The Zero Carbon Step Code: Implementation

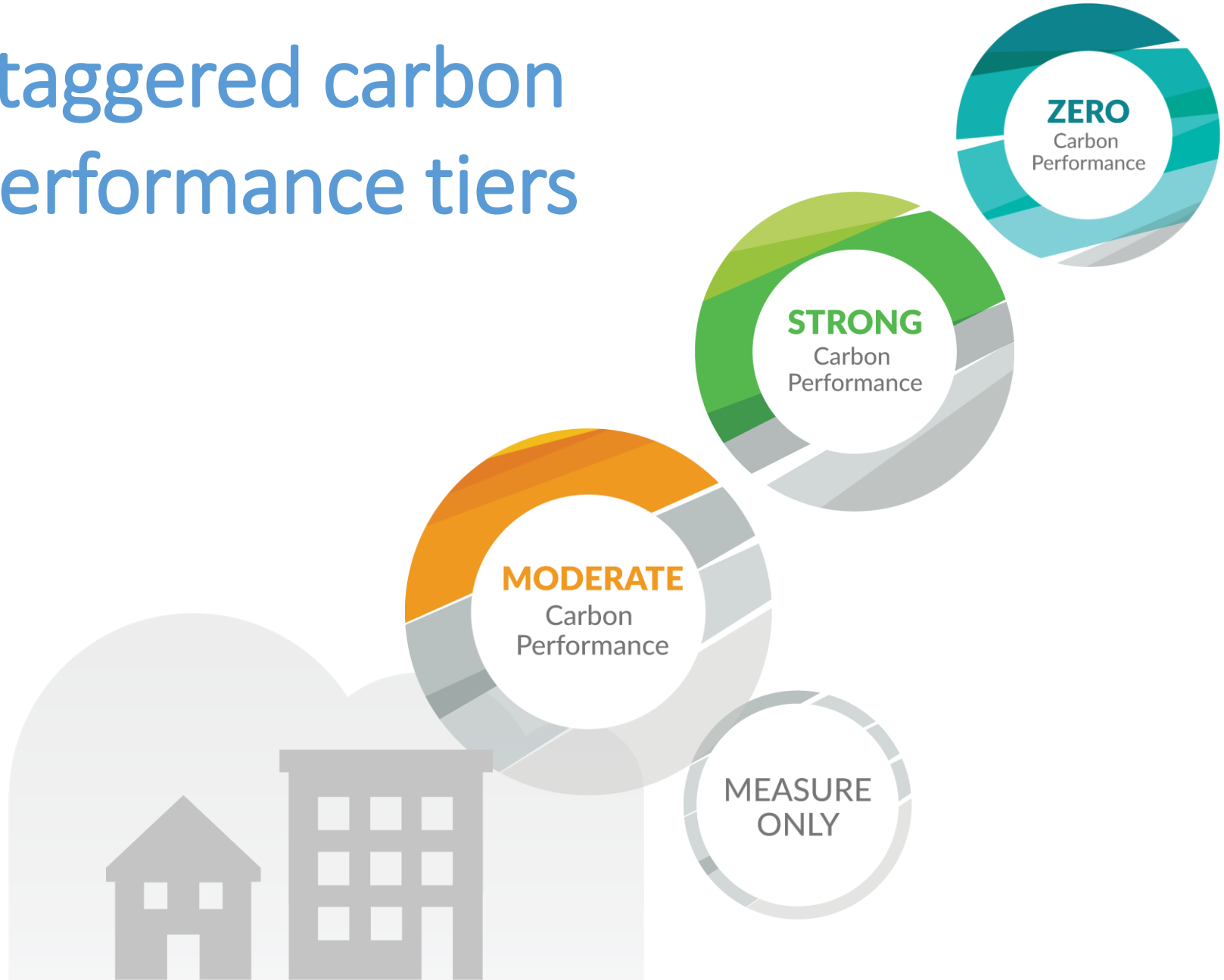
BOABC

Derek de Candole
Community Energy Specialist
City of Victoria

May 29, 2023

ZERO CARBON STEPCODE

Staggered carbon performance tiers



The Zero Carbon Step Code: Implementation

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ZERO CARBON STEPCODE

Step Code in Saanich and Victoria

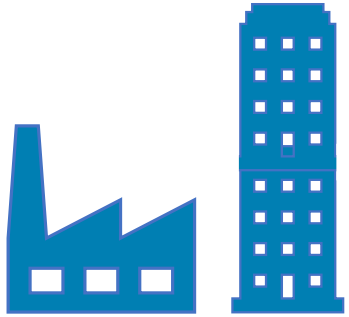
Part 9 Residential Buildings

Step 3

(Step 2 for Laneway Houses)

4-6 Storey MURBs

Step 3



7+ Storey MURBs, and Commercial buildings

Step 2

Adopted January 1, 2020

Calculating GHGi

$$\frac{(\text{Annual kWh } \textbf{electricity} \text{ X } \textbf{0.011} \text{ kgCO}_2\text{e}) + (\text{Annual kWh } \textbf{gas} \text{ X } \textbf{0.18} \text{ kgCO}_2\text{e})}{\text{Modelled Floor Area}}$$

= GHGi

Step Code in Saanich and Victoria

Part 9 Residential Buildings

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4-6 Storey MURBs

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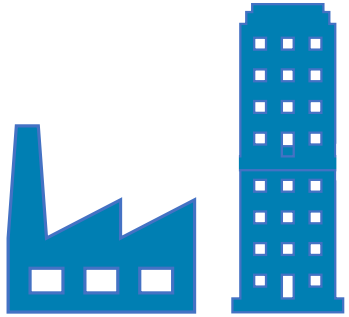


7+ Storey MURBs, and Commercial buildings

Step 2

Adopted January 1, 2020

Compliance Approaches to Date

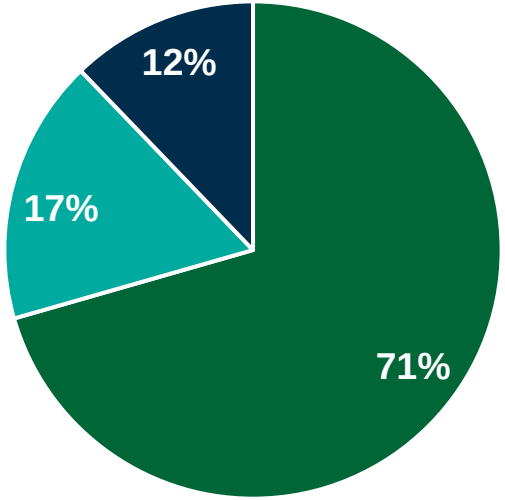
Common Construction Approaches

- 83% of buildings use 2x6 construction with batt insulation in the cavity. R19-24

- 78% of buildings use 6 mil poly inside studs for the air barrier
  - Average score: 2.68 ACH
  - Lowest 1.1 ACH
- 14% use an exterior air barrier
  - Average score: 1.95 ACH
  - Lowest 1.2 ACH

Compliance Approaches to Date (regional)

Space Heating by Fuel Type

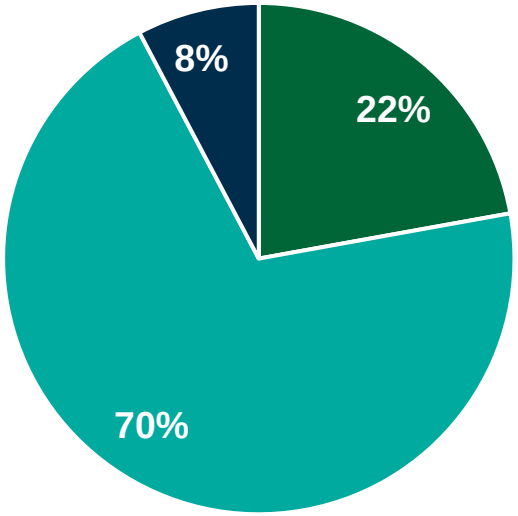


Electric Gas Electric and Gas

Common Space Heating Equipment

- Air Source Heat Pumps 57%
- Electric Baseboards: 13%
- Combination NG: 12%

Water Heating by Fuel Type

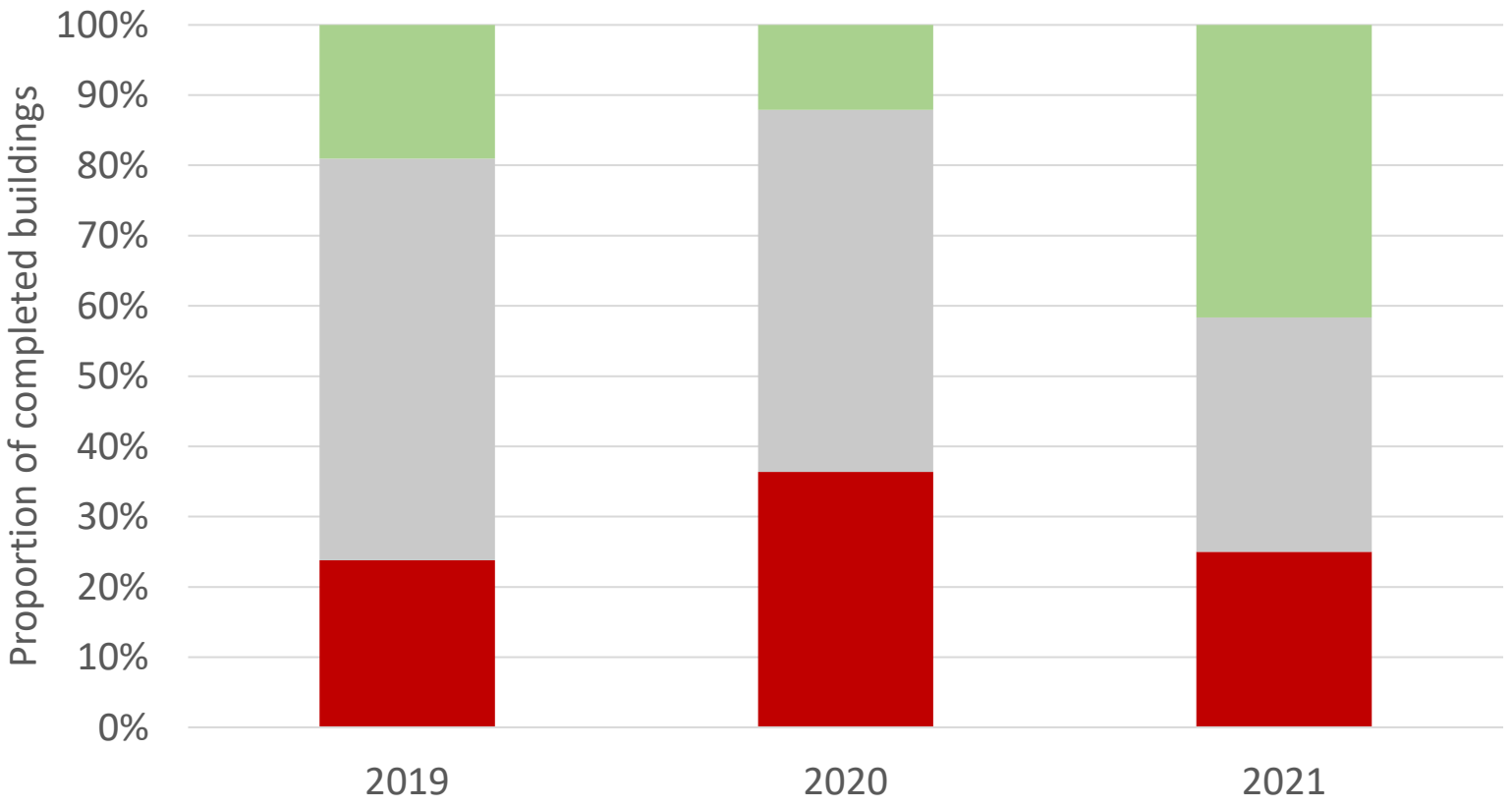


Electric Gas Electric and Gas

Common Hot Water Heating Equipment

- Natural Gas On-demand: 70%
- Electric tanks: 20%

Compliance Approaches to Date

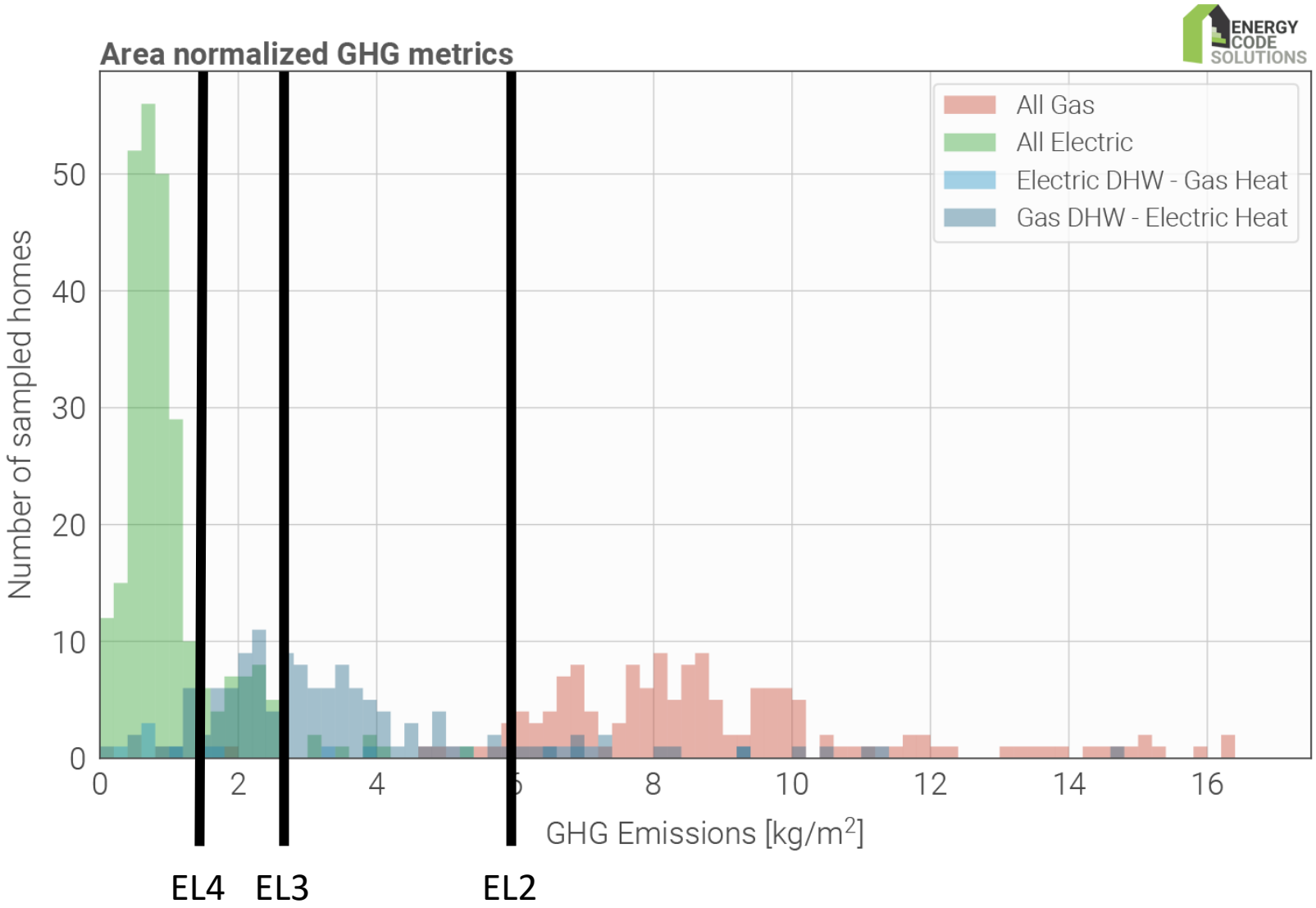


Low Carbon: All Electric

Medium Carbon: Some combination of gas and electric

High Carbon: All Gas

Bernhardt Contracting Data



Part 3 Compliance Approaches to Date

Common Construction Approaches for Part 3 Buildings

1301 Hillside Ave – Step 3

Part 3 Compliance Approaches to Date

Almost entirely multi-unit buildings – 6 stories or less

- Rely heavily on baseboards for in-suite heating
- Heat pumps frequently used in amenity spaces and on upper floors (for cooling)
- Domestic Hot Water usually supplied by gas boilers
- Common areas heating via MUA units almost always gas fired

2570 Fifth Street

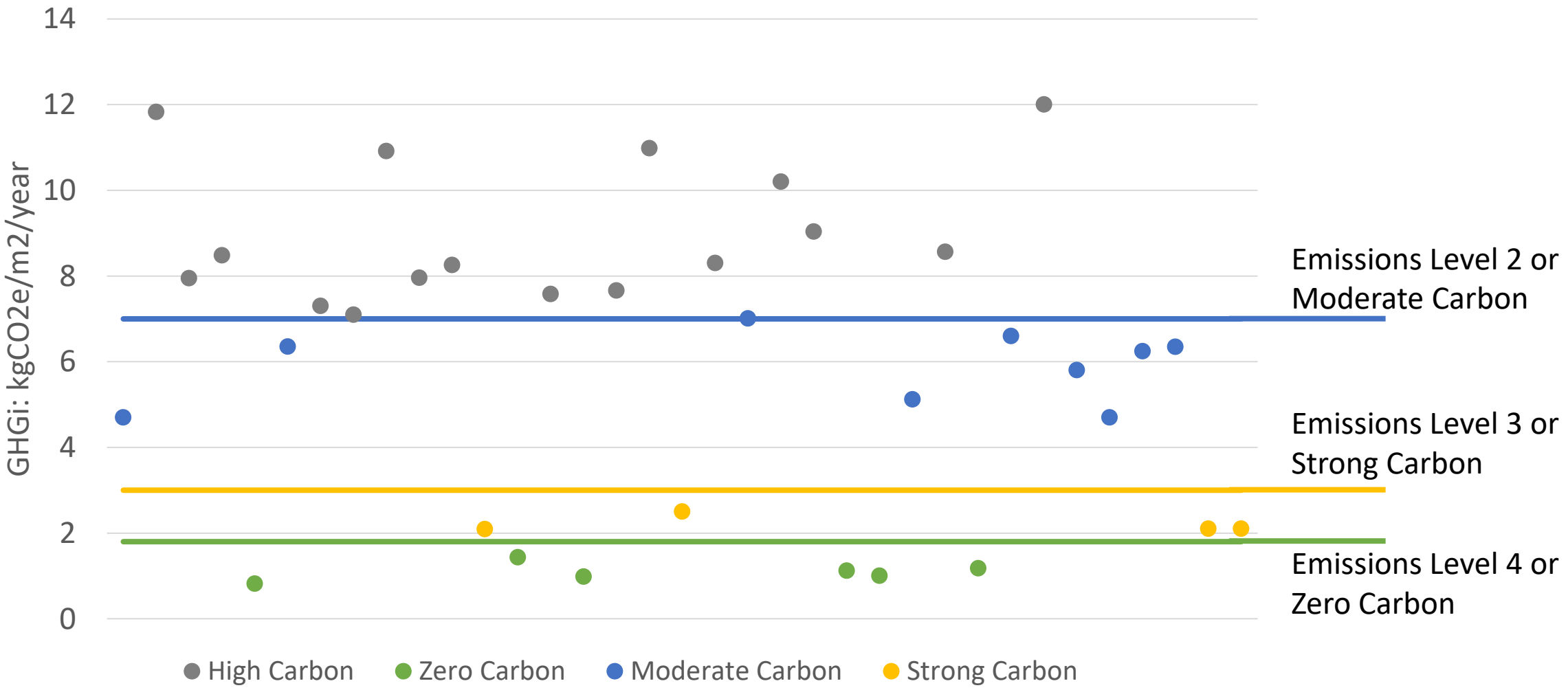
Part 3 Compliance Approaches to Date

Common Energy Saving Measures

- Reduced lighting power density
- ERV in every suite
- Condensing boilers
- Fixed passive shading
- High performance roof
- Low flow fixtures in suites
- High performance glazing

1301 Hillside Ave – Step 3

MURBs and Mixed Use Part 3 Buildings GHGi and Approximate Carbon Pollution Standard Thresholds



Step Code in Saanich and Victoria

Part 9 Residential Buildings

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(Step 2 for Laneway Houses)

4-6 Storey MURBs

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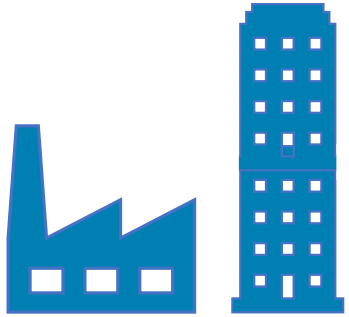

7+ Storey MURBs, and Commercial buildings

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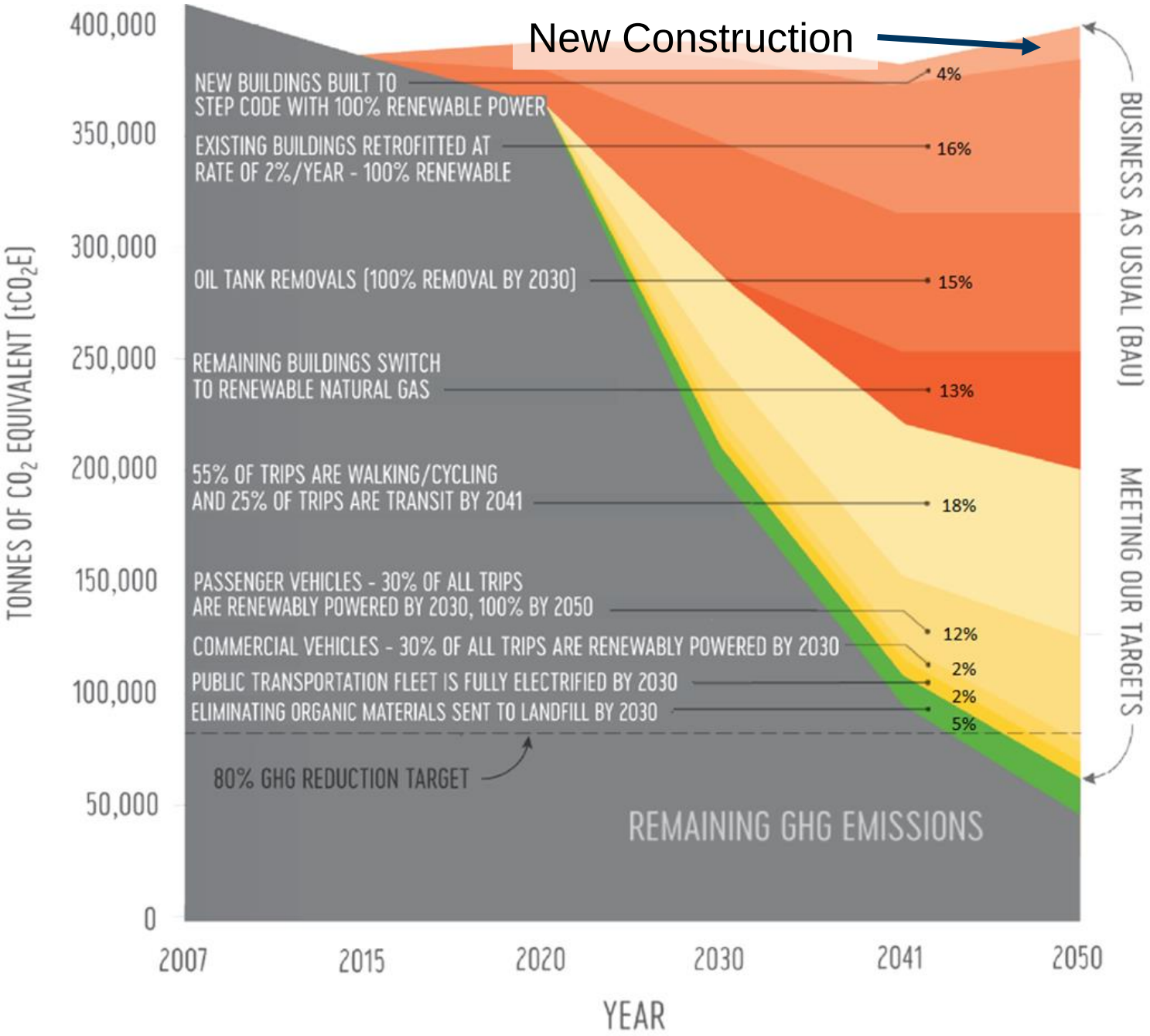
Adopted January 1, 2020



Emission Reductions Targets

50% GHG emissions reduction by 2030

80% GHG emissions reduction by 2050

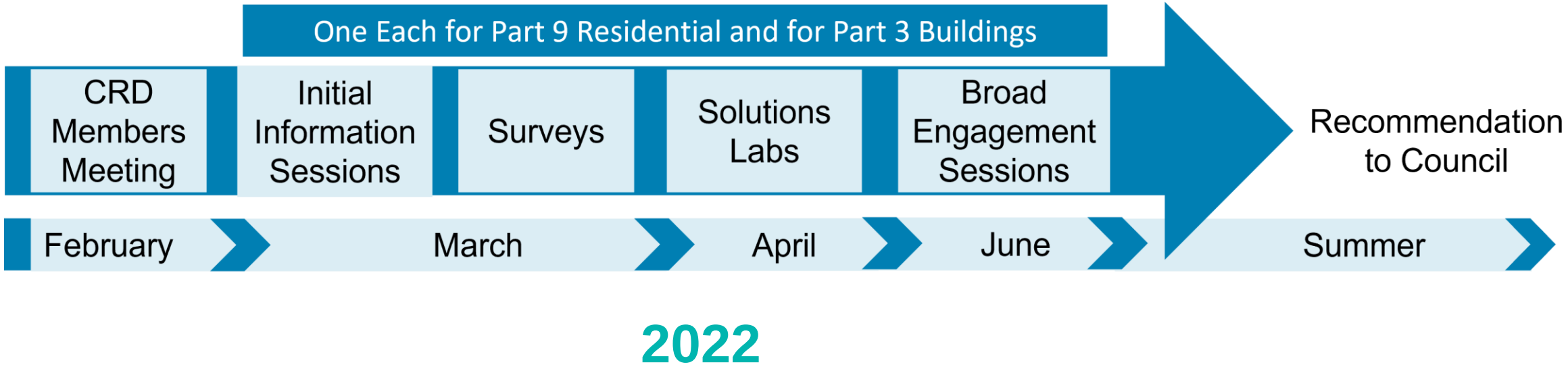
100% Renewable Energy by 2050

Council Direction

Decarbonize new construction

- Integrate low/zero carbon energy systems into the Step Code approach
- By 2025 for residential less than 6 stories
- By 2027 for greater than 6 stories and commercial

2022 Engagement Summary



Phase 1: Info Sessions & Survey

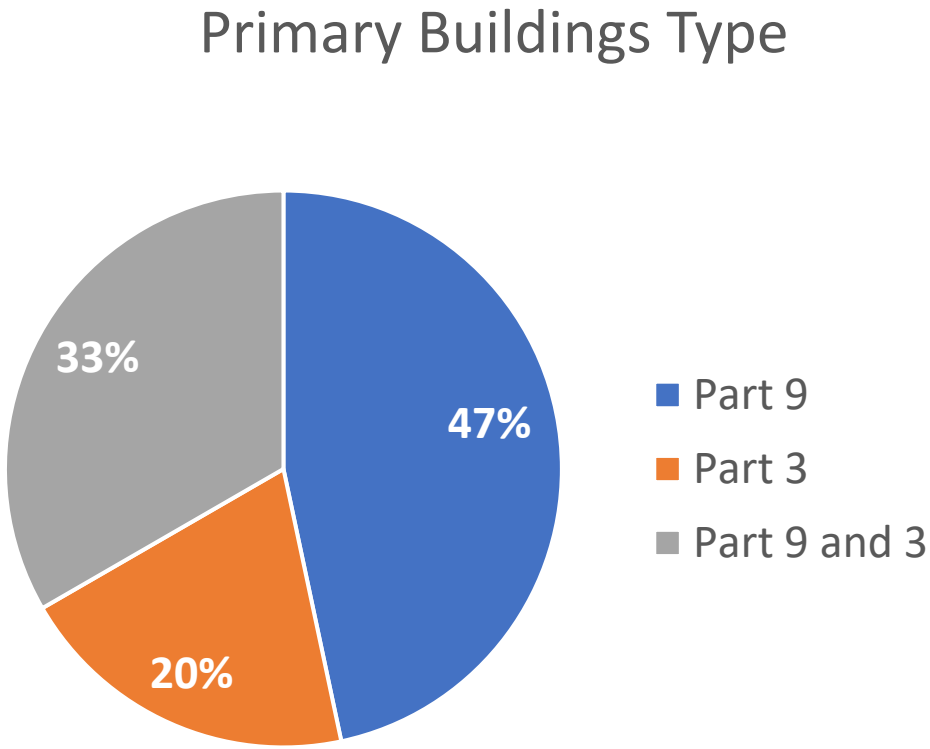
Initial Information Sessions

- BC Energy Step Code adoption to date in the CRD
- Overview of Carbon Pollution Standards (GHGi)
- Provincial and local government direction to reduce emissions from new construction:
  - BC Step Code
  - Provincial Carbon Pollution Standards
- Provincial direction for 100% equipment efficiency requirements;
- Examples of approaches taken to achieve higher steps of the Step Code and low carbon energy systems;
- Overview of the Step Code industry engagement process and timeline, ways to provide input and next steps
- Panel Q&A

Survey Results Overview

Results Overview

- 31 completed surveys
- About half builders/developers/GC and half design/modelling professionals
- All but 2 had some Step Code construction experience

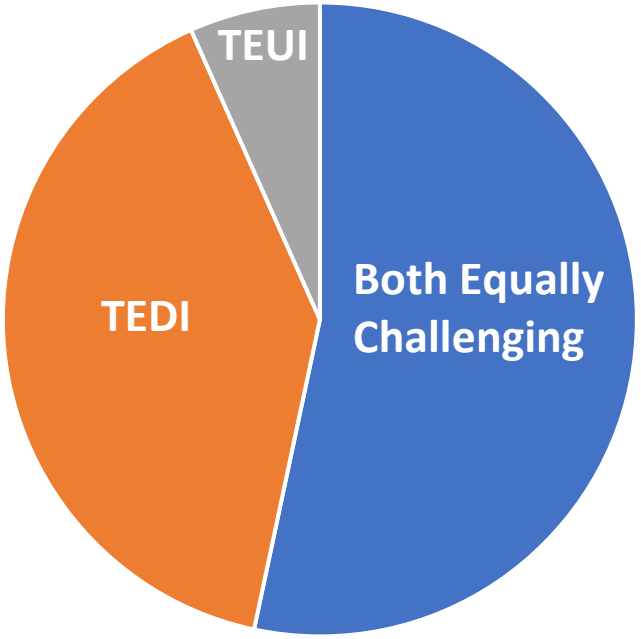


Part 3 Survey Results

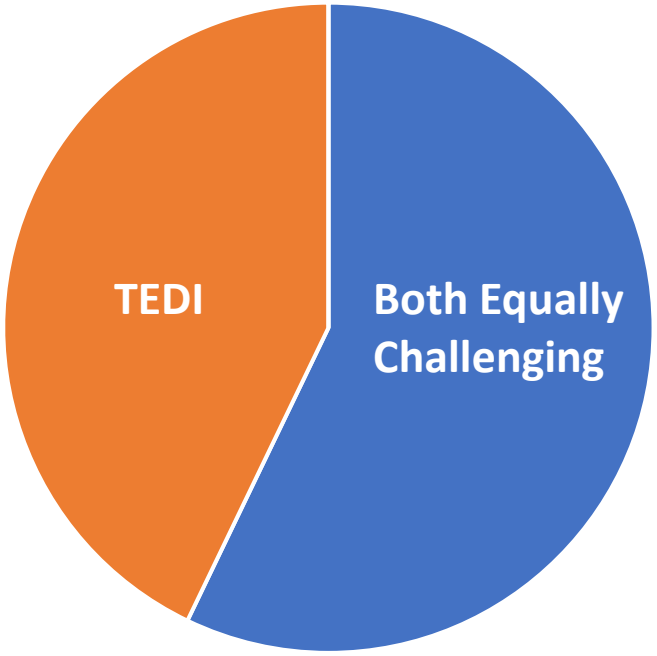
Survey Results Overview

What is the most Challenging part of the Step Code?

Lower Steps (2/3)



Upper Steps (3/4)



Survey Results Overview

Two most challenging elements to meeting the Thermal Energy Demand (TEDI) requirements?

1) Design Impacts
   - Nearly tied and picked most often

2) Incremental Cost
   - Picked as second most challenging by a big margin

Survey Results Overview

Two most challenging elements to meeting the Total Energy Use Intensity (TEUI) requirement?

1) Availability of Appropriate Equipment, and Design
   - Tied for picked most often, but not by much
2) Incremental Cost
   - Picked as second most challenging

Survey Results Overview

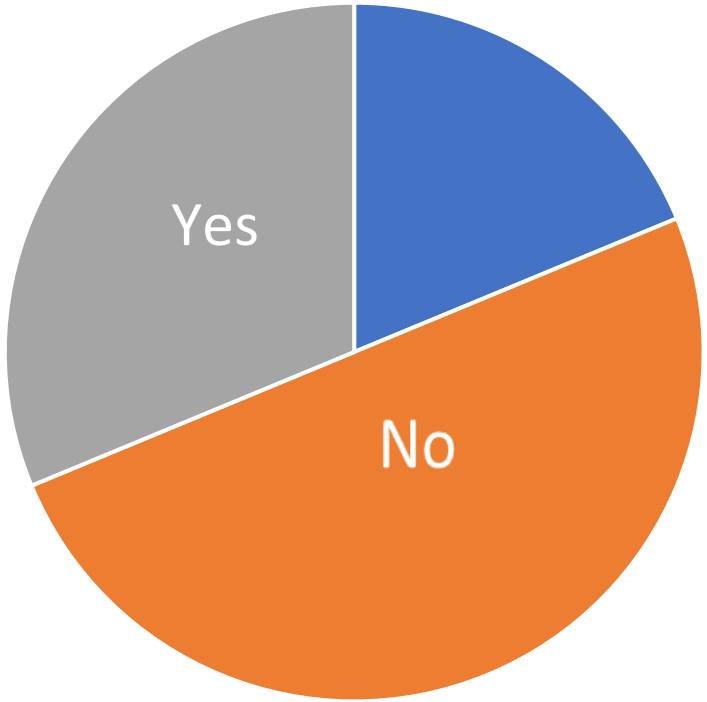
Overall, what do you feel are the top two key barriers to adopting the higher steps of the Step Code?

1) Additional Construction Costs
   - By far the most often picked first

2) Lack of Consumer Demand
   - By far the most often picked second

Survey Results Overview

Do you feel there are barriers to installing electric heating systems?

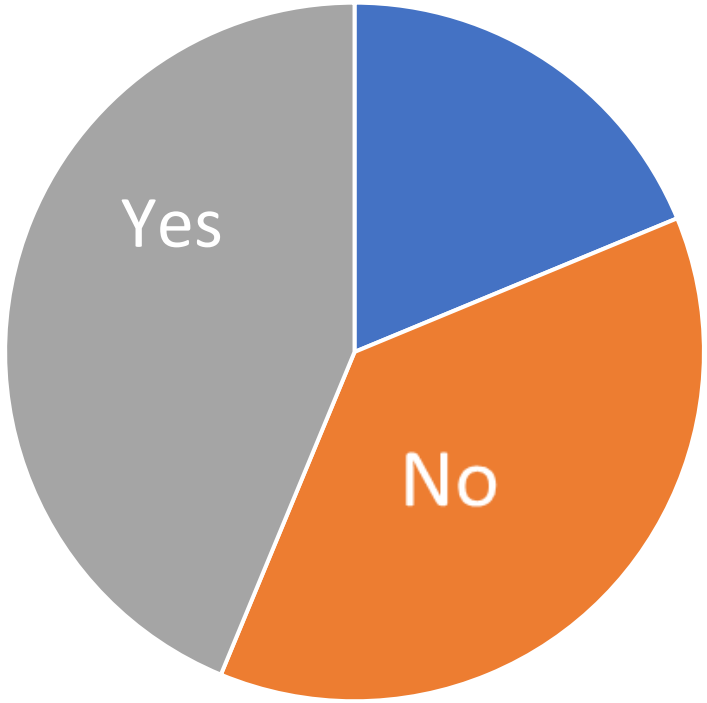


Two most identified barriers:

- Availability of appropriate equipment
- Confidence in relatively new practices/equipment

Survey Results Overview

Do you feel there are barriers to installing electric hot water systems?



Two most identified barriers:

- Operating Costs
- Electrical Service

Part 9 Survey Results

Survey Results Overview

Two most challenging elements to meeting the Airtightness requirement?

1) Finding Required Expertise
   - Picked as first most challenging by a big margin
2) Incremental Cost
   - Picked as second most challenging by a big margin

Survey Results Overview

Two most challenging elements to meeting the Envelope requirements?

1) Design Impacts and Finding Required Expertise
   - Nearly tied and picked most often
2) Incremental Cost
   - Picked as second most challenging by a big margin

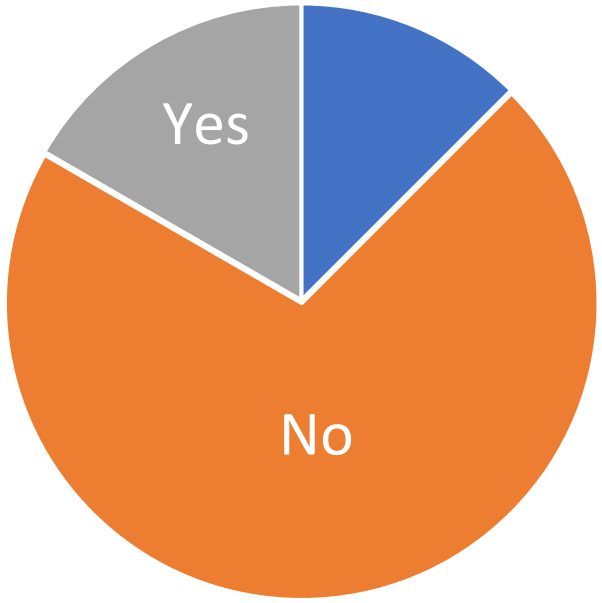
Survey Results Overview

Two most challenging elements to meeting the Equipment requirements?

1) Design Impacts and Availability of Equipment
   - Nearly tied and picked most often
2) Incremental Cost
   - Picked as second most challenging by a big margin

Survey Results Overview

Do you feel there are barriers to installing electric heating systems?



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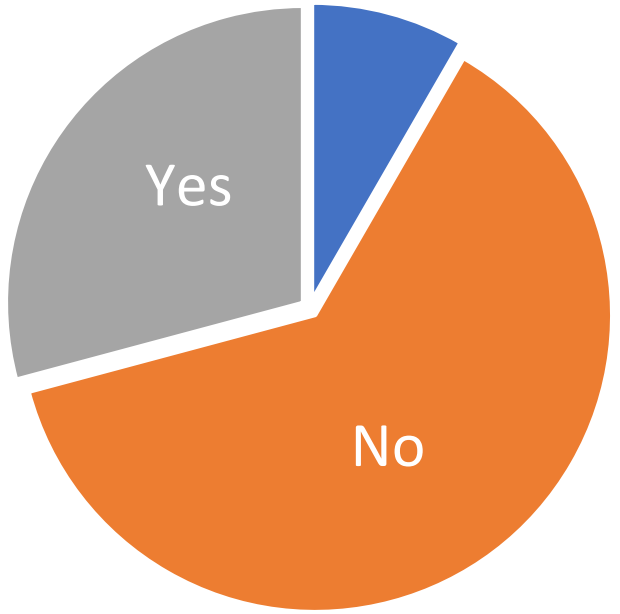


Survey Results Overview

Barriers to Electric Hot Water Systems

1) Operating Costs
2) Electrical Service / Confidence in relatively new practices/equipment
3) Incremental Cost Increase
4) Availability of Equipment

Survey Results Overview

Barriers to Electric Heating Systems

1) Incremental cost increase
2) Electrical service
3) Operating costs
4) Availability of appropriate equipment

Phase 2: Solutions Labs

PART 9 Engagement Options – April 2022

		Requirement	Adoption Date
Option 1	Efficiency Pathway	Step 4	June 2023
		Step 5	January 2025
Option 2	Hybrid Efficiency / Low Carbon Pathway	Step 4 OR BCBC Step 3 with Low Carbon Construction*	June 2023
		Step 5 OR BCBC Step 3 with Zero Carbon Construction*	January 2025
Option 3**	Low Carbon Requirement Pathway**	BCBC Step 3 AND Low Carbon Construction*	June 2023
		BCBC Step 3 AND Zero Carbon Construction*	January 2025

PART 3 Engagement Options – April 2022

Table 2: Draft Options for Part 3 Residential and Hotels, 6 Storeys or Fewer

Option		Requirement	Adoption Date
Option 1	**Efficiency Pathway**	Step 4	June 2023
Option 2	**Hybrid Efficiency / Low Carbon Pathway**	Step 4 **OR** BCBC Step 3 with Low Carbon Construction*	June 2023
		Step 4 **OR** BCBC Step 3 with Zero Carbon Construction*	January 2025
Option 3**	**Low Carbon Requirement Pathway****	BCBC Step 3 **AND** Low Carbon Construction*	June 2023
		BCBC Step 3 **AND** Zero Carbon Construction*	January 2025

* The definition of Low and Zero Carbon will relate to the proposed Part 3 metrics in the provincial policy bulletin.

**This option is not available today but is expected to be provided as an option with the release of the 2022 BCBC update, which is anticipated to integrate the provincial low carbon pollution standards.

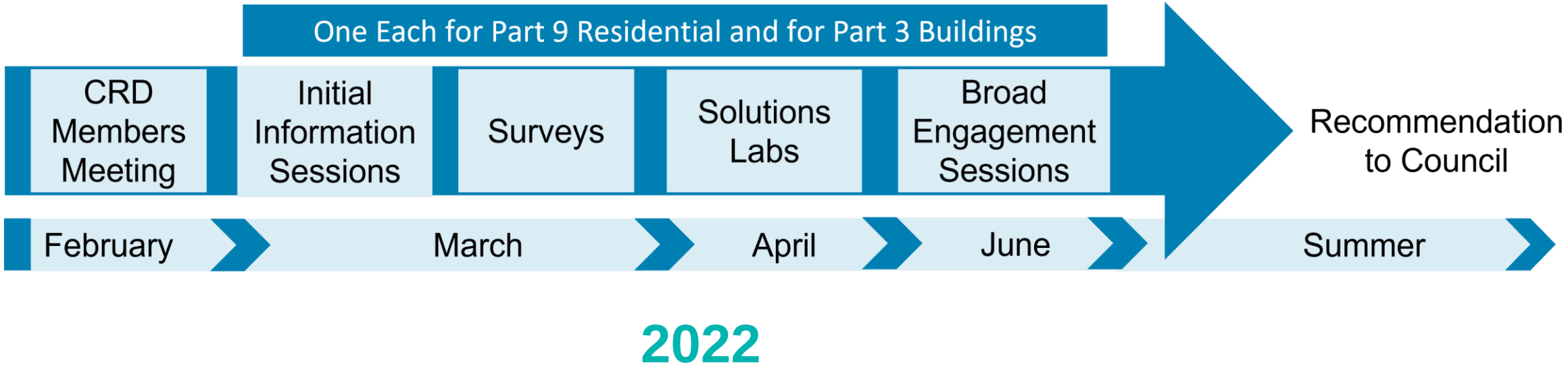
What We Heard

- Agreement on the need for carbon emission reductions
- Current Step Code requirements do not fundamentally change how buildings are built; accelerating to higher steps could
- Construction costs are a key concern
- Support for focusing regulation on greenhouse gas emissions reduction; efficiency is secondary
- Desire for significant lead time before new regulations come into effect and/or allowance for legacy applications
- Simplicity in messaging, keep policy simple and easy to understand

What We Heard

- Labour market challenges a concern
- Housing availability and affordability challenge is a core consideration
- Decarbonizing is technically possible and achievable by industry today
- Consumer understanding is lagging – City should communicate the benefits of decarbonization
- Industry training would support new efficiency and carbon regulations
- Regional consistency remains a priority
- Uncertainty around how renewable natural gas (RNG) will contribute
- BC Hydro grid capacity and connection process – ongoing concern

2022 Final Engagement

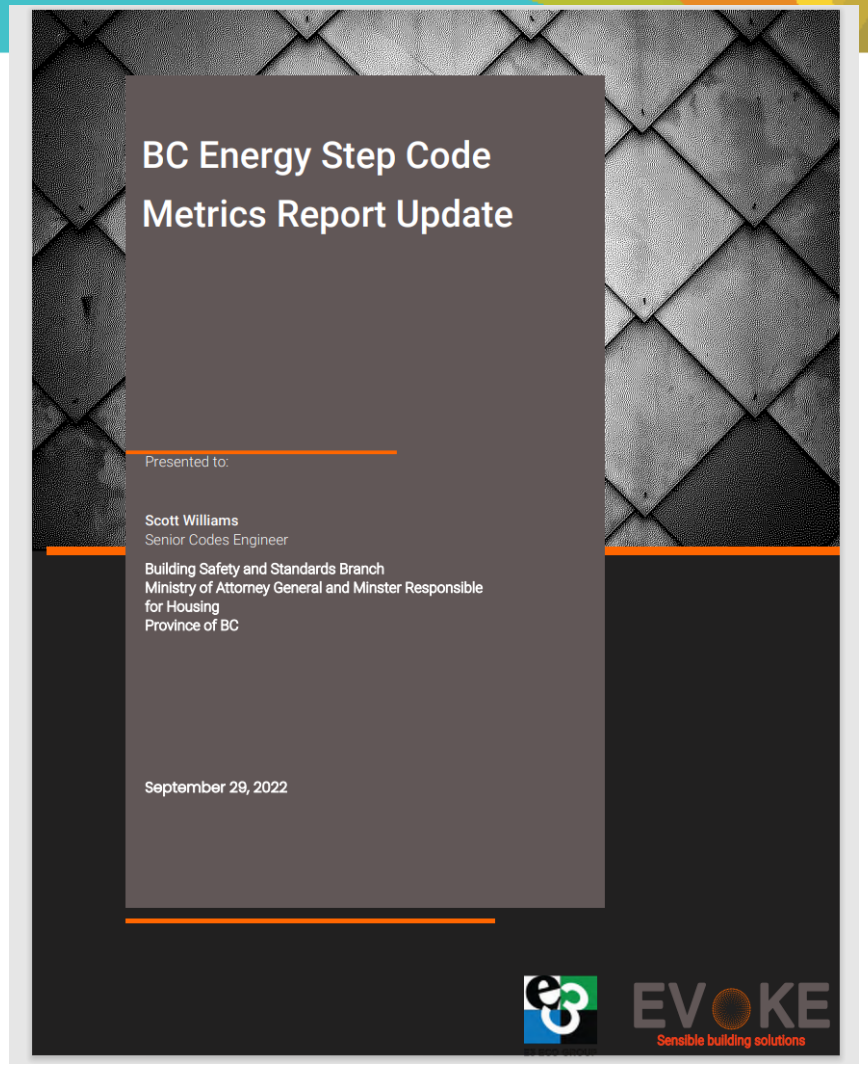


Technical Review

BSSB Costing Report

- 7 Part 9 archetype analyses for climate zones 4-8
- 5 Part 3 archetype analyses for climate zones 4-8
- Scenarios for each Step of the Energy Step Code and Emissions Level
  - Scenario include mechanical equipment options for both space and hot water
- Scenario Outputs Include:
    - Annual GHGs
    - GHGis
    - Annual modelled utility cost per sqm
    - Total Incremental cost per sqm
    - % difference in initial capital cost
    - % difference in operating cost

All relative to a defined base case.



[Reports | Energy Step Code]

Medium Single Family Dwelling data tables: Climate Zone 4 (Vancouver)

	Step 3					Step 4					Step 5				
Target Level Achieved	None		Medium	Low	Zero Carbon Ready	None	Medium		Low	Zero Carbon Ready	None	Medium		Low	Zero Carbon Ready
GHG Target (based on 237m² unit size)	>1422 kgCO₂/yr		1422 kgCO₂e/yr	592 kgCO₂e/yr	355 kgCO₂e/yr	>1422 kgCO₂/yr	1422 kgCO₂e/yr		592 kgCO₂e/yr	355 kgCO₂e/yr	>1422 kgCO₂/yr	1422 kgCO₂e/yr		592 kgCO₂e/yr	355 kgCO₂e/yr
	A	B					A	B				A	B		
Space heating equipment															
Gas furnace	●	●				●	●				All modeled options meet	●			
Electric baseboard				None modeled					None modeled					None modeled	
Air-source heat pump			●		●			●		●			●		●
Water heating equipment															
Tankless gas heater 95%	●		●			●		●				●	●		
Electric resistance															
ASHP		●			●		●			●					●
Cost and performance data															
Annual modelled GHG	2119	1631	803		138	1712	1206	800		134		1374	793		127
Annual modelled GHGI	8.9	6.9	3.4		0.6	7.2	5.1	3.4		0.6		5.8	3.3		0.5
Annual modelled utility cost ($/m²)	4.5	4.9	4.6		4.6	4.4	4.8	4.5		4.5		Not calculated	4.3		4.3
Annual modelled utility cost increase vs. base case (%)	0	8.9%	2.2%		2.2%	0	9.1%	2.3%		2.3%		0%	Not calculated		Not calculated
Total ICC vs. base case ($/m²)	0	1.4	10.0		13.2	0	2.3	11		2.3		0.0	13.2		16.3
% ICC vs base case	0%	0.1%	0.4%		0.6%	0%	0.1%	1%		0.6%		0.0%	0.6%		0.8%

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	A	B					A	B				A	B		
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Electric baseboard															
Air-source heat pump			●		●			●		●			●		●
Water heating equipment															
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ASHP		●			●		●			●					●
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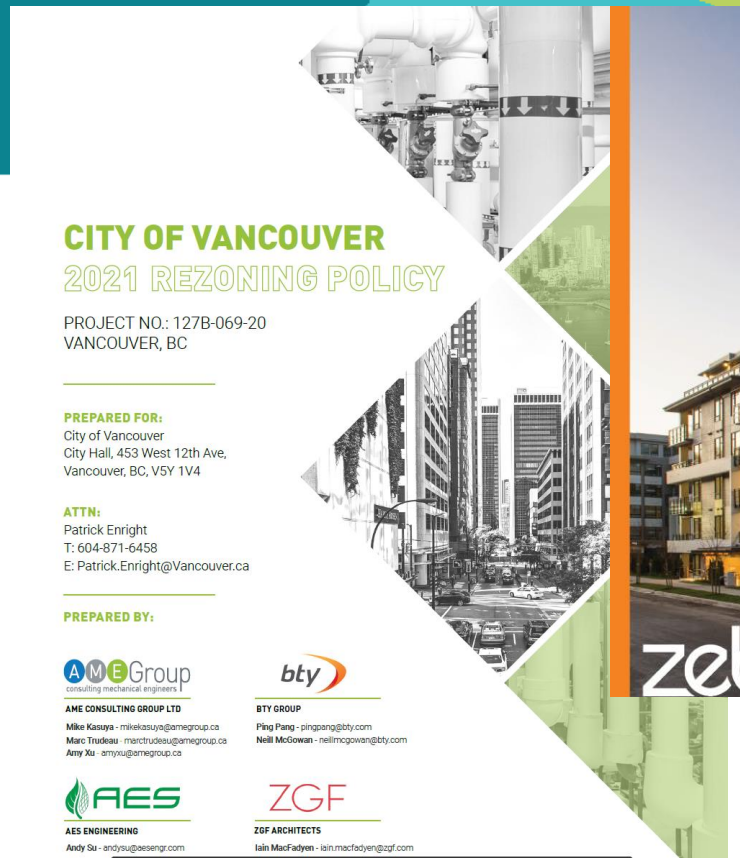
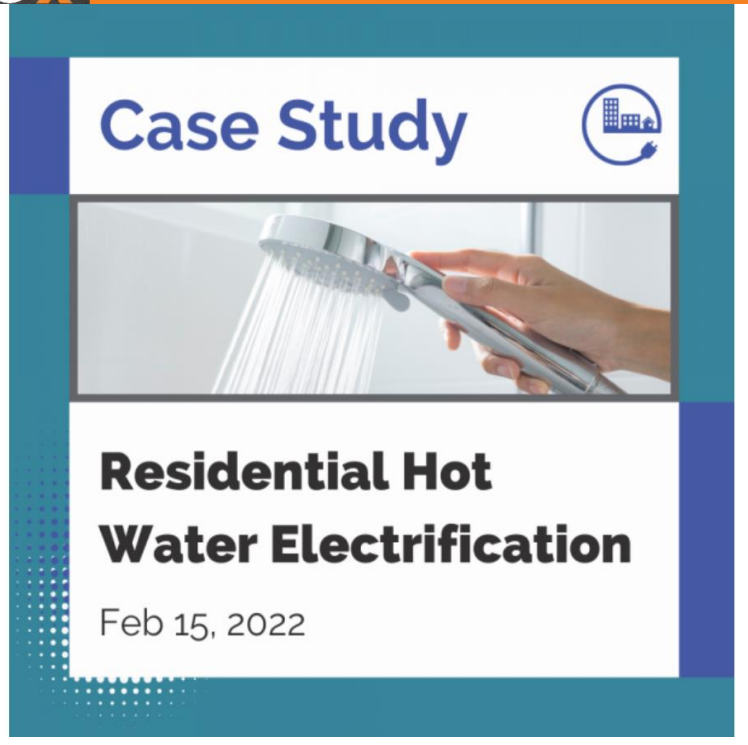
% ICC vs base case	0%	0.1%	0.4%		0.6%	0%	0.1%	1%		0.6%		0.0%	0.6%		0.8%

Key Resources





[B2E and Industry Resources | b2electrification.org]

[ZEBX: Resources – ZEBx]

Domestic Hot Water in Part 9 Residential Buildings

Comparison of Regular Gas vs. Electric Water Heating Systems					
Attributes	**Regular Gas**		**Electric**		
System	Standard Gas Tank	Tankless System	Standard Tank	Premium Tank	Heat Pump Hot Water System
Annual Operation Costs Source: FortisBC Home Energy Calculator	$341	$230	$499	$488	$126 - $191
Annual Maintenance Costs	None	$100 Annually	None	None	$100 Annually
25-year Cost Projection Results (Includes purchase price, operational costs, maintenance fees. Does not include rebates)	7 yr. Tank $14,596 10 yr. Tank **$12,775**	**$13,250**	7 yr. Tank $15,689 10 yr. Tank $14,725	**$13,500**	**Mid-Efficiency (UEF2.3):** $13,044 **High-Efficiency (UEF3.5):** $11,419

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Annual Maintenance Costs	None	$100 Annually	None	None	$100 Annually
25-year Cost Projection Results (Includes purchase price, operational costs, maintenance fees. Does not include rebates)	7 yr. Tank $14,596 10 yr. Tank $12,775	**$13,250**	7 yr. Tank $15,689 10 yr. Tank $14,725	**$13,500**	**Mid-Efficiency (UEF2.3):** $13,044 **High-Efficiency (UEF3.5):** $11,419

Domestic Hot Water in Part 9 Residential Buildings

Comparison of Regular Gas vs. Electric Water Heating Systems					
Attributes	**Regular Gas**		**Electric**		
System	**Standard Gas Tank**	**Tankless System**	**Standard Tank**	**Premium Tank**	**Heat Pump Hot Water System**
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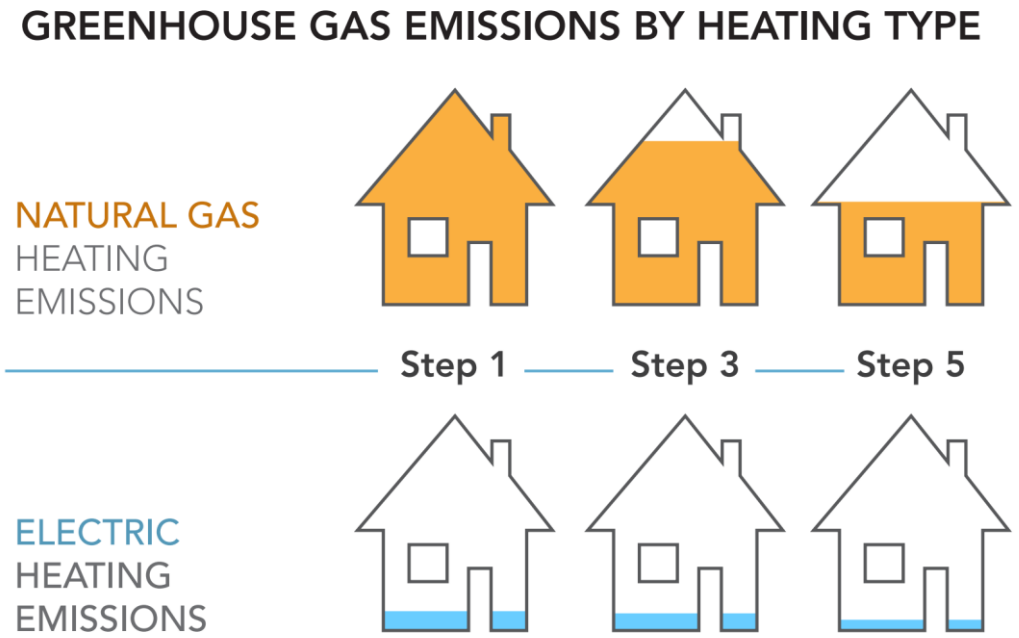
Technical Review - Key Conclusions

- Costing Analysis:
  - Operating Costs: 7% savings – 2.2% annual cost increase
  - Capital Costs:: 0.1% cost savings to a 2.2% capital cost increase
- Analysis shows that fully electric buildings are consistently able to achieve the zero-carbon ready standard for all building types

Technical Review - Key Conclusions

- All new construction needs to use 100% renewable energy by 2025
- The Step Code can result in buildings that produce significant emissions over their lifetime because it is fuel agnostic
  - Natural gas has 17 times higher global warming potential than electricity

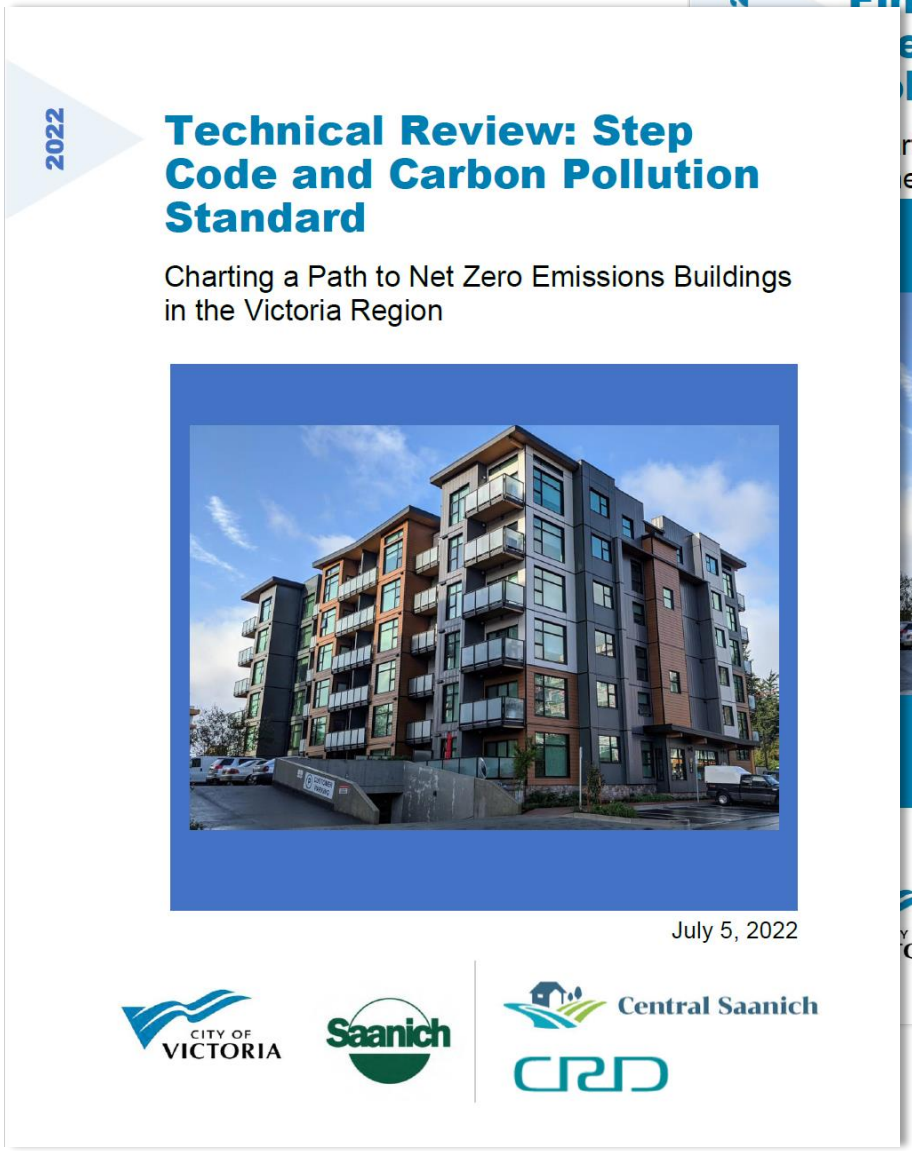


Source: Metro Vancouver Climate 2050 Roadmap: Buildings (Oct. 2021)

ZCSC Reports

July 21 2022 Council Report

- Technical Review
- Engagement Report
- Summary of the ZCSC

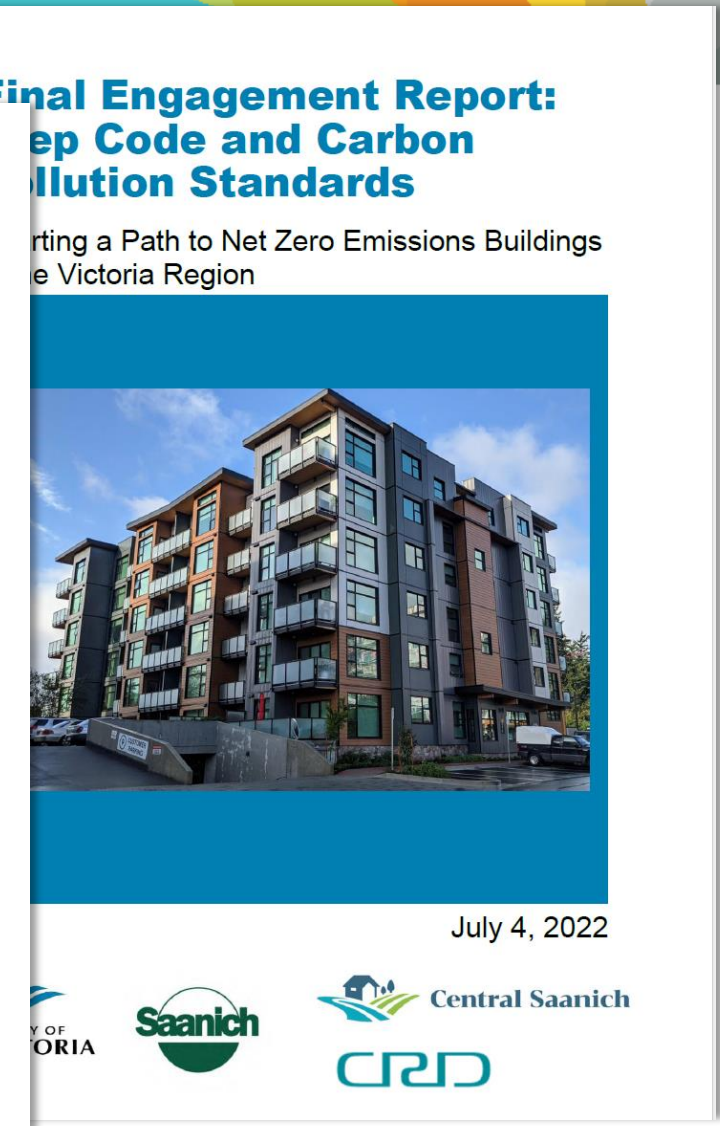

2022

Technical Review: Step Code and Carbon Pollution Standard

Charting a Path to Net Zero Emissions Buildings in the Victoria Region

July 5, 2022

CITY OF VICTORIA · Saanich · Central Saanich · CRD


22

Final Engagement Report: ep Code and Carbon llution Standards

rting a Path to Net Zero Emissions Buildings e Victoria Region

July 4, 2022

Saanich · Central Saanich · CRD

[filestream.ashx (escribemeetings.com)]

Zero Carbon Step Code Adoption

July 2022 Council Direction

RECOMMENDATION

1. **Harmonize Energy Step Code Requirements with the Province**
2. **Adopt the Zero Carbon Step Code incrementally with all buildings reaching Emissions Level 4 by July 1, 2025**

2023 Climate Action Progress Report

- **Observable decrease in residential emissions**
- **New natural gas connection continue to increase**
- **Despite progress, not on track for 2030 targets**
  - Additional and enhanced measures are required

COV 2022 Progress Report WEB.pdf (victoria.ca)

Implementation: District of Saanich + City of Victoria

TODAY

Houses, townhouses, duplexes, triplexes, or garden suites.

November **2023**

ZERO Carbon Performance

July **2024**

ZERO Carbon Performance

Condos + Apartments 6 storeys or fewer

November **2024**

ZERO Carbon Performance

Offices

All Condos + Apartments

Communications

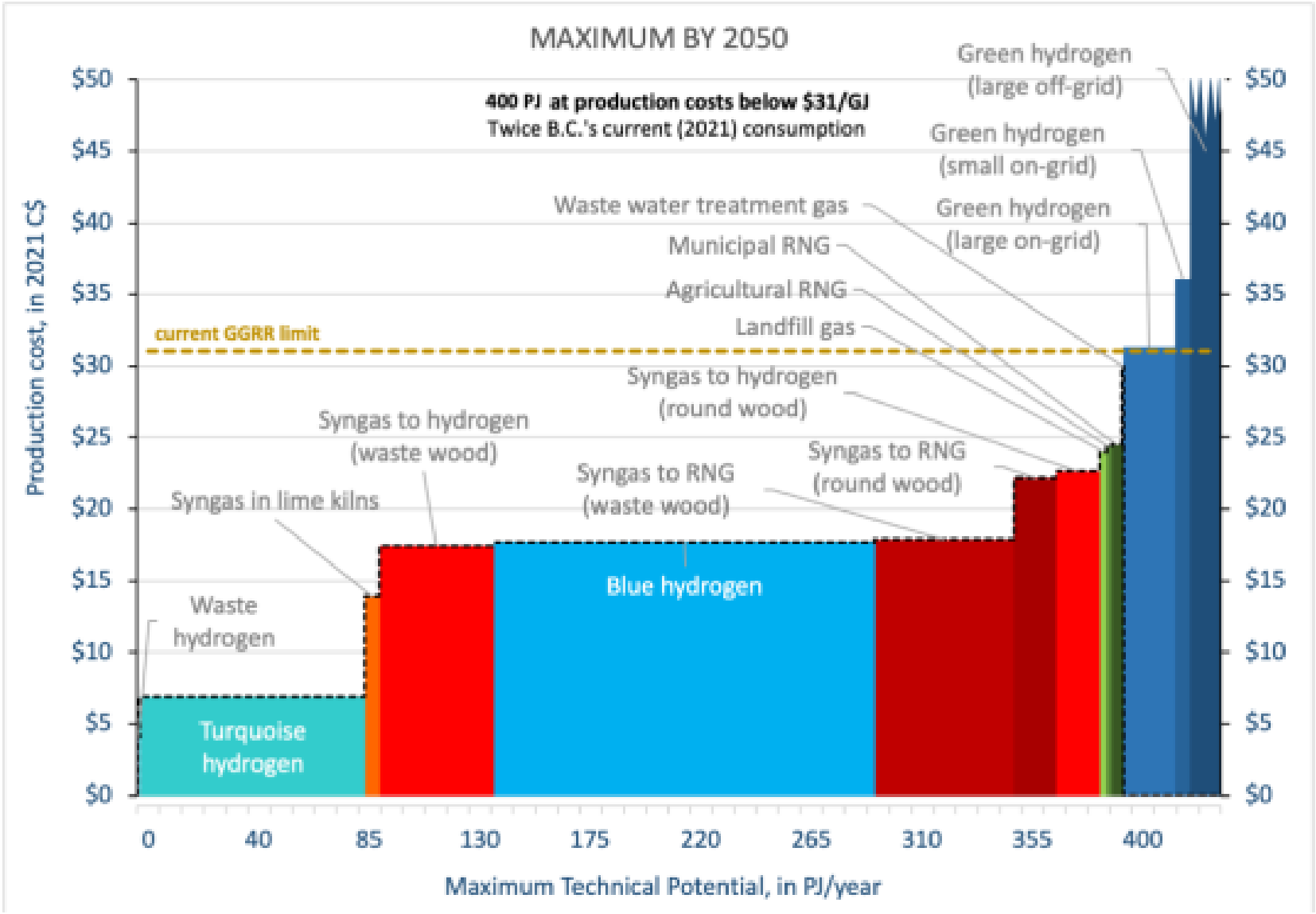
- Step Code webpages
  - www.saanich.ca/stepcode
  - BC Energy Step Code | Victoria
- Zero Carbon Step Code FAQ
  - On webpage (step code, building and development)
  - In Rezoning and DP application packages
- Emails to industry associations
  - CHBA, UDI, VICA, VRBA
- Zero Carbon Step Code Webinar(s)
  - Collaboration with City of Victoria, Saanich and CRD
- Presentations to industry as requested
- More Information – www.energystepcode.ca

Discussion and Questions

Extra Slides

Renewable Gas and Low Carbon Fuels

[renewable-gas-study-final-report-2022-01-28.pdf (fortisbc.com)]



***Note**: For better readability, the scale of the x-axis (potential in PJ/year) is different for each graph*

Figure 3 **Production Cost and Technical Potential in the Maximum Scenario by 2050.** Market prices may be higher than costs.