



ZERO CARBON  
**STEP**CODE



# Builder Engagement Zero Carbon Step Code August 2024

# Agenda

**1. Overview of Zero  
Carbon Step Code**



**2. Provincial Targets**



**3. Summerland Context**



# Zero Carbon Step Code Vs. Energy Step Code

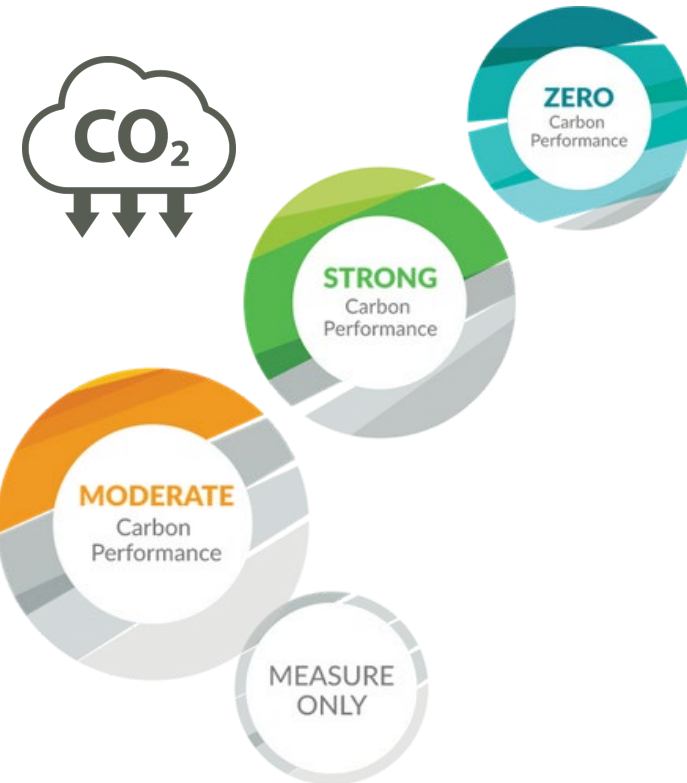
The **BC Energy Step Code** sets energy efficiency requirements for **NEW** buildings.

PATHWAY TO 2032: **PART 9 (HOMES)**



The **Zero Carbon Step Code** sets greenhouse gas emissions targets for **NEW** buildings.

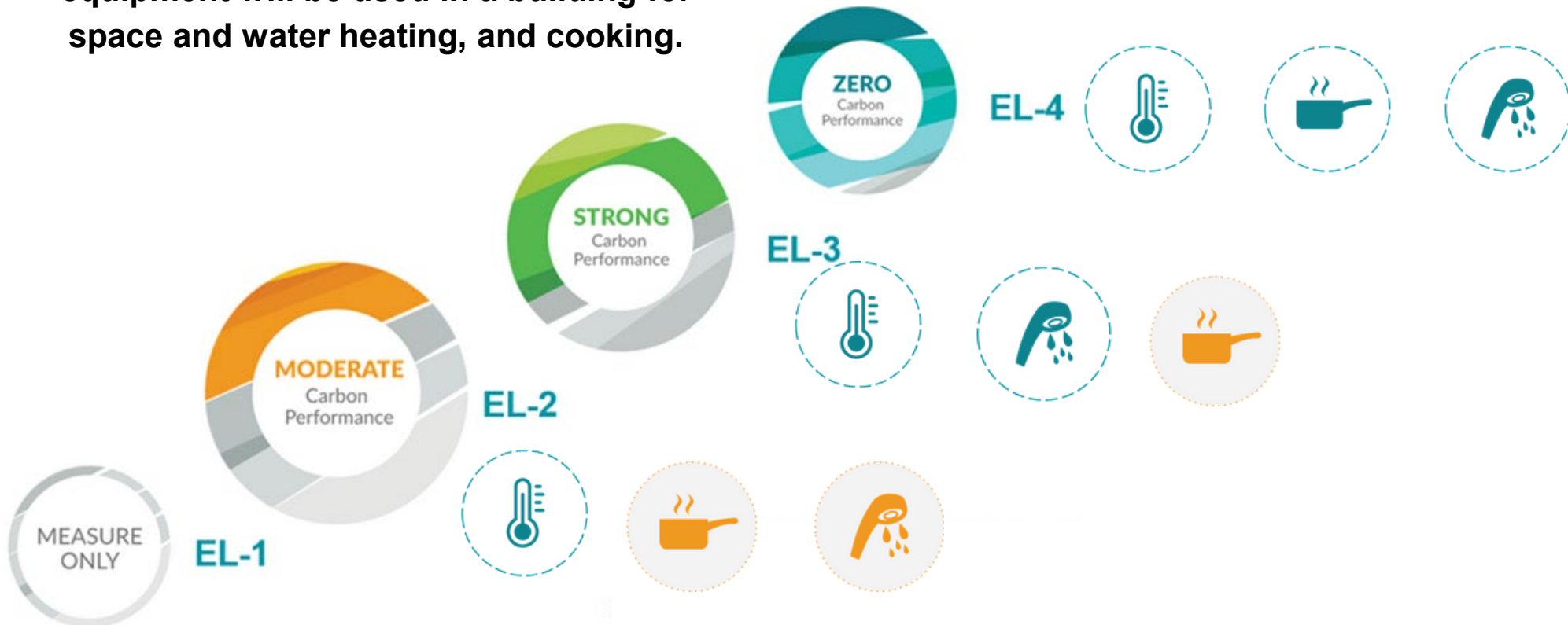
PATHWAY TO 2032: **PART 3 (WOOD-FRAME RESIDENTIAL)**



# What is needed to meet Zero Carbon Step Code?



Building to zero-carbon standards requires making a choice about what kind of equipment will be used in a building for space and water heating, and cooking.



# What Counts in the Emissions Calculations



ZERO CARBON  
**STEP**CODE

- **Principle Heating System**
  - Heat Pump
  - Gas Furnace
  - Combo system
- **Supplementary Heating Equipment**
  - Hybrid (gas)
  - Electric supplement in heat pump
- **Hot water**
  - tank
  - boiler
- **Redundant backup systems**
  - generator
  - gas or wood fireplace
- **Equipment and Appliances**
  - cooking
  - laundry



# Zero-carbon electric equipment



98%

Electricity generated in BC is from renewable resources

- electric induction cooktops are gaining popularity in the marketplace



- Electric heat pumps provide cooling in the summers and heat in the winters.
- Cold Climate heat pumps work efficiently down to -25C, with some maintaining efficiency over 200% at -18 C



- efficient electric water heaters are readily available



# Many types of buildings can be regulated under the Zero Carbon Step Code



**Part 9:**  
Smaller + simpler  
buildings, specifically...



Homes and smaller  
residential buildings

**Part 3:**  
Larger and more complex buildings, including...



Offices

Condos + apartments

Financial  
institutions

Retail +  
grocery stores

# BCBC 9.37-Greenhouse Gas Emissions



## Performance

## Prescriptive

Table 9.37.1.3. Greenhouse Gas Emissions  
Forming part of Sentence 9.37.1.3.(1)

<u>GHG Emission Level</u>	<u>GHG Emission Compliance Options</u>				
	<u>Maximum GHG Emissions by House, Expressed in kg CO<sub>2e</sub>/year</u>	or	<u>Maximum GHG Emissions by House<sup>1</sup></u>		<u>Reduction of GHG Emissions by Energy Source of Building Systems<sup>2</sup></u>
			<u>Maximum GHGI of the House, Expressed in kgCO<sub>2e</sub>/m<sup>2</sup>/year</u>	<u>Maximum GHG Emissions by House, Expressed in kgCO<sub>2e</sub>/year</u>	
<u>EL-1</u>	<u>measure only</u>	or	<u>measure only</u>		<u>N/A</u>
<u>EL-2</u>	<u>1050</u>		<u>6.0</u>	<u>2400</u>	<u>Energy sources supplying heating systems have an emissions factor ≤ 0.011 kgCO<sub>2e</sub>/kWh</u>
<u>EL-3</u>	<u>440</u>		<u>2.5</u>	<u>800</u>	<u>Energy sources supplying heating and service water heating systems have an emissions factor ≤ 0.011 kgCO<sub>2e</sub>/kWh</u>
<u>EL-4</u>	<u>265</u>		<u>1.5</u>	<u>500</u>	<u>Energy sources supplying all building systems, including equipment and appliances, have an emissions factor ≤ 0.011 kgCO<sub>2e</sub>/kWh</u>



# Prescriptive Pathway

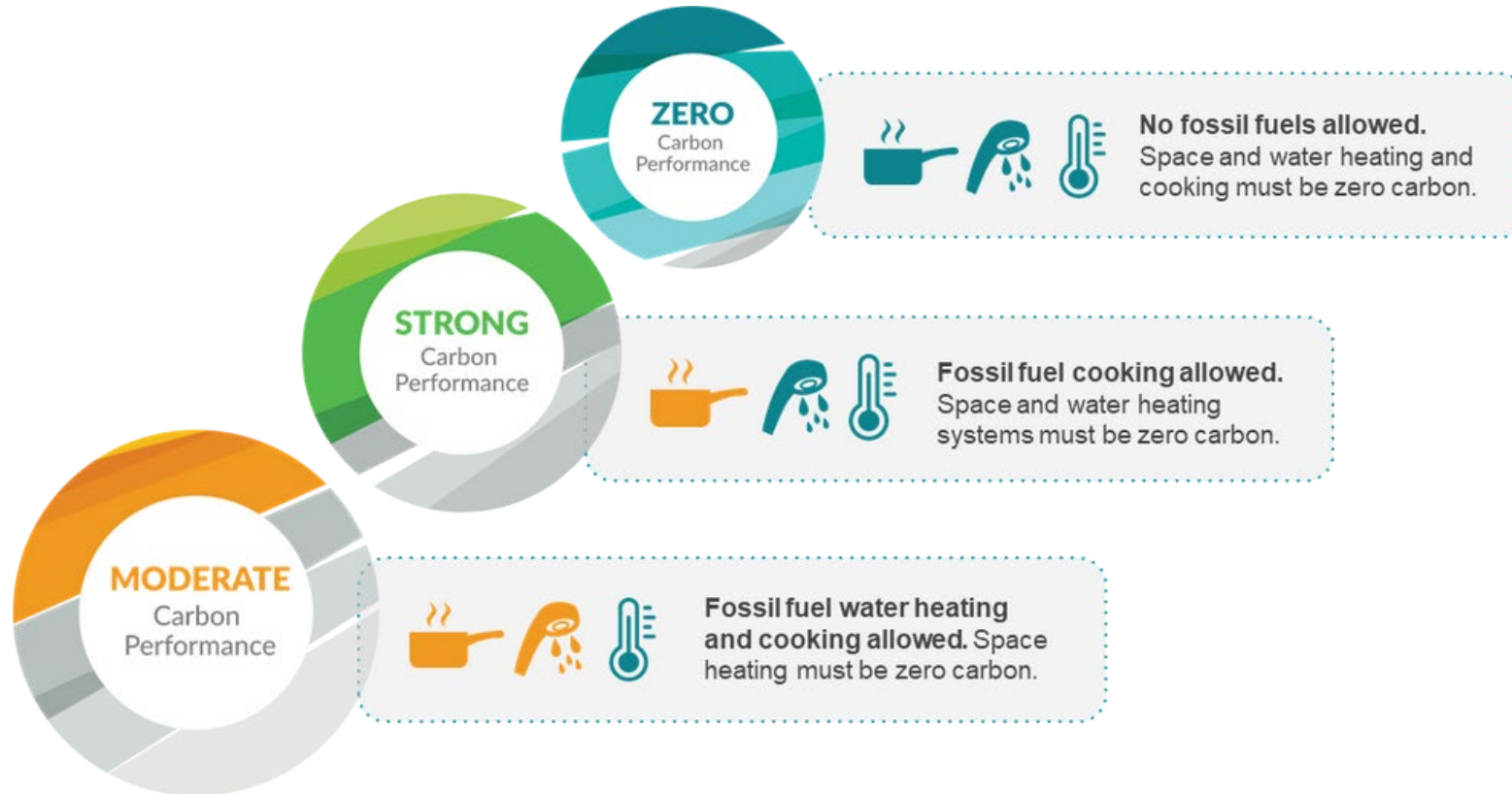


## Part 9:

Smaller + simpler  
buildings, specifically...



Homes and smaller  
residential buildings



# Performance Pathway

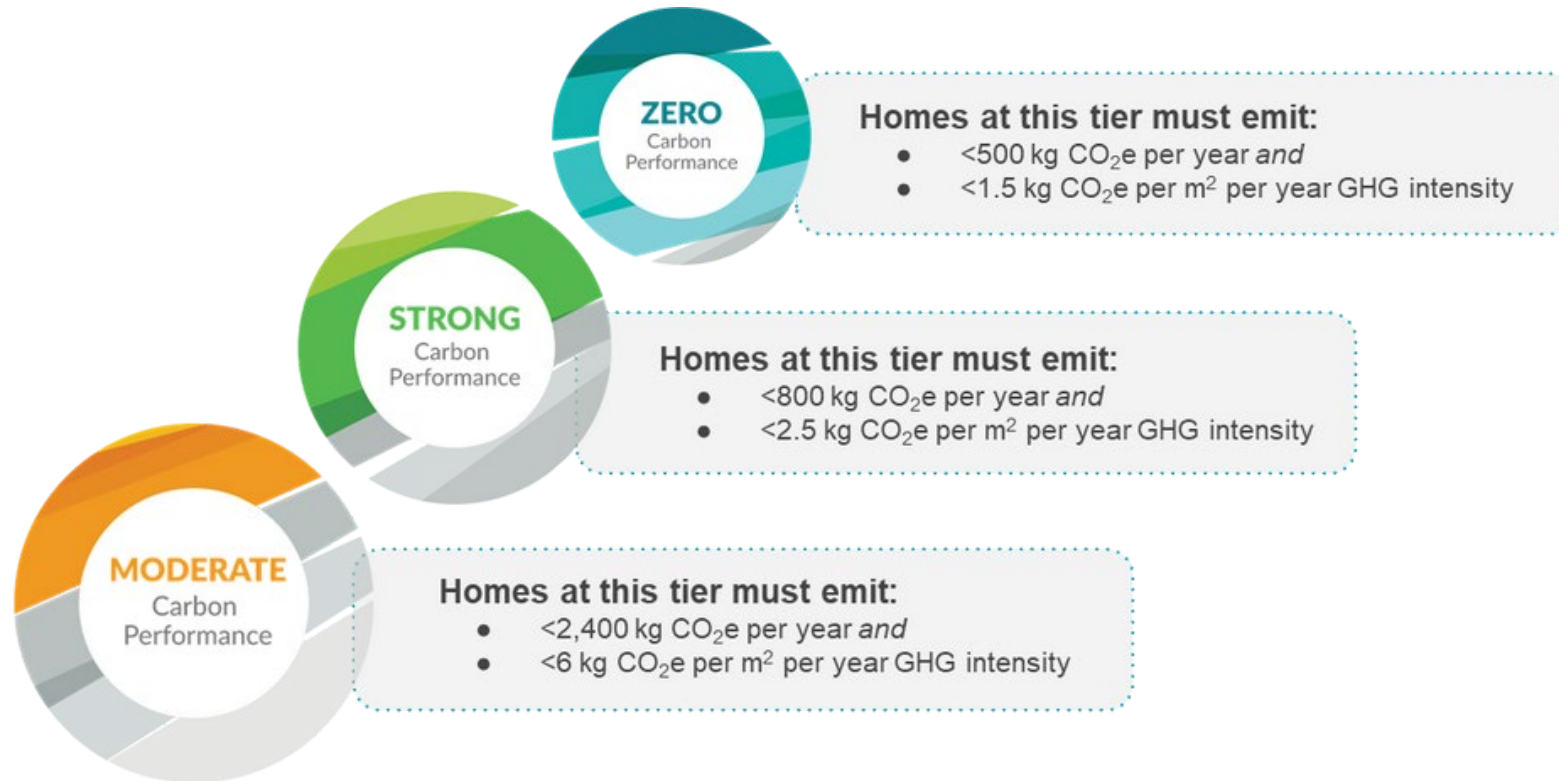


## Part 9:

Smaller + simpler  
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# Updated Energy Reports

## B: ENERGY STEP CODE COMPLIANCE SUMMARY

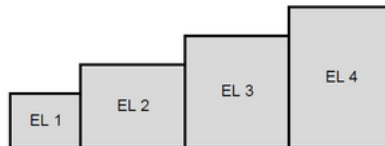
BC Building Code Performance Compliance Path:  
9.36.6. BC Energy Step Code

Energy Step Code
Step Required
3
Proposed Step Achieved
3

Achieved  
↓



Zero Carbon Step Code
Level Required
EL 1 - Measure Only
Proposed Level Achieved
EL 1 - Measure Only



## F: 9.36.6. ENERGY STEP CODE COMPLIANCE (see BCBC Sentence 2.2.8.3.(3) of Division C)

Proposed House Rated Energy Consumption (GJ/year):		Reference House Rated Energy Target (GJ/year):			
29		77			
Proposed House Metrics		Unit	Mid Con Step Requirements	Proposed House Result	Proposed House Pass or Fail
Step Code Level		Step 3, 4 or 5	3		
Mechanical Energy Use Intensity (MEUI)		kWh/(m <sup>2</sup> ·year)	75 (max)	43	Pass
% Improvement		%	20 (min)	63	
Thermal Energy Demand (TED)		kWh/(m <sup>2</sup> ·year)	44 (max)	64	Pass
% Heat Loss Reduction		%	10 (min)	24	
Airtightness in Air Changes per Hour at 50 Pa differential		ACH @ 50 Pa	2.5 (max)	2.3	
Normalized Leakage Area		10 Pa (cm <sup>2</sup> /m <sup>2</sup> )	1.2 (max)	0.8	Pass
Normalized Leakage Rate		L/s/m <sup>2</sup>	0.89 (max)	0.6	
<b>Step Code Requirements Met:</b>					<b>Yes</b>
Software Used:		Hot 2000	Version:	11.11	
Heated Floor Area (m <sup>2</sup> )		189.00	Climate Data (Location):		SUMMERLAND
Building Volume (m <sup>3</sup> )		599.20	Degree Days Below 18°C (HDD):		3359
FWDR:		11.4%	% Of Space Cooled		More than 50%

## G: ZERO CARBON STEP CODE

Proposed House Metrics		Unit	Proposed Level Requirement	Proposed House Result	Proposed House Pass or Fail
Zero Carbon Step Code Level		EL-1 - EL-4	EL 1 - Measure Only		
Total GHG		kg CO <sub>2e</sub> / year	NA (max)	590	Pass
CO <sub>2</sub> Per floor area with Max	Per Floor area	kg CO <sub>2e</sub> /m <sup>2</sup> /year	NA (max)	3	Pass
	Max	kg CO <sub>2e</sub>	NA (max)	590	
Perscriptive	Heating		NA	Carbon	Pass
	Hot Water		NA	Carbon	
	All building systems, equipment and appliances		NA	Carbon	
<b>Target Reached</b>					<b>Yes</b>

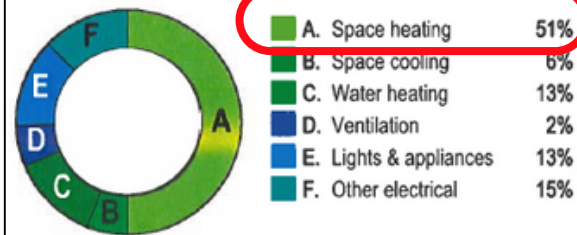
# Examples of homes in Summerland

## House #1



### HOW YOUR RATED ENERGY IS USED:

The chart below represents the breakdown of rated annual energy consumption in your home under standard operating conditions. You can use these figures as a guide to help identify where you can lower home energy costs through proper home maintenance, efficient home operation, energy efficiency renovations or equipment replacement.



### WHERE YOUR HOME LOSES HEAT:

Houses lose heat through their exterior shell, or building envelope. The chart below shows where and how your home loses heat. The

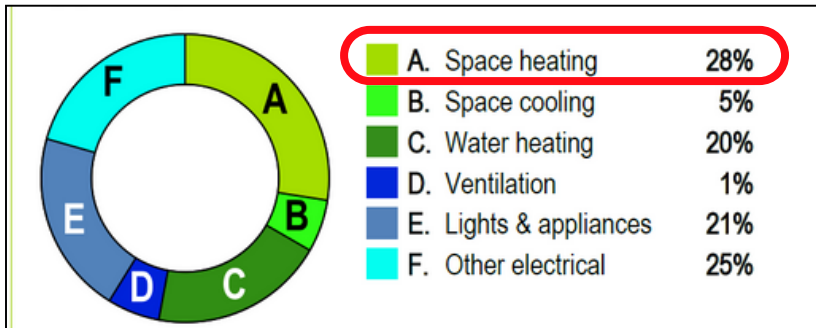
Space Conditioning (Heating & Cooling) Heating: Natural Gas Condensing Furnace Cooling: Central Air Conditioner

Electrification of the space heating could be one way in which the emissions can be reduced and meet EL-2

This house in Summerland attains Step Code 3, but does not meet the emission target for EL-2 of 2,400 kg of CO<sub>2</sub>e annually.

#	Metric	Units	Reference House	Proposed House	As-Built House
1	Airtightness NLA@10Pa	cm <sup>2</sup> /m <sup>2</sup>	1.15	0.75	1.10
2	Rated Greenhouse Gas Emissions	kg/year	11585	3000.00	3100.00
3	Rated Greenhouse Gas Intensity	kg/m <sup>2</sup> /year	47	12.00	13.00
4	Rated Energy Use Intensity	GJ/m <sup>2</sup> /year	0.44	0.33	0.37
5	Peak Thermal Load (PTL)	W/m <sup>2</sup>	43	-	33.55
6	% of the Building's Conditioned Space Served by Space-Cooling	%	N/A	Not more than 50%	More than 50%
7	% Lower Than Reference House With Baseloads Included	%	N/A	18.8%	16.5%

# Examples of homes in SummerlandHouse #2



G: ZERO CARBON STEP CODE				
Proposed House Metrics			Proposed Calculations	
Proposed House Metrics	Unit	Proposed Level Requirement	Proposed House Result	Proposed House Pass or Fail
Zero Carbon Step Code Level	EL-1 - EL-4	EL 1 - Measure Only		
Total GHG	kg CO <sub>2e</sub> /year	NA (max)	590	Pass
CO <sub>2</sub> Per floor area with Max	Per Floor area	kg CO <sub>2e</sub> /m <sup>2</sup> /year	3	Pass
	Max	kg CO <sub>2e</sub>	590	
Perscriptive	Heating	NA	Carbon	Pass
	Hot Water	NA	Carbon	
	All building systems, equipment and appliances	NA	Carbon	
			<b>Target Reached</b>	<b>Yes</b>

**Table 9.37.1.3.**  
**Greenhouse Gas Emissions**  
 Forming part of Sentence 9.37.1.3.(1)

GHG Emission Level	GHG Emission Compliance Options			
	Maximum GHG Emissions by House, Expressed in kg CO <sub>2e</sub> /year	or	Maximum GHG Emissions by House <sup>1</sup> Maximum GHGI of the House, Expressed in kgCO <sub>2e</sub> /m <sup>2</sup> /year	Maximum GHG Emissions by House, Expressed in kgCO <sub>2e</sub> /year
EL-1	1050		6.0	2400
EL-2	1050	or	6.0	2400
EL-3	440		2.5	800
EL-4	265		1.5	500

This home would fall under EL-2 (but lands between an EL-2 and EL-3).

Furnace and DHW use natural gas. Switch one out to electric and likely meeting EL-3

# Performance Pathway



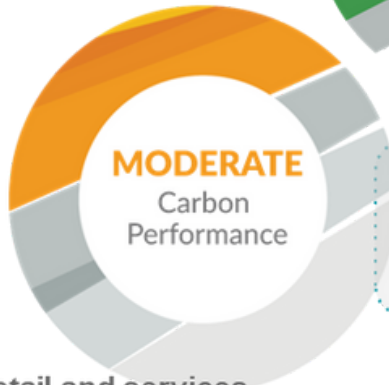
Part 3:  
Larger and more complex buildings, including...



- **Hotels and motels:** <math><2 \text{ kg CO}\_2\text{e} / \text{m}^2 / \text{year}</math>
- **Retail and services buildings:** <math><2 \text{ kg CO}\_2\text{e} / \text{m}^2 / \text{year}</math>



- **Hotels and motels:** <math><4 \text{ kg CO}\_2\text{e} / \text{m}^2 / \text{year}</math>
- **Retail and services buildings:** <math><3 \text{ kg CO}\_2\text{e} / \text{m}^2 / \text{year}</math>



- **Hotels and motels:** <math><9 \text{ kg CO}\_2\text{e} / \text{m}^2 / \text{year}</math>
- **Retail and services buildings:** <math><6 \text{ kg CO}\_2\text{e} / \text{m}^2 / \text{year}</math>



# Performance Pathway



## ZERO CARBON STEP CODE

Part 3:  
Larger and more complex buildings, including...



Offices

Condos + apartments

Financial institutions

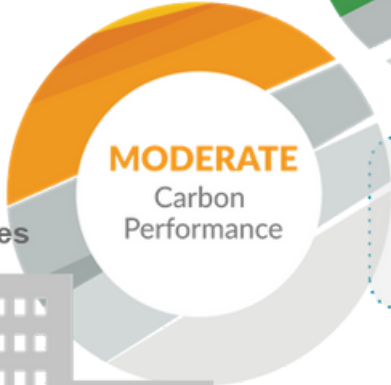
Retail + grocery stores



- **Larger residential buildings:** <math><1.8 \text{ kg CO}\_2\text{e} / \text{m}^2 \text{ per year}</math>
- **Offices:** <math><1.5 \text{ kg CO}\_2\text{e} / \text{m}^2 \text{ per year}</math>



- **Larger residential buildings:** <math><3 \text{ kg CO}\_2\text{e} / \text{m}^2 \text{ per year}</math>
- **Offices:** <math><3 \text{ kg CO}\_2\text{e} / \text{m}^2 \text{ per year}</math>



- **Larger residential buildings:** <math><7 \text{ kg CO}\_2\text{e} / \text{m}^2 \text{ per year}</math>
- **Offices:** <math><5 \text{ kg CO}\_2\text{e} / \text{m}^2 \text{ per year}</math>

Larger residential buildings



# BCBC 10.3- Greenhouse Gas Emissions



**Table 10.3.1.3.**  
**Greenhouse Gas Emissions**  
 Forming Part of Sentence 10.3.1.3.(1)

<u>GHG Emission Level</u>	<u>Maximum GHGI of the Building, Expressed in kgCO<sub>2e</sub>/m<sup>2</sup>/year</u>			
	<u>Residential Major Occupancy</u>		<u>Business and Personal Service and Mercantile Major Occupancies</u>	
	<u>Hotels and Motels</u>	<u>Other Residential Occupancies</u>	<u>Offices</u>	<u>Other Business and Personal Service and Mercantile Occupancies</u>
<u>EL-1</u>	<u>measure only</u>			
<u>EL-2</u>	<u>9.0</u>	<u>7.0</u>	<u>5.0</u>	<u>6.0</u>
<u>EL-3</u>	<u>4.0</u>	<u>3.0</u>	<u>3.0</u>	<u>3.0</u>
<u>EL-4</u>	<u>2.0</u>	<u>1.8</u>	<u>1.5</u>	<u>2.0</u>



# Origin of the new regulation



**“By 2030, all new buildings will be zero carbon, and all new space and water heating equipment will meet the highest standards for efficiency.”**

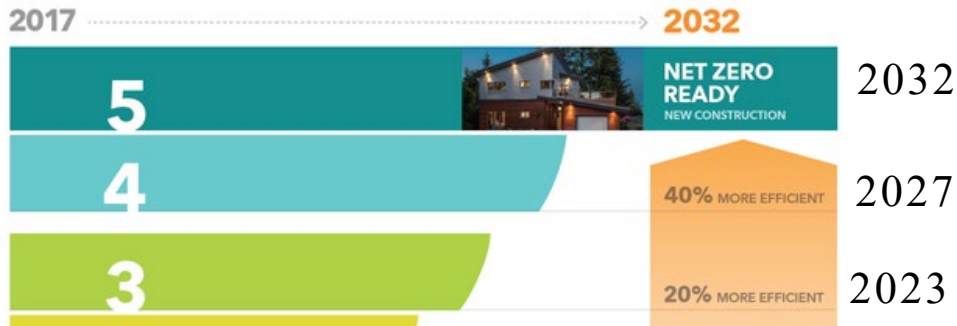
*– CleanBC Roadmap to 2030*



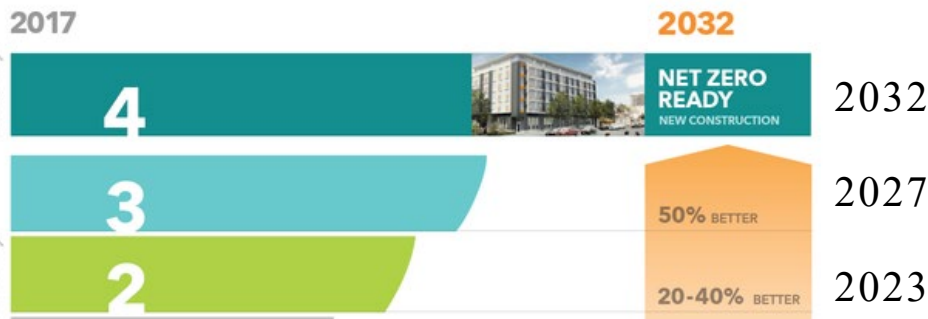
# Provincial Targets



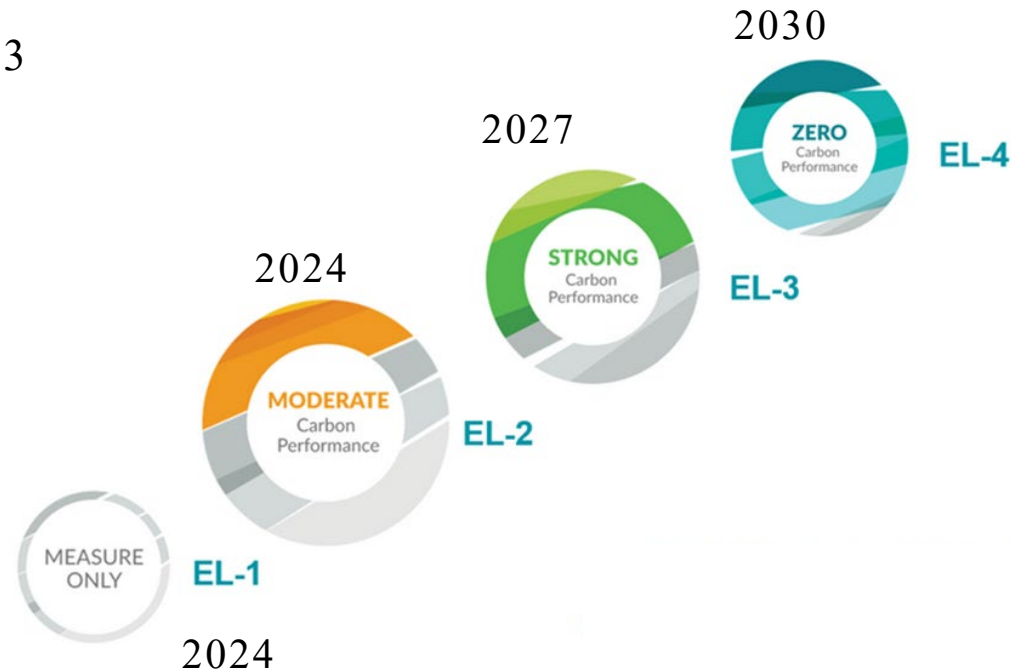
## PATHWAY TO 2032: PART 9 (HOMES)



## PATHWAY TO 2032: PART 3 (WOOD-FRAME RESIDENTIAL)



The ZCSC is currently 'opt in' at this time until the Province directs an emission performance level to be met



# Fossil fuels burned in buildings are driving climate change



**Buildings are either the number one or two source of carbon pollution**

**29%**

City of Kamloops



**12%**  
British  
Columbia

**33%**

District of  
Summerland



**36%**

City of Kelowna

# How much more will it cost to build homes that meet Zero Carbon Step Code?



A technical report from the BC Building Safety and Standards Branch examined the potential incremental costs associated with building new homes to EL-2, EL-3 and EL-4.

## Part 3 Buildings (Energy Step Code Level 2)

0% to 1.4%



0% to 1.4%

1.2% to 1.3%



Was not modelled

-0.1% to 2.1%



0% to 1.9%

## Part 9 Buildings (Energy Step Code Level 3)

# Myth Busting: Natural Gas



**Does the highest level of the ZCSC (EL-4) ban the use of natural gas in new builds?**

No

**Can renewable natural gas be used to comply with the Zero Carbon Step Code?**

Yes

**Are the use of gas stoves in new building construction permitted?**

For **Part 9 buildings** (such as single family homes and townhouses), Yes and No

For **Part 3 buildings** (mid- and high-rise apartment buildings)

Yes



• **Principle Heating System**

- Heat Pump
- Gas Furnace
- Combo system



• **Supplementary Heating Equipment**

- Hybrid (gas)
- Electric supplement in heat pump



• **Hot water**

- tank
- boiler



• **Redundant backup systems**

- generator
- gas or wood fireplace



• **Equipment and Appliances**

- cooking
- laundry



# Myth Busting: Going Electric



**Will there be enough locally available electricity?**

Yes, and Solar!

**Is heating with natural gas cheaper than electricity?**

Depends, but possibly

**What will happen to our homes if electricity goes out? What options are there for distributed power generation as back up?**

There are options!



# What is Summerland doing to implement the Zero Carbon Step Code?



## Next Steps

**Bring back a staff report with findings, results from a public survey and final recommendations for opting into adopting the ZCSC**