth in Canada contingent on LNG exports after 2025, power sector main cause for decline after 2030 as well

Long-Term – Annual Price Outlook



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Recap of Short to Long-Term Market Conditions

- Short-term pain, long-term growth, levelling off after 2030
- $5.00 - $6.00 US/MMBtu Henry Hub winter 21/22, $4.00 2022, then below $3.00 (in real $2020) through 2038
- Continued production growth through associated gas, Haynesville, and Montney basins
- Increased demand through LNG exports, offsetting reduced demand from power sector (occurring after 2030)

Regional Market Factors

01 Regional Constraints

02 Sumas Market Disconnection

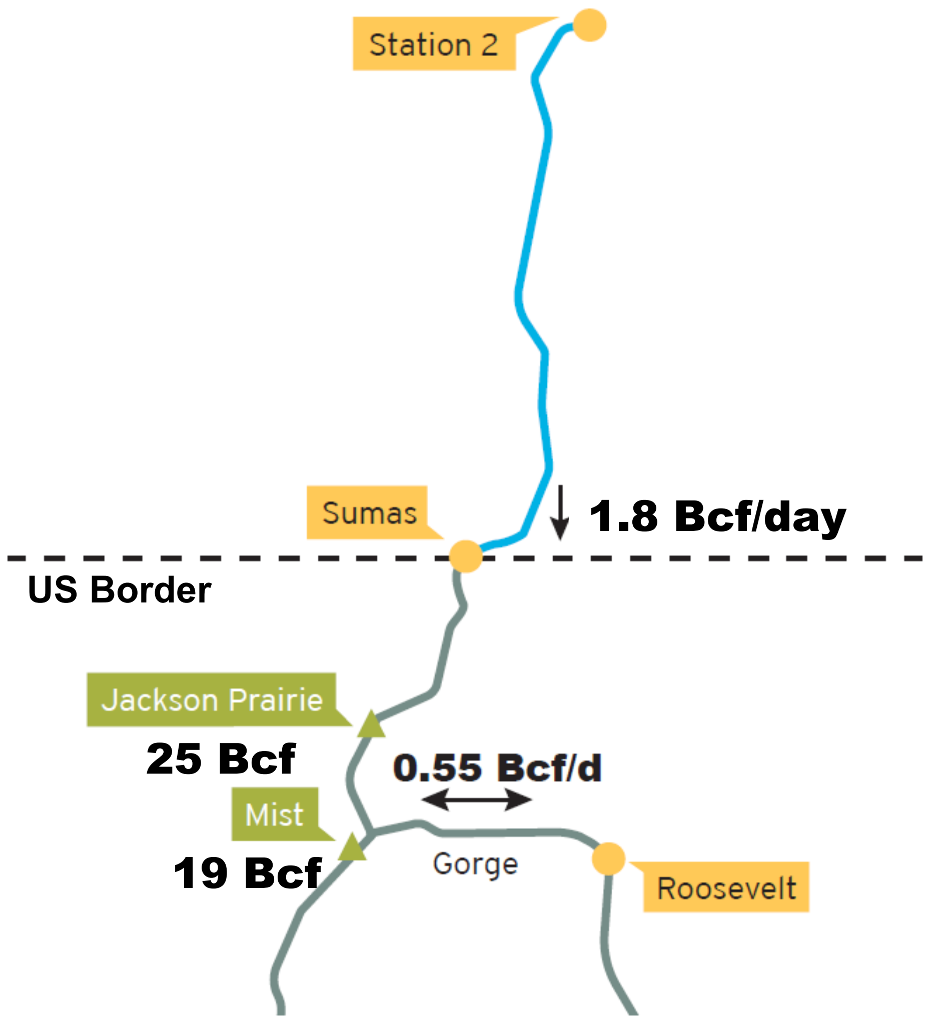
Short to Long Term Strategies

03 Mitigating Market Risks

04 Portfolio Approach to Resiliency

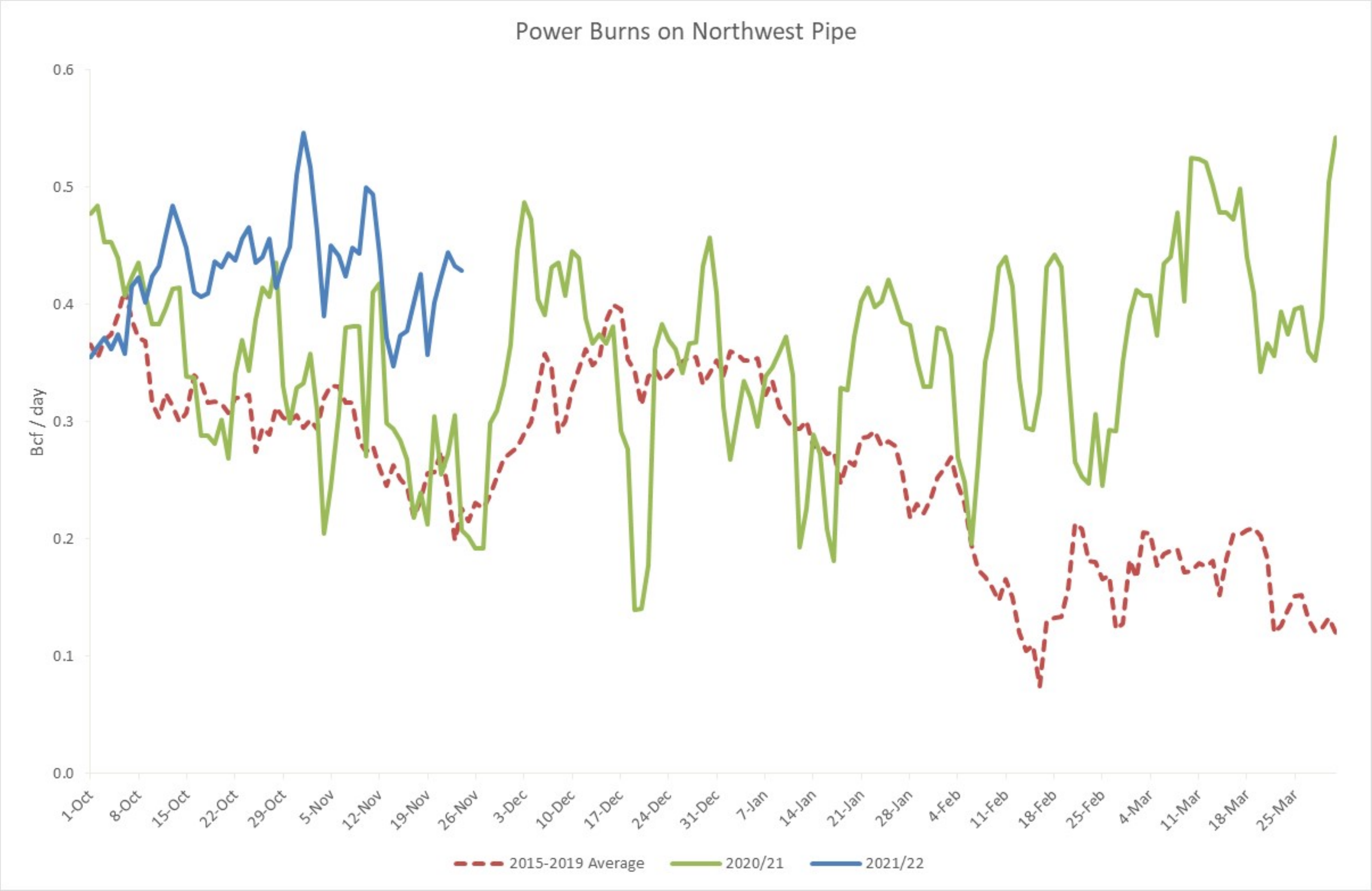
05 Portfolio Approach to Load Scenarios

Regional Challenges – Seasonal Constraint



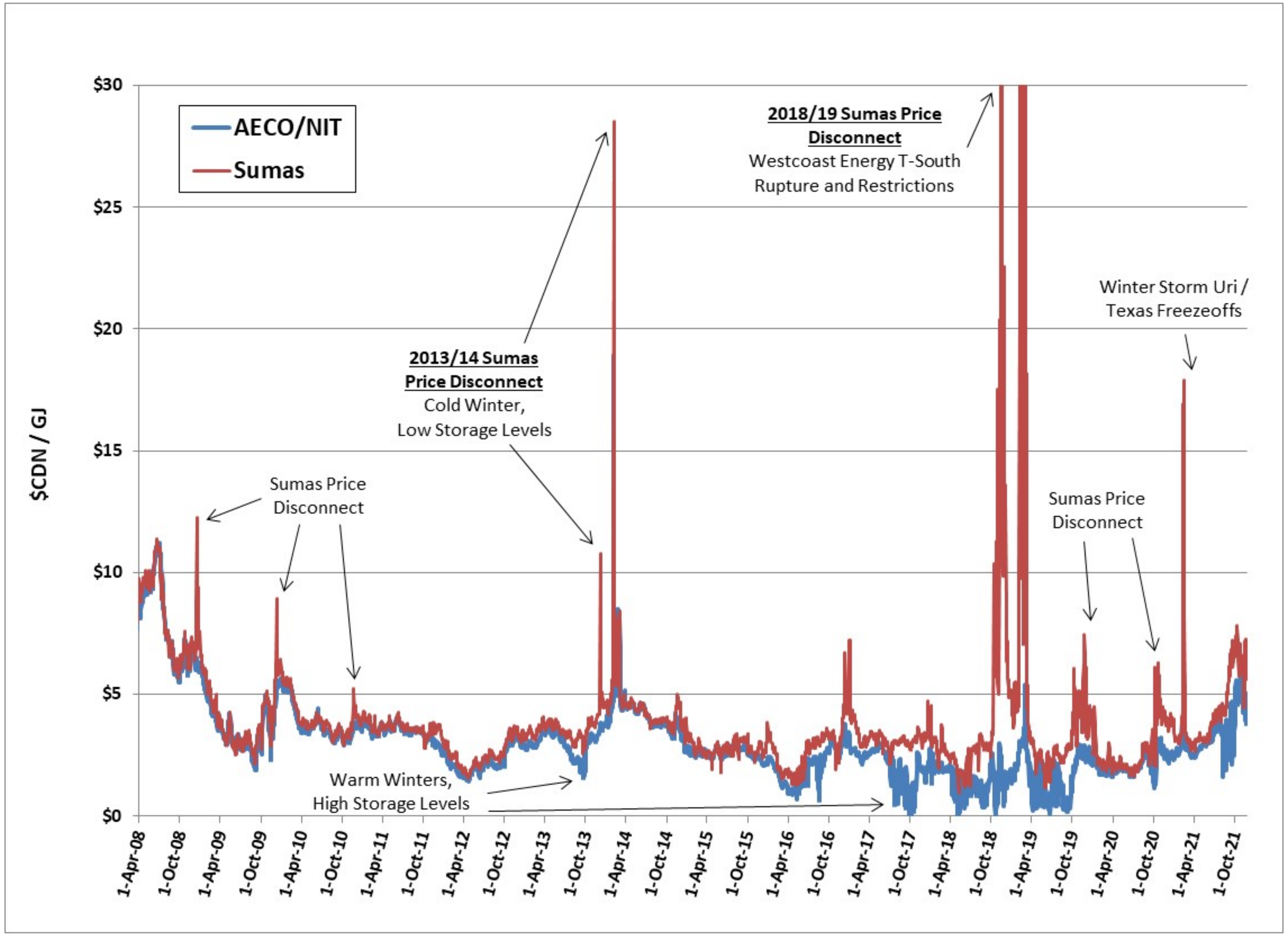
- Limited Resources in the PNW
- Baseload supply requirements for I-5 Corridor (Lower Mainland, Seattle, Portland)
- Short-term assets in the region (JPS & Mist storage, gas-fired power generators)
- Coincidental winter demand on gas and power systems served by natural gas infrastructure

Gas-Fired Power Generation

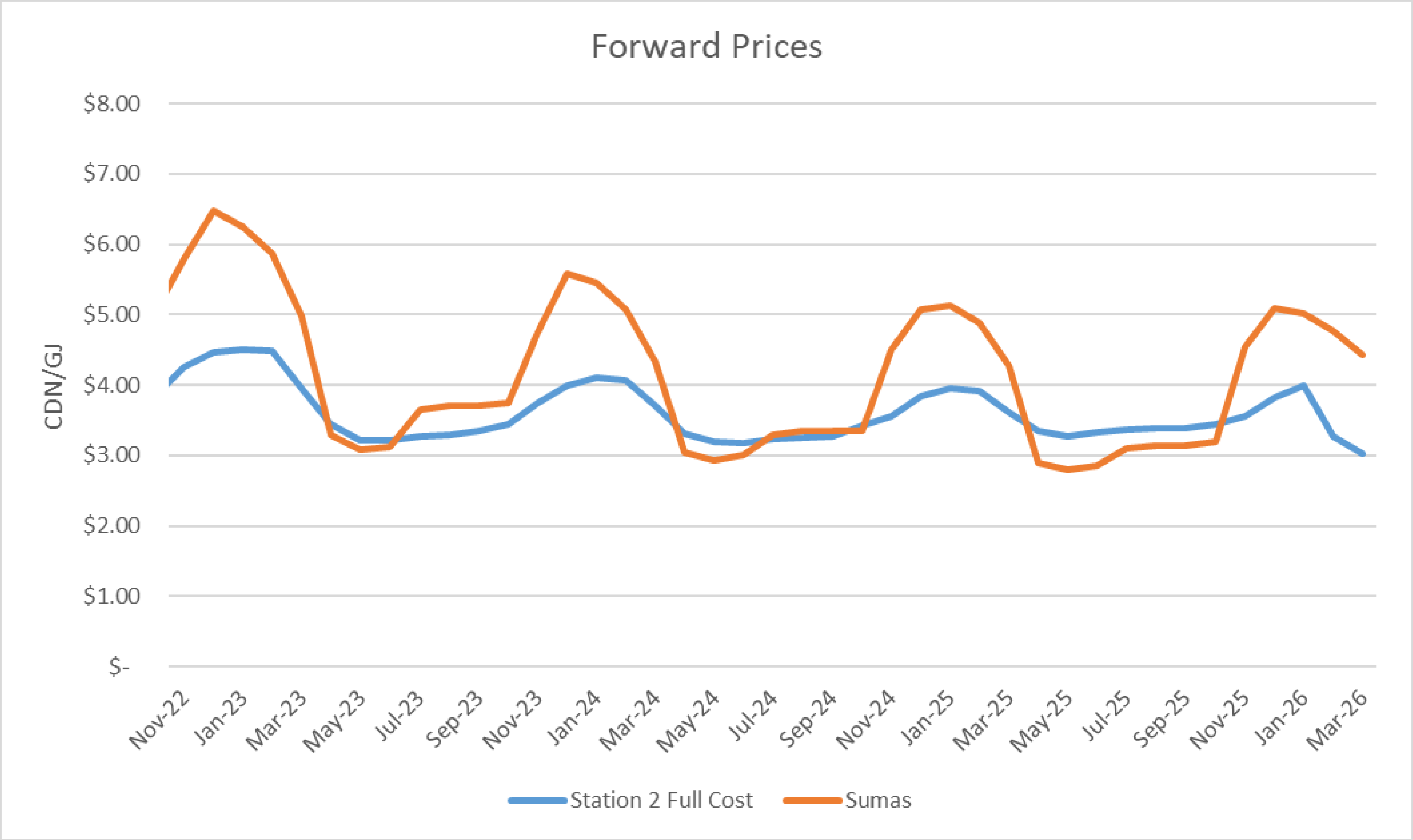


Gas Winter (Nov-Feb)	Bcf / day
15/16	0.28
16/17	0.20
17/18	0.26
18/19	0.24
19/20	0.39
20/21	0.35
Nov 21 MTD	0.43

Huntington/Sumas Market Disconnection



Sumas Forward Market



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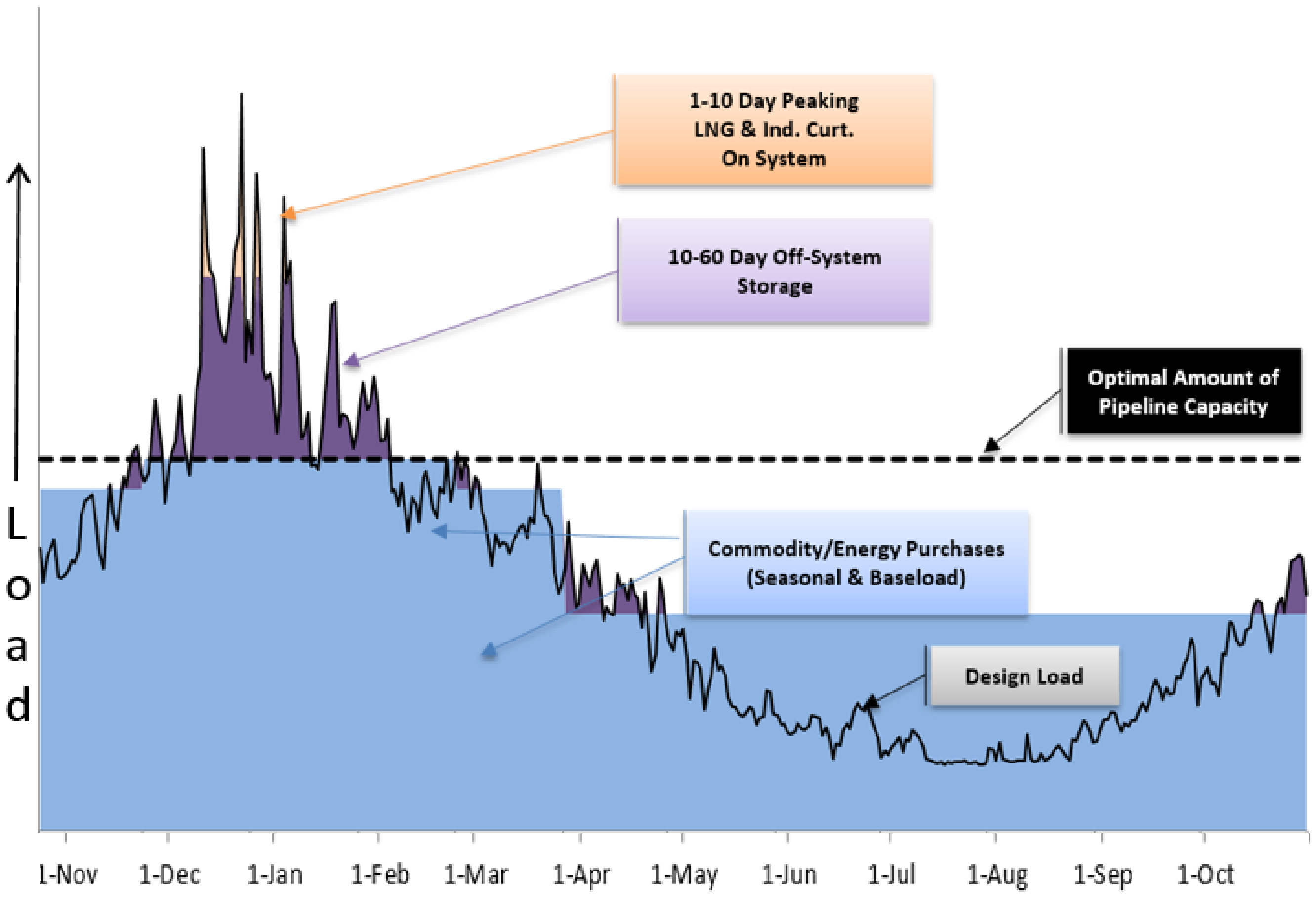
Regional Market Implications in PNW and Western Canada

- Greater price volatility, increased demand with less increased infrastructure

- Increased reliance (both peaking and baseload) on natural-gas fired power generation (with Sumas input) in PNW

- Contract at Supply hubs (Station 2 and AECO) instead of Market/Demand hubs (Sumas)

Energy Supply Portfolio Planning



Portfolio Approach to Regional Market Risks:

- Load Requirements met with firm resources;
- Purchase supply at Station 2 and AECO/NIT;

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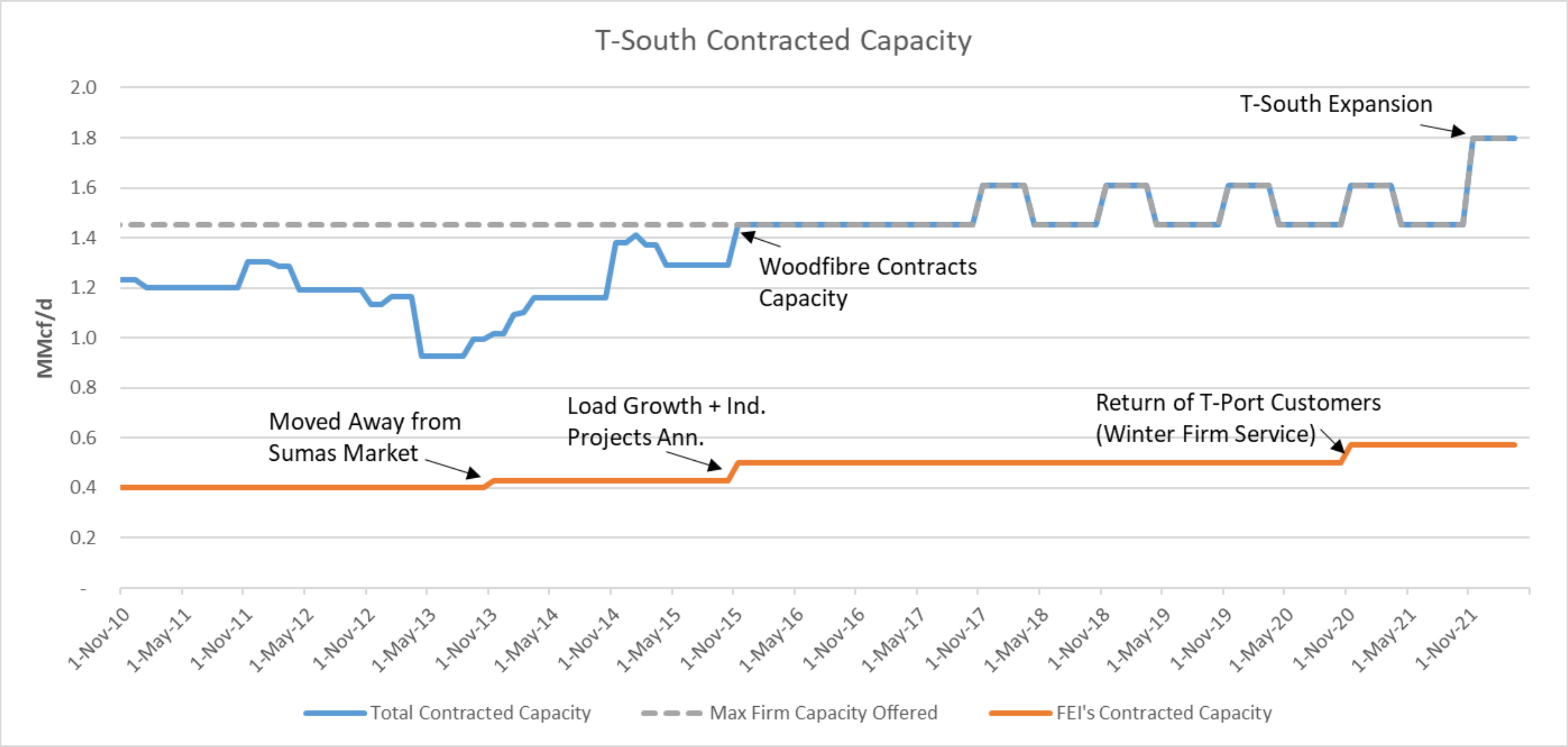
Contracting Firm Resources vs Alternative Solution

- FEI's portfolio approach to physical and financial risk differs from other regional shippers
  - This is reflected in contracted capacity on T-South



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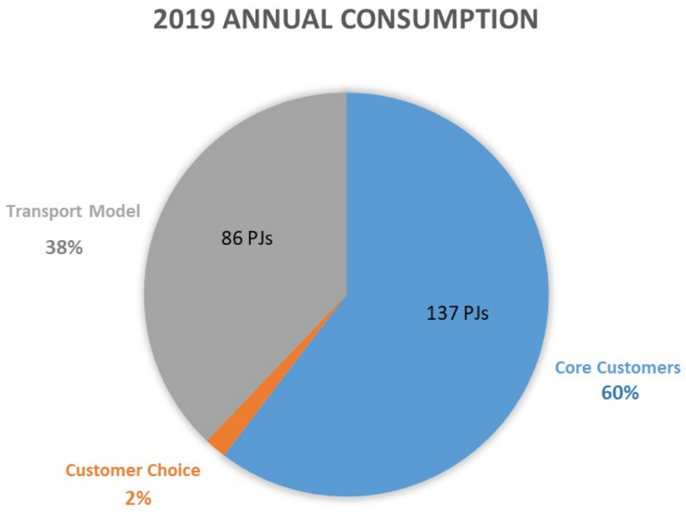
FortisBC (Bundled Service) or Transportation Gas Marketer

Buying from FortisBC:

- No fixed rates; Cost of Gas can change quarterly
- Regulated by British Columbia Utilities Commission (BCUC);
  - Regulations Prevents FortisBC from offering fixed-term/fixed rates.

Buying from a Gas Marketer:

- Contracts are Negotiated;
- Not Regulated by British Columbia Utilities Commission (BCUC);
  - Marketers are free to offer different prices and terms to customers.
- Can charge fixed or variable rates, or both;



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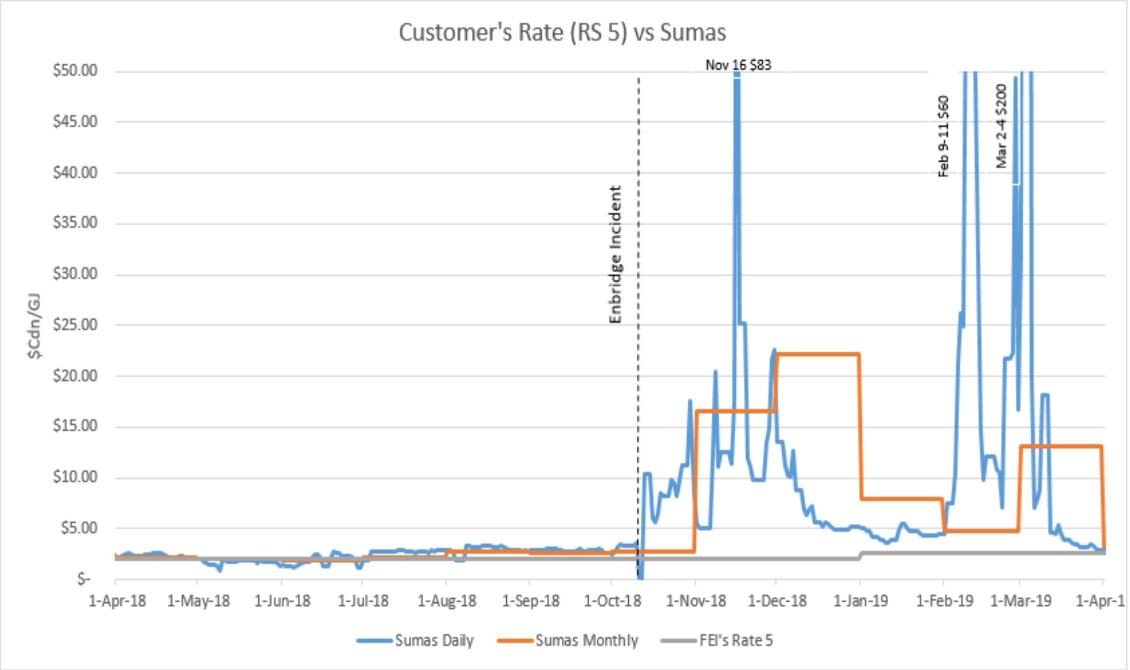
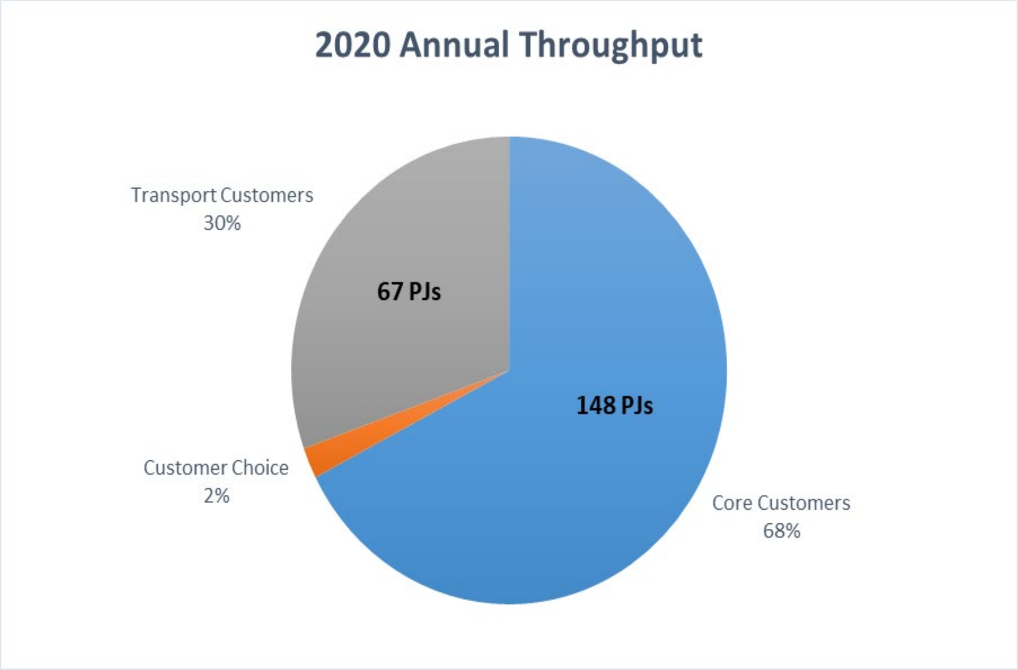
Customer Movement Between Bundled Service and Transport Model





- After the 2018/19 winter, 40% of the Transportation Customers in the Lower Mainland returned to Bundled Service
- Winter Load Forecast Increased by ~10%

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Gas Supply Planning – Resiliency Considerations

Diverse Pipelines and Supply

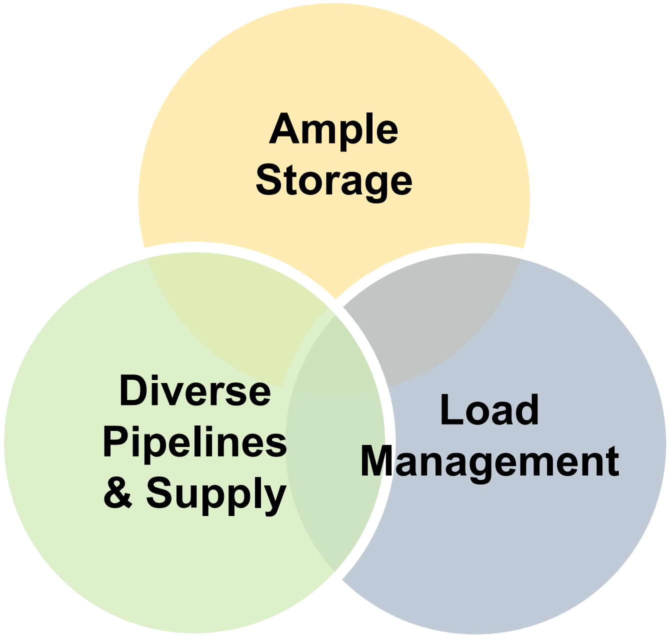
- Access to multiple regional pipelines for continuous supply

Ample Storage

- Preferably on-system storage to manage expected and unexpected changes in supply for a period of time

Load Management

- Ability to manage load during a period of supply constraint allows an operator to shed load in a controlled shutdown, maintaining supply for maximum number of customers



Resiliency in Regional and FEI's Context

Winter (151 day) Pipeline Supply (Bcf)	
T-South to Huntingdon	272
Gorge	81
Total	**353**

Storage Assets	
Jackson Prairie (Washington)	25
Mist (Oregon)	19
On-System Storage (Tilbury & Mt Hayes)	2
Total	**46**

T-South Pipeline Incident (Oct 2018 – Nov 2019)

Phase One

No Flow Event (First 48 hours immediately following the rupture of the 36-inch pipeline)

Phase Two

Refers to 24-day period following first phase where gas supply was severely constrained (~50%)

Phase Three

Refers to 56 week period following second phase where pipeline was restricted to approx. 85% (NEB Order)

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Short Term Considerations

- FEI has mitigated a portion of the risk if a future pipeline incident occurs **(phase three of T-South incident)**
  - Secured the only opportunity in the marketplace to diversify its portfolio by taking back NW Natural's portion of Southern Crossing Pipeline capacity effective Nov 1, 2020.
  - Holding contingency resources (15% planning margin) to mitigate future risk of supply disruptions.
- Additional resources in the region required to increase gas supply resiliency

Future Projects to Enhance System Resiliency

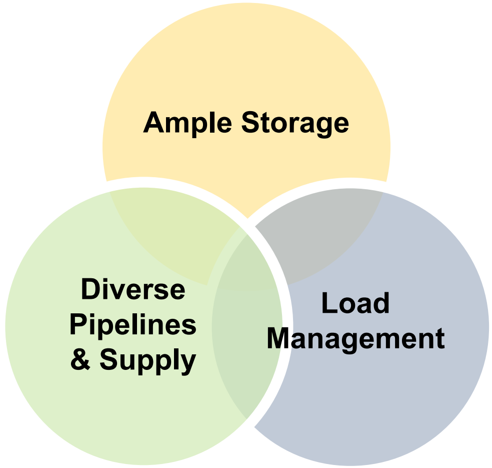
Incident shows multiple solutions are required to improve resiliency:

Phase 1 – "No Flow Event" - FEI requires additional on-system physical resource

1. Filed CPCN Application for a Tilbury Expansion (3 Bcf; 800 MMcf/day of vaporization)
2. Filed CPCN Application for Advanced Metering Infrastructure

Phase 2 – "Pipeline Capacity Restrictions" - FEI requires additional pipeline infrastructure to manage the duration of the supply disruption.

3. Regional Gas Supply Diversity Solution – FEI's Southern Crossing Pipeline Extension to the Lower Mainland



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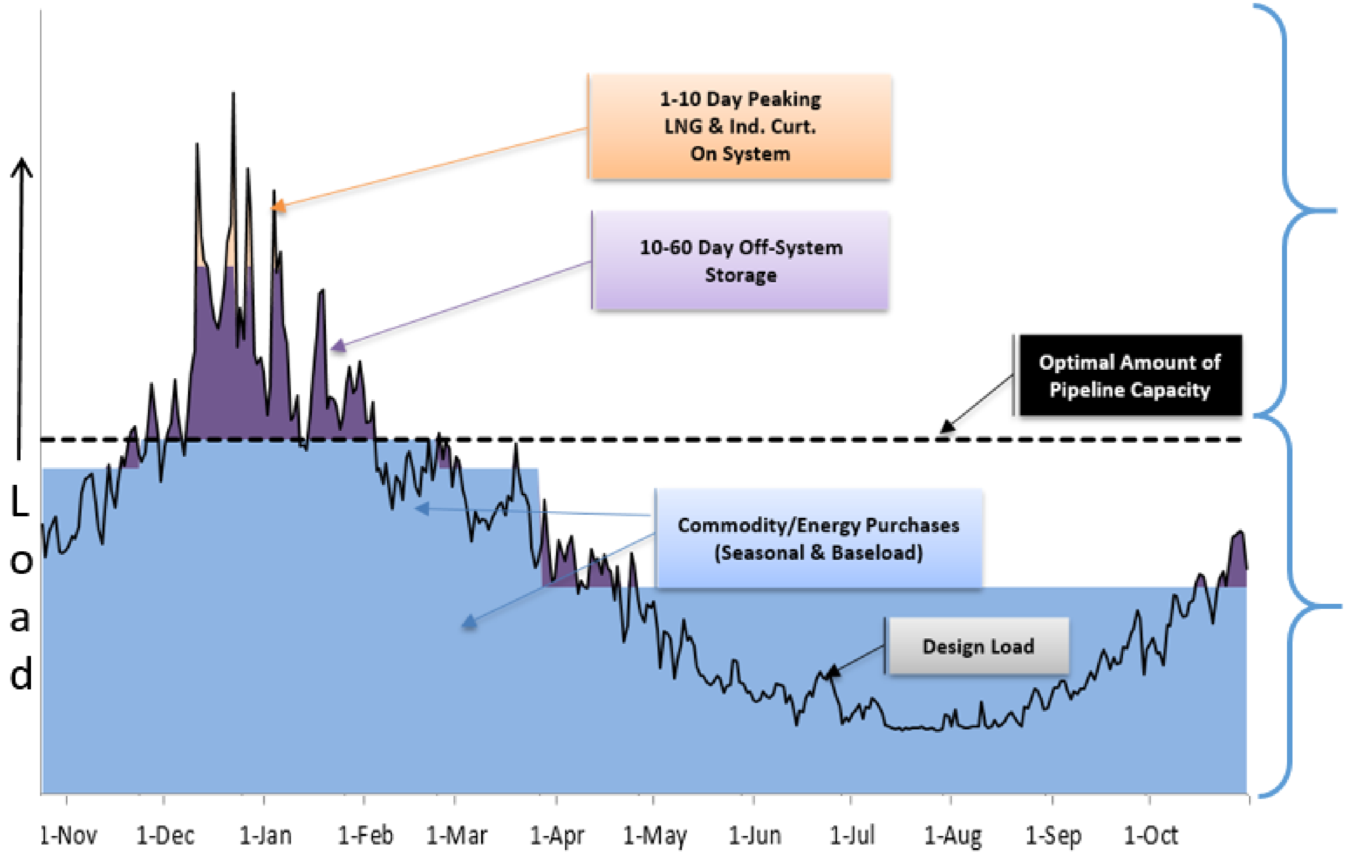
Portfolio Approach to Resiliency

Resiliency Measures Should Reflect Optimal Annual Contracting Plan Supply Portfolio



Resiliency for shorter duration load requirements achieved economically by:

- Market Area Storage
- Increased on-system storage/ vaporization
- Load Management Tool
- Commercial Arrangements (Capacity Recall)

Resiliency for longer duration load requirements achieved economically by splitting optimal capacity between existing and new pipelines

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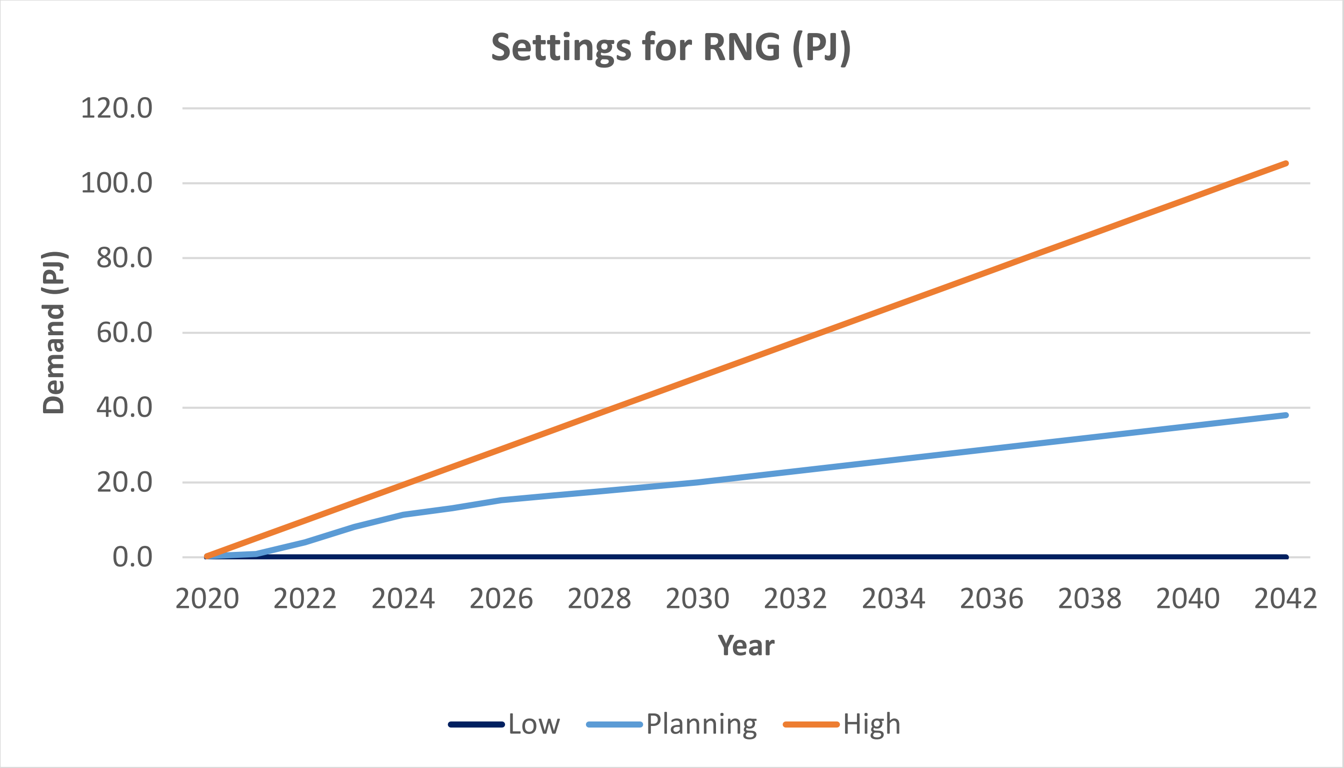
Future Portfolio Planning for Renewable Natural Gas

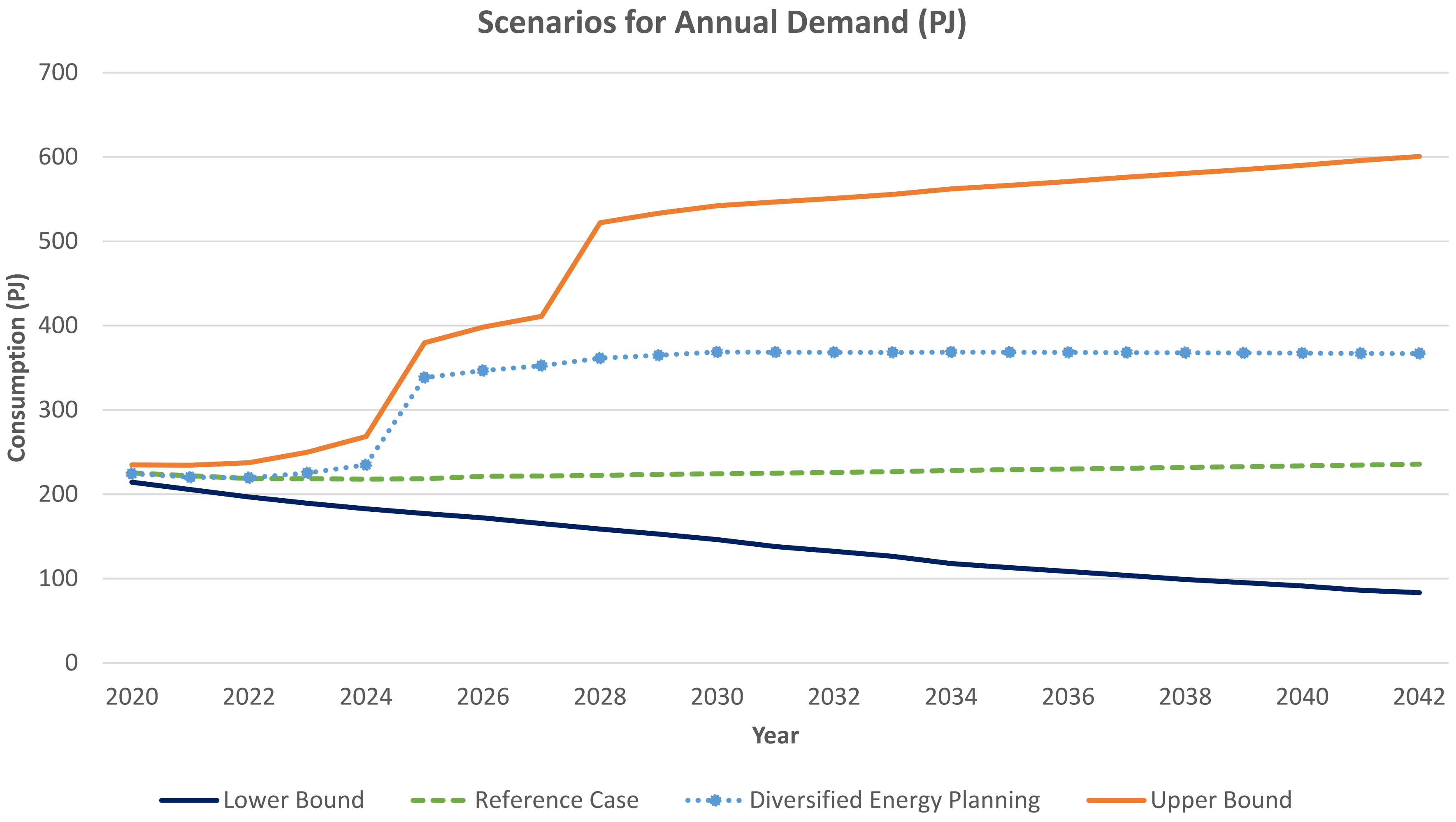


Gas Supply Planning focused on:

1. Project Location (Off-System vs On-System)

2. Supply Reliability (Firm Requirements)

Portfolio Planning for Different Load Forecasts



Conclusion

FEI will continue with its existing contracting strategies:

- Contract at Supply Hubs (Station 2 and AECO/NIT) instead of Demand Hub (Huntingdon);
- Customer Forecast Load Requirements Met with Firm Resources

Resources in portfolio are flexible enough to handle potential long term supply reductions (Renewable Natural Gas, Lower Demand Scenarios);

FEI's Long Term Supply Planning is focused on the following market factors:

- Resource Constraints (Winter);
- Pricing Risks at Huntingdon/Sumas Market Hub;
- Increasing load forecast scenarios;
- Enhancing supply resiliency

Infrastructure investments in the region are required to respond to these market factors.

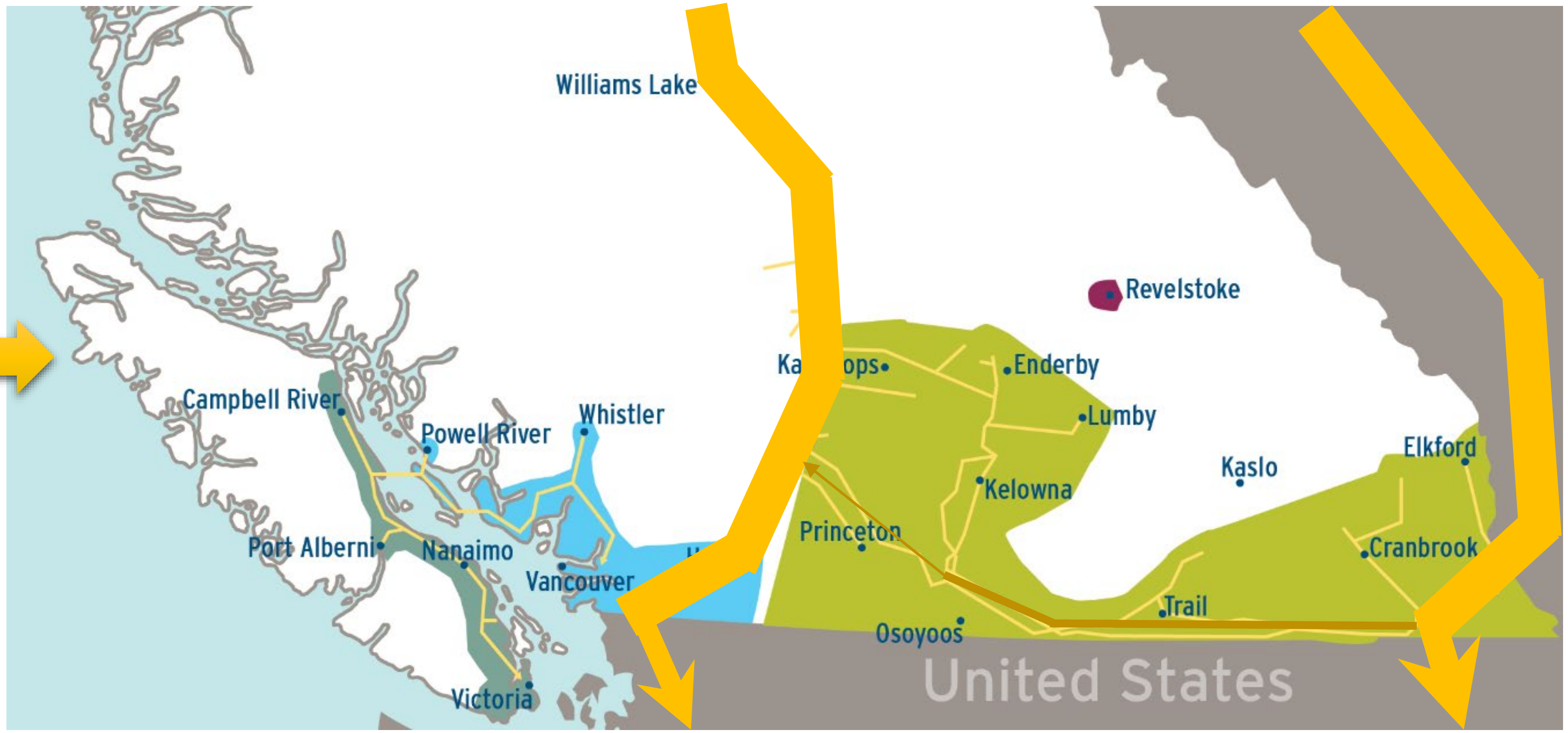
Questions and Discussion

Infrastructure Transition to Renewables and Resiliency

Regional Gas Supply Diversity (RGSD)

FEI's Southern Crossing Pipeline Extension to the Lower Mainland

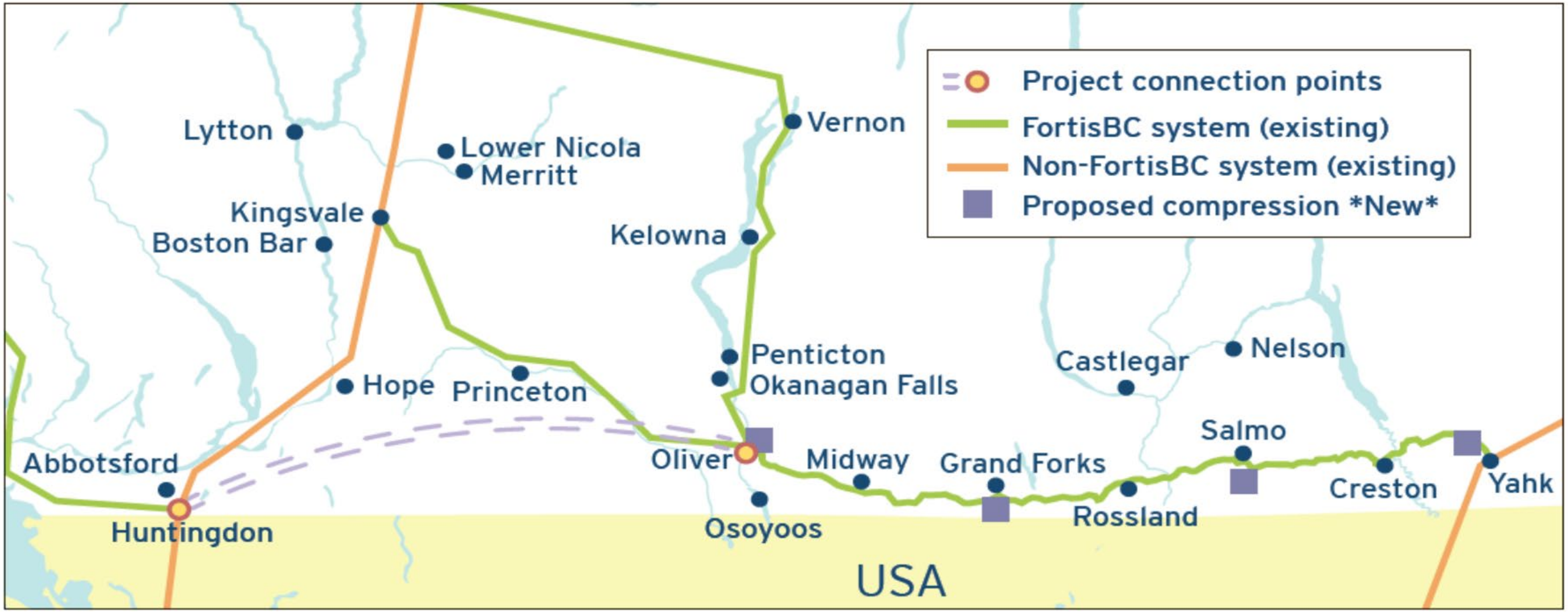
Regional Energy Infrastructure Overview



- Natural gas to majority of FortisBC customers supplied via North-South Enbridge T-south pipeline (2018 outage)
- Existing Southern Crossing pipeline provides a secondary, low capacity East to West supply connection from Alberta – line thicknesses depict relative capacity

Regional Gas Supply Diversity (RGSD) Project Concept

- Extension of **FEI's Southern Crossing Pipeline** at Oliver to the Lower Mainland



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Regional Energy Infrastructure Need and Vision

Need:

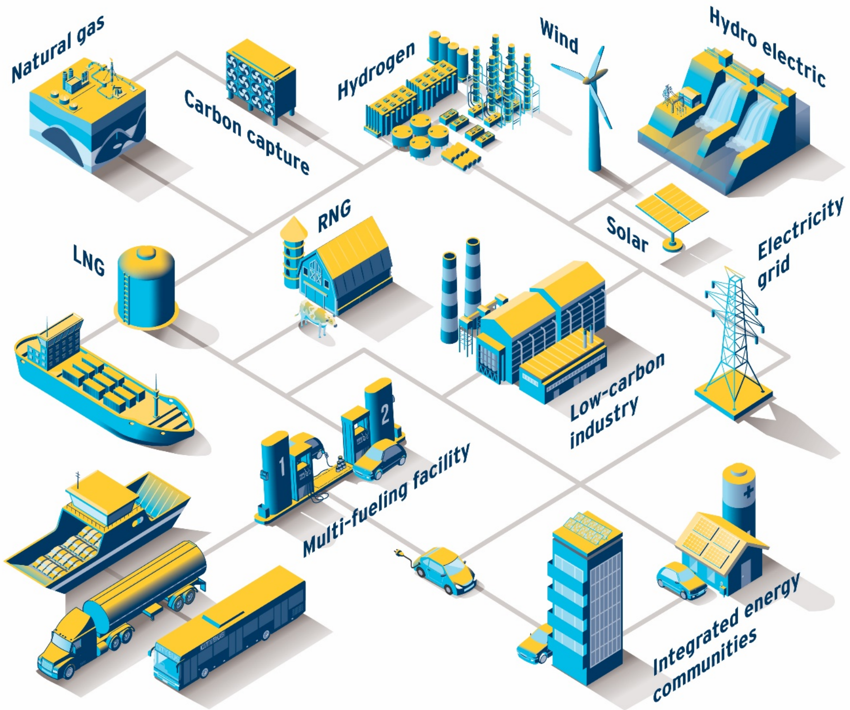
- **Resilient Communities** – provides a second energy source and benefits to on-route communities
- **Clean Energy Transformation** – accelerate the delivery of renewable and low-carbon energy to customers
- **Energy Supply** – supply source to alleviate capacity constraints in the region

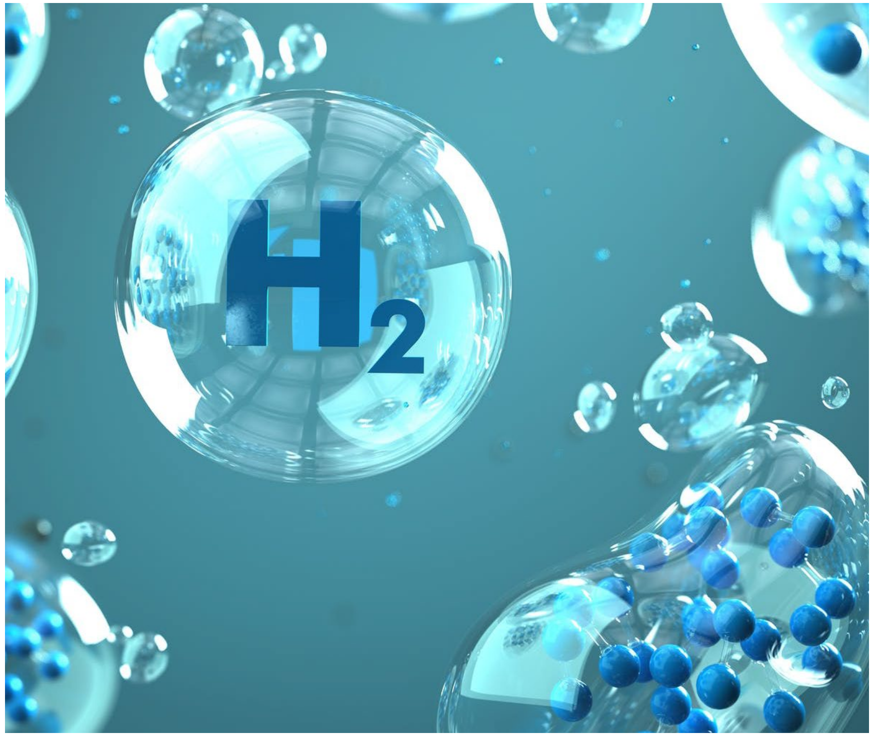
Vision:

- **Regional Clean Energy Solution** – capacity to deliver clean energy to meet expected demand
- **Indigenous Opportunities** – create inclusion and long-lasting partnerships with Indigenous communities

Regional Energy Infrastructure Need and Vision

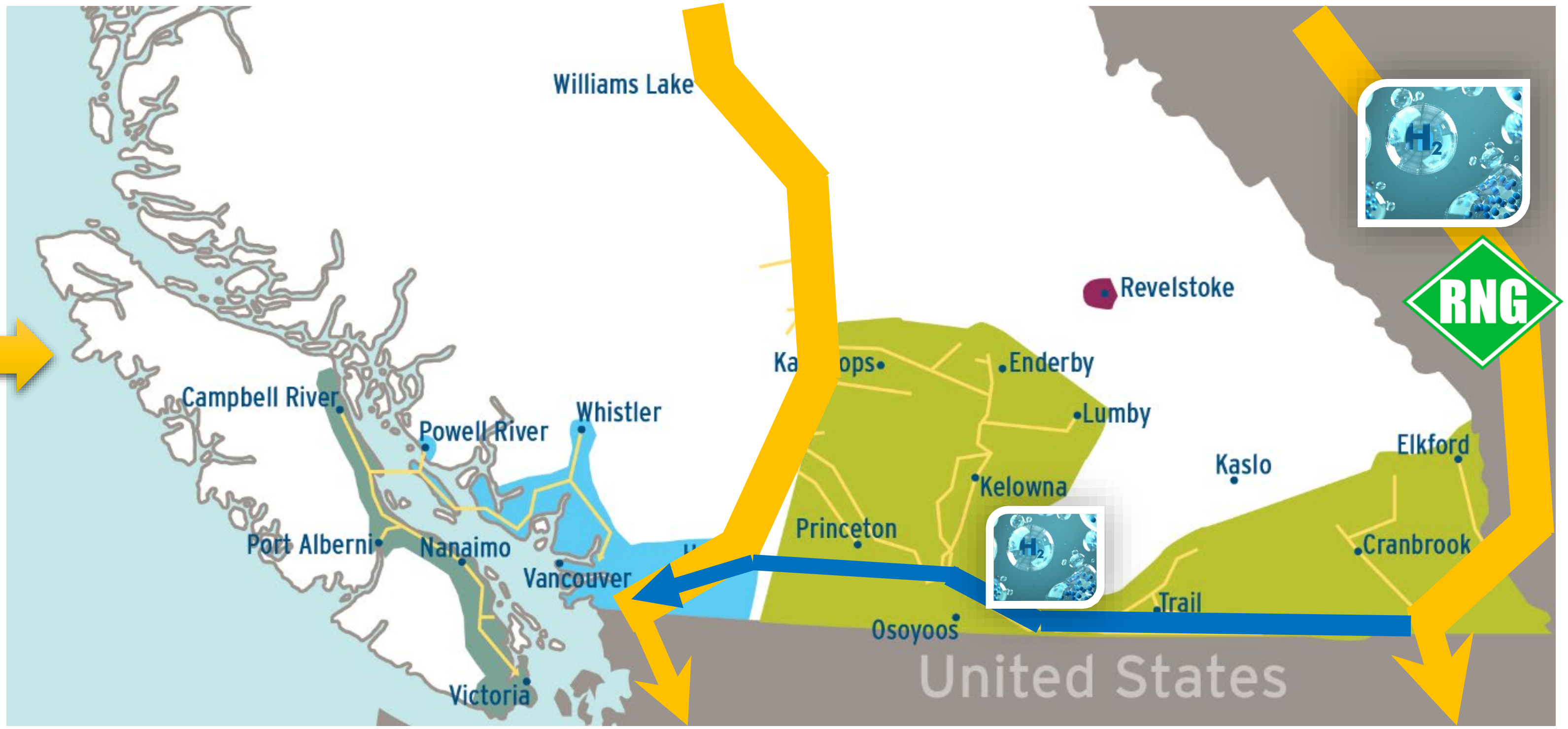
Resilient Communities





Clean Energy Transformation

Resilient Supply and Clean Energy Transformation Concept



- Increase capacity of East to West supply & connect to Vancouver area; designed to carry Hydrogen
  - Enables supply of Hydrogen from Alberta & capture of on-route Hydrogen & bio-methane
  - Provides significant secondary supply source to Vancouver & Southern Interior to assure supply reliability

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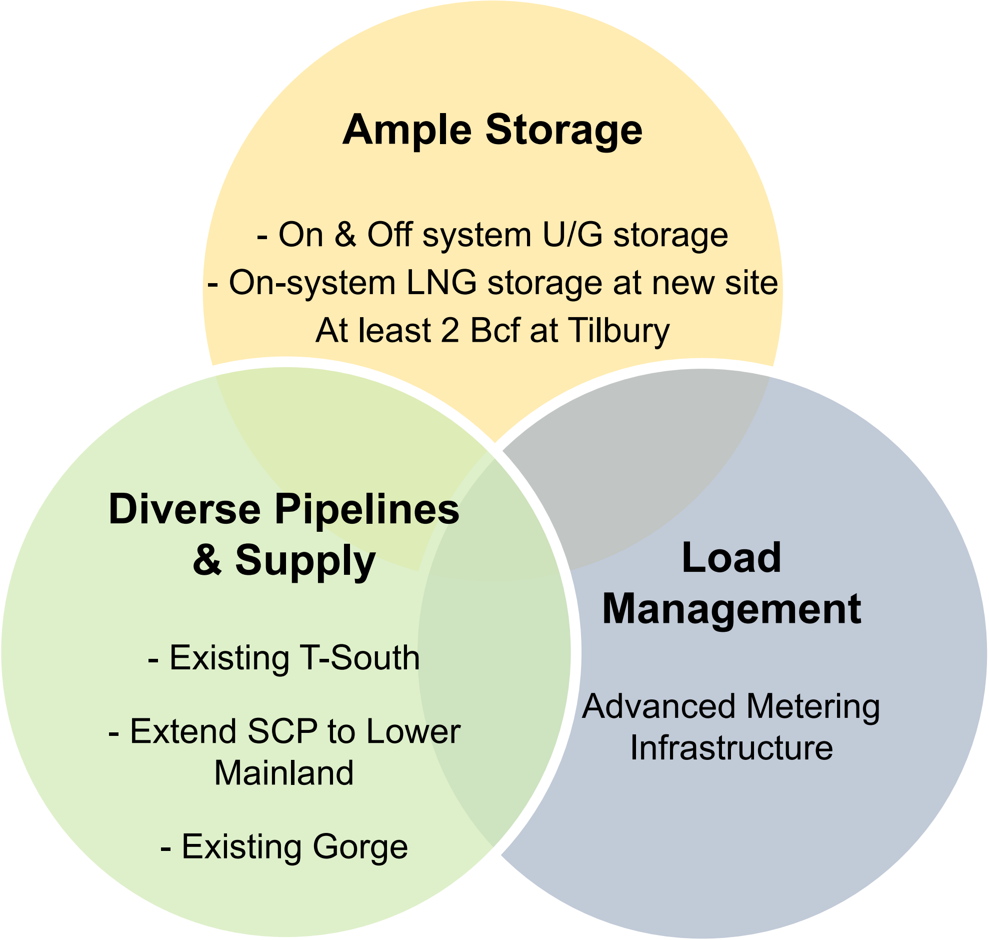
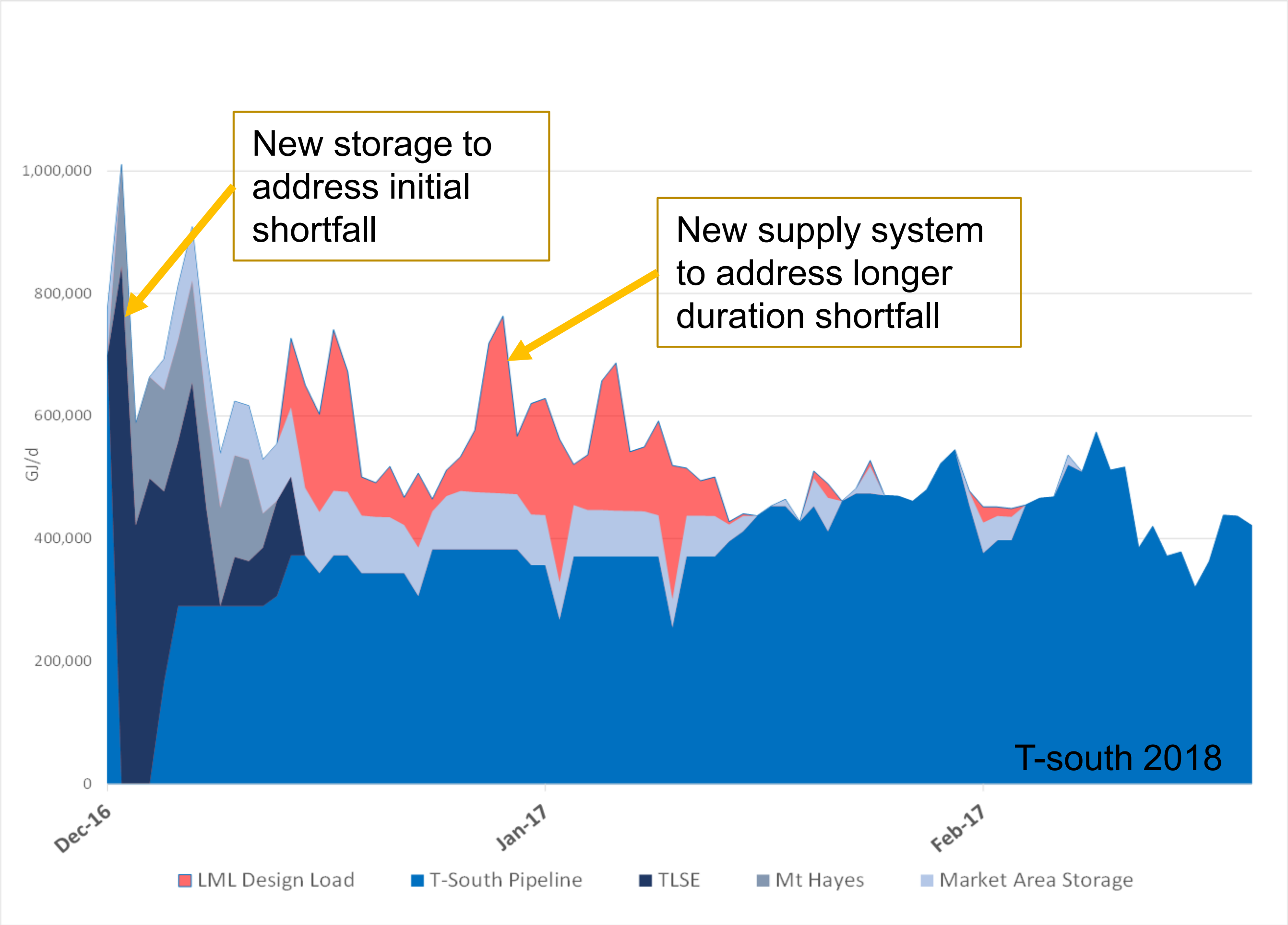
RGSD Will Complement Tilbury Expansion (TLSE)

- In the Tilbury CPCN and with Guidehouse work FEI outlined the **optimal resiliency solution** to include **Tilbury LNG and optimally sized pipeline** for mid and long-term disruptions.

- Recent events last week with mud slides on Coquihalla, cybersecurity breach at Colonial and Texas winter outage highlights the need for a resilient system.



Resilient Supply Challenge



- Chart compares FortisBC cold weather customer load to capacity available during actual T-south event
- Addressing shortfall:
  - More on system storage (application to BCUC for approval underway)
  - Second independent supply system (concept stage)

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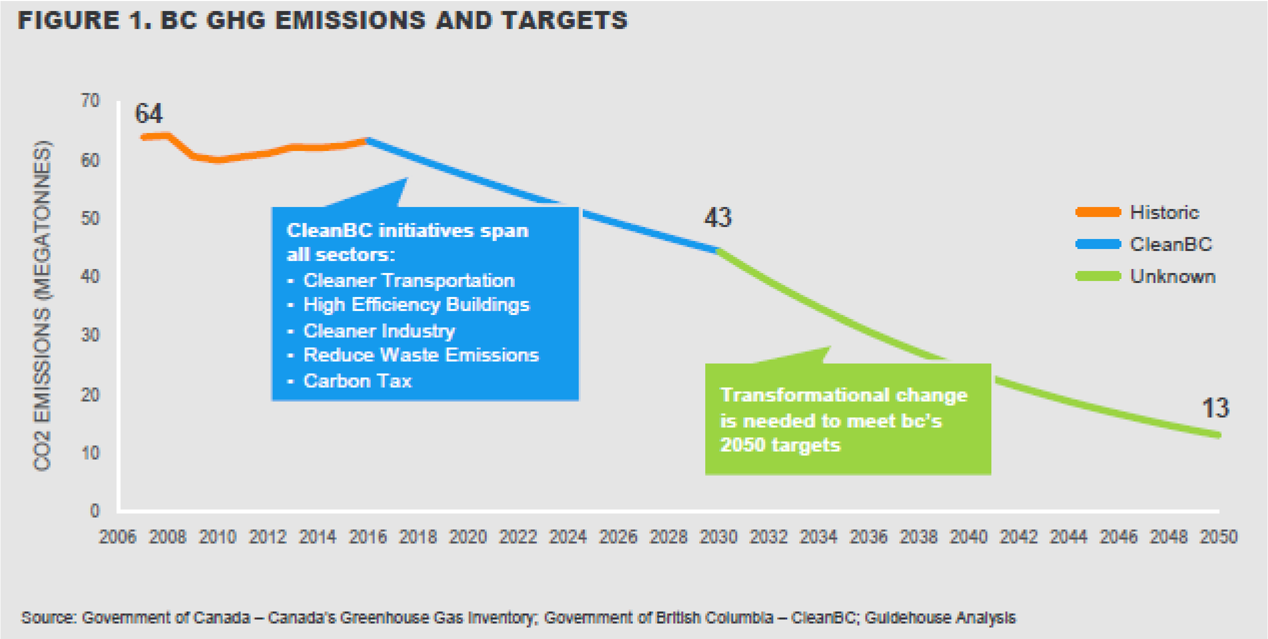
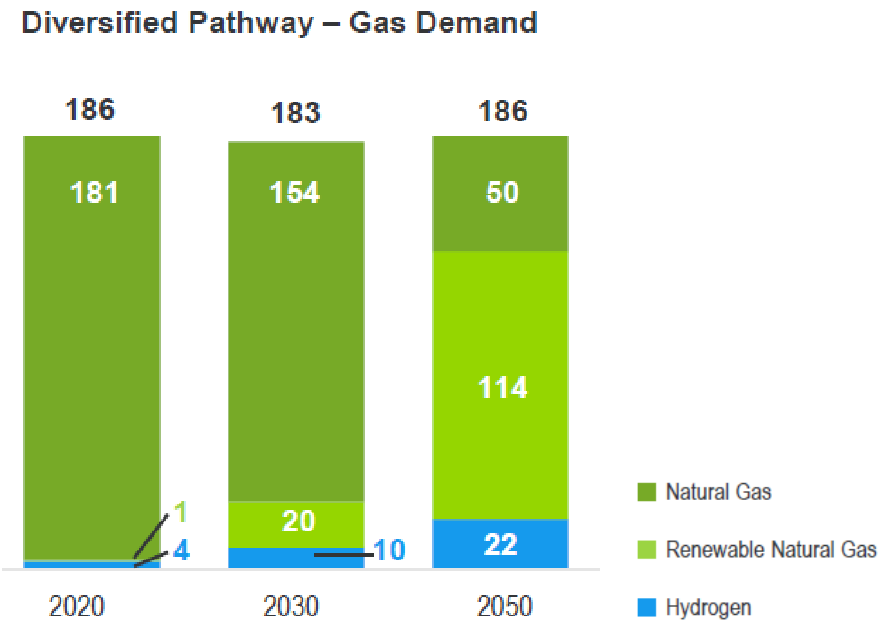
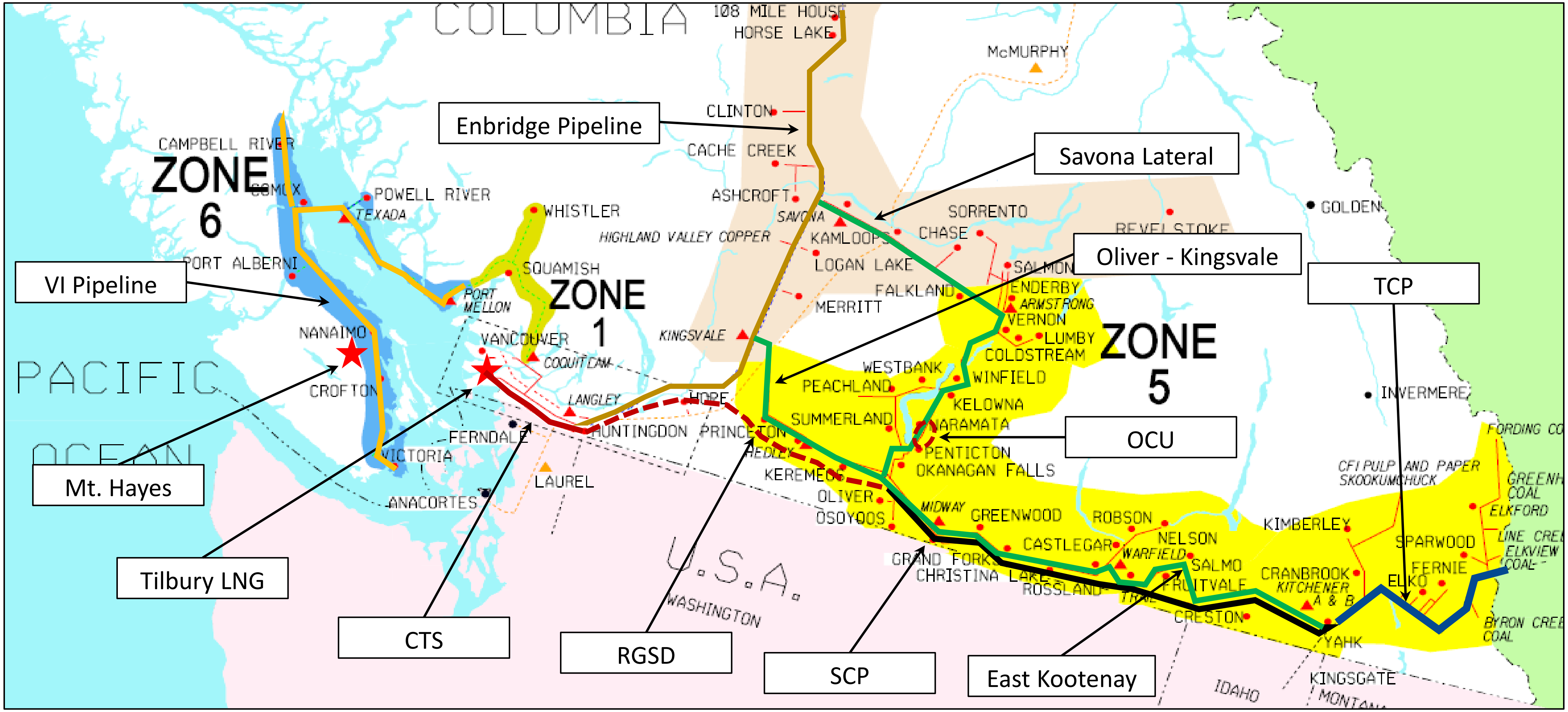
Net Zero by 2050 Challenge





- Transformational change will require significant increase in hydrogen & renewable natural gas supply
  - See **FortisBC Clean Growth Pathway & BC Hydrogen Strategy**
- New hydrogen-ready pipe system
  - strategically located to increase access to hydrogen & renewable natural gas
  - functions as an accelerator for feed-in projects including solar & wind

Transmission Network- RGSD Strengthens Entire System



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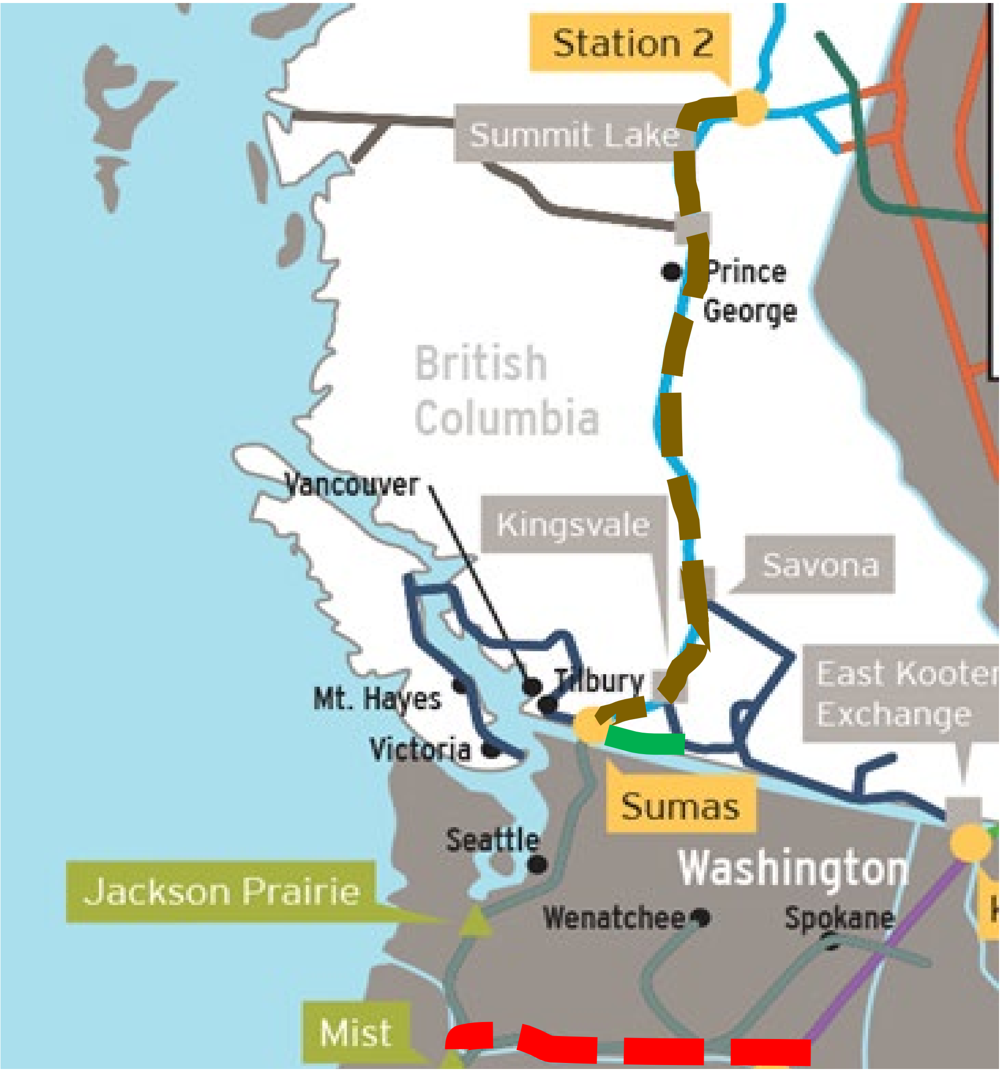
Evaluation of Alternatives

Regional Pipeline Options to meet longer duration needs



- T-South Expansion
- SCP Extension
- Gorge Expansion (NWP)

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Evaluation of Pipeline Expansion Alternatives

Pipeline Option	Resiliency	Clean Growth Pathway	Energy Supply	Indigenous Opportunities
T-South expansion	▼	▼	▲	▼
SCP to Lower Mainland extension-RGSD	▲	▲	▲	▲
Gorge expansion	▼	▼	▬	▼

Superior Alternative	▲	Acceptable Alternative	▬	Inferior Alternative	▼

FEI 2030 Customer Bill Impact - RGSD vs T-South Expansion

	RGSD (approx. 243 KM Extension) *Preliminary Results*	**T-South Expansion** (900 Km with required looping) (FEI do nothing) - not Hydrogen ready ($0.85/GJ Toll - $1.00/GJ) Impact to FEI 700 TJ/d of capacity
CAPEX	$4B (includes AFUDC)	
Cost of Service (COS) 5 year avg	$0.3B/year	
Gas Supply Benefits (revenues)	$0.1B/year	
Net COS 5 year avg	$0.2B/year	$0.15B/year
Approx. 2030 FEI Customer Bill Impact	Approx. 5.0%	Approx. 4%

Evaluation Criteria
(non-quantified)

	RGSD				T-South Expansion			
	Resiliency	Clean Growth Pathway	Energy Supply	Indigenous Opportunities	Resiliency	Clean Growth Pathway	Energy Supply	Indigenous Opportunities
	▲	▲	▲	▲	▼	▼	▲	▼

Superior Alternative	▲	Acceptable Alternative	▬	Inferior Alternative	▼

Milestone Development Work

Prior to 2021	2021	2022/23	2027/28	2028	2029
Introduced pipeline solution in LTGRPs, ACPs and Compliance Report	Completed studies on key development components and preliminary business plan	Indigenous Engagement Project Development File CPCN	Approvals ▪ CPCN ▪ EA ▪ BCOGC	Construction	In service

Ongoing Stakeholder and Indigenous dialogue

Questions and Discussion

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.**

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Thank you

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