Welcome to today's CHBA Net Zero Webinar!

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Today's Webinar

November 8, 2023, from 10:30-11:30 PT / 1:30-2:30 ET

Understanding the Challenges of Electrifying Heating Loads: A Case Study for Builders

Presented by:

Paul Chernikhowsky, Director of Technical Risk and Governance, FortisBC, and David Bailey, Manager, Customer and Energy Forecasting, FortisBC

The Canadian Net-Zero Emissions Accountability Act enshrines in legislation Canada's commitment to achieve Net-Zero emissions by 2050. To better understand the impacts of this transition, FortisBC conducted an electrification costing study for the city of Kelowna. FortisBC is both a gas and electric utility, and Kelowna is covered by both the gas and electric sides of the utility, so FortisBC knows the gas loads, the capacity of the current electric distribution grid, and can determine what capital upgrades are necessary to increase capacity, and the associated costs.

Join us for this webinar to hear the results of this study and see the dynamic model that can be used to play out different scenarios, not just in BC, but across Canada.

CHBA Members will be able to access the recording & slide deck at chba.ca/NZwebinars

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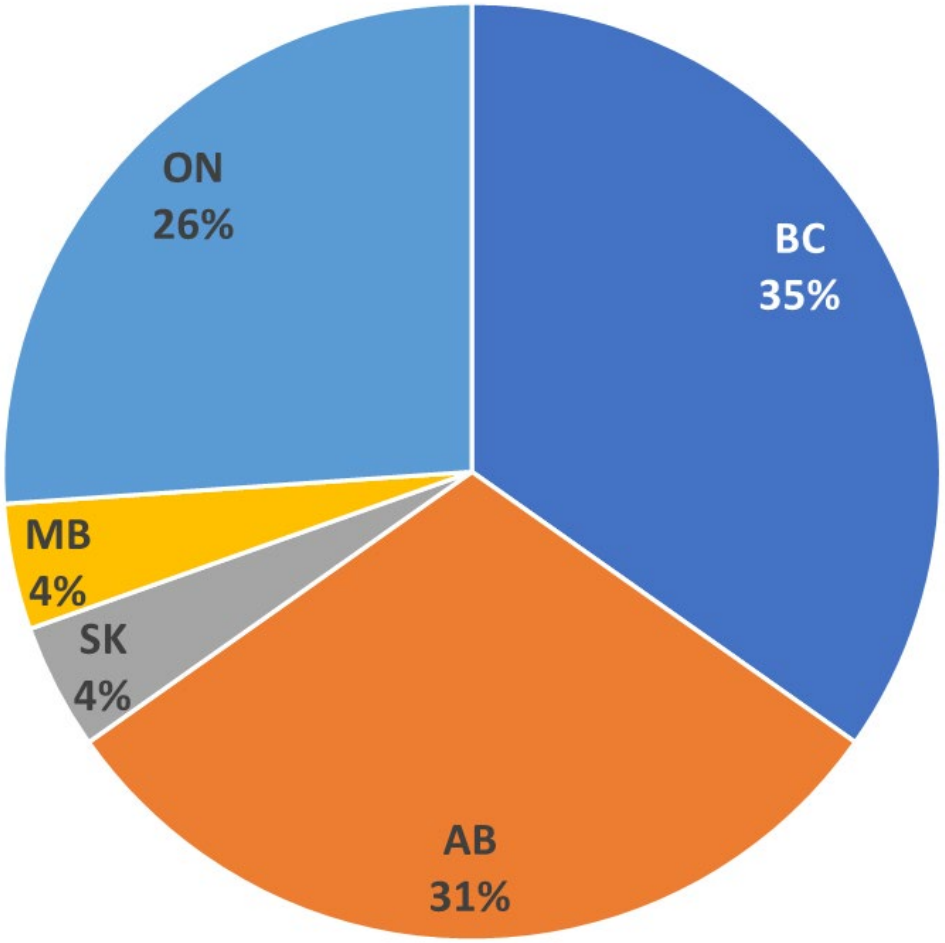
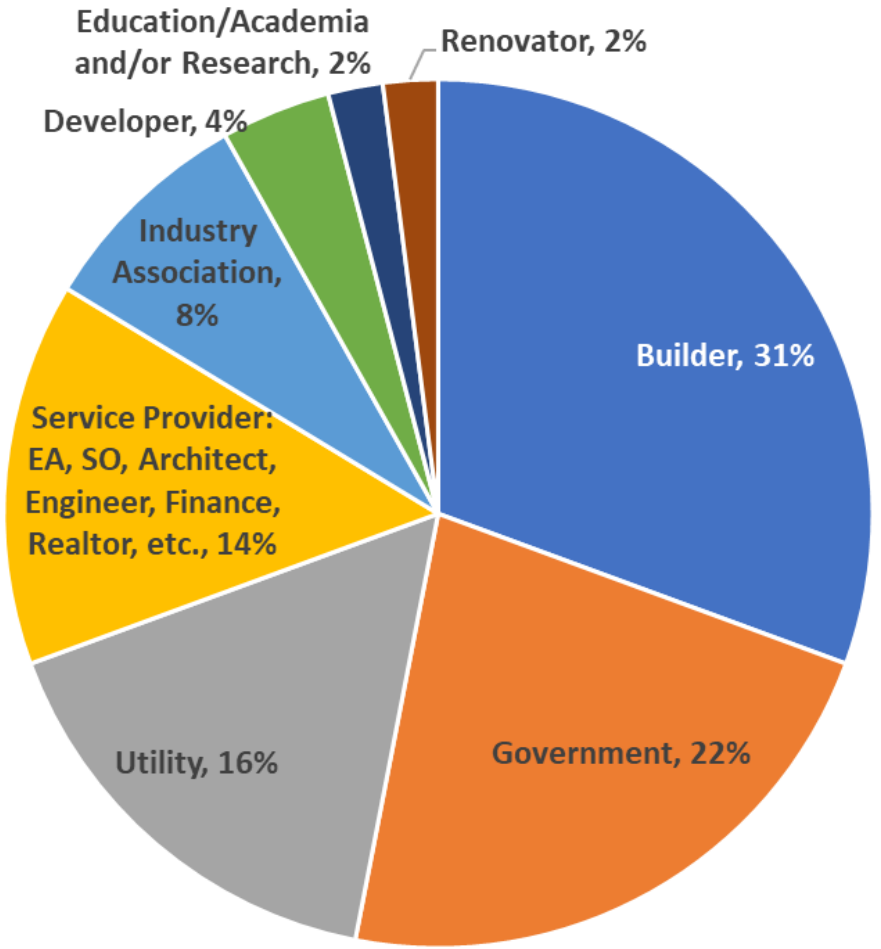
POLLS

Where are you logging in from today?



What member category do you fall under?



Electrify Kelowna

An analysis of gas to electric load shifting

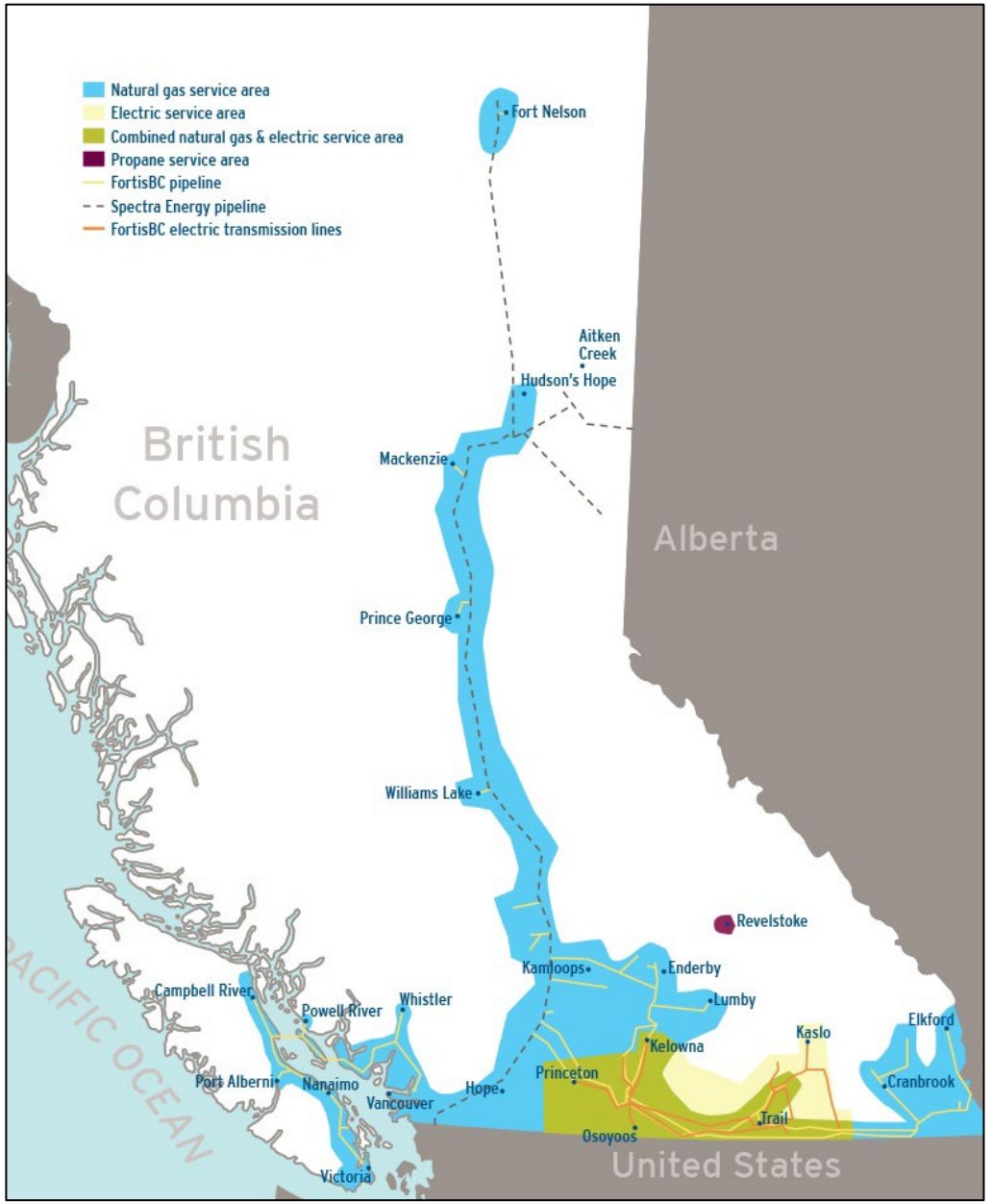
Presentation to the Canadian Home Builder's Association

Paul Chernikhowsky, P.Eng., Director, Technical Risk & Governance
David Bailey, P.Eng., Customer Energy & Forecasting Manager
Alex Fermon, Product & Services Marketing Manager

Nov 8, 2023

About FortisBC

- FortisBC is the largest energy provider in the province of BC
- Combined, we serve **1.2 million** customers, providing:
  - **1.1 million** gas customers
  - **180,000 electric** customers (including direct and indirect)
- We serve **135 communities** across BC and 58 Indigenous communities across 150 traditional territories
- We directly employ **2,700** British Columbians



Energy at work FORTIS BC™

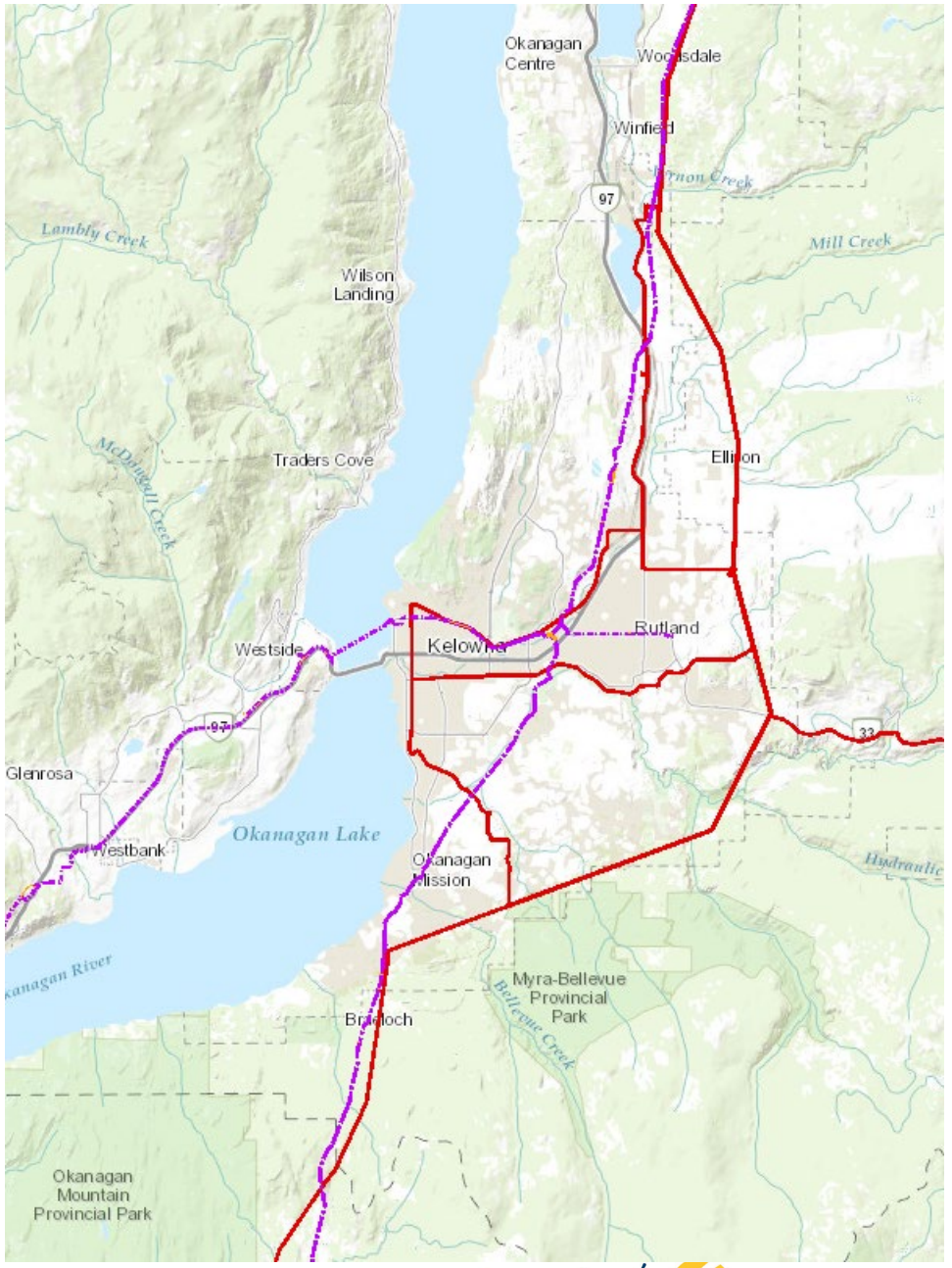
Introduction

FortisBC (both gas and electric) has been investigating the energy system impacts of electrification and decarbonization strategies:

- FortisBC 2020 *Pathways* Study
- GHGRS submission
- UVic building electrification
- UBCO hydrogen investigations
- Net-Zero strategy
- *Electrify Kelowna* study

Kelowna - energy supply

- FortisBC provides both gas (purple lines) and electricity (red lines) to the City of Kelowna
- *Electrify Kelowna* is an-house analysis that leverages both gas and electric utility data
- The analysis was filed with BCUC as part of FortisBC's Long-Term Gas Resource Plan regulatory review
- A key concept for discussion – the difference between:
  - **Energy:** electricity or gas used over a period of time in gigajoules (GJ), kilowatt-hours (kWh)
  - **Demand:** instantaneous or point-in-time consumption of electricity in watts or megawatts (MW)



Energy at work FORTIS BC™

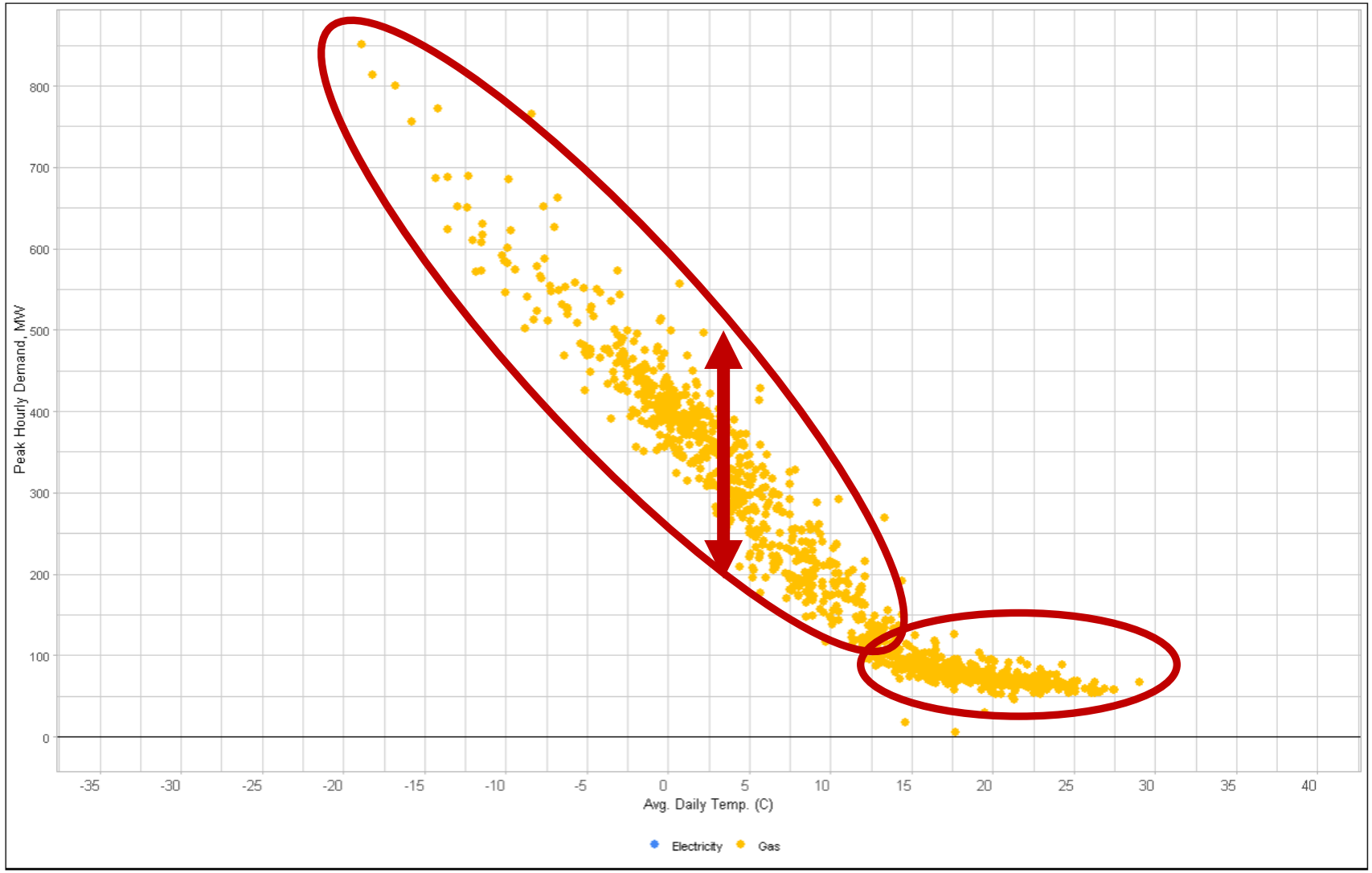
Kelowna – gas/electric energy deliveries

2020 Metrics	FEI Gas	FBC Electricity
Residential Customers		
Number of Customers	39,811	66,926
Energy (PJ)	3.0	2.4
Energy (GWh)	840	669
Commercial and Industrial Customers		
Number of Customers	4,700	9,324
Energy (PJ)	2.7	2.5
Energy (GWh)	756	701
Total		
Number of Customers	43,850	76,250
Winter Peak Demand (MW)	851	325
Annual Energy (PJ)	5.7	4.9
Annual Energy (GWh)	1,596	1,370

PJ = petajoules (1 million GJ) = 277.8 GWh
GWh = gigawatt-hours (1 million kWh) = 0.0036 PJ

The Electrify Kelowna Model

Gas loads by temperature in Kelowna



The model starts with a gas scatter plot

Load is not impacted by weather when > 15C

When it is colder than 15C space heating takes over

Over time dots could:

- Shift “up” (eg customer growth)
- Shift down (eg better bldg. envelopes)

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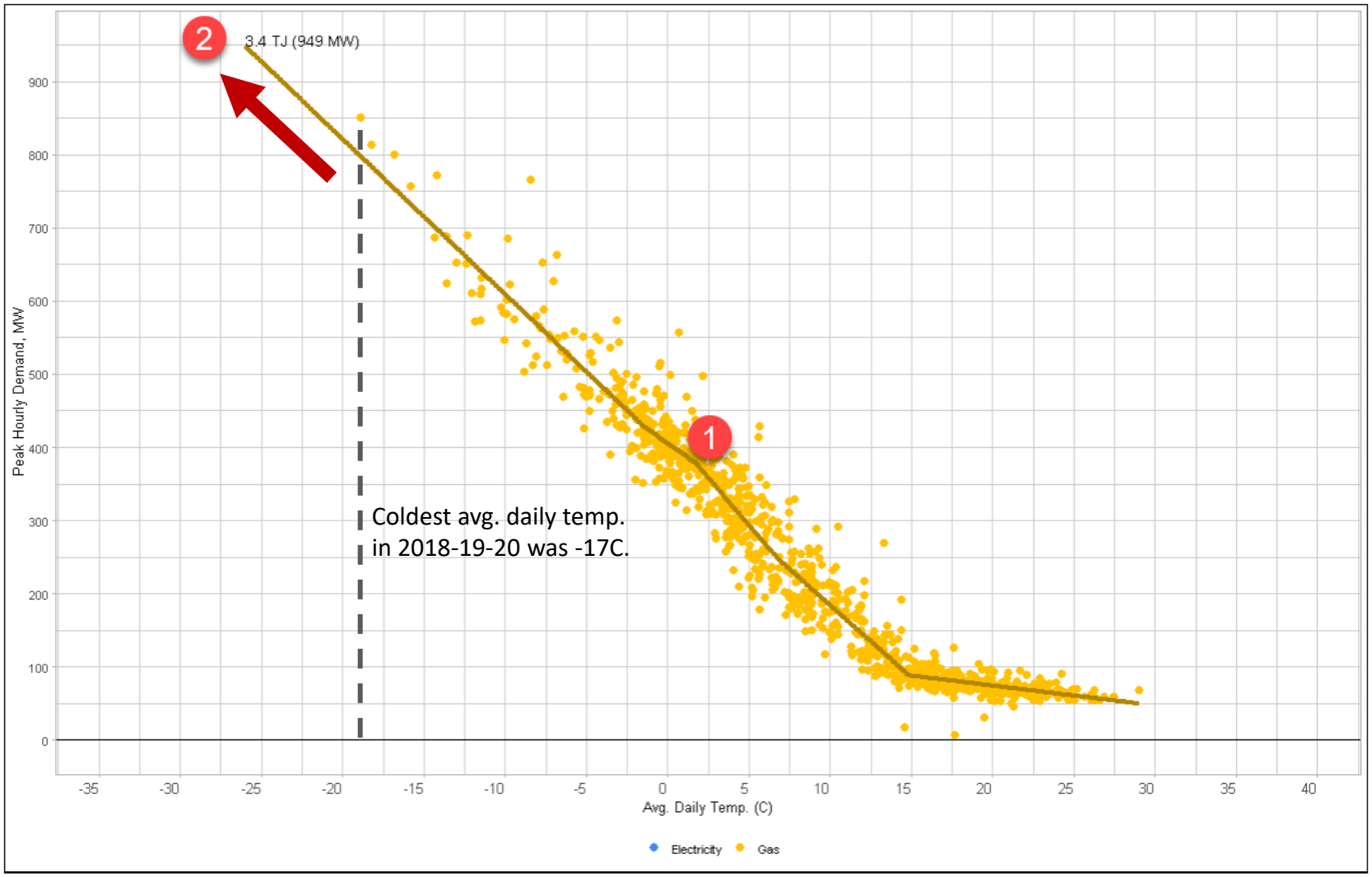
Forecasting heat loads

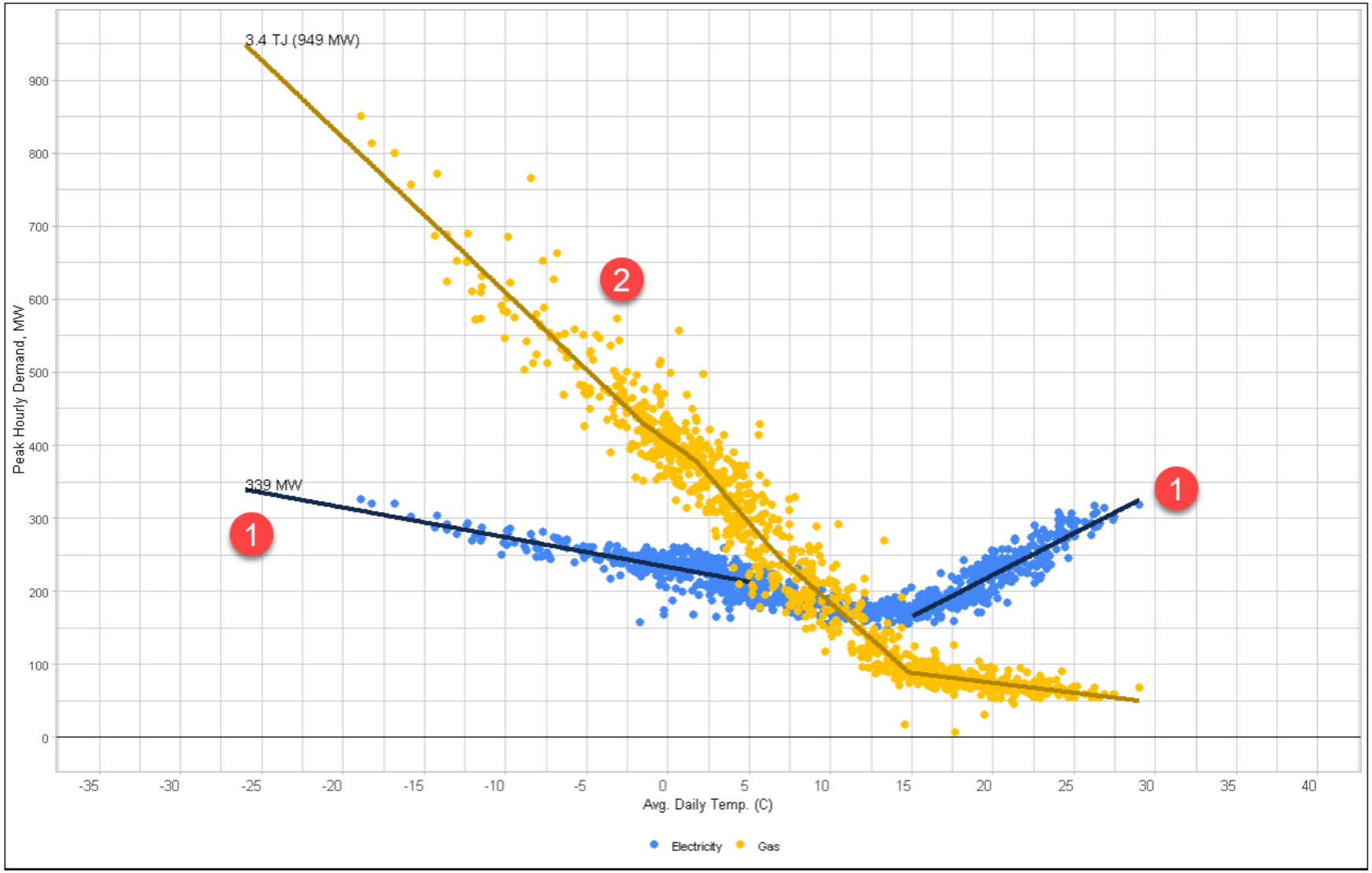


1. Fit a (regression) line and extend out to the **Design Temperature**

2. For Kelowna the **Design Temperature** is -25.9C (avg of overnight low and daytime high).

   Note:
   Dec. 22, 2022 Kelowna recorded -26.2C.

Model - Add Electricity



1. Add electricity
   - It has two peaks
2. On colder days most of the energy comes from natural gas

Energy at work FORTIS BC™

Heat Pumps

Heat pumps are critical to this analysis

We used data from a Nov. 2020 field study[1]

Future heat pumps will likely be better

Heat pumps are more efficient in warmer weather

- The “COP” changes with temperature
- As it gets colder they become less efficient

None of the currently installed heat pumps in the study operate at the -25.9C design temperature in Kelowna

[1]: “BC Cold Climate Heat Pump Field Study” prepared for FortisBC by RDH Building Science Inc. , November 2020

Slider Tool

I developed an interactive software application so we can experiment with various inputs.

- E.g.: growth rates, EVs, weather, DSM savings, heat pumps

Demo….

Summary of Results

	Amount of Gas to Electric Load Shifting				
	0%	25%	50%	75%	100%
Mean Daily Temperature (°C)	Resulting Electric Peak Demand (MW)				
0	352	423	495	566	597
-5	376	474	573	672	714
-10	399	529	660	791	845
-15	422	598	774	950	1,027
-20	445	675	905	1,135	1,331
-26	476	744	1,012	1,279	1,547

- Currently, the ultimate capacity of the electric system in Kelowna is approximately **550 MW**
- If the electric peak demand exceeds this value, then potentially large and costly upgrades will be required

Kelowna electric system, today – and tomorrow?

	Year	Winter peak demand capacity	Total Cost
First 230 kV line (72L)	1975	N/A	N/A
Second 230 kV line (73L)	1985	N/A	N/A
Conversion of Kelowna sub-transmission loop from 69 kV to 132 kV	1989	N/A	N/A
Third 230 kV line (74L)	1996	200	$6.5 million (1996 $)
DG Bell Terminal 230/132 kV transformer addition	2004	370	$15 million (2007 $)
Okanagan Transmission Reinforcement 230 kV Project	2010	510	$104 million (2011 $)
Kelowna Bulk 230/132 kV transformer addition	2023	550	$23 million (2023 $)

?

Potential Required Electric Upgrades

Description	Approximate Project Costs ($ Millions)		
	744 MW (25%)	1,012 MW (50%)	1,547 MW (100%)
New Distribution Stations	120	180	360
New Distribution Feeders	80	120	240
Meshing Kelowna 138 kV Transmission System	20	20	20
138kV Transmission Line Re-conductor	80	120	240
138kV Transmission Line Addition	60	90	180
Ashton Creek to Vaseux Lake (ACK-VAS) #1 500 kV Transmission Line	500	500	500
DG Bell Second 230/138 kV Transformer Addition	20	20	20
Kelowna 230kV Source (Line & Terminal Station)	50	50	50
Ashton Creek to Vaseux Lake (ACK-VAS) #2 500 kV Transmission Line	n/a	450	450
Additional Kelowna 230kV Source (Line & Terminal Station)	n/a	n/a	50
Total	**930**	**1,550**	**2,110**

Note: these estimates do NOT include land costs nor any upgrades to BC Hydro's system in order to accommodate this project, of which FBC would be expected to provide a contribution based on the principles of cost causation.

Is there any gas to electric load switching scenario that works?

Let’s try adjusting the sliders to see if there’s any feasible or plausible scenario

Demo…

What are we doing about it?

- Most optimal route to reduce GHG emissions while maintaining an affordable and reliable energy system requires increased integration of the gas and electric energy systems:
  - Harness benefits of the gas system during cold periods (storage and deliverability);
  - Transition base load to electric heat pumps via hybrid heating systems;
  - Peak demand shifting for EV charging in transportation sector;
  - Deep energy retrofits to improve aging building stock;
  - Increased deliveries of renewable gas; and
  - Support for next generation high efficiency technologies, including gas and electric heat pumps.

Thank you

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