

Deep Emissions Retrofit Dialogue

zeb^x

 **BC Hydro**
Power smart

 **CITY OF
VANCOUVER**

Series

Deep Emissions Retrofits of Homes: How to Get it Right

Tue, Oct 26, 2021
from 12.30pm - 2.30 pm PDT
Free webinar | zeb.org



**HOME PERFORMANCE
STAKEHOLDER COUNCIL**

Song: The Necessary Change – Music Ruined My Life



RR-2

POLICY REPORT DEVELOPMENT AND BUILDING

Report Date: July 5, 2016
Contact: Sean Pander
Contact No.: 604.871.6542
RTS No.: 11195
VanRIMS No.: 08-2000-20
Meeting Date: July 12, 2016

TO: Vancouver City Council
FROM: Green Building Manager, Sustainability Group
SUBJECT: Zero Emissions Building Plan

RECOMMENDATION

- A. THAT Council approve the Zero Emissions Building Plan (attached as Appendix A) and adopt a target to reduce emissions from new buildings by 90% as compared to 2007 by 2025 and to achieve zero emissions for all new buildings by 2030 including intermediary time-stepped GHG emission and thermal energy demand targets as described in the Plan.
- B. THAT Council direct staff to report back with specific recommendations to reflect the first step of these limits in the Rezoning Policy for Green Buildings and Vancouver's Building Bylaw along with any synergistic updates to Neighbourhood Energy connection requirements by Q1 2017.
- C. THAT Council direct staff to build all new City-owned and Vancouver Affordable Housing Agency (VAHA) projects to be Certified to the Passive House standard or alternate zero emission building standard, and use only low carbon fuel sources, in lieu of certifying to LEED Gold unless it is deemed unviable by Real Estate and Facilities Management, or VAHA respectively, in collaboration with Sustainability and report back with recommendations for a Zero Emissions Policy for New Buildings for all City-owned and VAHA building projects by 2018.
- D. THAT Council direct staff, in consultation with industry, to develop a three year, \$1.625 million Zero Emissions Home Program for detached and row houses (\$325K in 2017 from the Climate Action Rebate Incentive Program Reserve, \$650K in 2018 and \$650K in 2019 from a funding source to be determined and reported back to Council), and report back to Council with specific recommendations for tools to catalyze leading builders to demonstrate cost effective approaches to building zero emissions homes by 2017.

F. THAT Council approves in principle \$700,000 over three years (\$300K in 2017, \$200K in 2018, and \$200K in 2019 from the City's 2017 Innovation Fund, subject to Council approval of the 2017 Innovation Fund budget) towards establishing a non-governmental Zero Emissions Building Centre of Excellence with the mission to facilitate the compilation and dissemination of the knowledge and skills required to design, permit, build and operate zero emission buildings in BC, and direct staff to engage partners, secure matching funding, consult with stakeholders and report back with recommendations for implementation in 2017.

COLLABORATE

Accelerate Solutions



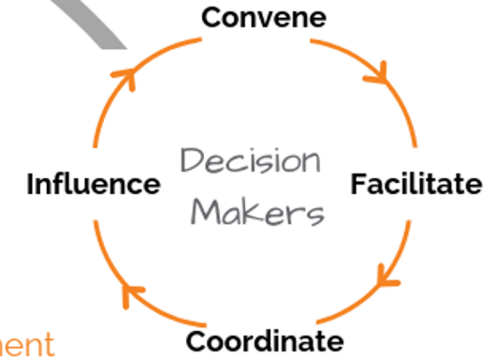
Designers
Builders
Academia
Developers
Manufacturers

zebx

"connecting industry to solutions"

~~ADVANCE~~ ACCELERATE

Remove Barriers &
Identify Opportunities



Government
Global Experts
Mission-Aligned Organizations
Industry Associations

SCALE

Build Capacity



Season 1 Episode 5

Recorded at Past Event: Jul 22 @ 12:00 pm – 1:00 pm

The Builders Have Spoken: The Cost of High-Performance Construction



▶ 0:00 / 53:32



Overview

In our June Decarb Lunch, we presented [ZEBx's in-depth analysis](#) of construction costs for high-performance multi-unit residential buildings in BC. Of the seven buildings in the study, two all-electric, Step 4 buildings were constructed for well under the average cost of similar code-minimum residential buildings in the area. Both buildings were constructed by developer/builders: [Vidorra Developments](#) and [Highstreet Ventures](#). How did they achieve this impressive result? Was it the fact that they are developer/builders? Do they have some special recipe for constructability or cost-effective high-performance building development?

The July 2021 was a collaboration with the Pacific Region [UDI](#).

ARTICLE



zebx
ZERO EMISSIONS BUILDING EXCHANGE



Marketing the High-Performance Home

Sep 2021





NearZero.ca

A green initiative sponsored by the City of Vancouver and CleanBC to gather data and encourage the construction of more high-performance homes.

PROJECT BROUGHT TO YOU BY:

PASSIVEHOUSE
CANADA Build better.
Feel better.

 CITY OF
VANCOUVER

 **GREENEST**
CITY

zebx
ZERO EMISSIONS BUILDING EXCHANGE

cleanBC
our nature. our power. our future.

[Home](#)

[About NearZero](#)

[Overview](#)

[Requirements](#)

[Deliverables](#)

[Compensation](#)

[ZEBx](#)

[Register](#)

Decarb Lunch Series

zebx

 **BC Hydro**
Power smart

 **CITY OF
VANCOUVER**

From Net-Zero Energy to Near-Zero Emissions

Fri Oct 29, 2021,
from 12- 1pm PDT
Free Webinar | zebx.org

 **BC HOUSING**

Be part of it first.

Join the **Building to Electrification
Coalition launch event**

Sep 29, 2021

11am- 12pm PDT

Free Webinar

Building zobx Electrification

Photo: Brayden Law on Unsplash



B2E

**Building to
Electrification
Coalition**

The BC Building Electrification Road Map was created through the contributions and collaboration of multiple stakeholders across the British Columbia building industry. It serves as an important starting point in a dialog between stakeholders on how to achieve GHG reduction goals.

While many organizations contributed their time and expertise to the development of the Road Map, staff from the following organizations and institutions were fundamental to its creation:

Funding partners and Steering Committee members:



Additional Steering Committee members:



Lead consultant:



Supporting consultants:



Photo courtesy of Andrew Latrelle

This report was prepared by Integral Group with input from a wide range of building sector stakeholders and the Road Map's Steering Committee which included representatives from BC Hydro, BC Ministry of Energy, Mines, and Low Carbon Innovation (Energy Efficiency Branch), BC Attorney General and Minister responsible for Housing (Building Safety and Standards Branch), City of Vancouver, City of Richmond, and Metro Vancouver.

The findings and views expressed in this report are those of the authors and do not represent the views, opinions, recommendations or policies of the Steering Committee members. The project's Steering Committee members do not represent, guarantee or warrant to any third party, either expressly or by implication: the accuracy, completeness or usefulness of, the intellectual or other property rights of any person or party in, or the merchantability, safety or fitness for purpose of, any information, product or process disclosed, described or recommended in this report.

5 CORE STRATEGIES

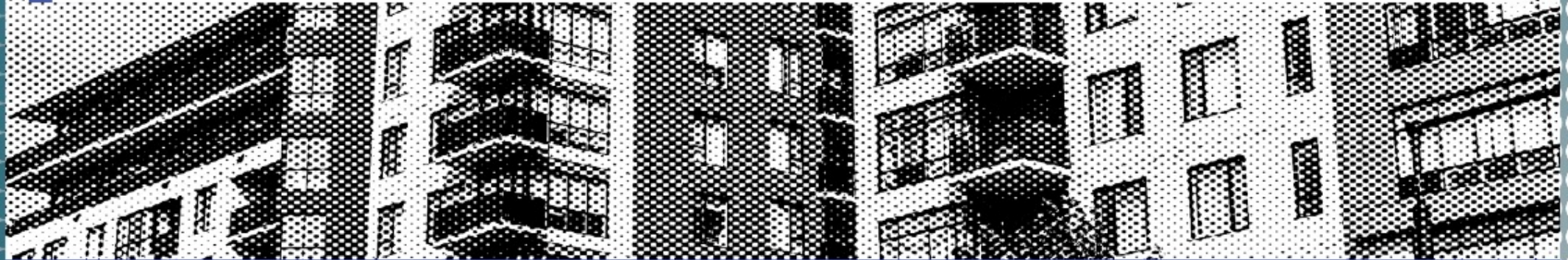
STRATEGY	OBJECTIVE
Create Market Demand	<ul style="list-style-type: none"> • Demonstrate provincial leadership through messaging and market signals • Raise level of consumer awareness about the benefits of electrification • Require building GHG performance data reporting and disclosure • Set a minimum energy performance standard of co-efficient of performance (COP) >1 by 2035 for space and water heating equipment
Improve Cost Competitiveness	<ul style="list-style-type: none"> • Reduce equipment and whole building capital costs • Level the playing field between natural gas and electric operational costs • Reduce electricity connection and system upgrade fees • Address housing affordability and building electrification • Reduce transactional costs for consumers
Address Systemic Barriers	<ul style="list-style-type: none"> • Reflect high efficiency features more accurately in property appraisals • Reduce landlords' legal barriers to undertake electrification retrofits • Ensure buildings connected to district energy systems can decarbonize • Improve access to capital • Reduce permitting complexity and time for new heat pump systems
Expand Industry Capacity	<ul style="list-style-type: none"> • Expand electrification sales force • Improve building electrification awareness, coordination, and advocacy • Build industry knowledge, experience, and competence • Expand the use of trade certifications and energy performance guidelines • Support growth in the number of people in the building electrification trades sector
Increase Available Technologies	<ul style="list-style-type: none"> • Support the development of building and equipment standards • Accelerate the certification of promising new technologies • Support the introduction of certified technologies • Expand the market in North American for building electrification

B2E Newsletter Launch



Apply for B2E Membership

Read & Subscribe to the B2E Newsletter



POLL 1

Tell us about yourself!

Three-part anonymous poll



**HOME PERFORMANCE
STAKEHOLDER COUNCIL**

The background of the slide is a photograph of a residential street. In the foreground, there's a paved road. Behind it, a row of houses is visible, some with green siding and others with yellow. There are lush green trees and manicured lawns with hedges. A dark blue horizontal band is overlaid across the middle of the image, containing white text.

Home Performance Stakeholder Council

Home Performance Contractor Network



**HOME PERFORMANCE
STAKEHOLDER COUNCIL**

Who is the HPSC?



Home Performance Sectors



Our Supporters



Home Performance Contractor Network (HPCN) Overview

Home Performance Contractor Network (HPCN)



FENESTRATION

Registration
OPEN

Mandatory*
OCTOBER 2021



HEATING, COOLING,
& VENTILATION

Registration
OPEN

Mandatory*
SPRING 2022



INSULATION

Registration
OPEN

Mandatory*
FALL 2022



RENOVATION

Registration
OPEN JANUARY 3,
2022

Mandatory*
TBD



ENERGY ADVISORS

Registration
OPEN JANUARY 3,
2022

Mandatory*
TBD

*For participating programs

Why join the HPCN?

- Subsidized training (for a limited time)
- Eligibility for rebate and incentive programs from program partners
- Public recognition for quality work and use of the HPCN logo
- Business information displayed in a public directory/search tool and promoted across BC
- Invitations to exclusive networking, engagement, and training opportunities



Program Partners

+ more to come!

Rebate or Incentive Type

Date that HPCN is Mandatory for Rebate or Incentive Programs



Window

FALL 2021



Income-Qualified Offer



Heating, Cooling, & Ventilation

FALL 2021



Income-Qualified Offer*

April 1, 2022



Better Homes & Home Renovation Rebate



Insulation

FALL 2021



Income-Qualified Offer**

November 1, 2022



Better Homes & Home Renovation Rebate

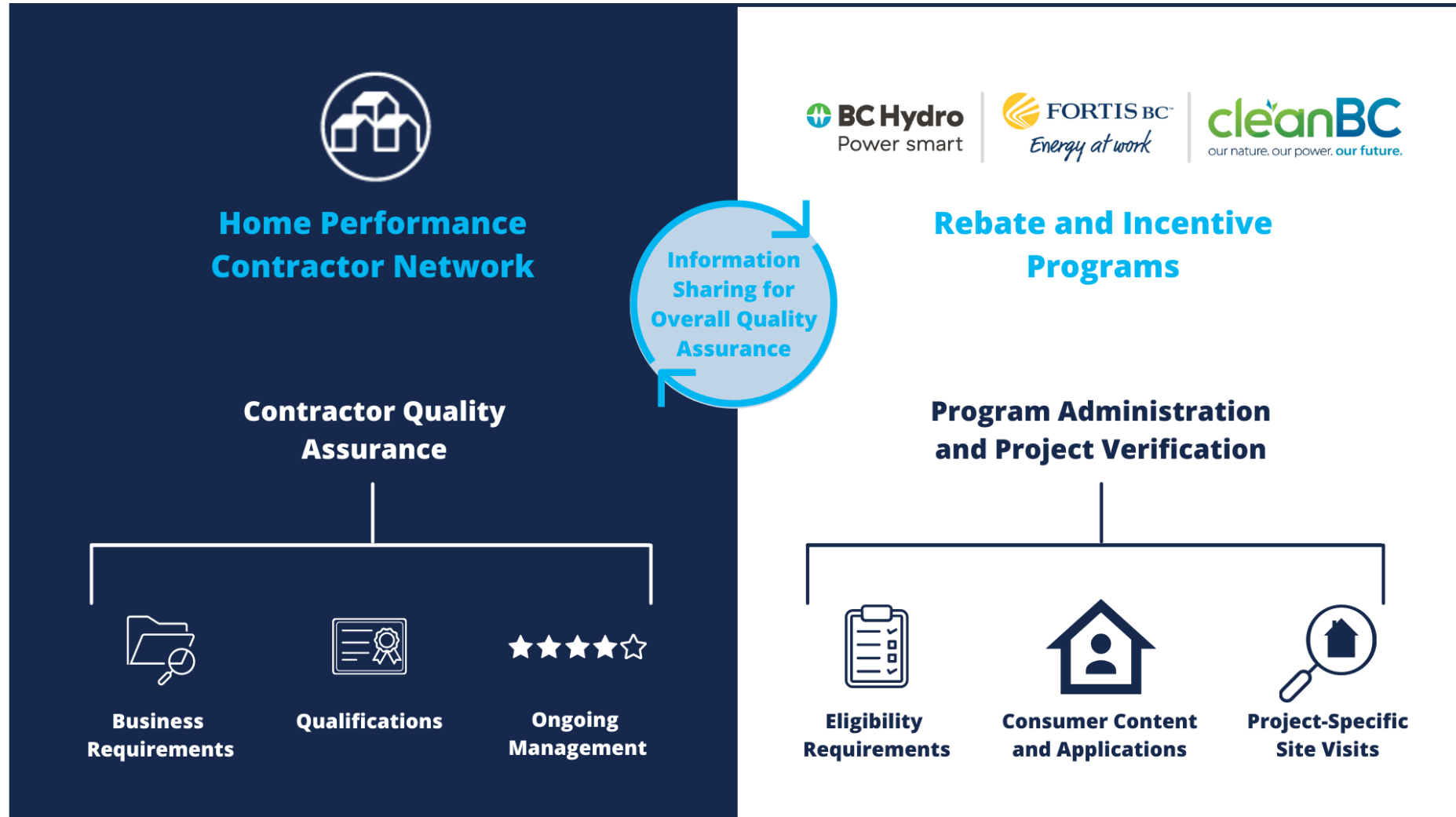
*Heat Pump PRC also eligible until March 31, 2022

**Insulation PRC also eligible until October 31, 2022



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HPCN and Rebate/Incentive Programs

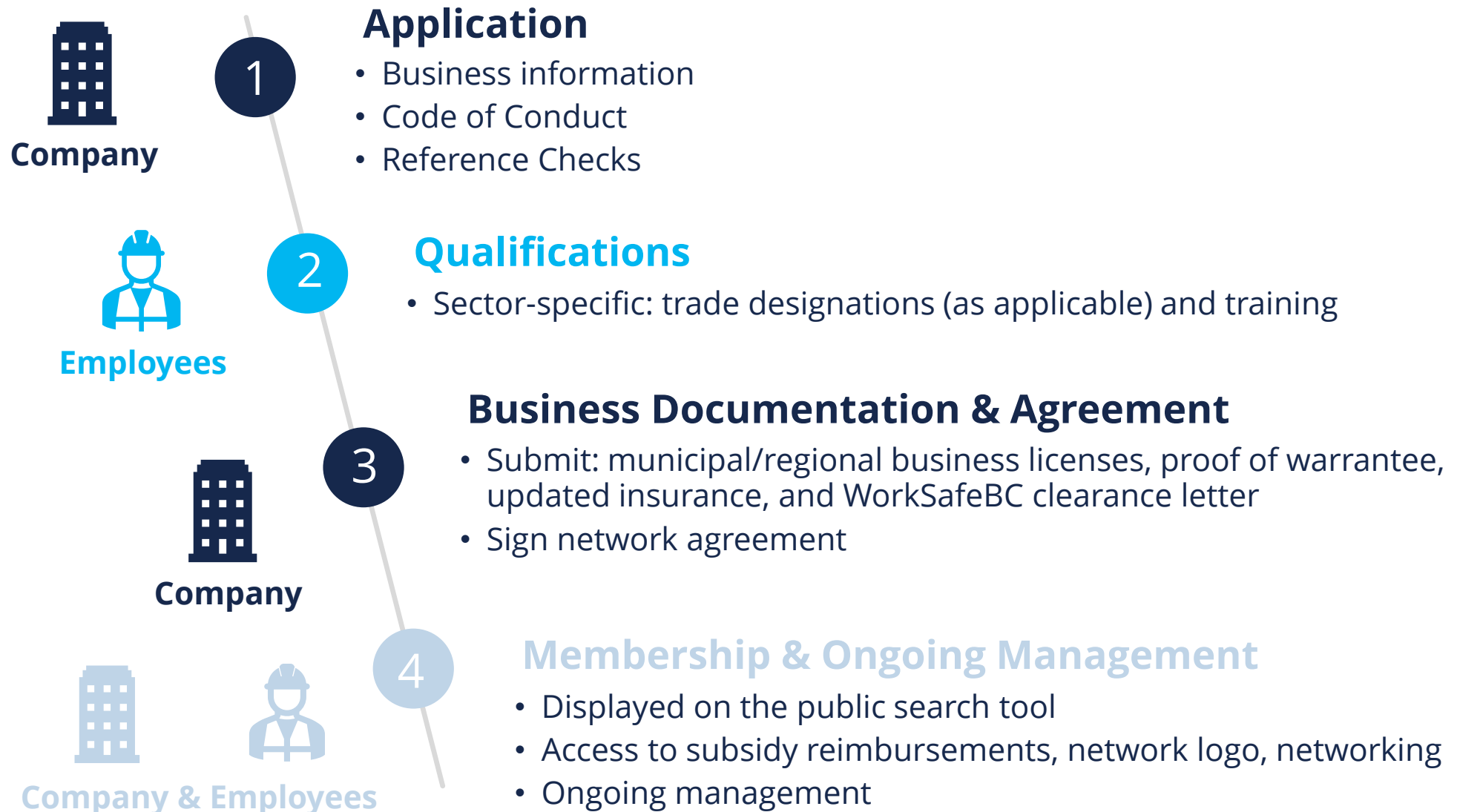


HPCN Eligibility

- Be companies or independent contractors. Individual installers are not eligible to apply on their own.
- Directly employ their installers for the relevant sector. Membership in the HPCN does not cover sub-contractors.
- Be currently be operating in British Columbia and have been operating in British Columbia for a minimum of three (3) consecutive years before the date of application.

homeperformance.ca/contractornetwork

HPCN Participation



HPCN Qualifications - HVAC

Requirement	Estimate Time (hours)	Subsidy
Trade Designation: Gas Fitter (mandatory for furnace installers)	n/a	n/a
Course: House-as-a-System Course	3.5	\$0 (free course)
Courses: TECA or HRAI [<i>Heat Loss Heat Gain & Principles of Ventilation/Moving Air</i>]	26-28.5	\$1,096-1,332 (course cost) + \$442-485 wage contribution
Course: Quality Installation of Forced Air Furnace and Air Source Heat Pump Retrofits in BC Homes	26	\$442 wage contribution (free course until December 31, 2021)
Total Time 55-58 hours		Total Subsidy \$2,022-2,220

Required for membership

6 months to complete



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HPCN Qualifications - INSULATION

Required for
membership

6 months to
complete

Requirement	Estimate Time (hours)	Subsidy
Course: House-as-a-System Course	3.5	\$0 (free course)
Course: Introduction to Insulation Installation (NAIMA)	2.5	\$0 (free course) + \$37 wage contribution
Course: Quality Installation of Insulation Retrofits in BC Homes (modules 0-2)	6.5	\$0 (free course until December 31, 2021) + \$495 wage contribution
Course: Quality Installation of Insulation Retrofits in BC Homes (modules 3-8)	26.5	

Total Time
39 hours

Total Subsidy
\$532



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Thank You

Next Steps

Details and registration
homeperformance.ca/contractornetwork

Questions? info@homeperformance.ca



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Context

- Why is there a growing focus on *existing* buildings?
- Why focus on deep **emissions** retrofits as opposed to deep **energy** retrofits?
- What does the future hold for emissions from buildings?



An aerial photograph of a suburban neighborhood. The image shows a grid of streets with houses on either side. Many trees are in bloom, with pink and purple blossoms visible. A prominent orange building is visible in the upper right. The overall scene is a typical residential area.

Why Focus on Existing Buildings?

- “Assuming projected demolition rates of ~1.4% per year, around 50% of existing buildings will still be in use by 2050.” – Pembina Institute, Building Energy Retrofit Potential in BC, 2016
- “Assuming historical demolition rates will continue at a similar pace, around 60% of existing buildings will still be in use by 2050.” - City of Vancouver Climate Emergency Action Plan, 2020

Why Prioritize Emissions?

- Energy is a proxy for emissions that makes more sense in areas where the electrical grid is high-carbon.
- The focus on emissions in areas where the electrical grid is low-carbon allows for a second emissions-reduction strategy: electrification.



What's in Store?

- “By 2030, the carbon pollution from building operations will be cut in half from 2007 levels.” - City of Vancouver Climate Emergency Action Plan, 2020
- The first set of requirements for detached homes could come as early as 2025.
- Exceeding the maximum allowable emissions limit would incur fines.



What's in Store?

CLIMATE 2050 BUILDINGS ROADMAP ACTION TIMELINE

STRATEGY	2021-2023	2024-2029	2030-BEYOND
STRATEGY 1 Signal the Transition to Zero Emission Buildings Through Requirements and Standards		GHG Performance Requirements for Existing Large Buildings	
		GHG Performance Requirements for Existing Houses & Townhomes	
	New Buildings Efficient and Electric		
		Require Greenhouse Gas Reductions During Renovations	
	Energy Labels for Homes and Buildings		
	Manage Indoor Air Quality in Building Codes		
			High Perform. Heating and Cooling Equip.
	Significantly Reduce Refrigerant Leaks in Building Equipment		
		Value Zero Emissions and Resilient Buildings in Lending Practices	
	Building Electrification Mandate for BC Hydro		

POLL 1

What did you tell us about yourself?



**HOME PERFORMANCE
STAKEHOLDER COUNCIL**

Getting to Zero – Carbon (& Energy)

Presentation Outline

- **My background**
- **Why we did it**
- **Decisions made**
- **Costs and paybacks (?)**
- **It takes a village... Thank you!**
- **An invitation to participate**

Goal: Share our learnings so that decarbonization challenges diminish quickly.



My Background in Energy



Chemical
Engineering

BSc



Petroleum
Engineer

PEng

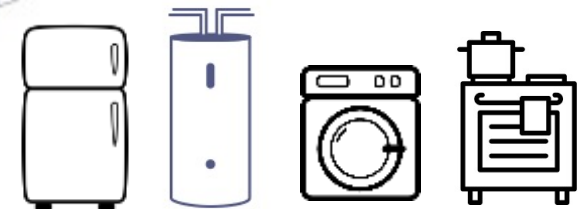
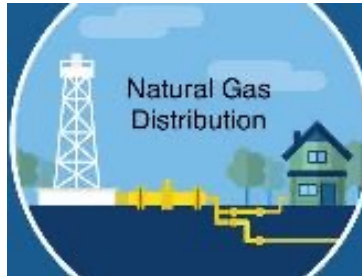
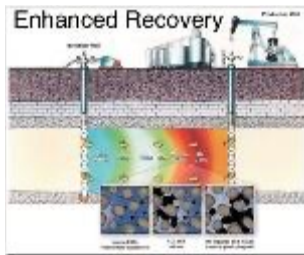


Sales & Efficiency
Engineer



Residential
Specialist
Engineer

Fellow of Engineers Canada (FEC)



zeb_x

My Work Gets Personal



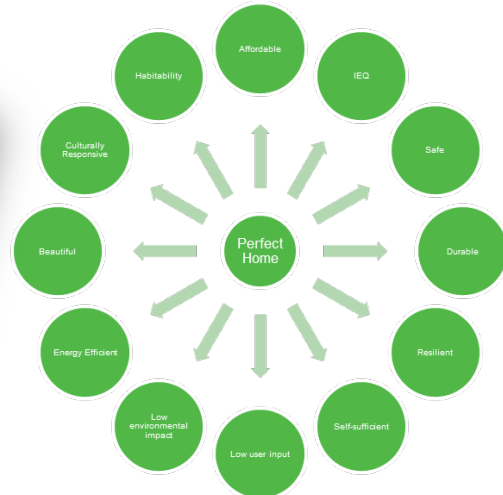
MECHANICAL HVAC GUIDELINES FOR PART 9 BUILDINGS



CSA EXP17



CSA EXP07



CSA EXP14



CHBA Net Zero Home Labelling Program



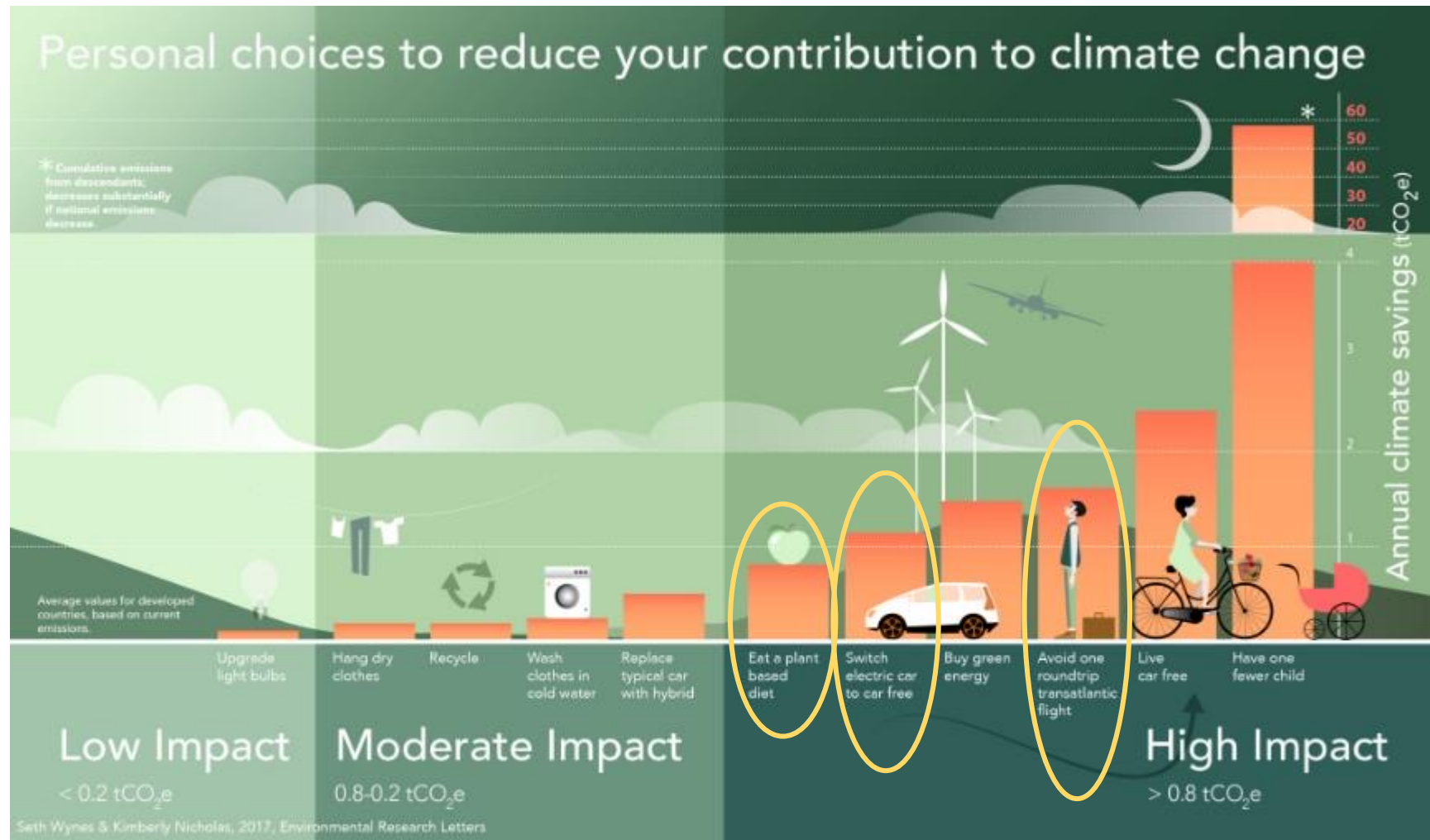
Net Zero Multi-Unit Residential Buildings (MURBs)



Net Zero Renovations



Why we decarbonized



Home

CH₄ Gas: 55 GJ = 2.8 T CO₂

Travel

Vehicles: 3.0 T CO₂

Flights: 4 /year 5.2 T CO₂
Offsets = \$134 Ok?
Or simply fewer flights?

Food

?? T CO₂

What started it all?



Major reno kitchen, Feb 2018

Buyer's Regret

- Gas cooktop with downdraft
It sucked, but not well enough
combustion gases
cooking particulate
It sucked, to clean

Solution

- Range hood & induction cooktop with
40A circuit
- Added benefits
healthier, safer, cooler, easier cleanup

While we're at it...

- Heat pump, 40A
- Greenhouse, 20A

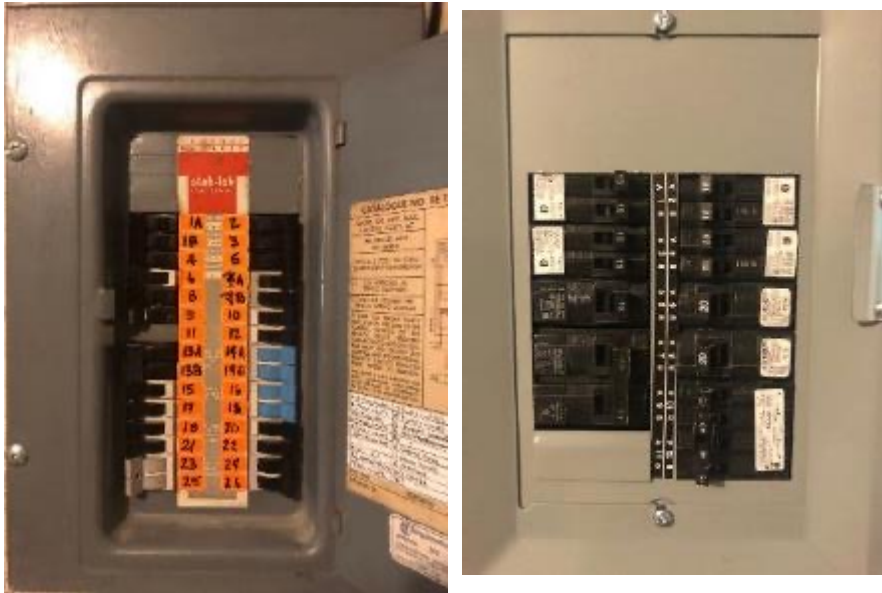


From this...

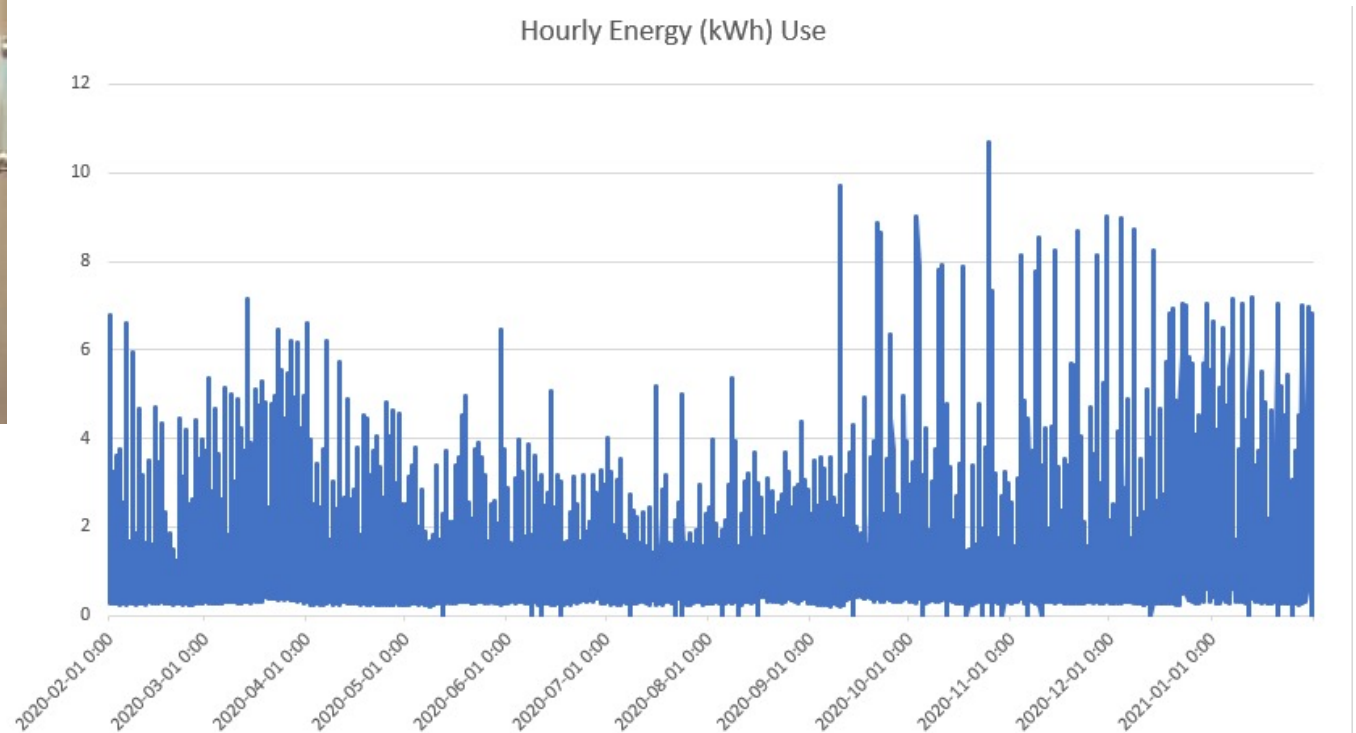


...to this

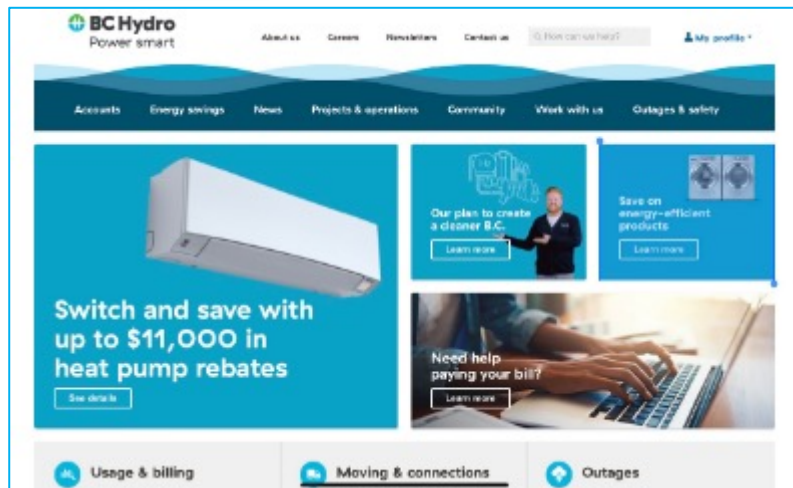
Do we really need an upgrade?



Old main with subpanel



Where's we at?



Ranking	Interval Start Date/Time	Net Consumption (kWh)	Proxy Peak (A)	Available Panel Capacity
				80 A - Column F
1	2020-10-25 19:00	10.7	50.14	29.86
2	2020-10-25 20:00	10.51	49.25	30.75
3	2020-10-25 18:00	10.36	48.55	31.45
4	2021-03-21 0:00	10.08	47.24	32.76
5	2021-03-20 23:00	9.86	46.20	33.80
6	2020-09-10 19:00	9.7	45.45	34.55
7	2020-11-30 3:00	9.01	42.22	37.78
8	2020-10-03 23:00	9	42.17	37.83
9	2020-12-04 4:00	8.96	41.99	38.01
10	2020-09-21 21:00	8.86	41.52	38.48
11	2020-12-08 3:00	8.73	40.91	39.09
12	2020-11-21 4:00	8.67	40.63	39.37
13	2020-09-22 1:00	8.64	40.49	39.51
14	2021-02-08 21:00	8.61	40.35	39.65
15	2020-09-10 18:00	8.55	40.07	39.93
16	2020-11-09 9:00	8.53	39.97	40.03
17	2020-09-10 21:00	8.5	39.83	40.17
18	2021-02-08 22:00	8.47	39.69	40.31
19	2020-11-14 14:00	8.22	38.52	41.48
20	2020-12-14 4:00	8.22	38.52	41.48
21	2020-10-03 22:00	8.16	38.24	41.76
22	2020-11-30 4:00	8.14	38.14	41.86
23	2020-11-04 4:00	8.13	38.10	41.90



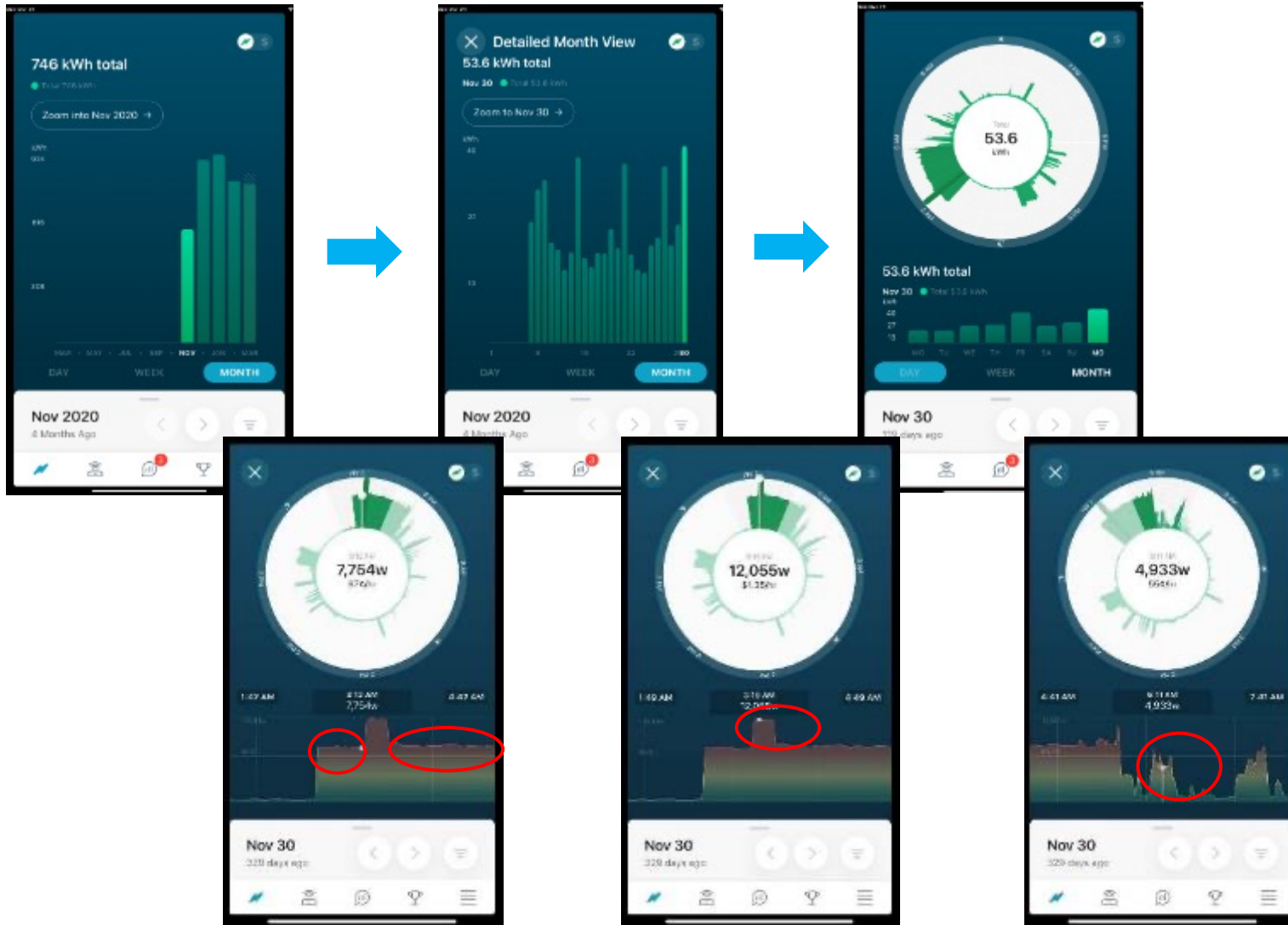
- Online data readily available
- Smart meters
 - in place for 10 years
 - data rich
 - Hourly data for up to 3 years
 - Panel loading, proxy
 - hourly energy → Amps
 - ~ 30 amps available

What happens when we add?

- Heat pump, 40A
- Greenhouse, 20A

Amperage $\approx \text{kWh} * 1000 / (0.97 * 220)$

HydroHome Helps?



HydroHome app

- Data from the Meter
Confirms what happened
- Data says
'Maybe'
- Power management opportunity
 - 100A could be enough
 - so much easier & less \$\$

What should I do? Ask for advice...



Ask the experts

NRCan Energy Advisor

Onsite analysis & report

– Air leakage test results

- 6.3 ACH₅₀

- Was 14 ACH₅₀ in 2001

– Insulation recommended

- Attic

- Garage

– Estimated energy use

- Hot water = 4,500 kWh

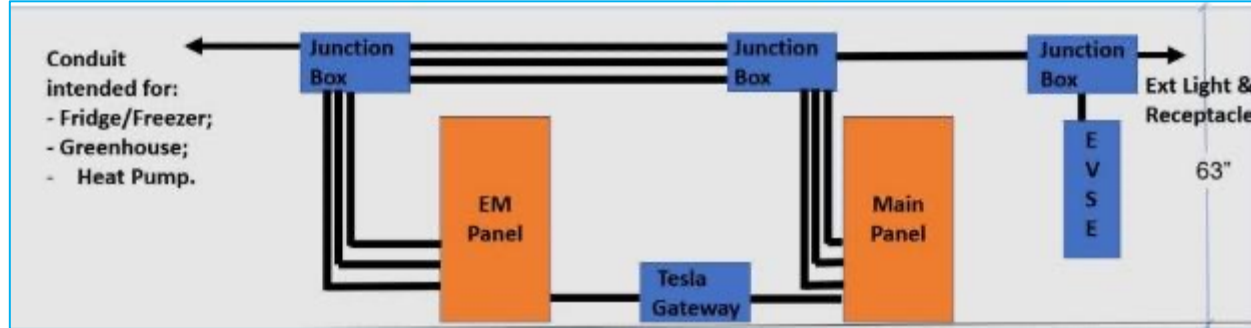
- Space heat = 10,000 kWh_e

- Heat pump = 3,333 kWh??

100

— *Journal of the American Medical Association*, 1997

What did it cost?



Electrical = \$13,000 – \$1,000
Future: Battery storage = \$13,000

HOT2000

Heating Load – 7246 Watts (24,723.35 BTU/h)
 Cooling Load – 3240 Watts (11,054.88 BTU/h) (0.921 Tons)

TECA CSA F280-12

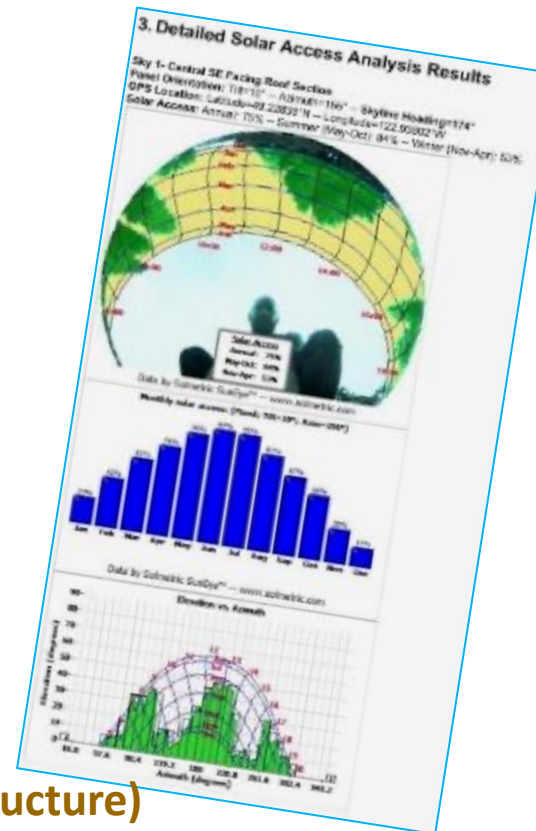
Heating Load – 9058.32 Watts (30,907 BTU/h)
 Cooling Load – 4693.73 Watts (16,015 BTU/h) (1.3 Tons)

COOLCALC – MANUAL J (Uses Google Earth and Year Built)

Heating Load – 9830.89 Watts (33,543 BTU/h)
 Cooling Load – 3563.01 Watts (12157 BTU/h) (1.01 Tons)

Heat pump = \$17,000 – \$11,000

Future: Solar PV = \$13,000 (w/o structure)



Which costs do we include – or exclude?

– Capital cost

Lesser cost HP, might have worked
 Future 'proofing' added electrical cost

Non-energy benefits

Less noise – inside & out

Better comfort

Resilience, self-sufficiency

– Operating costs

HP, expect to 'break even'

Forwarding looking, TOU rates

– Life cycle/ levelized costs – TBD

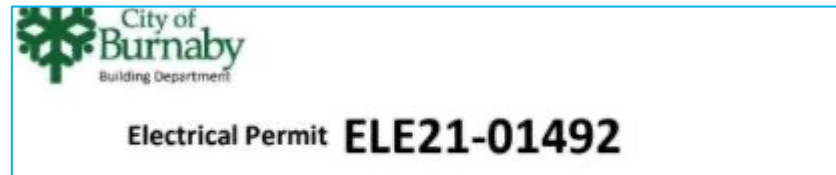
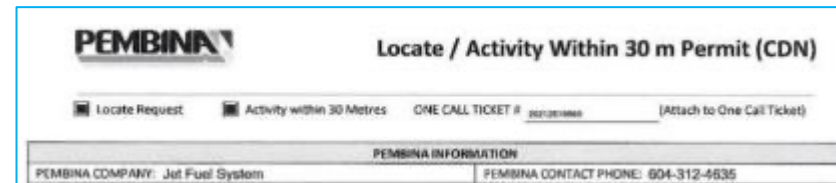
– Societal costs

GHG reduction, yes
 Health benefits, ??

Who do I get?



Qualifications



The paperwork

What do you look for?

Qualifications & recommendations:

– Electrician, Red Seal

Endorsements? PV, permit-ee

Willing to work with me

Electrical design

– Heat pump installer

TECA/ HRAI training?

Trained by manufacturer?

High Performance Contractor Network?

Sizing?

Future: Red Seal HVAC Technician?

– Electrical Systems Integrator

PV Generation

Electrical Storage

Power Management

Future resilience



Wrinkles



Service inside wall, not allowed today



Aerial Trespass , not allowed – we need a pole



55-year-old Jet fuel pipeline limits pole placement

Service Upgrade



Trenches dug; Conduit buried

Trenches filled

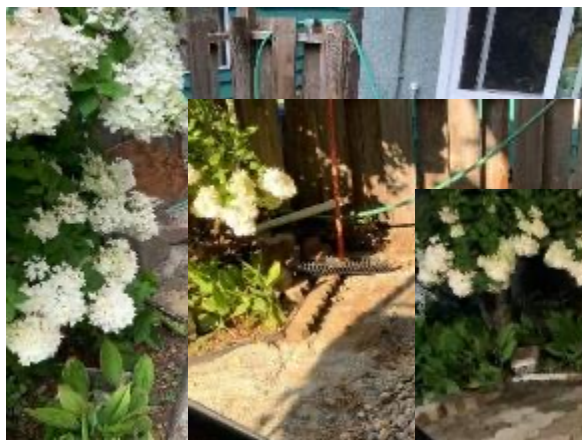
Garden restored



**New panels in –
a very long day!**

Old panels out

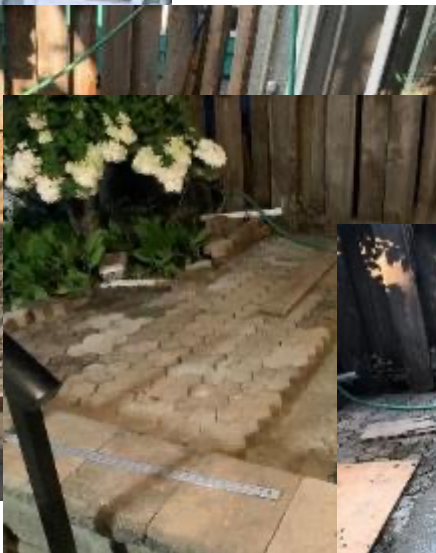
Heat pump goes in – Outdoor unit



Trench



Fill



Paving stones



Concrete



Pad ready



HP anchored



Job completed

Heat pump goes in – Indoor unit

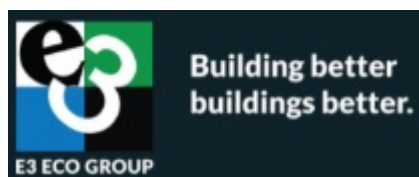


Refrigerant lines –
outdoor to indoor



Finished

Thanks a bunch...



MITSUBISHI ELECTRIC
Changes for the Better

P-SERIES

SUBMITTAL DATA: PVA-A36AA7 & PUZ-HA36NHA5
36,000 BTU/H AIR HANDLER AIR-CONDITIONING SYSTEM

Job Name:	Engineer:
Purchaser:	Application:
Submitted To:	For: <input type="checkbox"/> Reference <input type="checkbox"/> Approval <input type="checkbox"/> Construction
Submitted By:	Location:
System Designation:	Schedule No.:

UNIT OPTION: ☐ Standard Model

000108 PVA-A36AA7 000109 PUZ-HA36NHA5

Rated Power Requirement: 230V/208V, 1-Phase, 60 Hz

Minimum Circuit Ampacity (MCA)	Breaker Size	800% Cordless
Min 9.50 AMP	Outer 28 AMP	20 AMP 80 AMP

All wiring to be done in accordance with National Electrical Code and local codes and regulations.

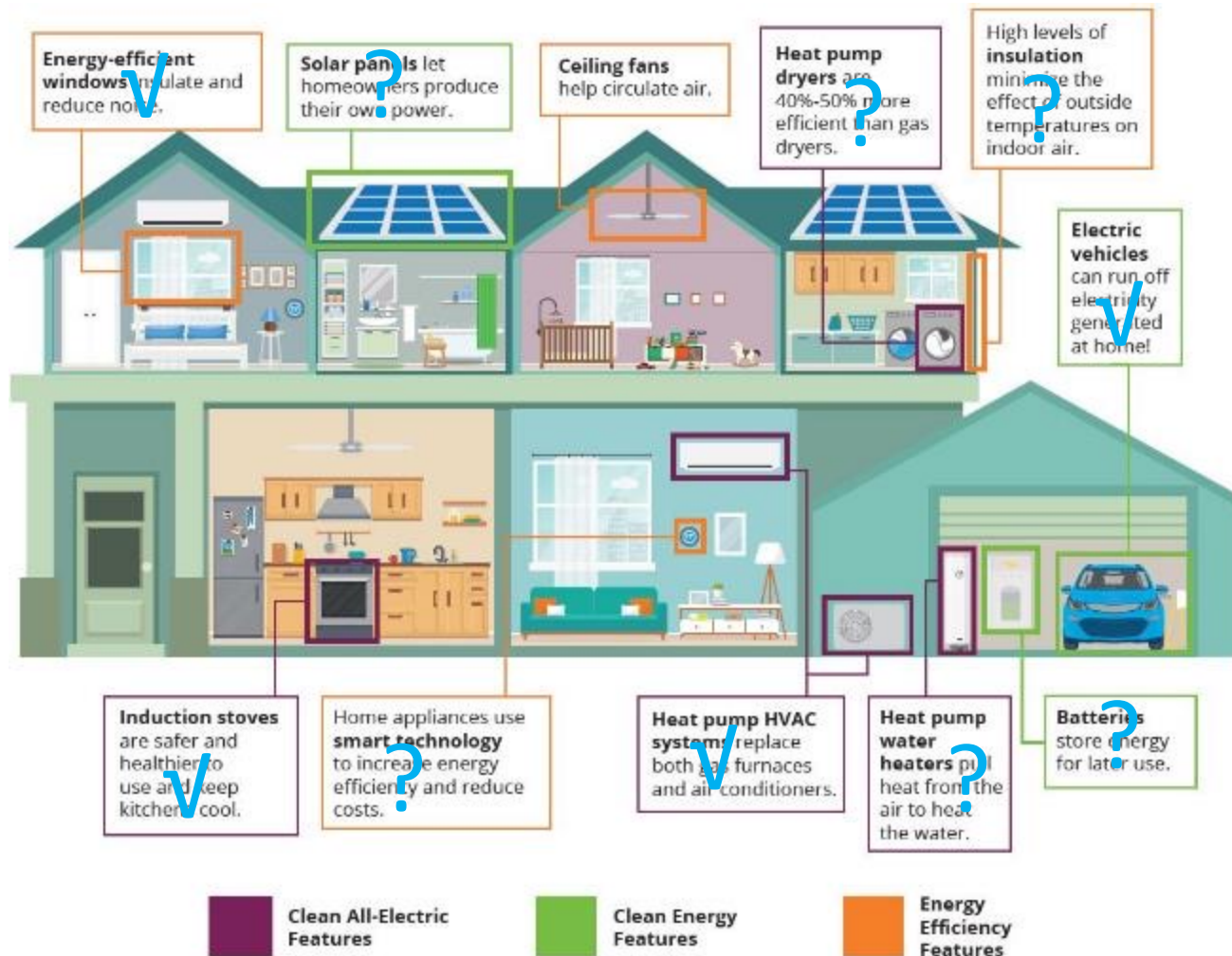


THE FUTURE IS ON

LEVITON

zeb x

Where are we?



Out: Single glazed windows, 2001
In: DG, Low-e, argon

Major reno kitchen, Feb 2018

Out: Gas mower, June 2020
In: Push mower

Out: Hybrid & gas van, Sept 2020
In: Electric vehicle

Out: Natural gas cooktop, Feb 2021
In: Induction cooktop

Out: Propane BBQ, May 2021
In: Wood pellet grill

Out: NG furnace, Sept 2021
In: Heat pump

Future:

Battery Storage

Power Management System

Solar PV Panels



Deep Emission Retrofits: Critical Mechanical Design Considerations

Prepared by:

Ecolighten Energy Solutions

1. Research Overview

- Background
- Objectives
- Methodology

2. Key Insights and Findings

3. Case Study – Newton Residence



BACKGROUND & OBJECTIVES



BACKGROUND:

- City of Vancouver objective is to draw 100% of its energy from renewable sources by 2025 for new buildings and 2050 for existing buildings.
- Nearly 30% of CoV's existing homes have gas boilers and a large portion of them are reaching end of lifecycle.



OBJECTIVES:

- Support participants with understanding their retrofit needs, identification of mechanical HVAC system options and installation considerations.
- Review site conditions and identify opportunities/limitations with air-to-water heat pump retrofit.
- Provide a summary report with key learnings and recommendations that could inform future program and policy design.

**PARTICIPANT
INTERVIEWS &
SITE VISITS**

KEY FINDINGS FROM INTERVIEWS & SITE VISITS



KEY FINDING #1: CONSUMER VULNERABILITY



- Consumers are very reliant on the HVAC contractor to determine appropriate solutions for their home, but they may not be armed with the ability to properly vet contractor recommendations and approaches. Full understanding of costs and potential barriers to installations is absent.
- Consumer supports are needed to build confidence in new technologies and improve technical literacy for fuel switching of hydronic equipment.
- Awareness of available rebates and understanding of access process is limited.

KEY FINDING #2: CONTRACTOR EXPERIENCE



- Experienced contractors with technical competency to deliver air-to-water heat pump solutions is limited when compared to air-to-air heat pump solutions for existing homes.
- Participant feedback on their engagement with contractors highlighted the need to increase contractor knowledge, capabilities and market interests in providing air to water heat pump solutions.

KEY FINDINGS FROM INTERVIEWS & SITE VISITS

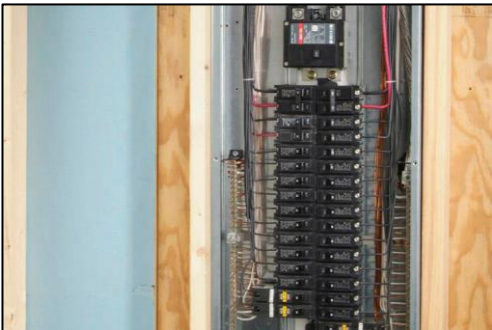


KEY FINDING #3: WHOLE HOME APPROACH



- Homeowners may be motivated to purchase a heat pump as a carbon reduction option for their home, but this may not be the most appropriate solution to address their home performance issues. Home renovations should focus on envelope first approaches and whole home solutions for energy retrofits to ensure heat pumps are properly sized and appropriately selected for retrofit applications.

KEY FINDING #4: ELECTRICAL PANEL / SERVICE



- Policy shifts towards efficient electrification creates challenges to accommodate electric needs especially in existing homes with 60A and 100A service. Existing home upgrade costs for electric panels and service upgrades can vary from \$1,000's to over \$10,000 to facilitate electrical upgrade requirements.

KEY FINDINGS FROM INTERVIEWS & SITE VISITS



KEY FINDING #5: INDOOR & OUTDOOR EQUIPMENT PLACEMENT



- **Homeowner compromises to accommodate mechanical room space**

Homes are typically designed to minimize the indoor space assigned for mechanical HVAC systems and split air-to-water heat pumps usually require an increased footprint for indoor unit, buffer tank, piping, etc.

- **Homeowner compromises to accommodate outdoor living space**

Existing homes tend to maximize the outdoor living environment and homeowners may need to sacrifice their yard space to accommodate the outdoor equipment in a location that will meet the various installation requirements, including manufacturer clearances and minimized refrigerant line lengths to optimize performance.



- **It is challenging to meet the City's setbacks and noise bylaw requirements.**

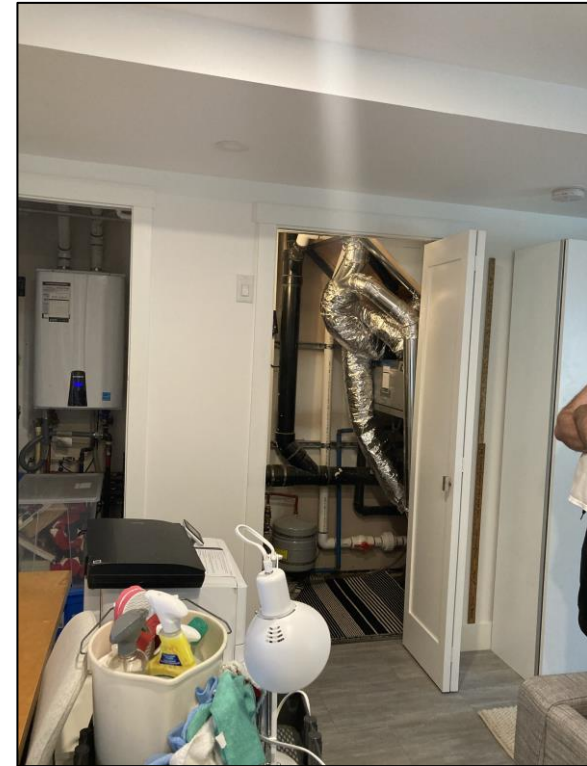
SITE PHOTOS - MECHANICAL ROOMS



Improper HVAC Installations



No Space in Mechanical Room



Storage in Mechanical Room

SITE PHOTOS – OUTDOOR SPACE



Limited Location Options



Preferred Location Doesn't Meet
Manufacturer Clearances



Location Compromises Outdoor Aesthetics

Heat Pump Retrofit

CASE STUDY: NEWTON RESIDENCE

CASE STUDY: HEAT PUMP RETROFIT



HOMEOWNER

- Highly motivated for electrification
- Recently completed EnerGuide assessment
- Home feels draughty but not really concerned
- Technical support provided by Ecolighten



EXISTING HOME

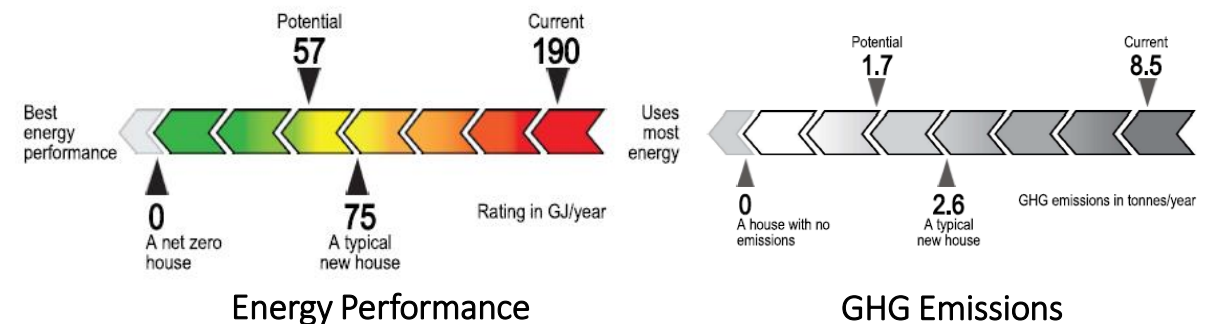
- 1928 Built
- 2400 ft² incl. basement
- Gas boiler w/ hydronic radiators to all floors
- 15 year-old hot water tank
- 100A electrical panel

EnerGuide Assessment Results

- Airtightness: 15.0 ACH
- Equivalent Leakage Area: 3355.9 cm²
- Space Heating: 74% of Total Heat Load
- Heat Loss: 36% from Air Leakage & 41% from Walls/Ceilings/Exposed Floors/Basement



ENVELOPE UPGRADE IS REQUIRED BEFORE HVAC.
e.g. air sealing, insulation top-ups, windows upgrade



CASE STUDY: EQUIPMENT PLACEMENT



Mechanical Room / Existing Equipment



Potential Location for Outdoor Unit



CONTRACTOR EXPERIENCE: INITIAL CONVERSATIONS & QUOTES



❑ What homeowner told us after his initial conversations with contractors...

- ✓ Heat pump installation was discouraged because of the existing hydronic distribution system and there will also be significant upfront electrical costs.
- ✓ Recommended by contractors just to upgrade his boiler & water heater.
- ✓ “Ultimately, I'm still interested in the heat pump, but I'm not as convinced it is a great fit with our house.” → Homeowner was **STILL MOTIVATED** but **CONFUSED**.



❑ Homeowner reached out to 3 contractors for an estimate of AIR-TO-WATER HEAT PUMP installation only one (1) came back with pricing of air-to-water heat pump. Electrical upgrade estimate was \$8,600.

Contractor 1:

Combi Boiler

\$12,500 (Heating) + \$5,400 (DHW)

Contractor 2:

Ductless Heat Pump

\$13,500 (3 Heads)

Contractor 3:

Air-to-Water Heat Pump

\$28,130

CONTRACTOR EXPERIENCE: ROUND 2 QUOTATIONS



- ❑ Due to high upfront costs and distribution system issues, homeowner could not proceed with air-to-water heat pump retrofit. After consulting with Ecolighten, homeowner re-requested an estimate of DUCTLESS MULTI SPLIT HEAT PUMP installation with *ROOM-BY-ROOM LOAD CALCULATIONS* as advised.

Contractor 1:

- Has NEVER HEARD of F280/ Room-by-Room calculations.
- Daikin 36,000 BTU with 3 Indoor Units @ \$13,500

Contractor 2:

- Advised homeowner that load calculation ISN'T NECESSARY.
- Trane 18,000 BTU & 36,000 BTU with 7 Indoor Units @ \$23,051

Contractor 3:

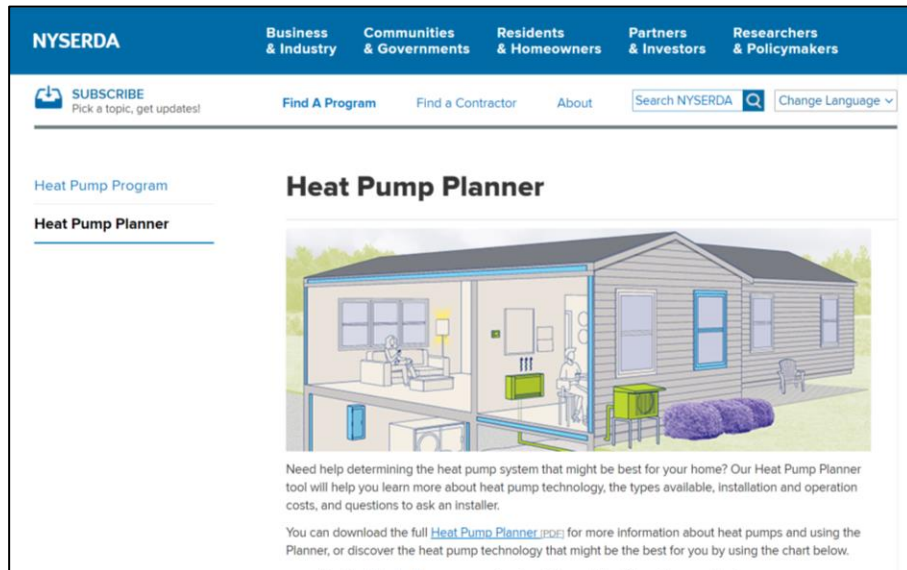
- DID NOT provide load calculations.
- Fujitsu 45,000 BTU with 4 Indoor Units @ \$24,866

- ❑ No load calculation was provided even upon homeowner's request. All contractors guesstimate the load and provided incorrectly sized equipment solutions. The outdoor unit capacity ranged from 36,000 BTUs to 54,000 BTUs with a varying number of indoor units. Hence, the pricing also varied from \$13,500 to \$24,866.

KEY TAKEAWAYS / RECOMMENDATIONS



❑ How Can We Better Support Homeowners?



Source: New York State Energy Research and Development Authority

- ✓ Homeowner education and support service is urgently needed to help reduce consumer vulnerability, increase awareness, and build confidence in selecting the best energy retrofit solution for their home.
- ✓ Support professionalization and quality workmanship to increase contractor capacity, knowledge, capabilities, and reliability.
- ✓ Review existing policies and bylaws to lower the barriers to the heat pump adoption. e.g. Noise Control By-Law #6555
- ✓ Review current rebate/incentive programs to diversify financial support options and better support homeowners with different retrofit solutions/budget.

THANK YOU.

**Local Government Approaches to
Enabling Home Retrofits
in the Decade of Action**

**ZEBx & HPSC
Deep Emissions Retrofits
Dialogue #2**

October 26, 2021



**Community Energy
Association**

About CEA



Community Energy Association (CEA) is a non-profit exclusively supporting local governments and indigenous communities on **CLIMATE** and **ENERGY** activities.

EXPERIENCE

25 years of operation
160 person-years of experience
17 staff distributed across BC



COACHING

900+ elected officials coached / trained
100+ local government staff coached / trained
1,200+ builders and tradespeople trained



PLANNING

100+ corporate or community plans
40+ research briefs and reports



IMPLEMENTING

6,000+ km of highway electrified for EV travel
25+ community-scale retrofit programs
15+ years being responsible for implementation for several communities



Agenda

- How are home retrofits part of the decade of climate action?
- How can local governments encourage and enable home retrofits?
- How can we scale-up retrofit programs?
- What are a few current program examples?



Local Government Retrofit Peer Network

The Local Government Low Carbon Retrofit Peer Network (RPN) provides a forum for local government staff and indigenous community representatives to share and collaborate on policy and program innovations and to coordinate with the Province to **accelerate BC's transition towards zero emissions existing buildings.**

Roles

Co-Chairs

Secretariat (CEA)

Members

Associate
Members

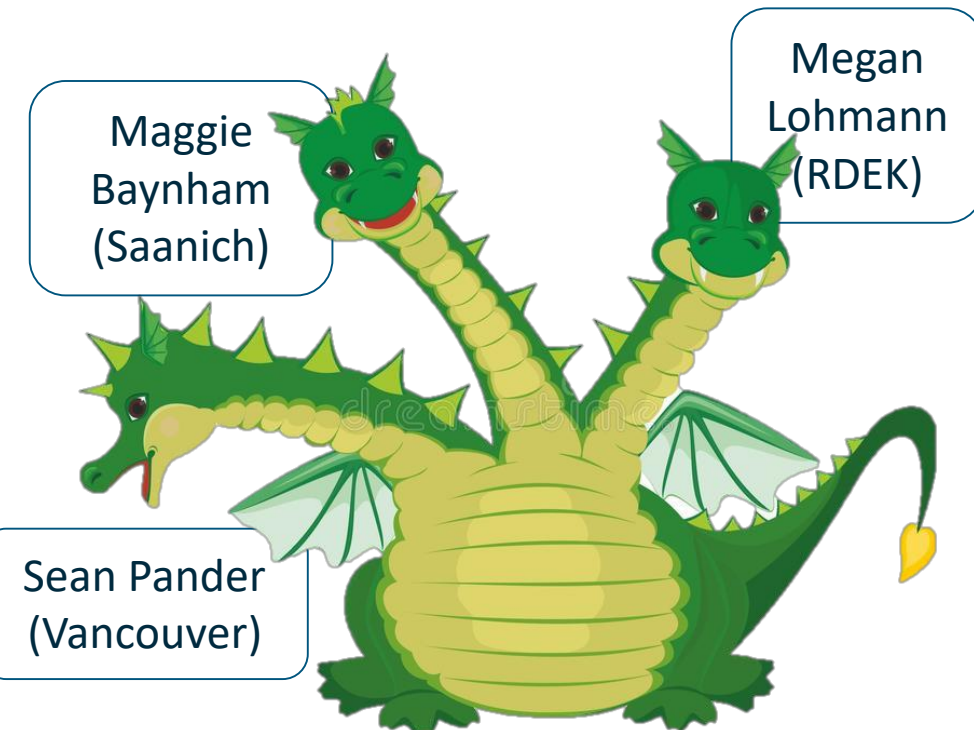
Functions

Peer to Peer
Learning

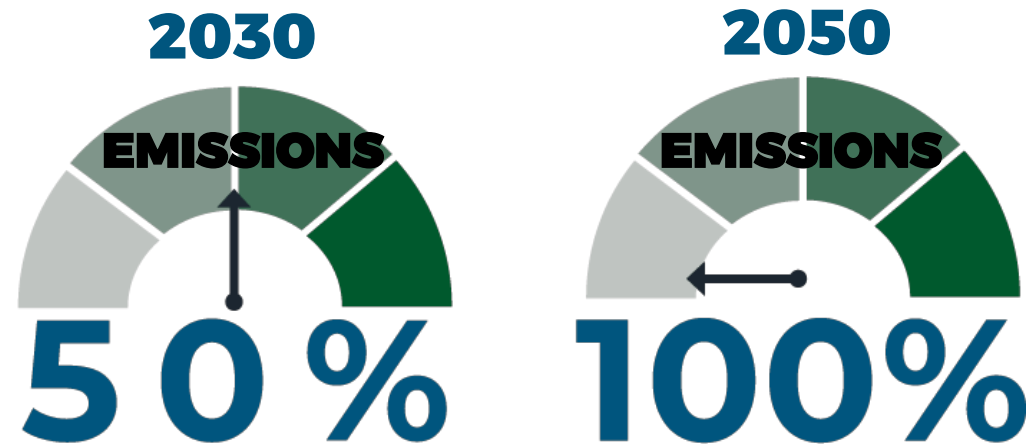
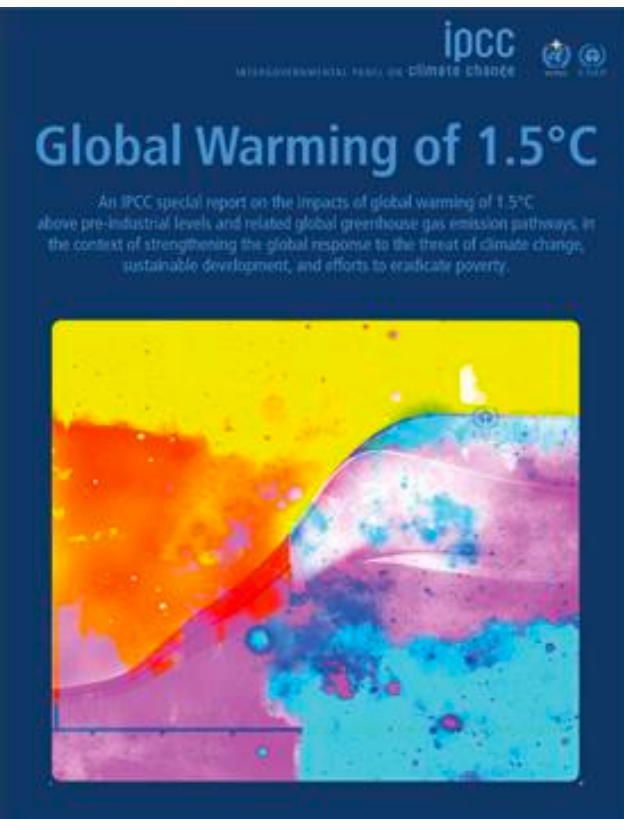
Projects and
Coaching

Information Flow

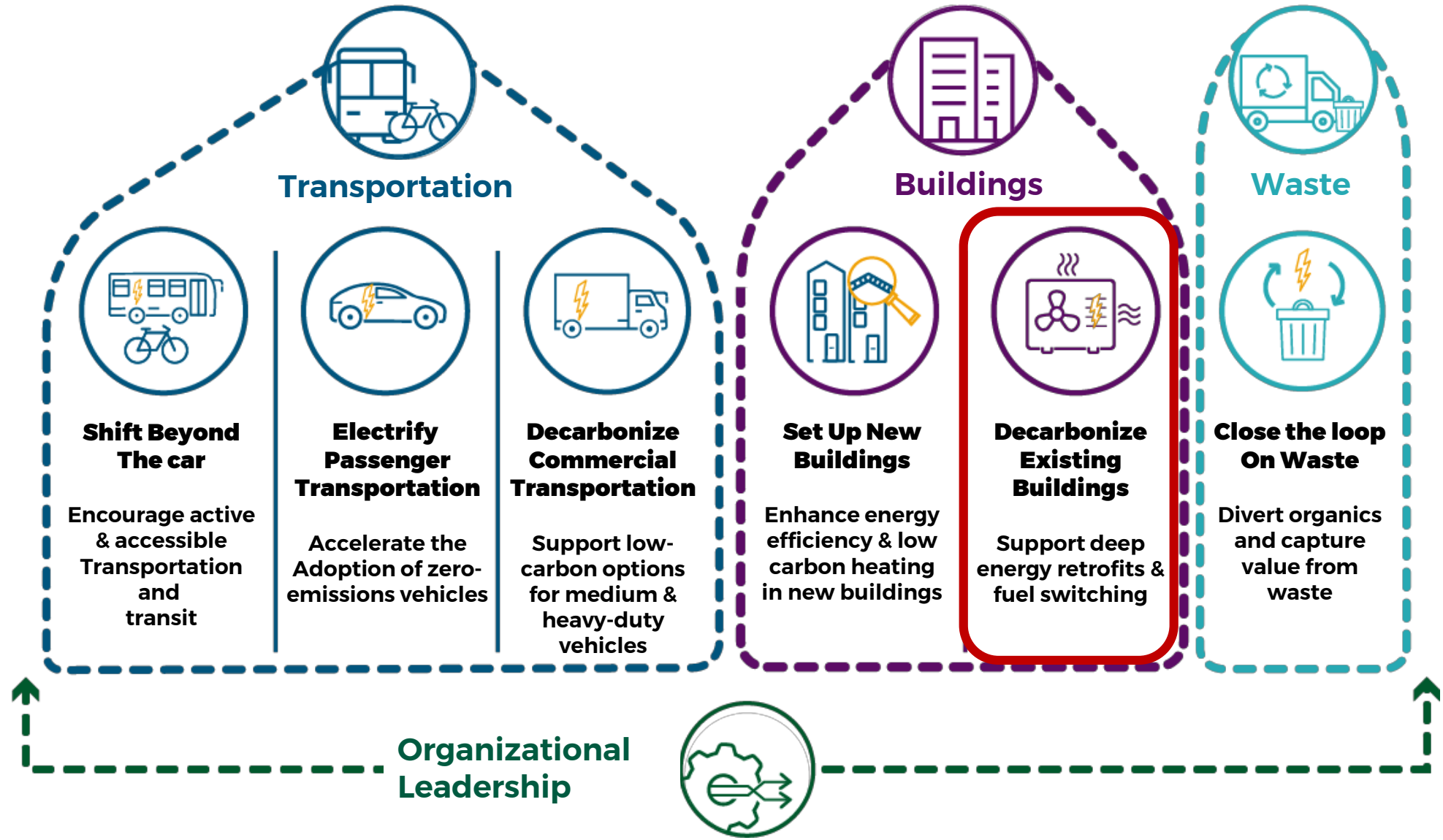
Advocacy



Decade of Action



The Big Moves

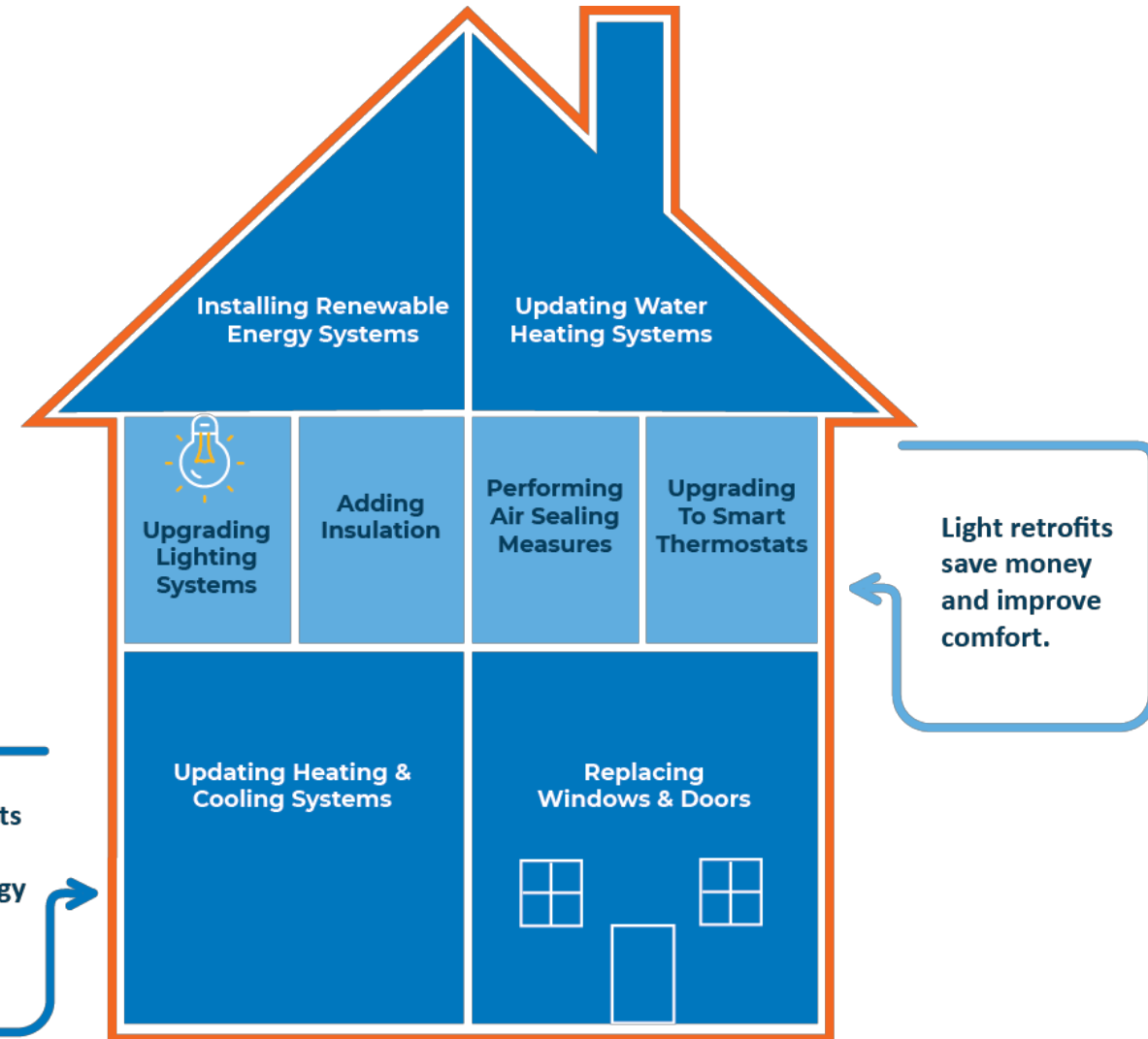


What Kind of Retrofits?



Retrofit Type	GHG Reduction	Cost Range
Typical (light)	10-30%	\$10-40K
Deep	40-60%	\$50-100K
Fuel Switching	~100%	\$10-25K

Deep retrofits significantly reduce energy costs and emissions.



Scale of Action to 2030



City of Nelson Example:

Fuel switch:

- 180 homes/yr

Deep retrofit:

- 500 homes/yr

Blended approach:

- Fuel switch 130 homes/yr +
deep retrofits on 125 homes/yr



Photo credit: Lucas Jmieff

Decade of Action: Buildings Trajectory



SECTOR	Tools	2020-2024 Test	2023-2027 Deploy	2026- 2030 Scale	TARGET	
Buildings	<div>Existing</div> <div></div>	Fuel Switch Programs	Air source heat pumps (ASHP) and low carbon alternative fuels research & experiments	(1%-2%) Gas to heat pump retrofits or renewable gas (RG) contracts	(7%-15%) fuel switching (ASHP or RG), baseboard to ASHP	50%
		Retrofit Programs	Low income deep & typical retrofit experiments with fuel switches	(1%-2%) Retrofit 1%-2% of low income housing annually	(7%-15%) Retrofit at scale to align with targets	
		Retrofit code	Regulate Adopt Retrofit code			
		Performance Standards	Large building benchmarking	Regulate or Incent large building emissions reduction		
	<div>New</div> <div></div>	Energy Step Code	Adopt Step Code and incentivize or require low carbon energy	Require 100% to be net zero (GHGI) and high efficiency (Step Code)		100%
		GHGI		Require 100% to be net zero GHG		

Local Government Levers



The Strategies

What needs to happen?



Policy & Regulation

- Enable retrofits through supportive policies and removing barriers
- Explore financing mechanisms such as property assessed clean energy (PACE)
- Establish requirements for labelling, benchmarking and energy performance



Program (Outreach & Engagement)

- Encourage deep energy retrofits through a coordinated outreach program
- Build industry capacity through a training and outreach program



Infrastructure

- Lead by example by retrofitting municipal facilities



Provincial Regulation



- Alterations Code in development – Energy efficiency standards for existing buildings in the BC Building Code
- “After 2030, all new space and water heating equipment sold and installed in B.C. will be at least 100% efficient (i.e. electric resistance heating, heat pumps, and hybrid electric heat pump-gas systems)” – CleanBC Roadmap to 2030

What more can be done?

- Retrofit/Alterations code that considers GHGs
- Mandatory benchmarking and mandatory energy labelling
- Carbon performance standard for existing buildings



Retrofit Programs



“One Stop Shop”: Handholding approach that weaves through all components of the retrofit strategy.

Local Government Roles:

- Setting targets and objectives
- Supporting financing
- Work with third party for program admin and rapid evolution

Program Administrator/Concierge Roles:

- Point of contact for building owners
- Managing contractors
- Monitoring performance
- Program refinement

Industry Capacity Building



- Align with Home Performance Contractor Network (HPCN)
- Needs assessment
- Hands on and locally-relevant training
- Local peer and expert support
- Support navigating increasingly complex rebate/incentive programs



Scaling Up Retrofit Programs



- Partnerships and collaboration
- Funding
- Capacity
 - Local governments
 - Industry
 - Building Owners
- Sing the same tune – market signals that we are moving towards house as a system goals and electrification
- Provincial and utility alignment

Program Examples

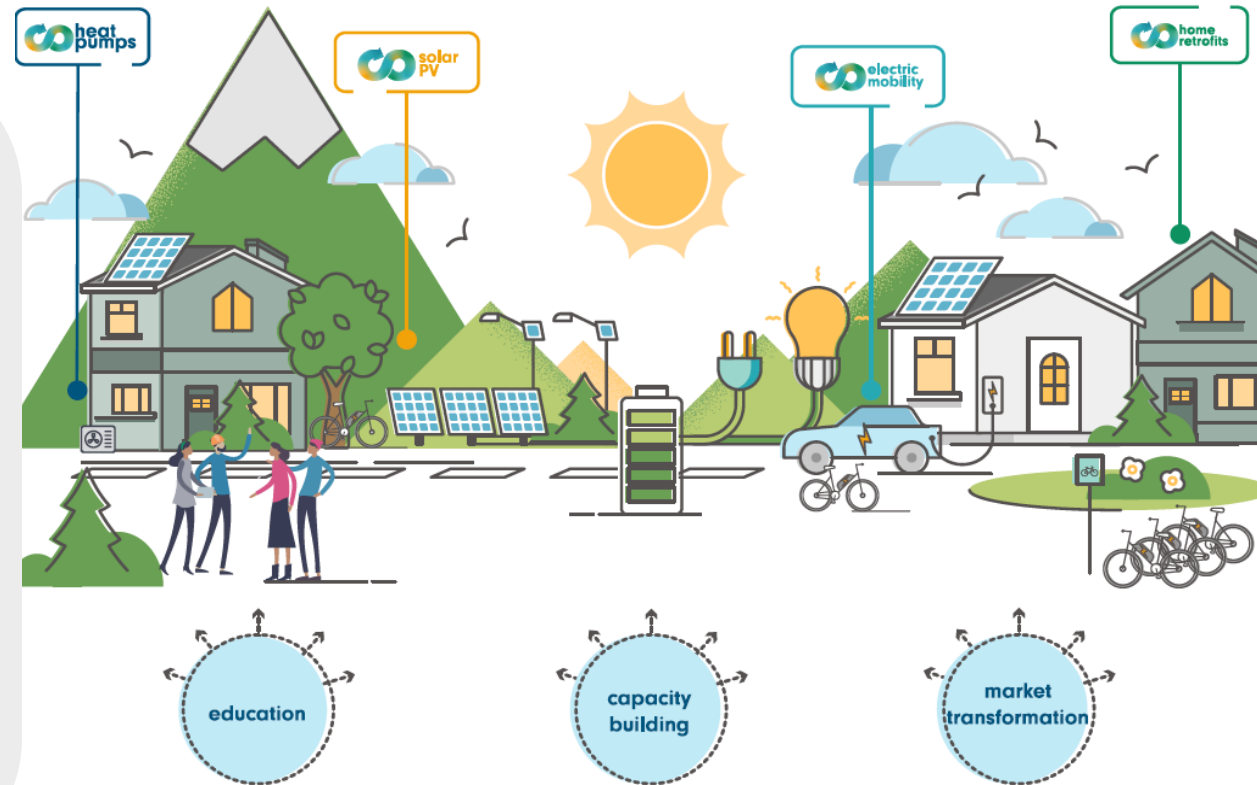


KOOTENAY clean energy transition

When we start to dream bigger....

A **sustainable, local business model**, where communities and homeowners can readily access:

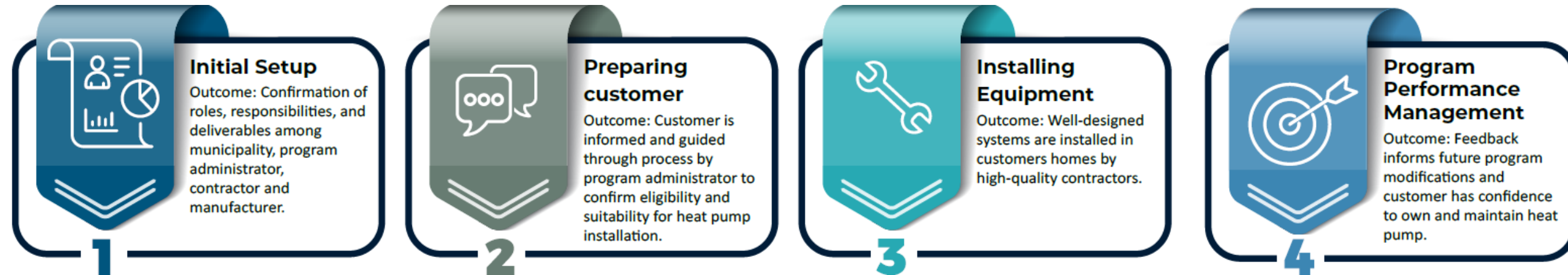
- current information, **support and guidance** on low carbon and clean energy options and rebates available
- **financial mechanisms** to support their endeavours
- **local skilled professionals** working together to advance local clean energy priorities and energy efficiency projects



Program Examples



Pumping Up Savings in Heat (PUSH)



Thank You!

Maya Chorobik

Director of Climate Leadership

mchorobik@communityenergy.bc.ca

