
zebx DecarbLunch Series
Powered by zeic
Decarbonizing Rooftop Units on Commercial Buildings
Fri Oct 24, 2025
12 - 1pm PDT
Free Webinar
zebx.org
Vancity
CITY OF VANCOUVER
SES CONSULTING
Decarbonizing the Built Environment

Unlocking the Potential of Rooftop Unit Electrification

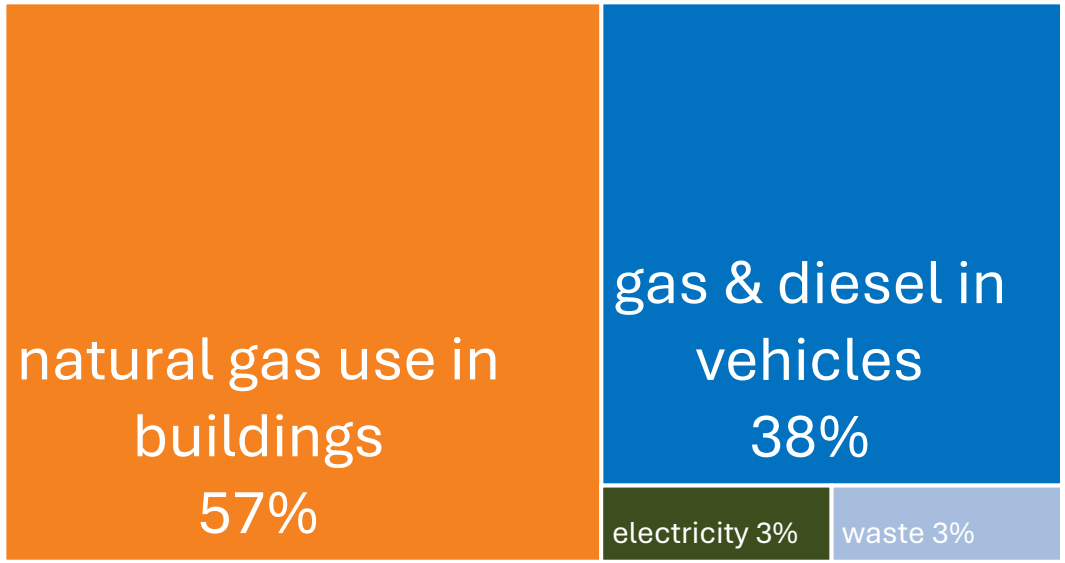
ZEBx Decarb Lunch

Ashley St Clair, Senior Green Building Planner

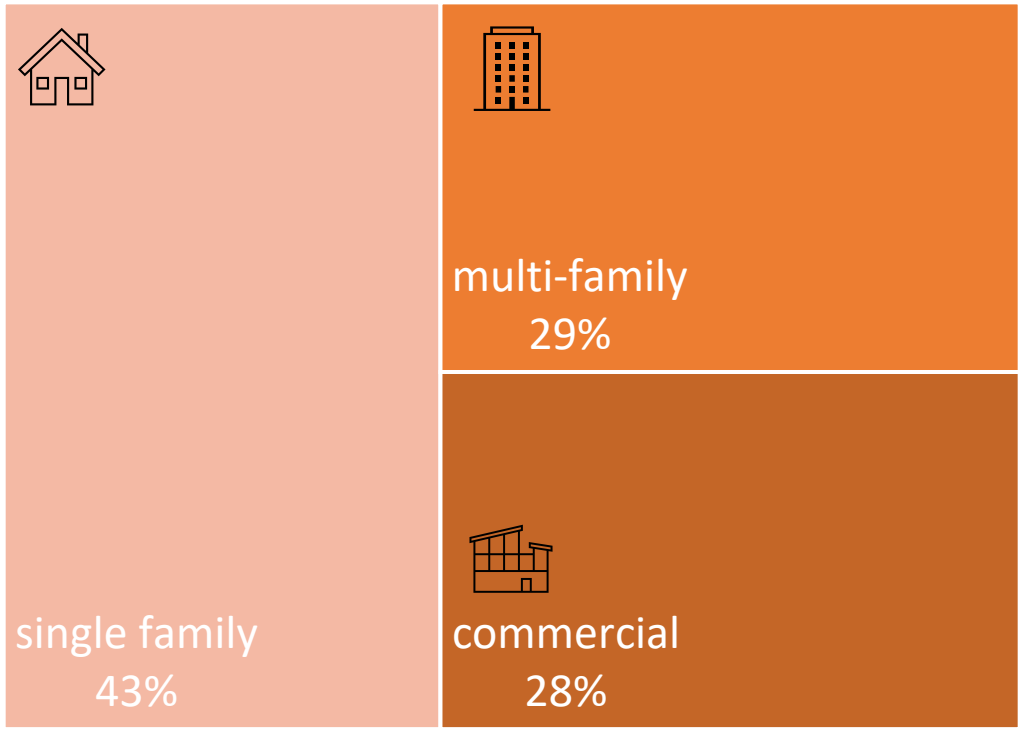
October 24th, 2025

CITY OF VANCOUVER | ENERGIZE VANCOUVER

Where is Vancouver's carbon Pollution coming from?

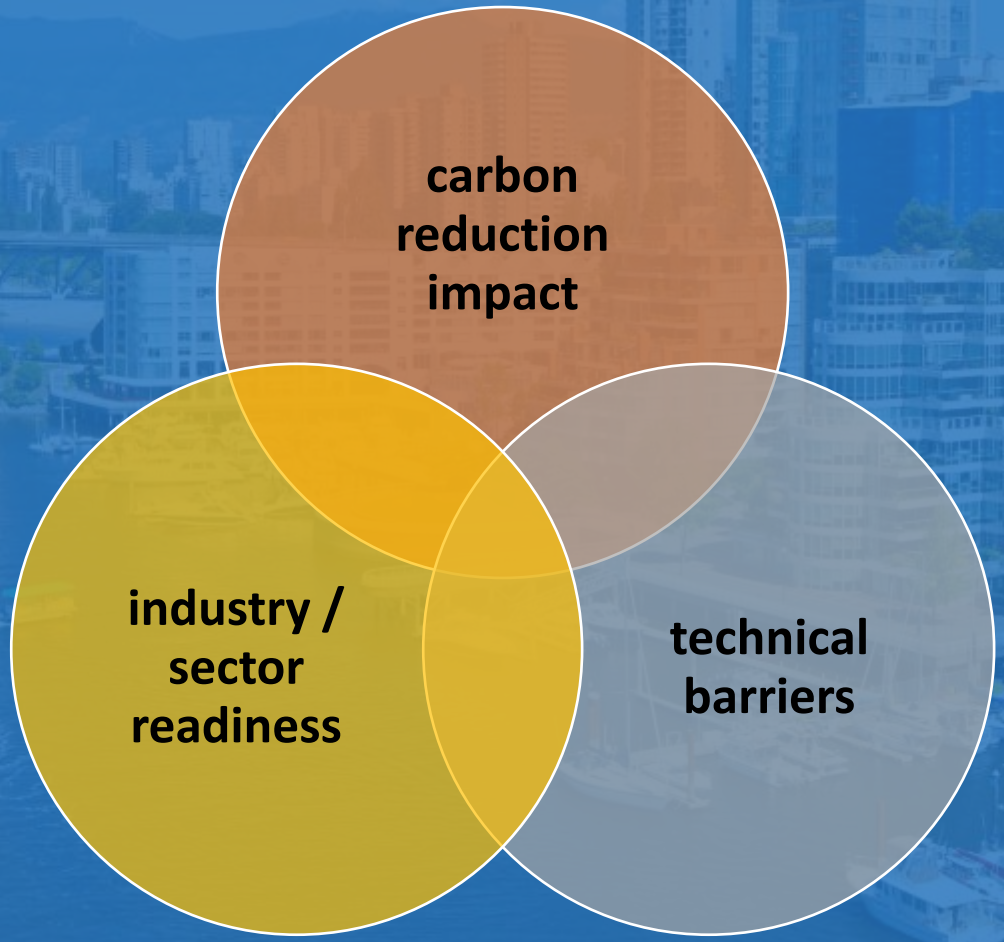


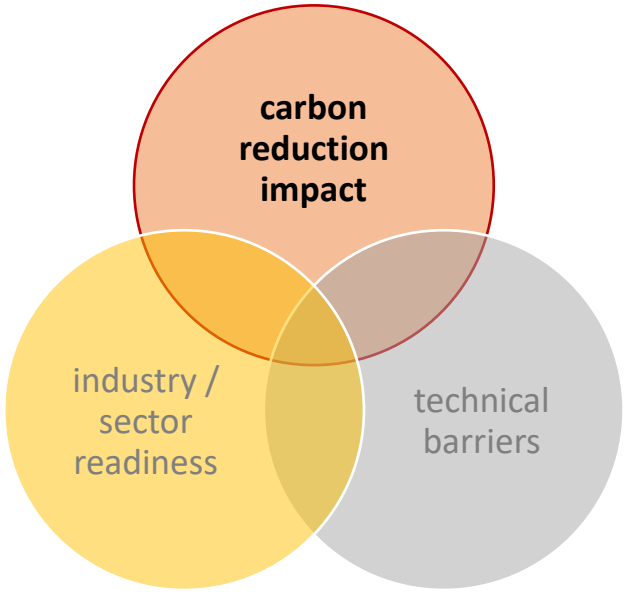
How do different building types contribute to carbon pollution?



ENERGIZE VANCOUVER

How do we think about achieving our climate goals for existing commercial buildings?





Impact of RTU Electrification

RTU Profile in Vancouver

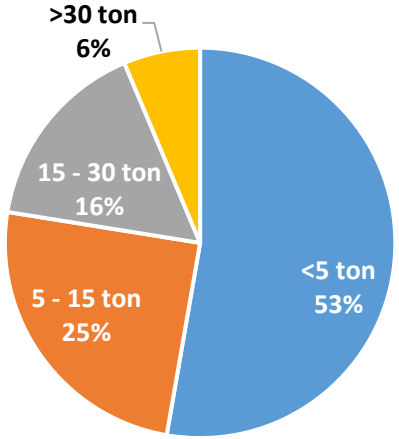
How many, how big, where?

7,176 units

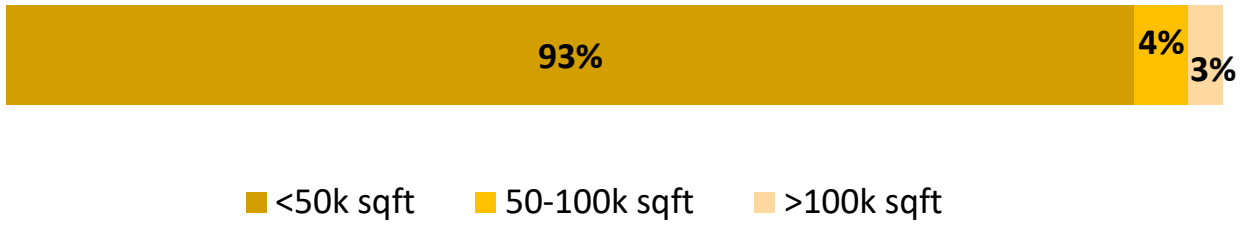
2,497 individual buildings

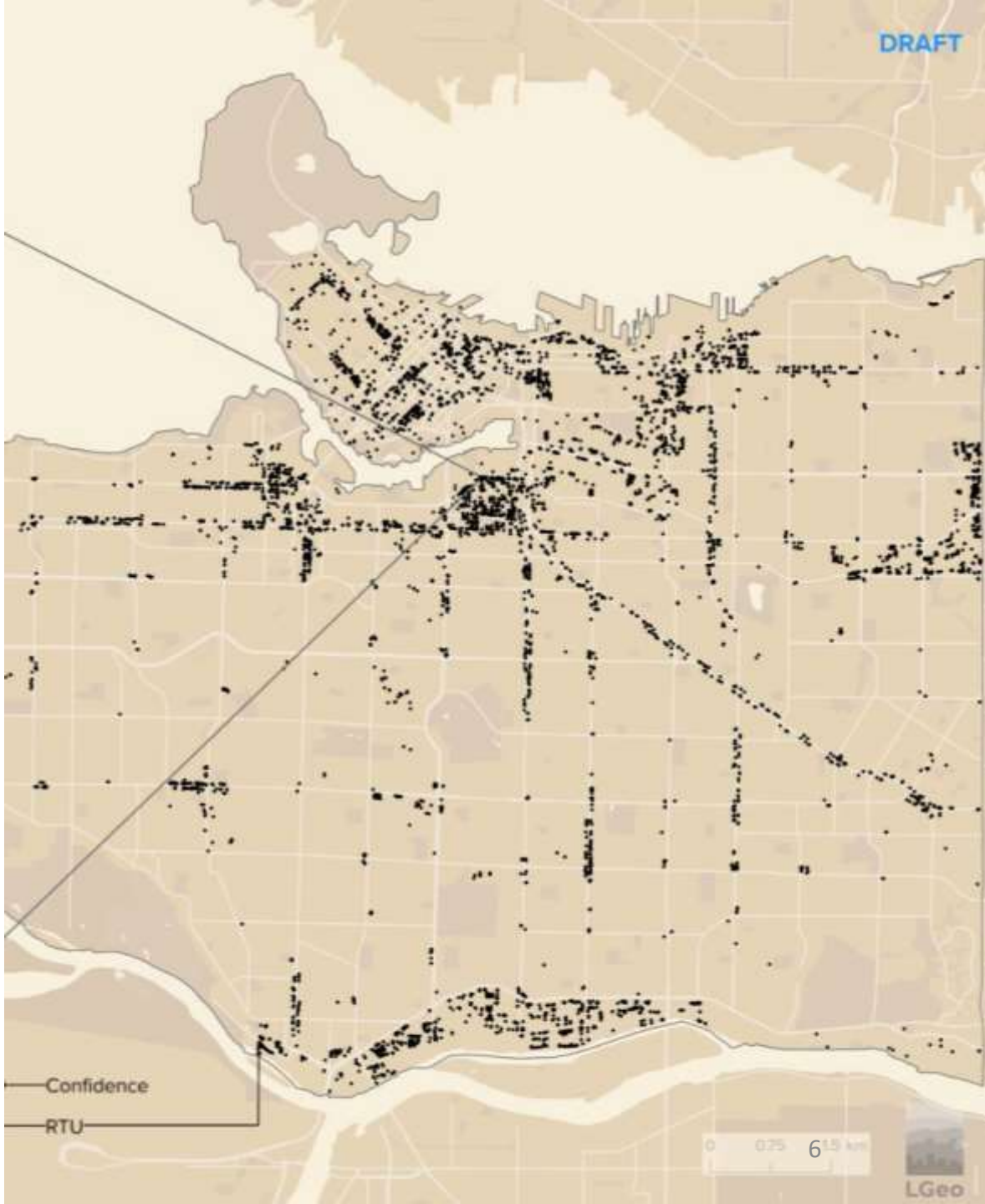
64 million sqft served

what sizes are the RTUs in Vancouver?



what size buildings are RTUs found on?

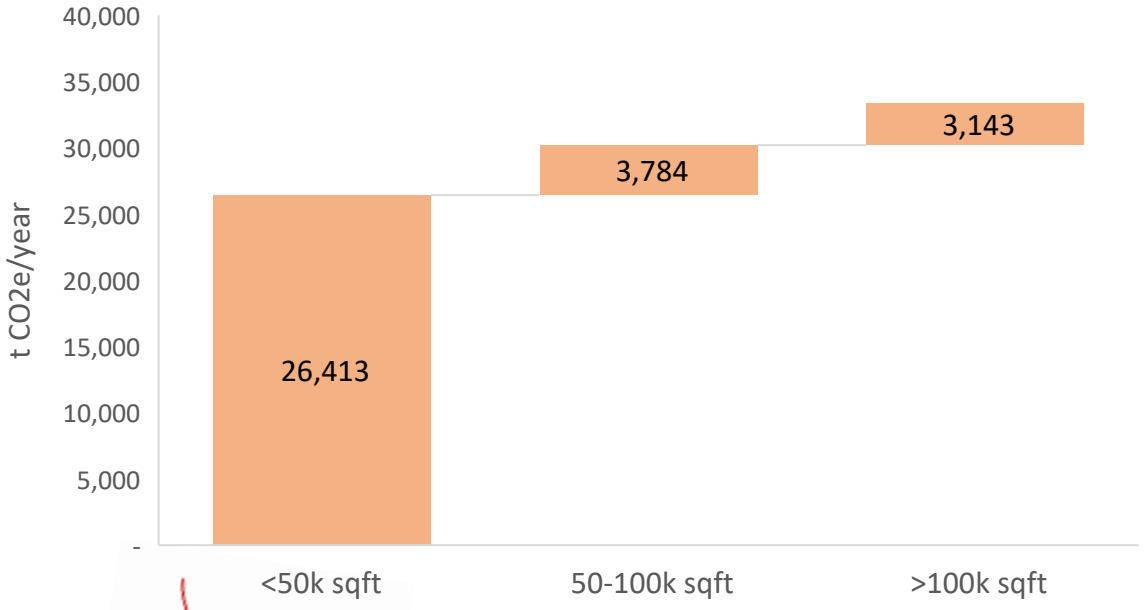




RTU Profile in Vancouver

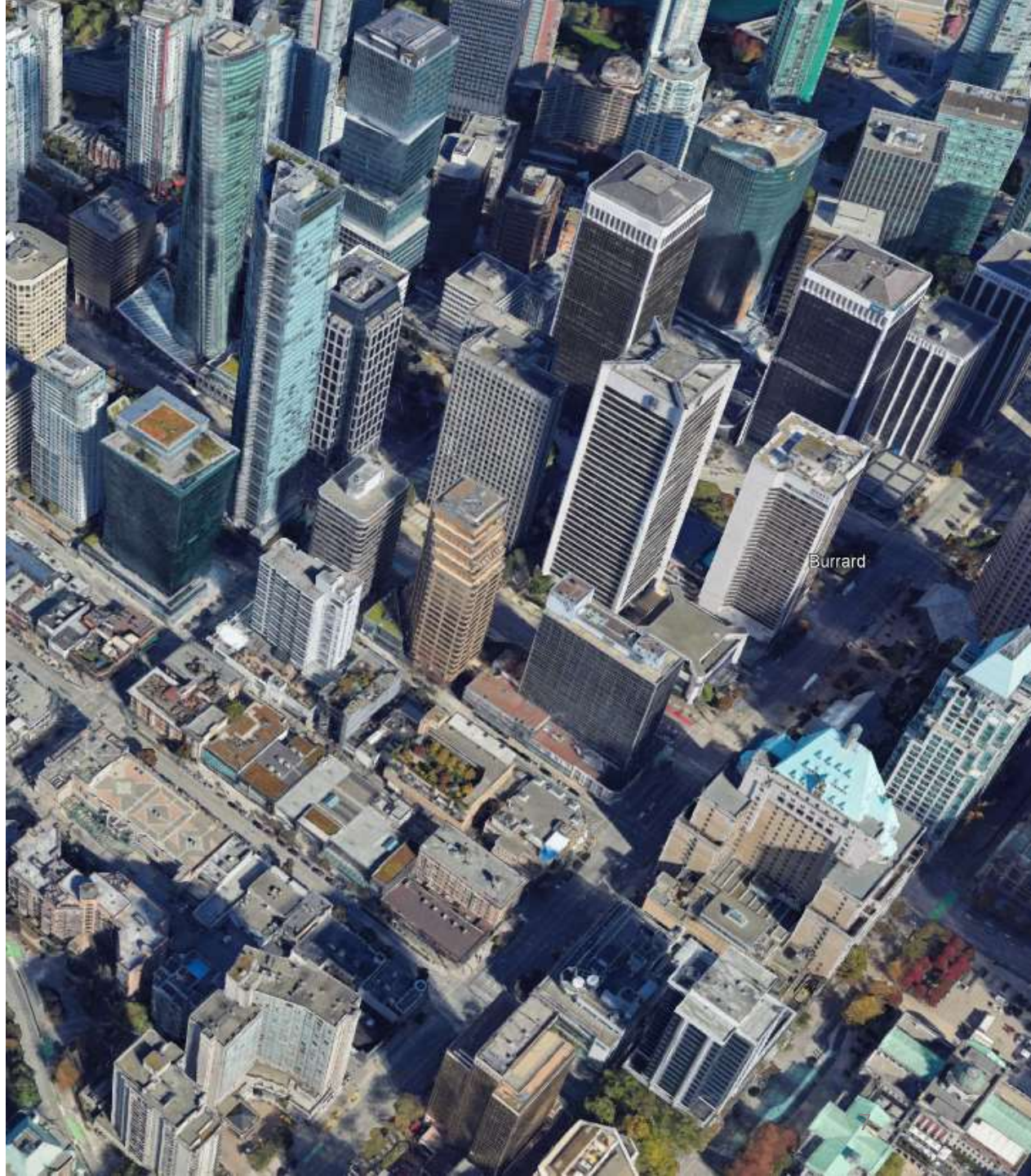
Emissions reduction impact?

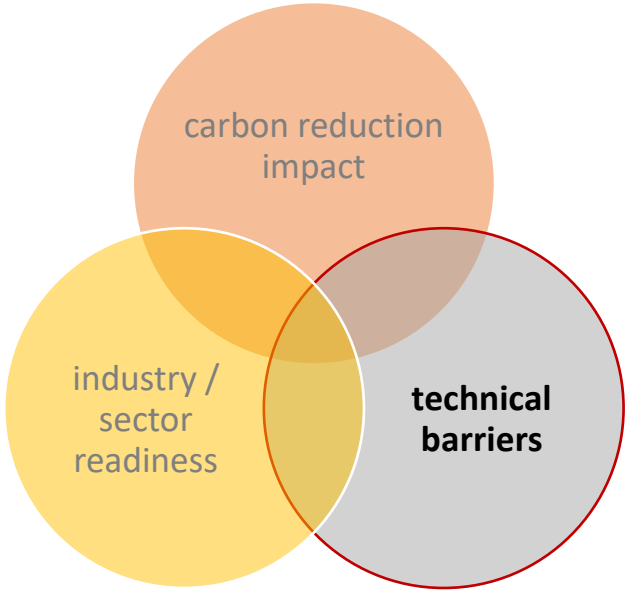
Estimated Annual GHG Emissions from RTU Equipment (<30 ton) Across Building Sizes



carbon reduction potential:

33,000 tons/year





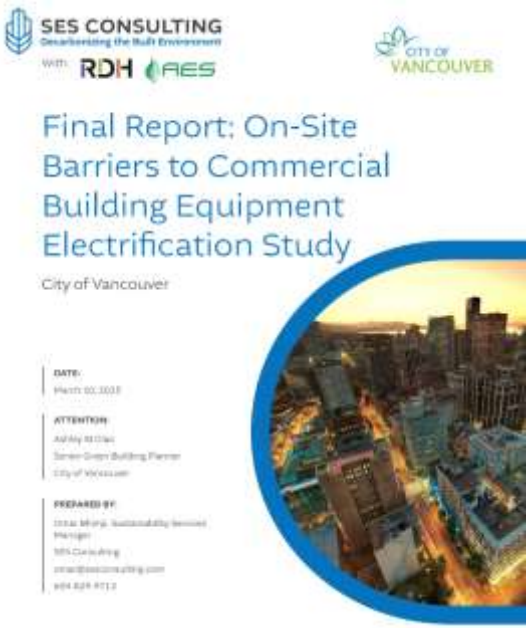
Feasibility of RTU electrification at scale

On-Site Barriers to Existing Building Electrification

Approach

- Identify and analyze the 'real-world' barriers to electrification of **18 commercial** buildings
- Assessed the feasibility of **full building electrification**, + **equipment-level electrification**

» DHW Heater
» Hydronic Boiler
» MAU
» Rooftop Unit
» Furnace
» Unit Heater
» Infrared Heater



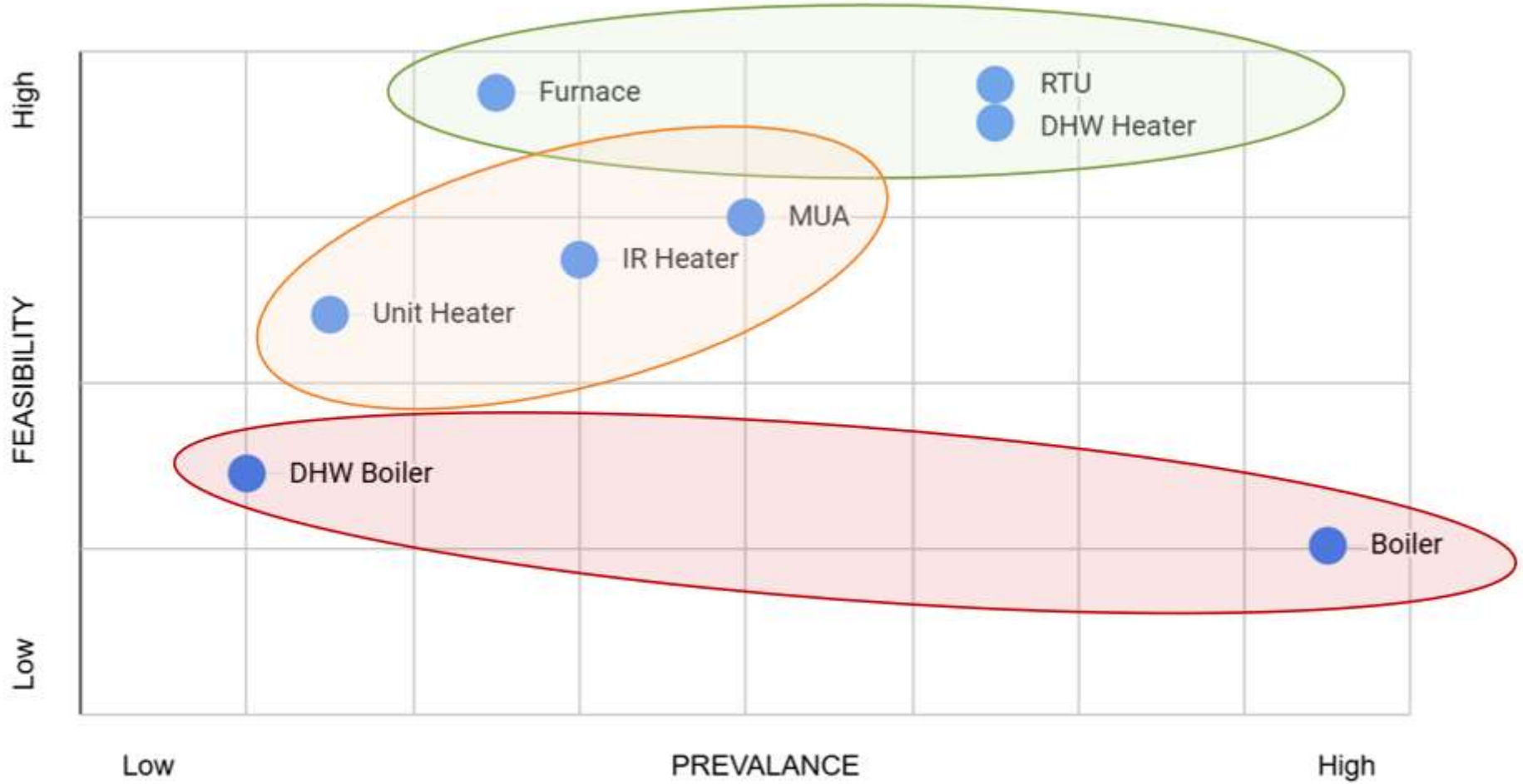
Barriers to Electrification

1. On-Site Barriers
2. Financial / Cost Effectiveness
3. Market Readiness

» Design complexity
» Operational complexity
» Installation disruptions
» Operational disruptions
» Electrical Capacity
» Structural load-bearing capacity
» Condition of existing infrastructure
» Physical space constraints
» Building envelope modifications required

On-Site Barriers to Commercial Building Electrification

Equipment – Prevalence vs. Feasibility of Electrification

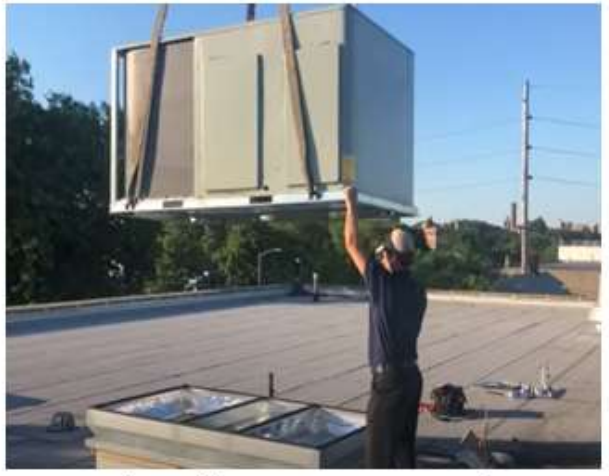


On-Site Barriers Study Findings: RTUs

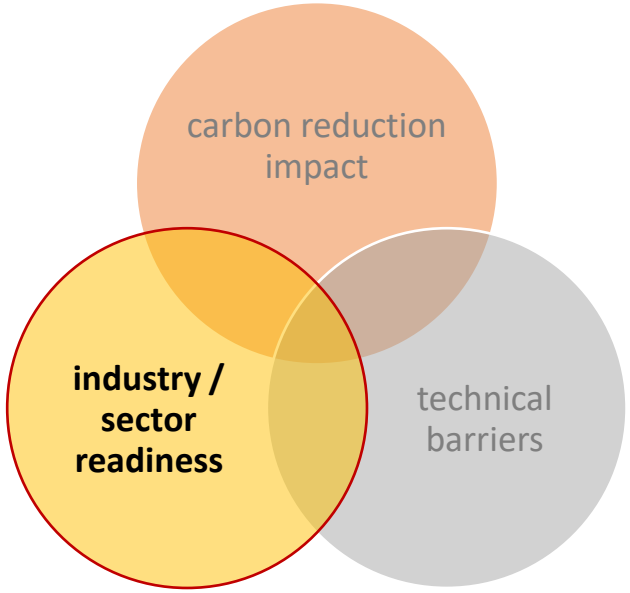
- **Electrical:** Most gas-fired RTUs can be replaced with a HP RTU without an electrical service upgrade
- **Structural:** HP RTUs are similar in size and weight to gas-fired RTUs for most systems under 10 tons
- **Cost:** Lowest cost premium of all equipment studied relative to business-as-usual replacement

lifting off old 10-ton unit

craning in curb adapter



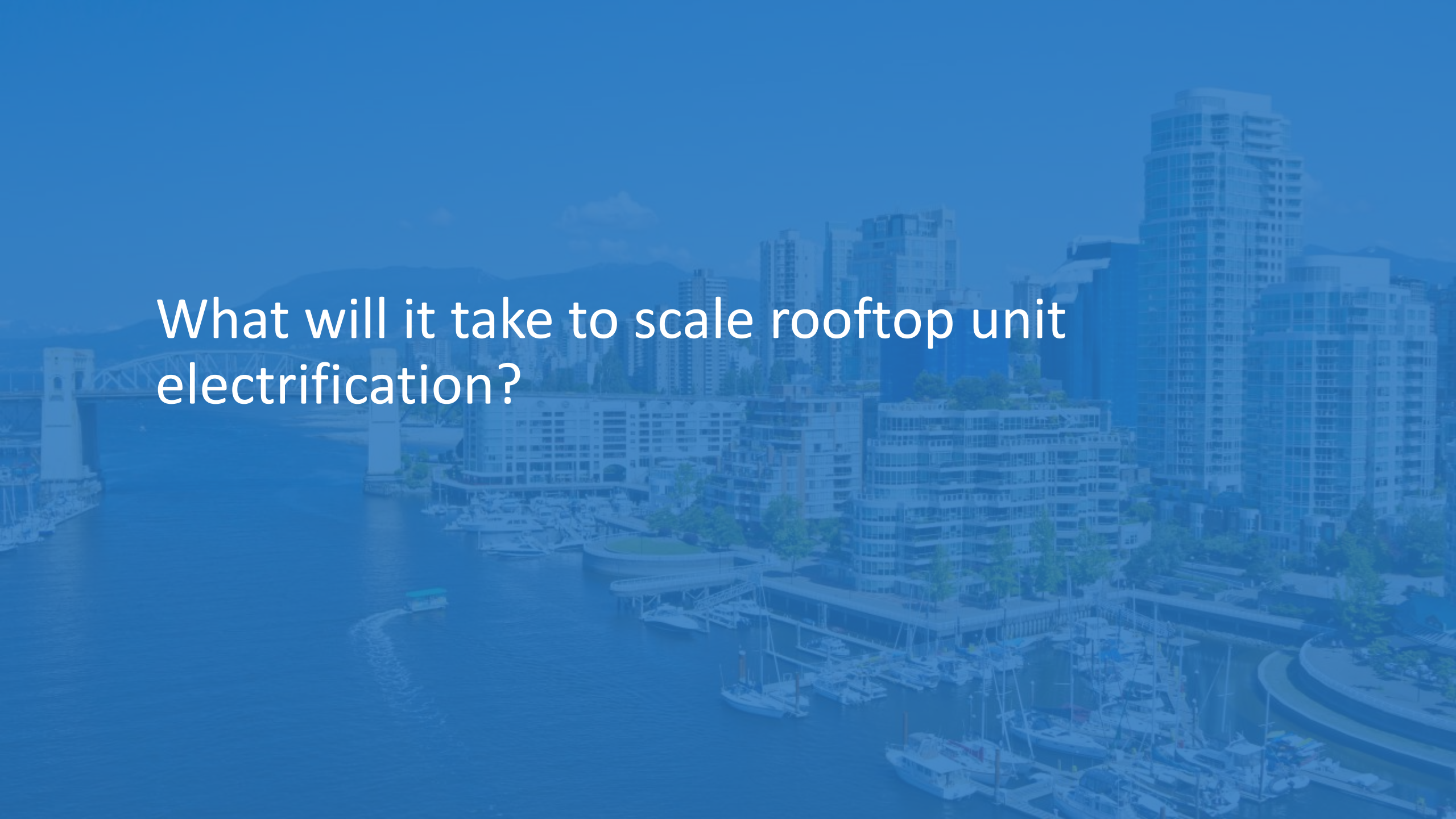
installing new 10-ton unit



How ready is the market?

On-Site Barriers Study Findings: RTUs

- **Product Availability:** HP RTUs are widely available and proven; local suppliers stocking units as demand grows
- **Awareness & Adoption:** awareness and uptake are increasing, though gas units remain the default at large
- **Standardization & Performance:** standardized practices for commissioning, controls, and operator training to ensure reliable performance outcomes
- **Streamlining Permitting:** Cities play a key role in ensuring permitting processes enable, not delay, these retrofits



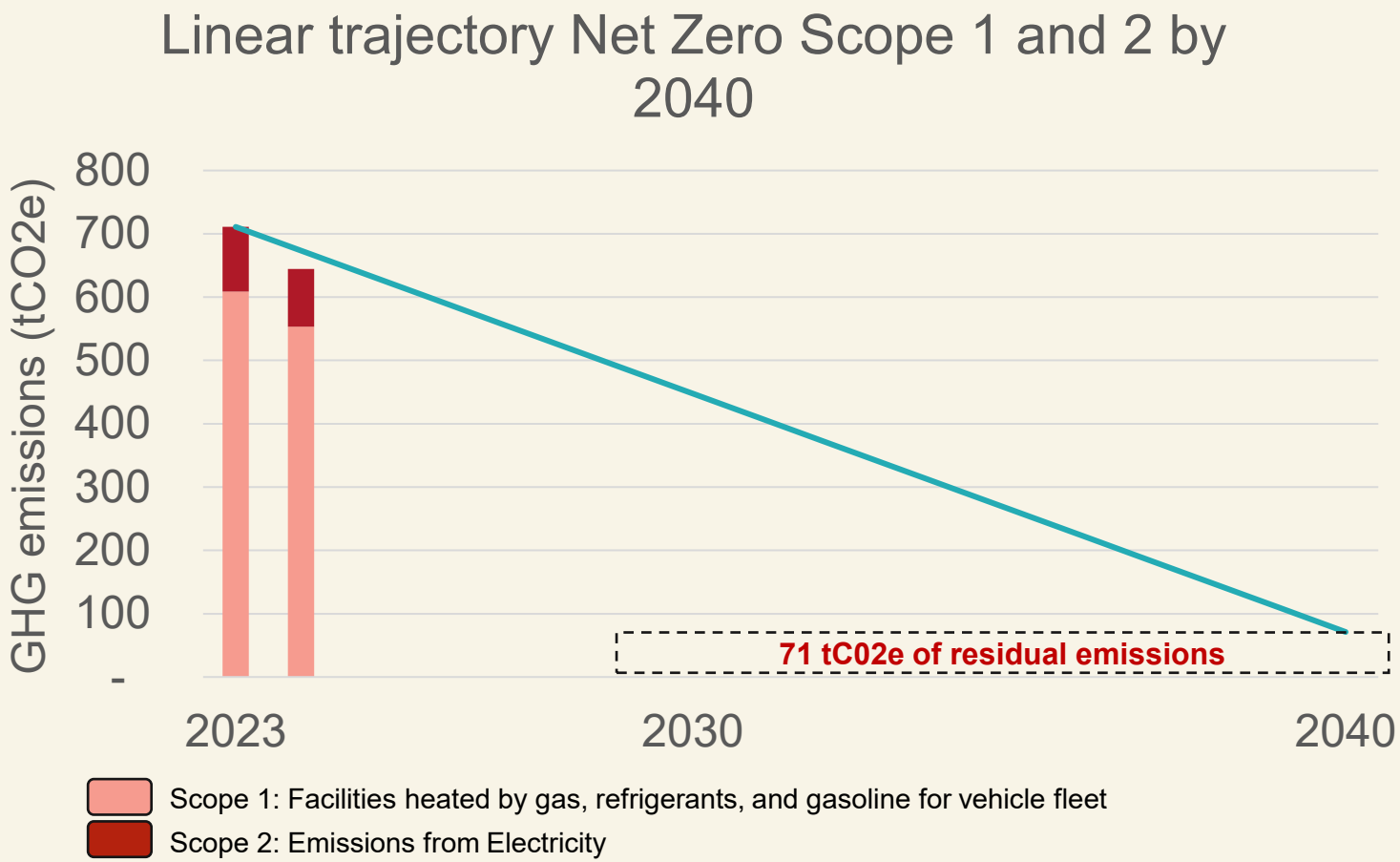
What will it take to scale rooftop unit electrification?

Commercial building RTU fuel switching: A portfolio approach

Nicole Montgomery
Vancity Credit Union

Vancity

The goal: Operational net zero

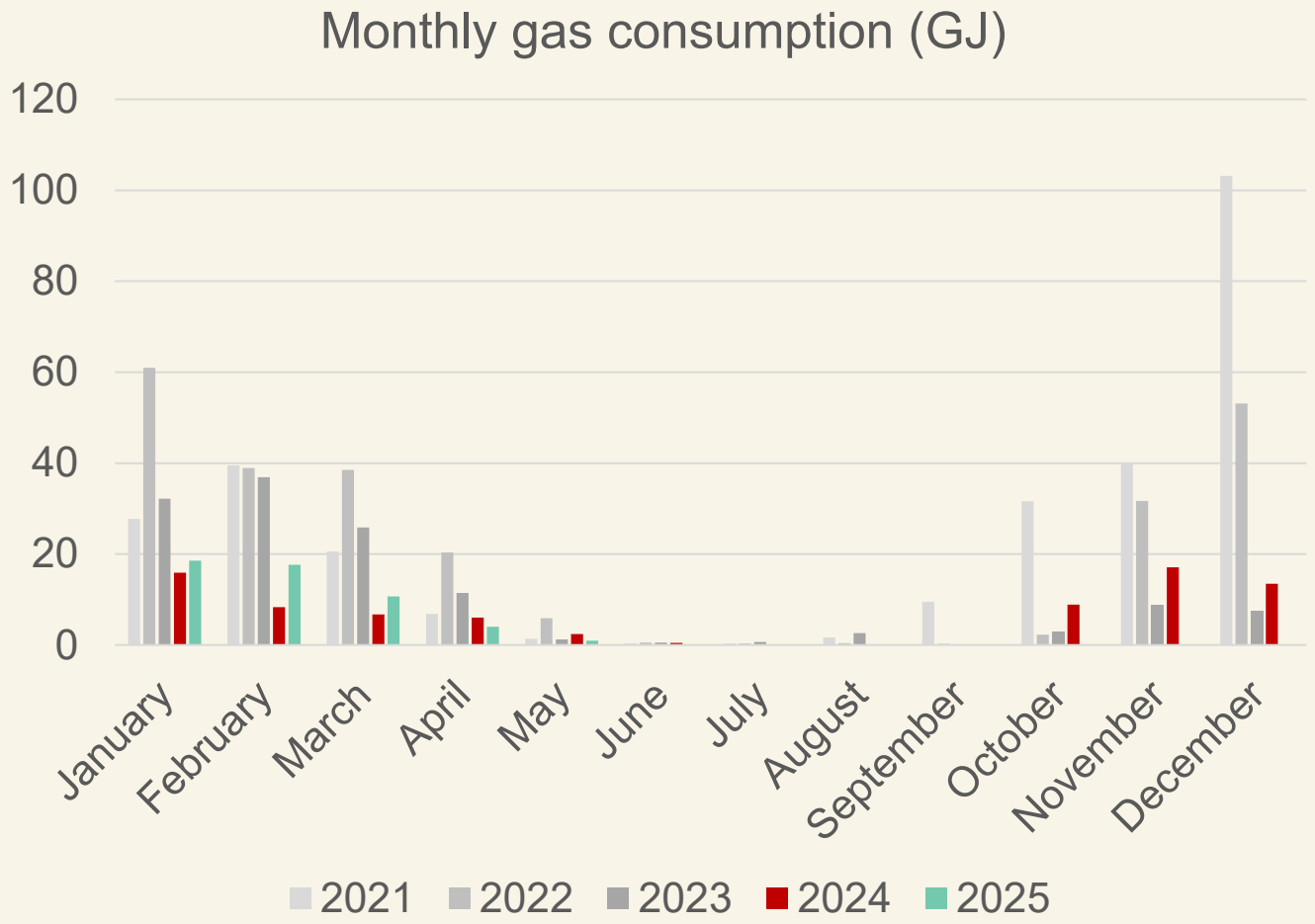


Step 1: Data, data, data

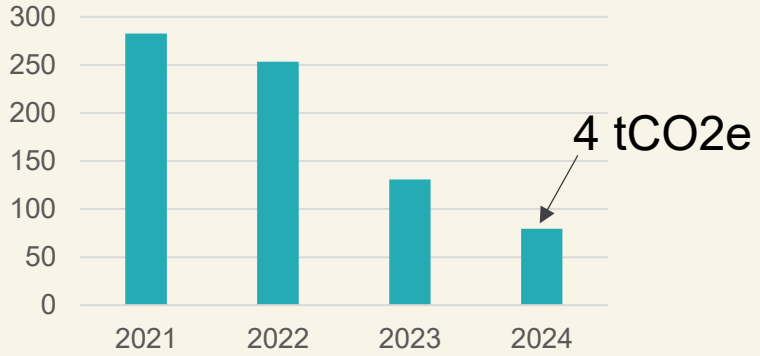
Location ID	Reprogrammed?	January	February	March	April	May	June	July	August	September	October	November	December
1		8%	-3%	1%	-9%	-29%	-13%	-5%	-19%	-23%	9%	17%	13%
4	Yes	-23%	2%	2%	37%	23%	70%	-11%	-64%	-17%	-15%	58%	34%
7		-4%	-27%	-8%	-15%	22%	92%	-43%	-10%	-20%	-17%	-23%	-11%
9		-16%	-2%	4%	7%	35%	75%	23%	107%	63%	64%	36%	8%
13	Yes	10%	1%	13%	-30%	-9%	35%	-63%	-20%	19%	-21%	-27%	-7%
18	Yes	2%	-46%	-25%	-42%	-36%	-21%	-93%	-95%	-62%	-33%	-17%	-29%
19		-9%	-12%	-7%	-26%	-25%	5%	-79%	-27%	8%	12%	12%	5%
21		-7%	-39%	-22%	-35%	-28%	-29%	-56%	79%	6%	-15%	-28%	-26%
23		-33%	-72%	-38%	-64%	-91%	-100%	-100%	-100%	-99%	-90%	-73%	-51%
25	Yes	24%	-2%	11%	-27%	32%	64%	100%	-57%	-28%	-20%	-17%	-13%
30		-13%	-24%	-50%	-90%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
31	Yes	15%	42%	36%	54%	130%	273%	220%	-100%	-81%	147%	-2%	-38%
32	Yes, 202412	24%	-11%	-9%	-26%	-22%	-53%	-55%	67%	162%	72%	-9%	-14%
36	Yes	-4%	-2%	-15%	20%	98%	65%	-28%	-79%	-31%	-38%	-44%	-50%
42	Yes	1%	-4%	-4%	-3%	25%	52%	4%	69%	57%	7%	-17%	-24%
44	Yes	-63%	-82%	-76%	-42%	-36%	-80%	-99%	-100%	-97%	-7%	-24%	-66%
46	Yes	-27%	-51%	-54%	-88%	-100%	-98%	-73%	-100%	-95%	-64%	-46%	-30%
50	Yes	-45%	-55%	-71%	-81%	-75%	-75%	-87%	448%	-15%	-49%	-8%	-15%
54	Yes	13%	-33%	-6%	-7%	42%	147%	104%	448%	-16%	-46%	-34%	-20%
56		-15%	-13%	-19%	-25%	-17%	-57%	-83%	-92%	-76%	-43%	-26%	-33%
58		-43%	-48%	-60%	-52%	-52%	-64%	-100%	-100%	-58%	-36%	-19%	-30%
81		24%	-33%	-17%	-6%	-57%	-3%	515%	227%	123%	4%	6%	16%
88		-31%	-27%	-11%	-12%	26%	14%	-72%	-100%	-17%	-18%	-9%	-14%

Vancity

Before and after: Controls optimization

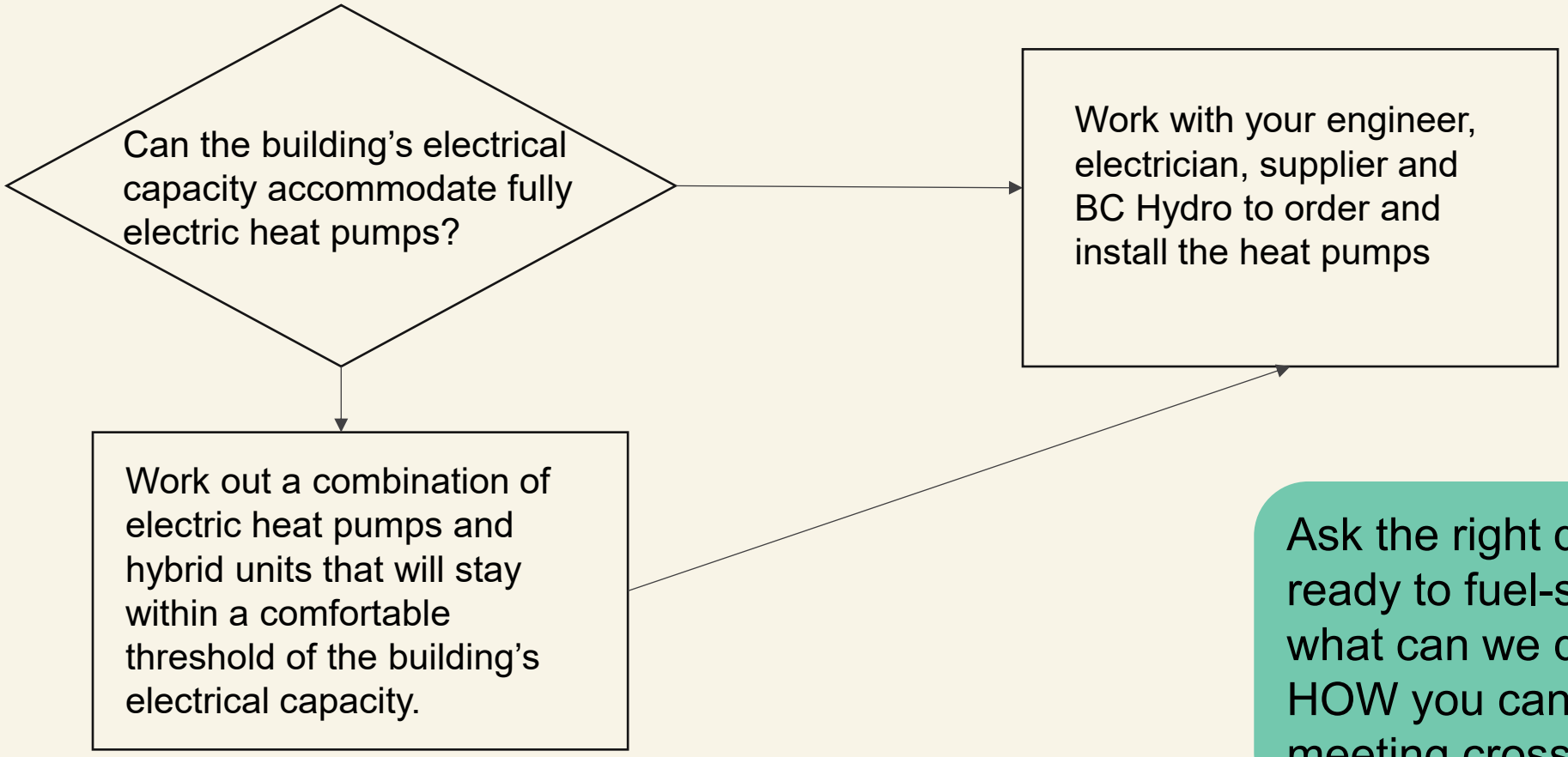


Annual gas consumption reduced significantly



Vancity

Define your problem



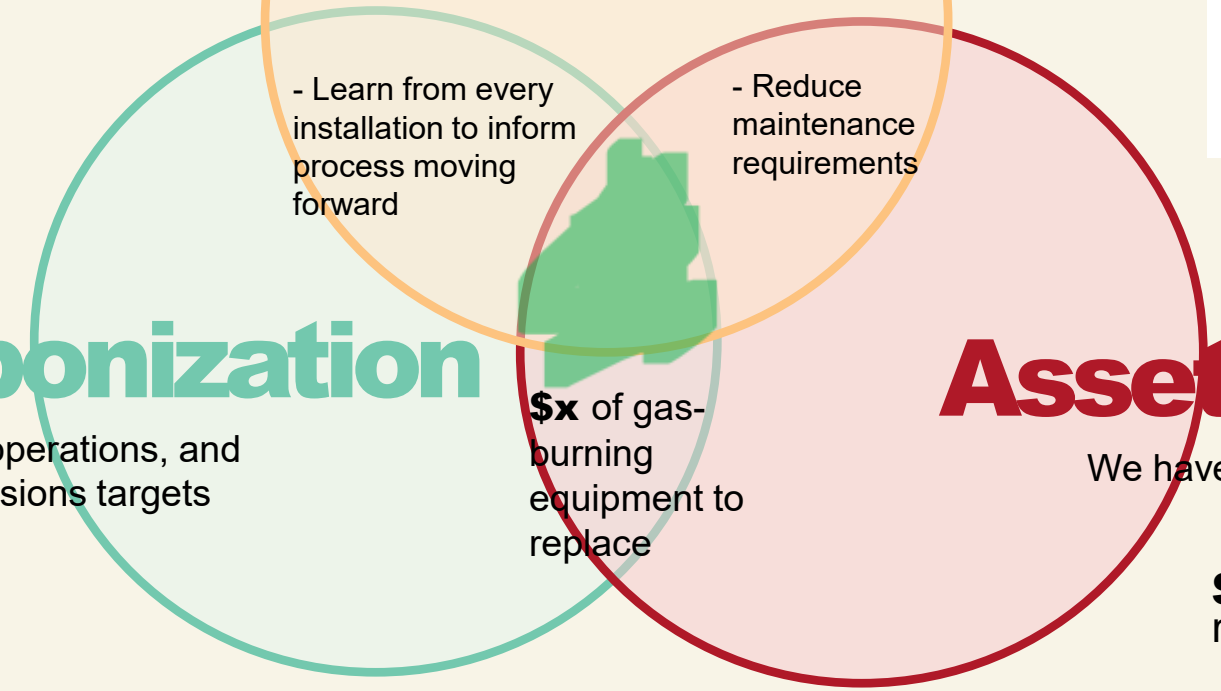
Ask the right questions! If you're ready to fuel-switch, don't ask: what can we do here? Instead, ask HOW you can fuel switch while meeting cross-cutting goals

Decarbonization Framework: A multi-objective approach

We need to be able to monitor performance and diagnose issues

Responsive Operation

When we decarbonize, we replace assets that have reached end of life, and that we have the infrastructure needed to diagnose and respond to issues



- Learn from every installation to inform process moving forward

- Reduce maintenance requirements

Decarbonization

Need to achieve NZ in our operations, and support our financed emissions targets

$x of gas-burning equipment to replace

Asset Replacement

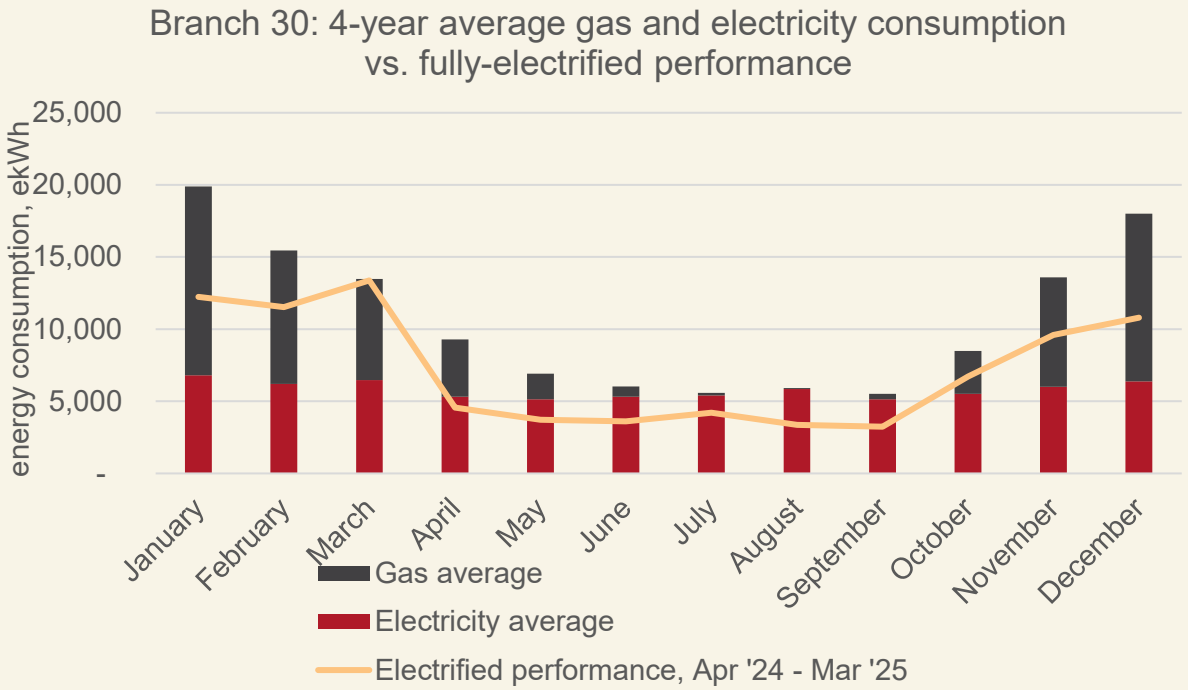
We have HVAC equipment that have reached end of life that need to be replaced

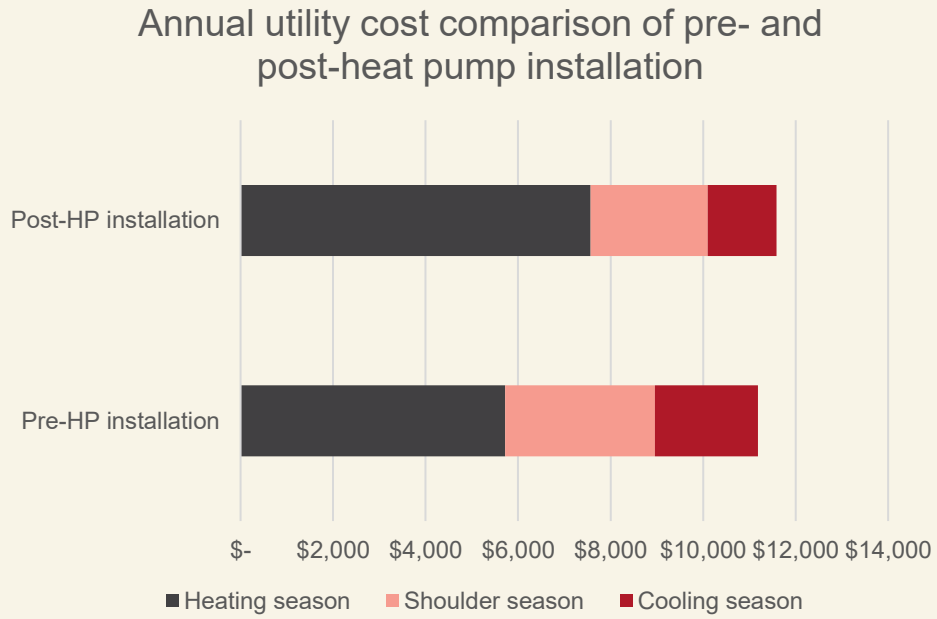
$x worth of HVAC equipment to replace either by us or landlord

Vancity

What we've accomplished: Guildford Branch

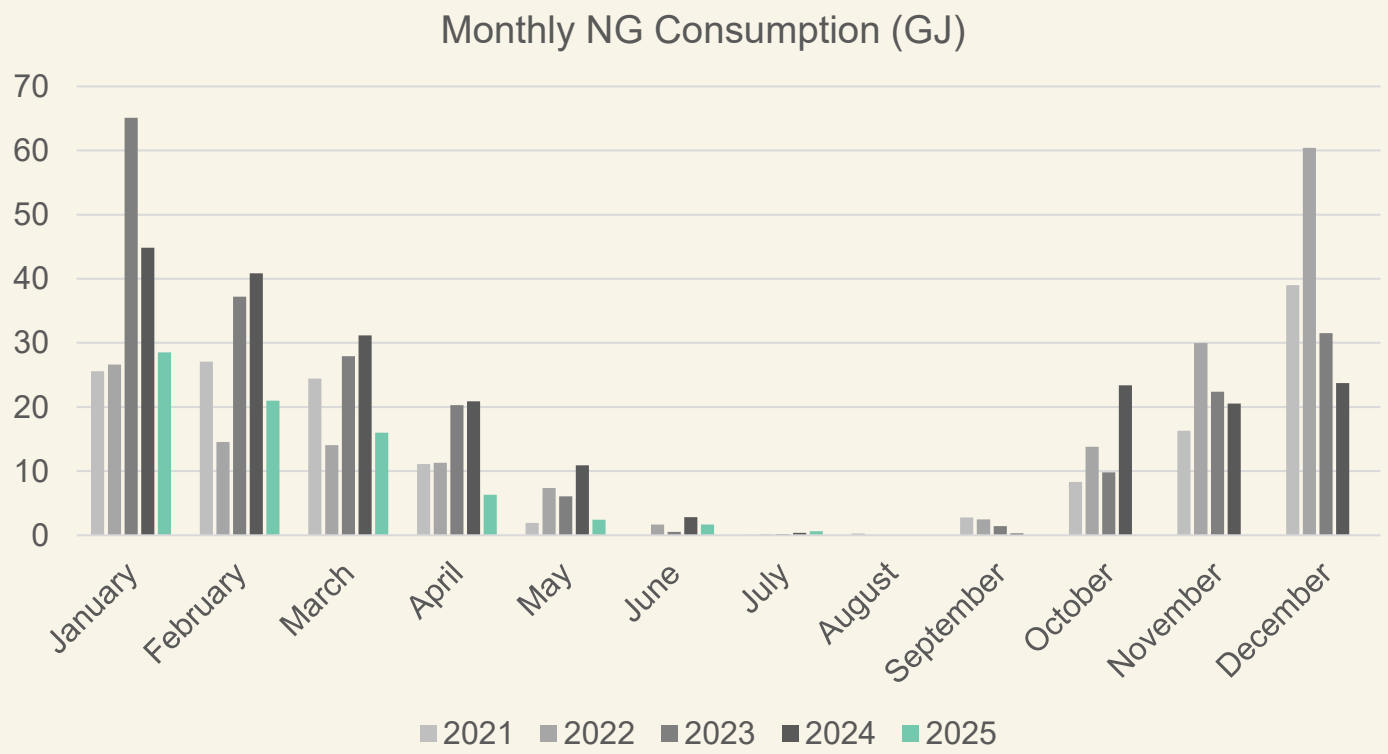
5 RTUs
All units reached end of life, replaced with a fully electric heat pumps in March 2024





Vancity

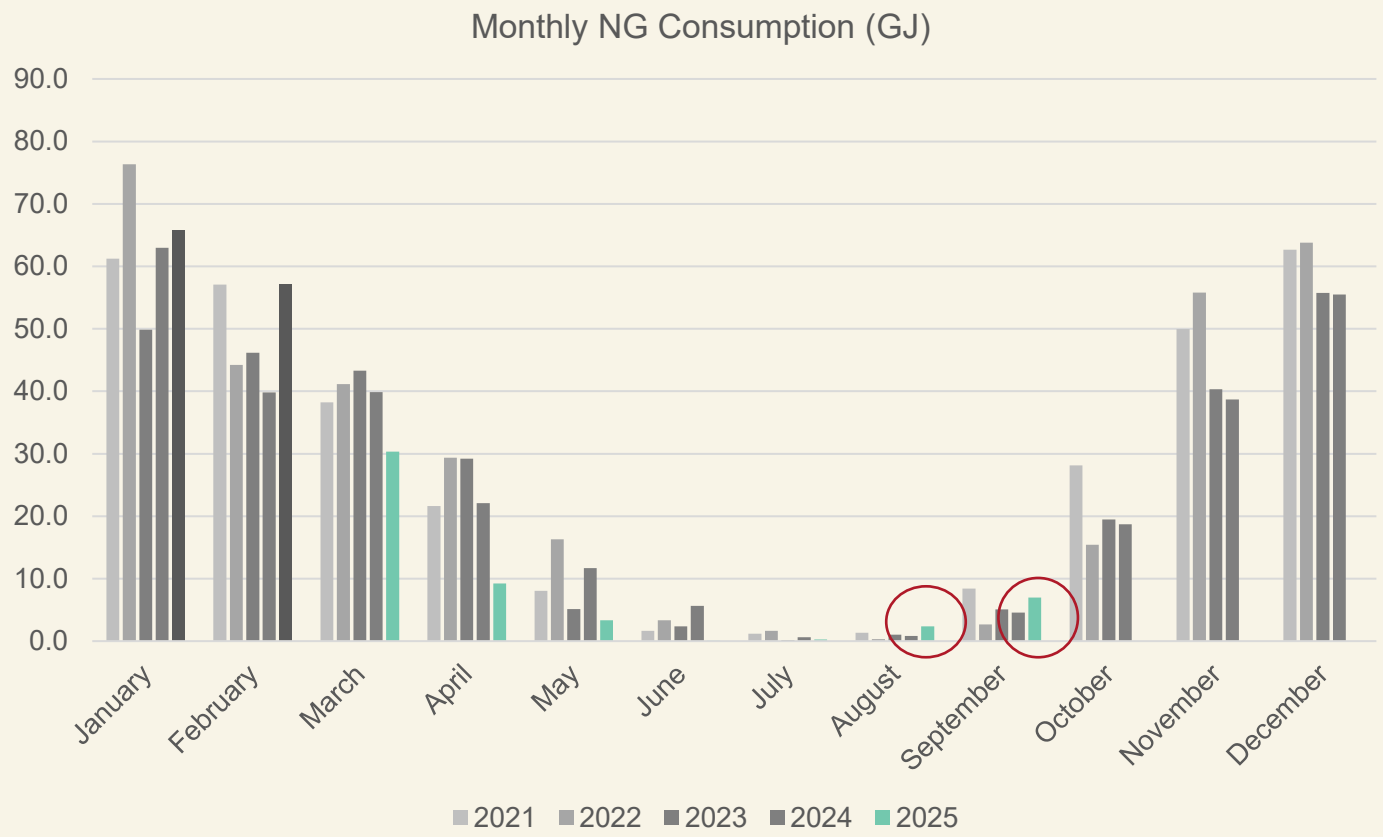
What we've accomplished: Branch B



3 RTUs
1 unit reached end of life, replaced with a fully electric heat pump in December 2024

Vancity

What we've accomplished: Branch C



6 RTUs
3 units reached end of life, replaced with a fully electric heat pumps in March 2025

Vancity

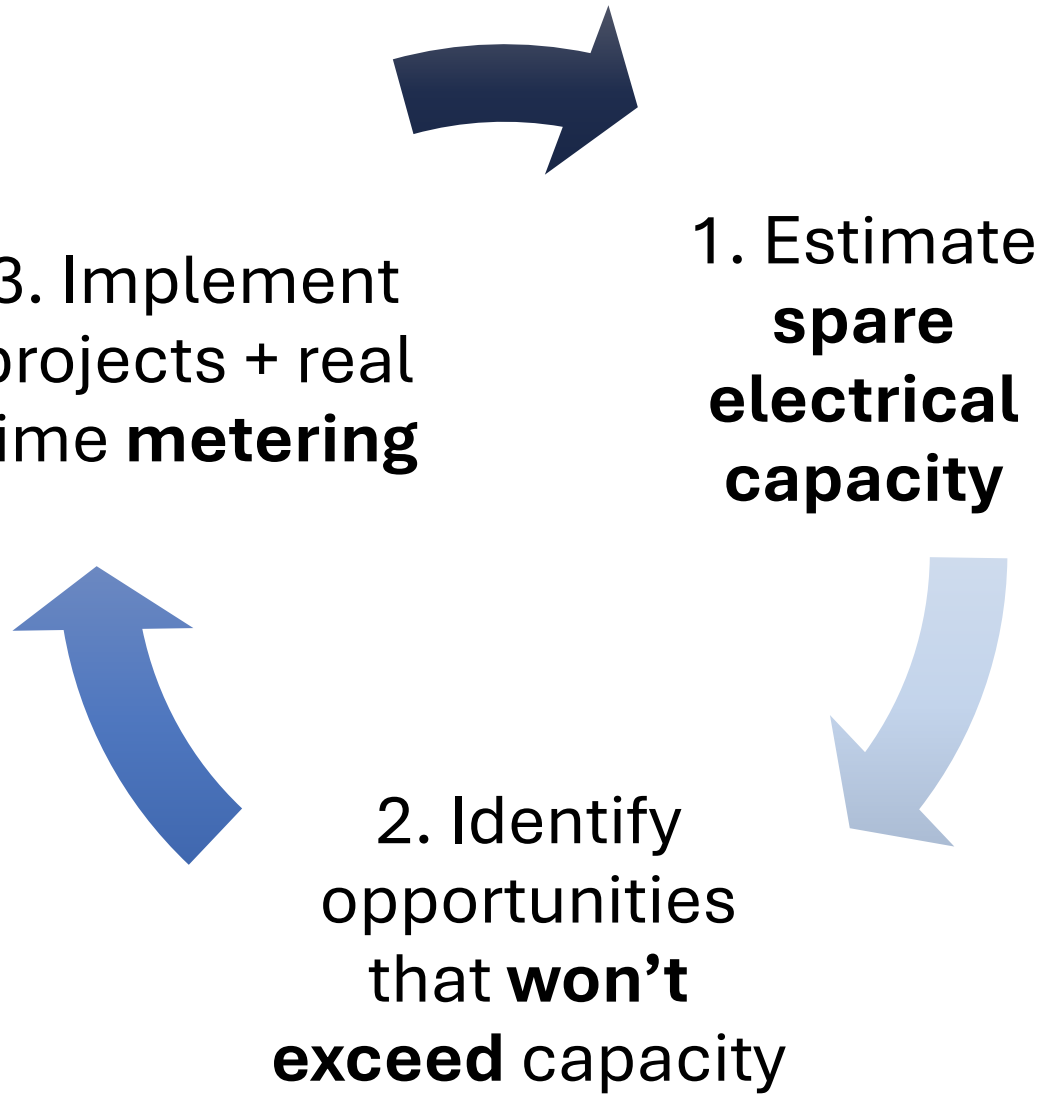
SES CONSULTING
Decarbonizing the Built Environment

Dual Fuel RTUs – Maximizing Emission Reductions

Stephanie Poole, SES Consulting

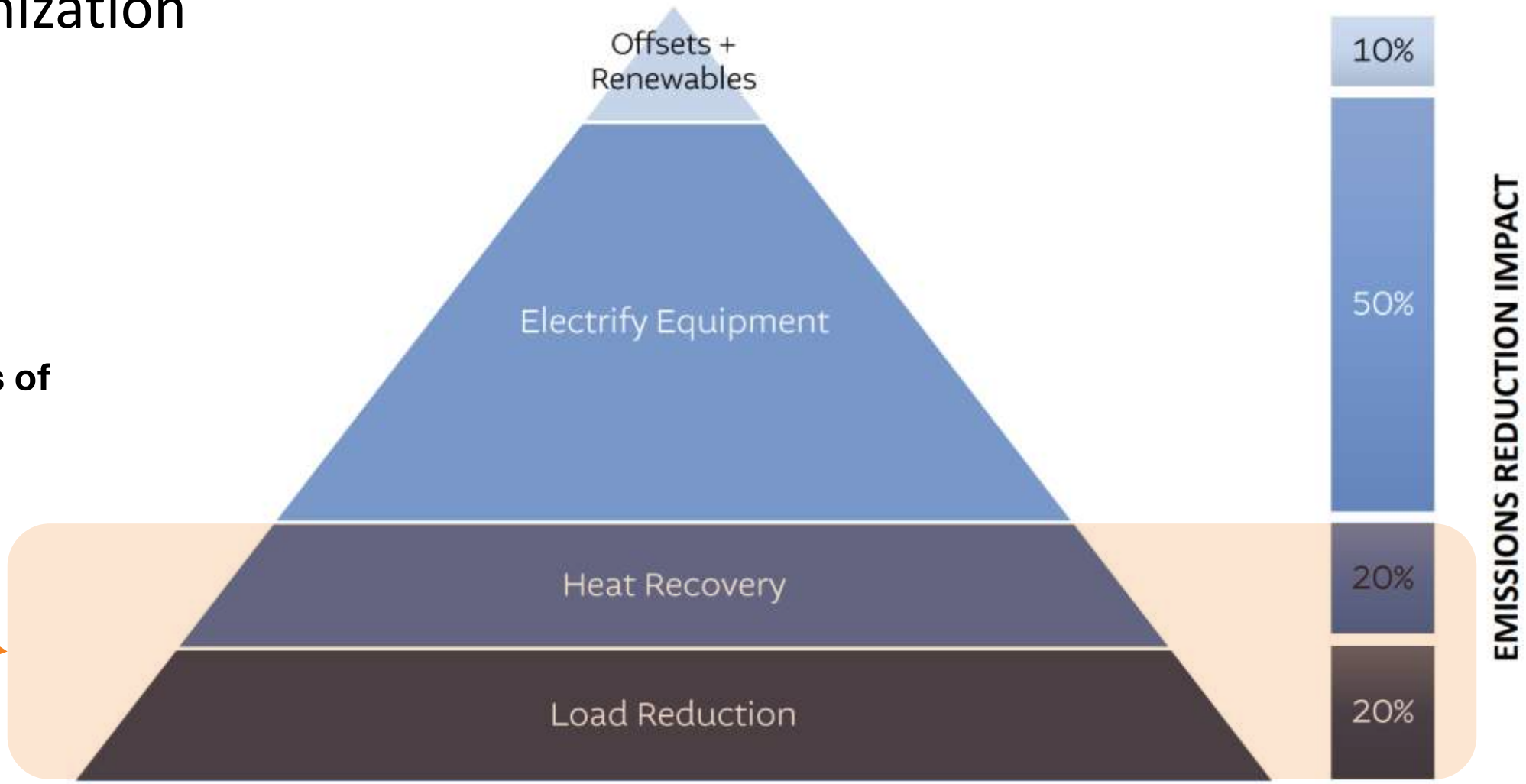
Why Dual Fuel Units?

A Phased Approach to Decarbonization



The Principles of Effective Decarbonization

The foundations of cost-effective electrification



SES

What is the difference between an RTU, an MUA, and an AHU?

Packaged Roof Top Units (RTU)

- One of the most common HVAC systems in many commercial buildings
- Often include gas-fired heat and electric cooling

DUAL FUEL– RTU OPPORTUNITIES

Packaged RTU Opportunities

- ASHP with gas backup
- No electric service upgrade required
- No structural upgrade required
- Predicted savings = 80-90% gas reduction
- FortisBC Rebate 30-50% of the total project cost
- Rebate should cover 100% of the incremental cost when done at end of life

Makeup Air Units (MUA)

- Very common HVAC systems in commercial buildings
- Include gas-fired heat, but generally not electrical cooling

DUAL FUEL – MUA OPPORTUNITIES

Custom MUA Opportunities

- MUA HP with gas backup
- Electric service upgrade required
- Structural modifications required
- Predicted savings = 30-50% gas reduction
- FortisBC Rebate 30% of the total project cost
- Rebate should cover 50% of the incremental cost when done at end of life

DUAL FUEL RTUS – MUA CASE STUDY

Project Background

- Dual fuel MUAs were installed at two social housing buildings
- New units replaced existing end of life gas fired units
- Served hallways and amenity spaces
- Predicted savings = 85% gas reduction
- Actual outcome
  - » Building 1: 10% savings in gas
  - » Building 2: 11% increase in gas

DUAL FUEL RTUS – CASE STUDY

Findings:

- Heat pump was not being used as first stage of heating.
  - The MUA controller setpoints were too high.
- Gas burner was short cycling
  - SAT Duct sensor too close to the gas burner
- Condensate pooling
  - drain pan slightly sloped away from drain point
- Heat pump was causing vibration, disrupting occupants

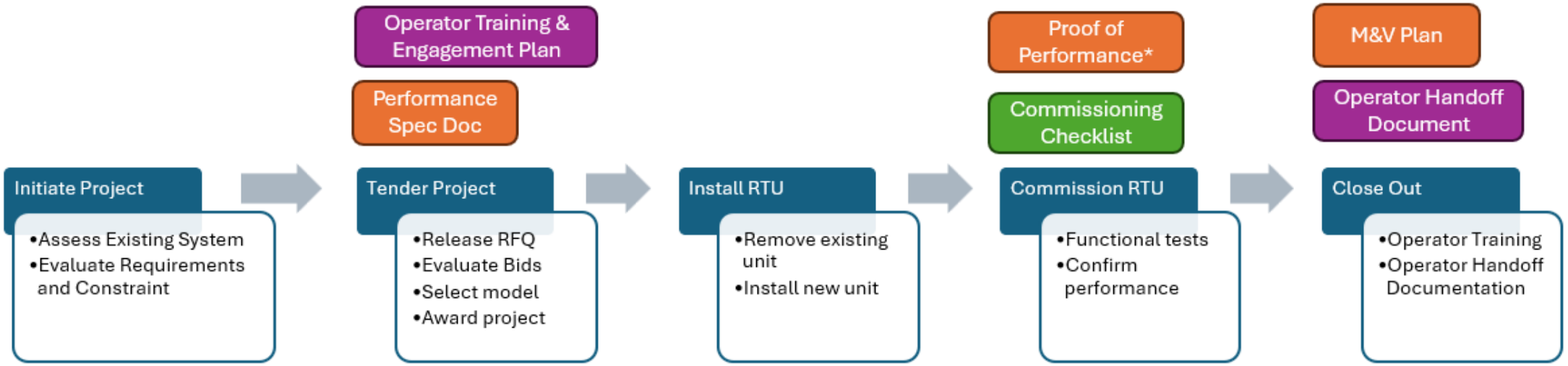
Solutions:

- Recommission the setpoints
  - Ensure heat pump was acting as the first stage of heating
- Updated control of the unit to be based on space temperature sensor
- Had contractor fix the drain pan
- Isolation pad was installed to reduce vibration
  - This should have been done as part of original install

MAXIMIZING EMISSION REDUCTIONS – LESSONS LEARNED

- Include an electric pre-heat coil for dual-fuel MUA
  - » MUA is 100% and below 7°C the evaporator coil starts to freeze
  - » Design preheat capacity for 10 °C so can run down to -3 °C
  - » Allows heat pump to run more often – Increases savings
- Choosing the right size of heat pump (likely not actually changing the size)
- Specify datalogging capabilities when selecting a model
- Include performance commissioning specifications in the RFP/IFT specs
  - » Outline specific operational conditions/tests the contractor shall run
    - ex. test switchover temp from HP gas/electric preheat and ensure SAT is being maintained
- Have someone validate commissioning

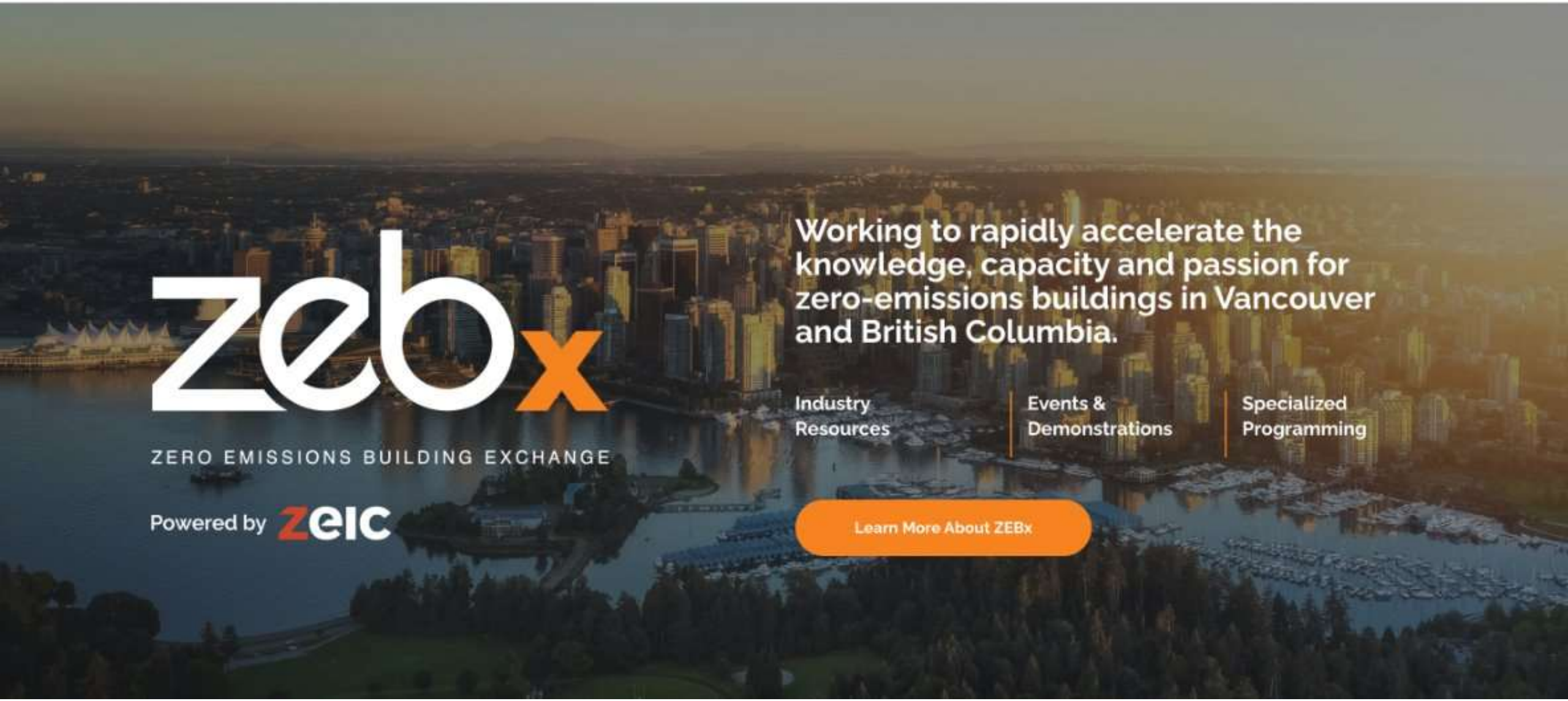
DUAL FUEL RTU – Methodology



M&V – Verify actual savings!

Deliverable Intended Audience

Contractor | Owner | Operator


zebx
ZERO EMISSIONS BUILDING EXCHANGE
Powered by ZEIC
Working to rapidly accelerate the knowledge, capacity and passion for zero-emissions buildings in Vancouver and British Columbia.
Industry Resources
Events & Demonstrations
Specialized Programming
Learn More About ZEBx