

3 YEARS OF KELOWNA STEP CODE

PERFORMANCE SO FAR, AND PATHWAYS
TO HIGHER STEPS

Today's Schedule

- Brief Recap on Performance Codes
- Zero Carbon Step Code Introduction
- Kelowna “Higher Steps” Data Analysis

Terms and Definitions

To Avoid Confusion For the purposes of this Session



Will be referred to Steps 1-5 Net Zero ready or other marketing around the Step levels will not be used.



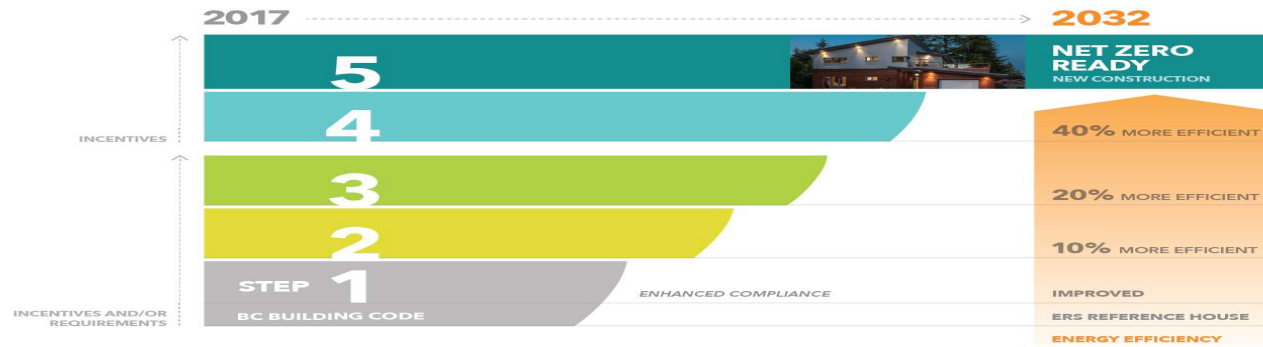
“Net Zero” Will mean the CHBA Net Zero program. This does not mean your power meter reads 0kW.



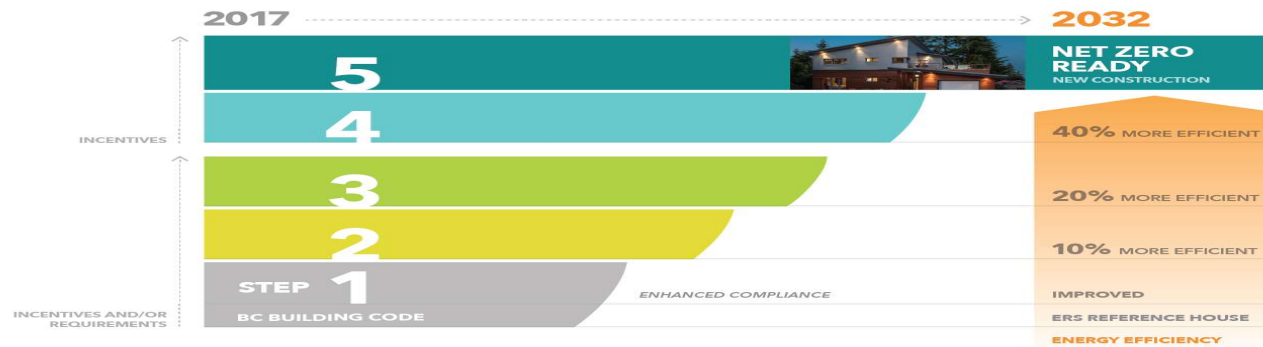
Carbon Step Code will be referred to by the Emissions Levels (EL), not by the marketing terms such as “Zero” - It’s not zero, this is false advertising.



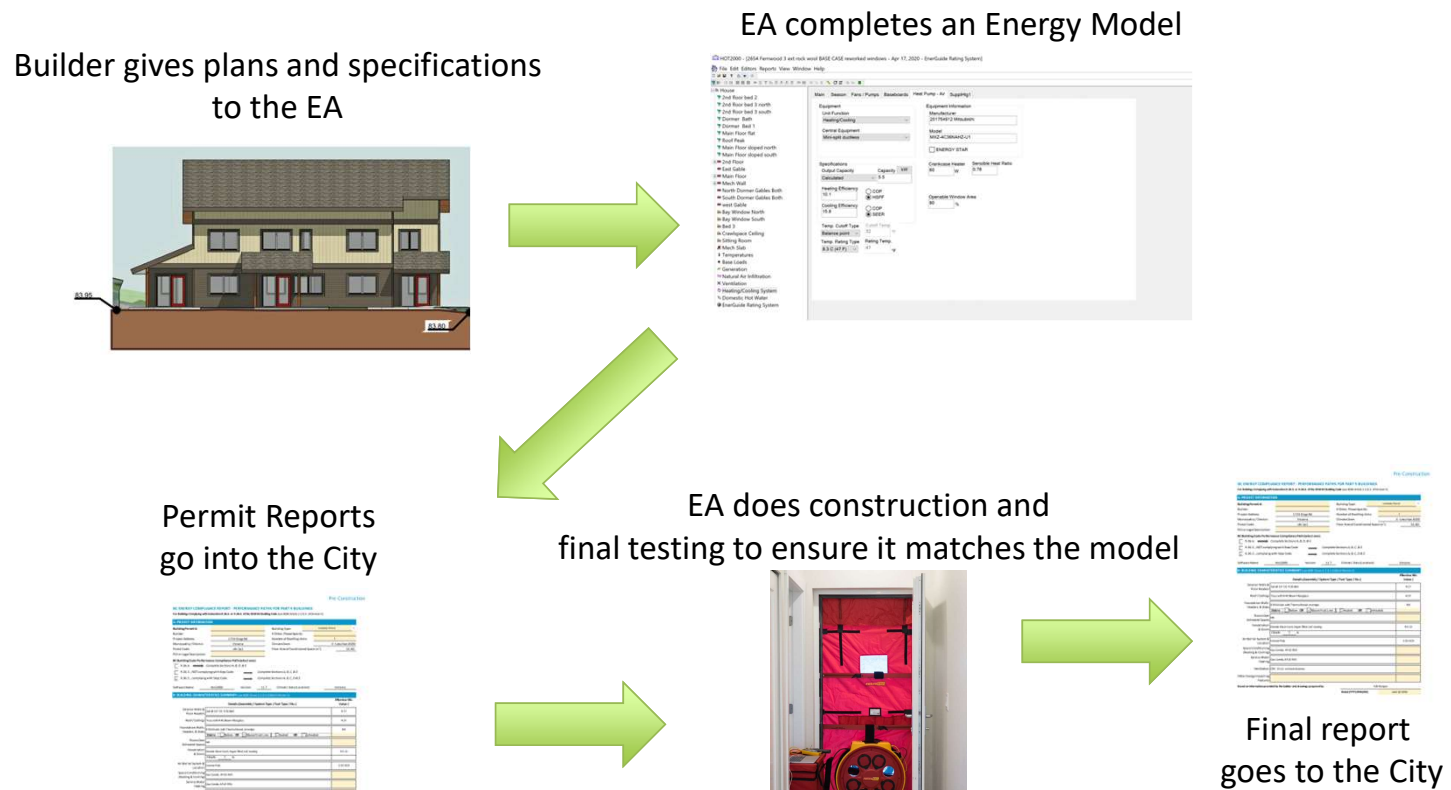
PATHWAY TO 2032: **PART 9 (HOMES)**



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Working with an EA



Three Metric Areas

Don't worry about the numbers - that is for the EA



Air Tightness			Systems and Equipment		Building Envelope	
ACH	NLA	NLR	% Improvement	MEUI	TEDI	% Heat Loss

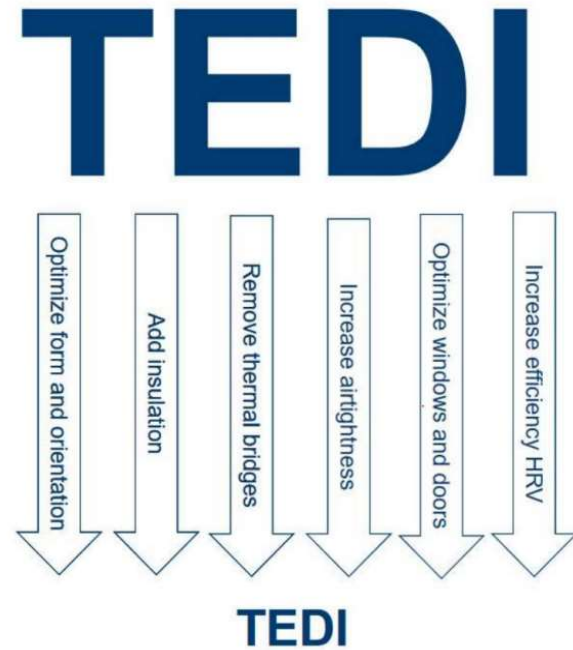
TEDI

Thermal Energy Demand Intensity

- The heat gains – the heat loss of the house per square metre of floor area



How hard your heating system works to keep the house warm



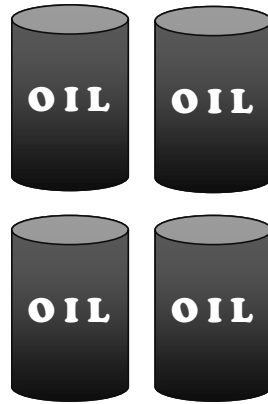
Three Metric Areas

Don't worry about the numbers - that is for the EA



Air Tightness			Systems and Equipment		Building Envelope	
ACH	NLA	NLR	% Better than ERS	MEUI	TEDI	% Better Gross Space Heat Loss

Why Does ACH Make So Much Difference?

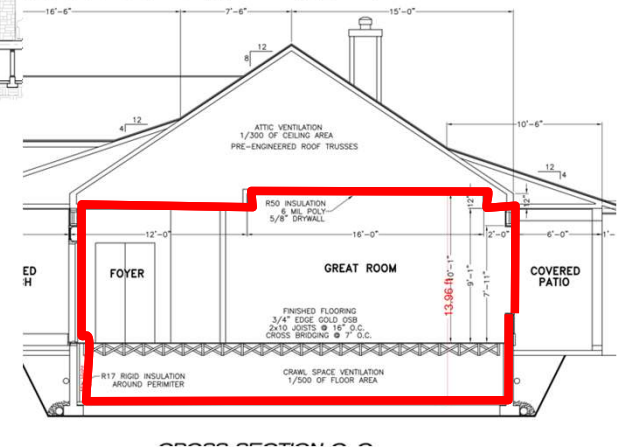
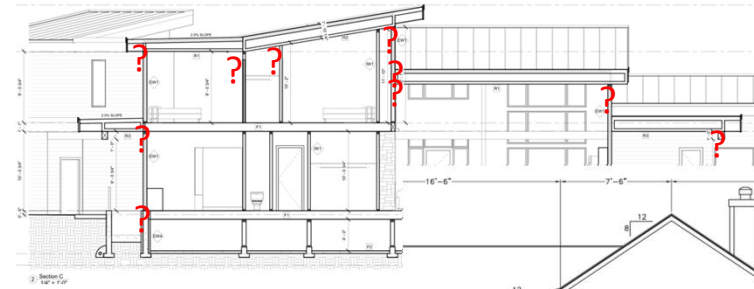
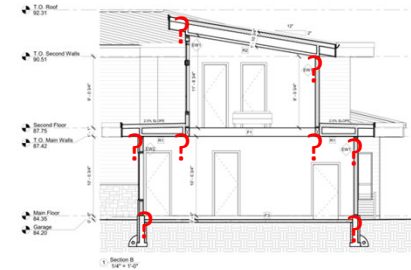


4 ACH@ 50



1 ACH@ 50

Why? Simpler Buildings Are Easier to Make Airtight



Three Metric Areas

Don't worry about the numbers - that is for the EA



Air Tightness			Systems and Equipment		Building Envelope	
ACH	NLA	NLR	% Better than ERS	MEUI	TEDI	% Better Gross Space Heat Loss

MEUI

Mechanical Energy Use Intensity (total energy use - base loads)

- The total energy use of the home per square metre of floor area

Base loads are not included:

Appliances, plugs and lights



Fuel Choice and Step Code

Step Code is Fuel Neutral ... Physics is Not



1 kW in = 0.95 kW out



1 kW in = 1 kW out



1 kW in = 2-4 kW out

“Zero” Carbon Step Code

- Three categories to choose from

- Total GHG per year
- GHG per m² with max cap
- Prescriptive



Several Different Metrics

All have about the same trend



What is Counted and What is Not

- **Principal Heating System**

- Heat Pump
- Gas Furnace
- Combo system



- **Supplementary Heating Equipment**

- The Gas side of the Hybrid
- Electric Supplement in Heat Pump



Sort Of

- **Hot Water**

- Tank
- Boiler



- **Redundant and Backup Systems**

- Generator
- Gas fireplace
- Wood fireplace



- **Equipment and Appliances:**

- Cooking
- Laundry



Only Prescriptive



What EL Level is this house?

Example

- **Principal Heating System**
 - Heat Pump
- **Supplementary Heating Equipment**
 - Gas Furnace
- **Hot Water**
 - Electric Tank
- **Redundant and Backup Systems**
 - Deisel Generator
- **Equipment and Appliances:**
 - Gas Cooking
 - Gas Laundry
- **Other**
 - Gas heated Driveway
 - Gas BBQ
 - Gas heated pool
 - Gas Patio Heater
 - Gas heated Garage



3 YEARS OF DATA

KELOWNA PERFORMANCE RECAP AND
PATH TO HIGHER STEPS (PART 9)

How did we get this Data?

- A tool Built for Energy Advisors By Energy Advisors
 - Gives more complete faster results
 - Checks errors
 - Automates repetitive task

HEET.ca

- HEET now contains 7000+ real world homes that can be data mined

Home Energy Exploration Tool

Increasing capacity and efficiency for EAs while reducing errors and admin work.

Get started →

Learn more 💡



HEET is available for use by all Energy Advisors

Date Range Of Homes

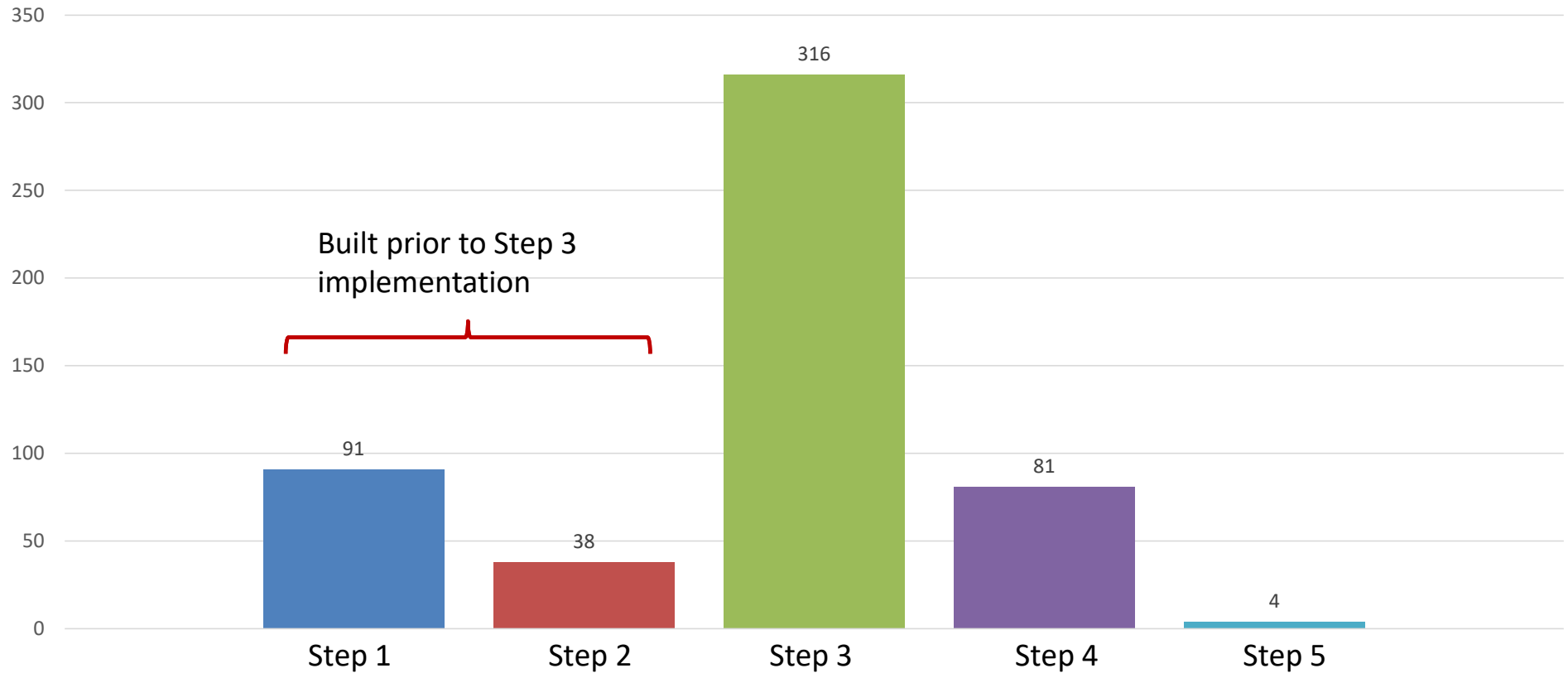
From Jan 2021* to Fall 2023

401 Step 3+ homes used for this project

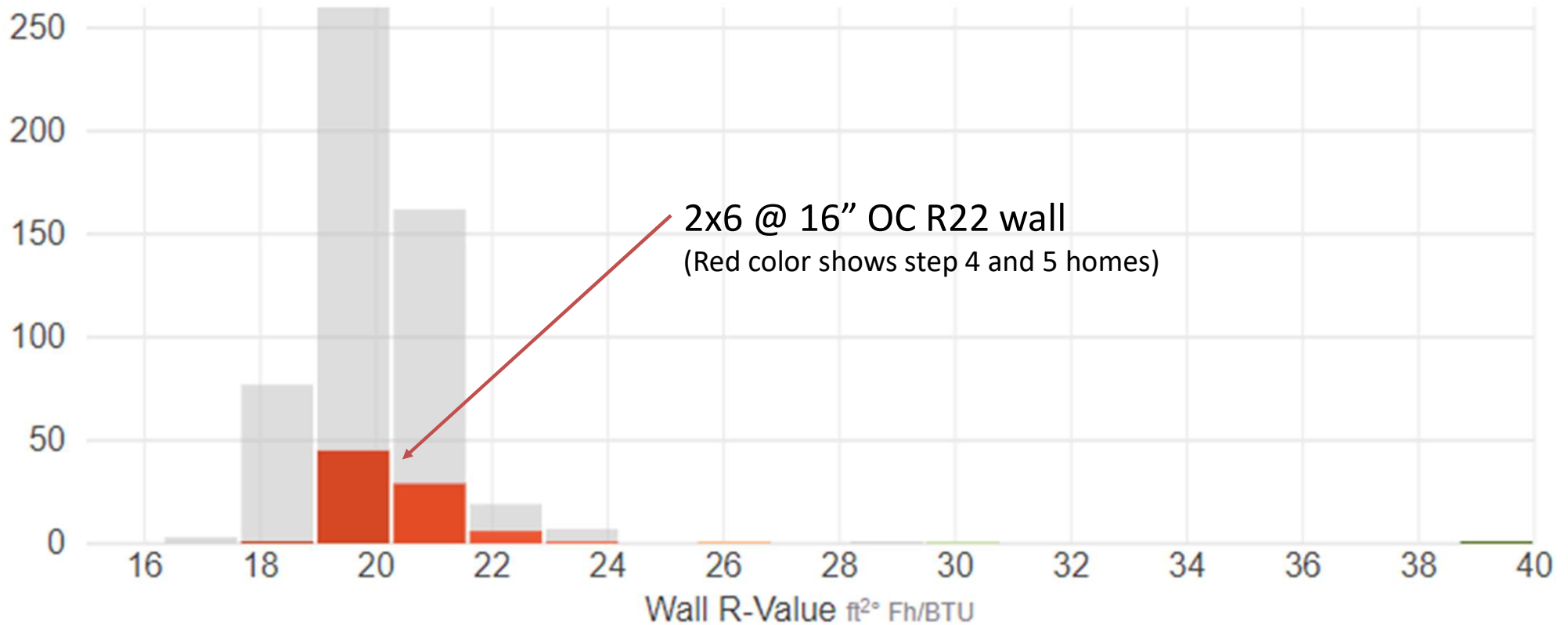
*Kelowna Step 3 in effect June 2021: some figures include Step 1 and 2 homes



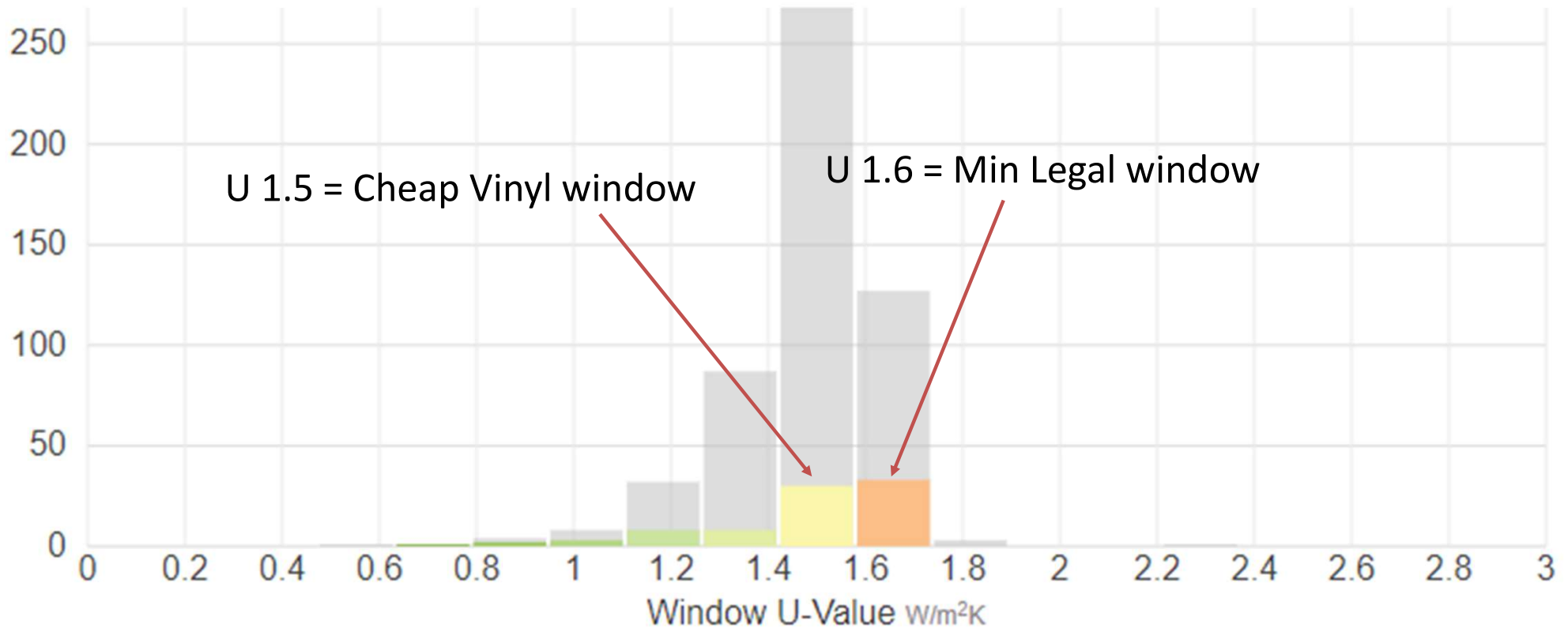
Steps Reached



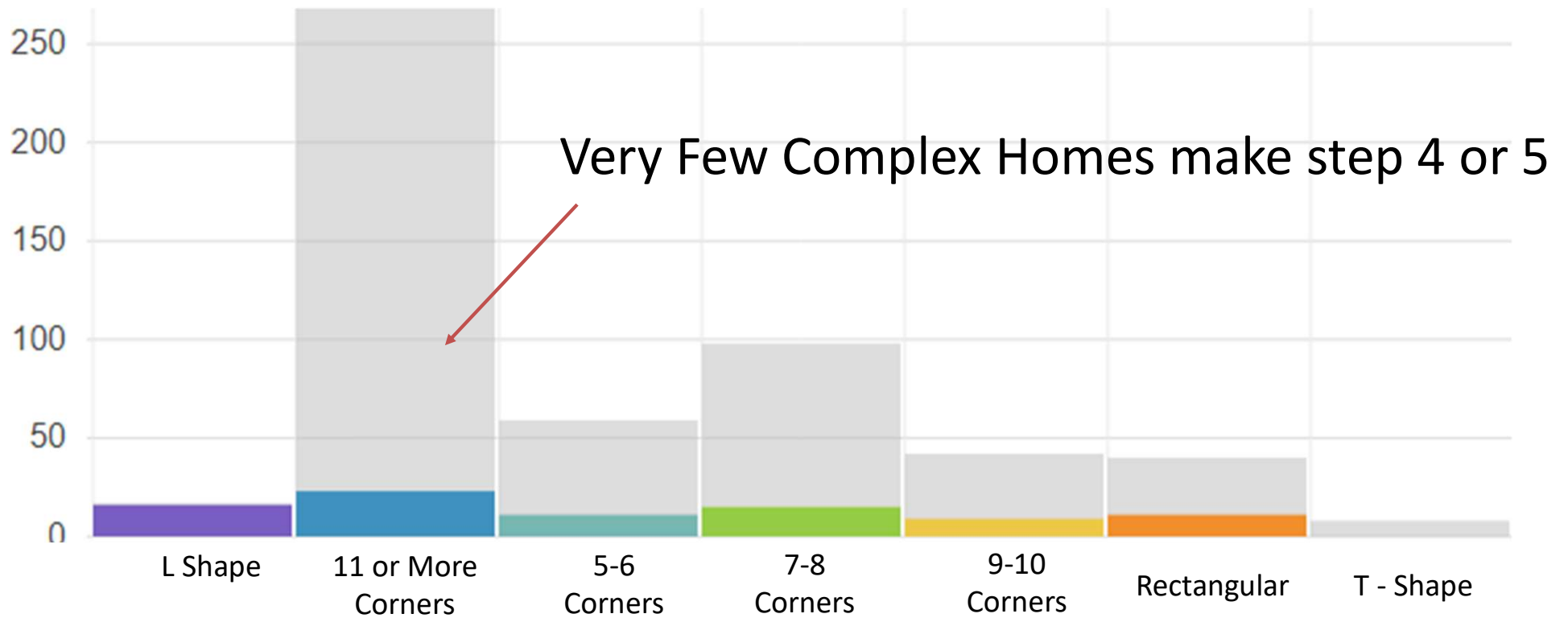
No upgrades necessary: Standard walls meeting Step 4 and 5



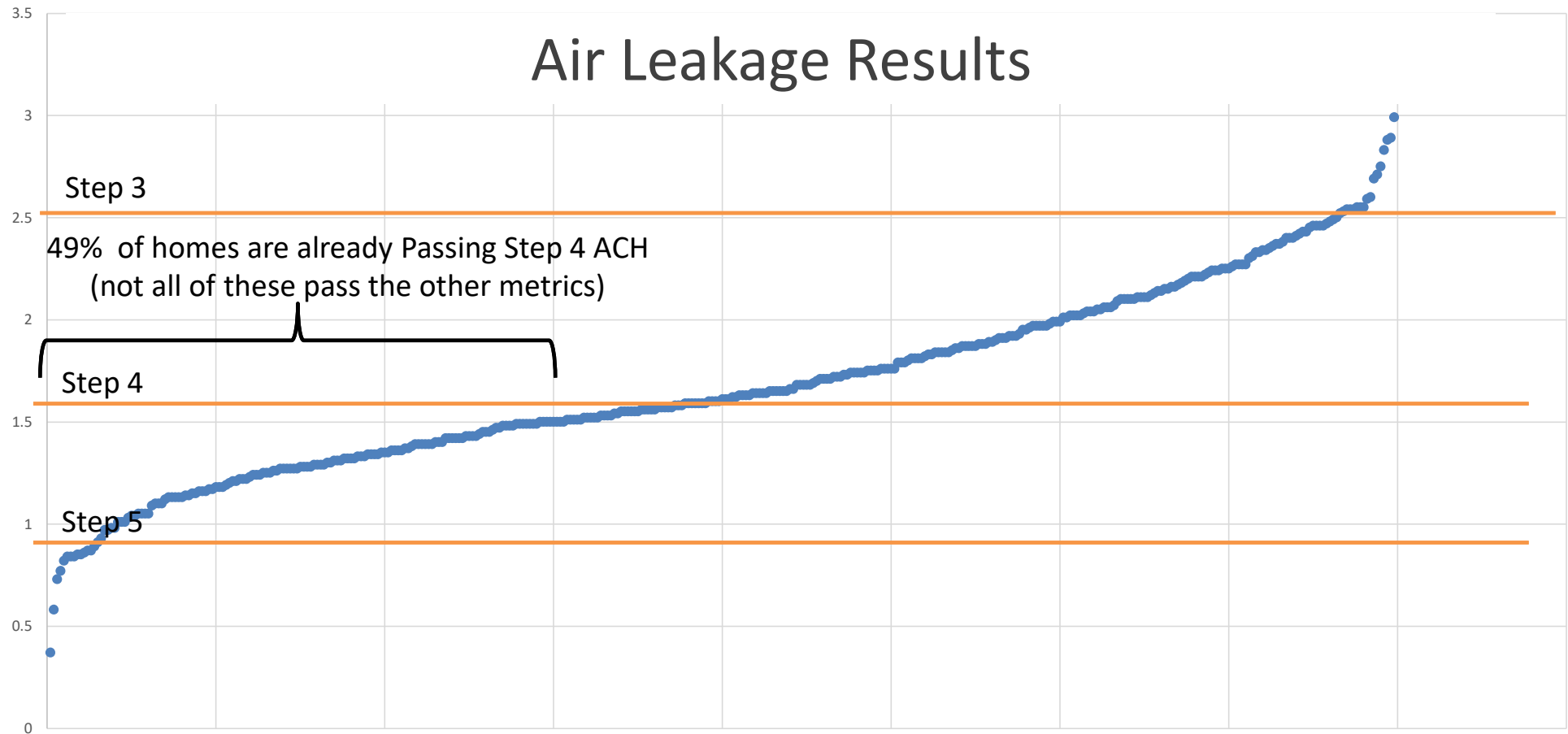
No upgrades necessary: Standard windows meeting Step 4 and 5



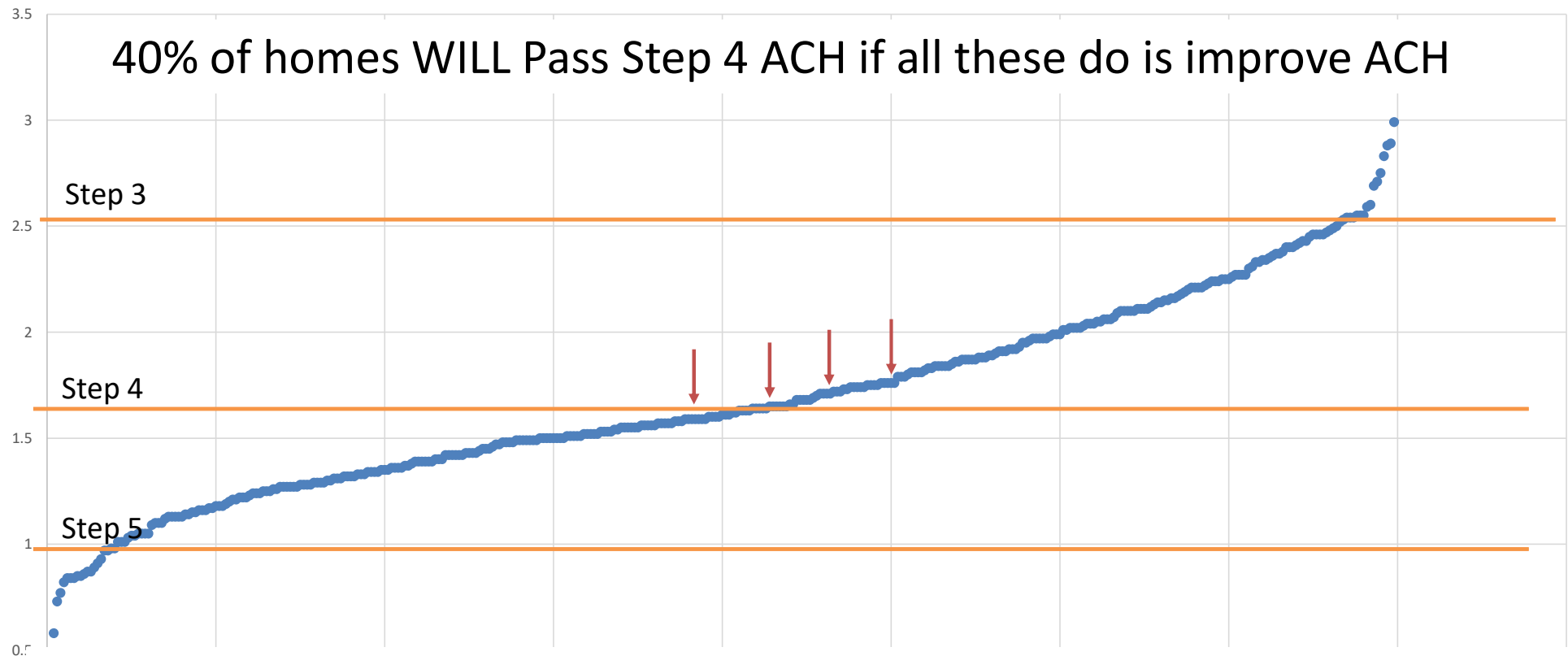
More corners = more difficult to meet step code



Air Leakage Results



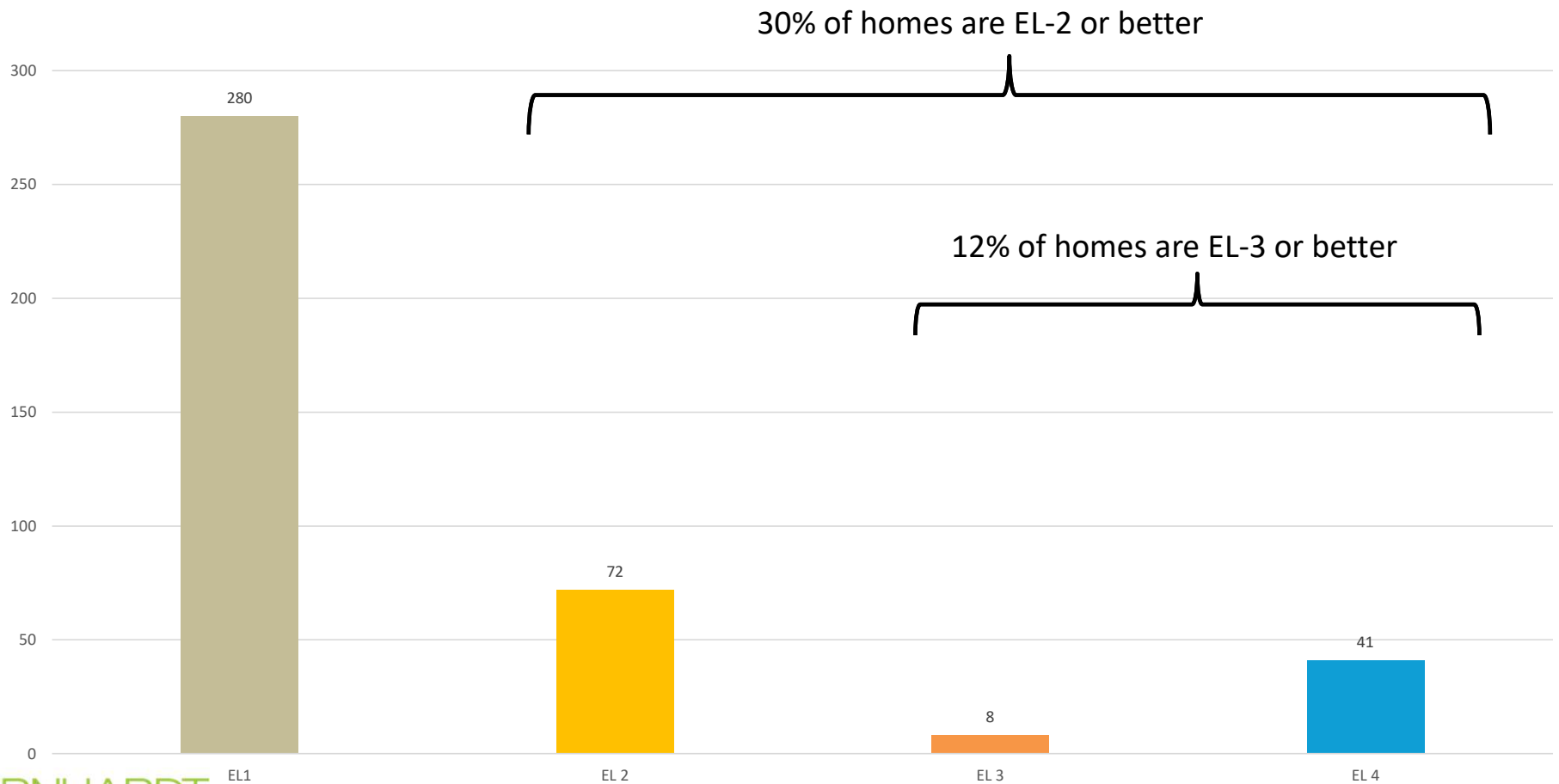
Filtering for Step 3 and above (since June 1, 2021, 401 Homes)



In this data set 21% pass step 4+

19% More homes would pass Step 4 if all they changed was ACH = 40% of All homes

Zero Carbon Step Code Where We Stand Today



Some New Terms



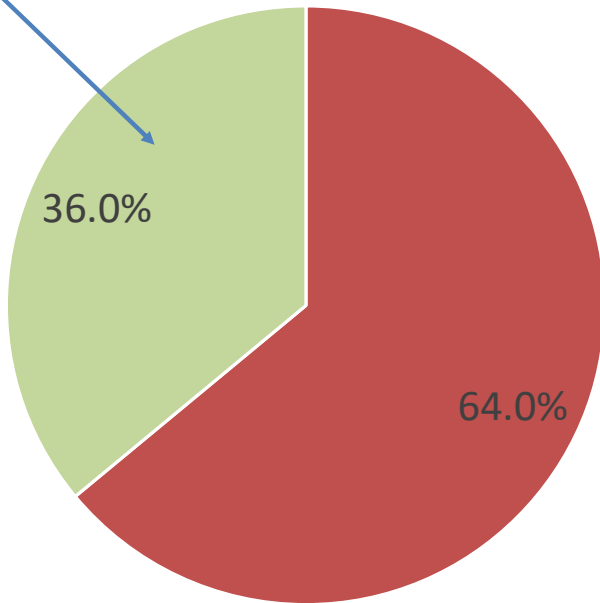
“EL-4 ready”

- Totally unofficial made-up term
- Used to describe a single component of a home
 - E.g: Gas furnace is not EL-4 Ready, Heat pump is
 - Doesn't mean the home is EL-4 with just this component

Systems / Fuel Types

A bit more than
1/3 EL-4 Ready

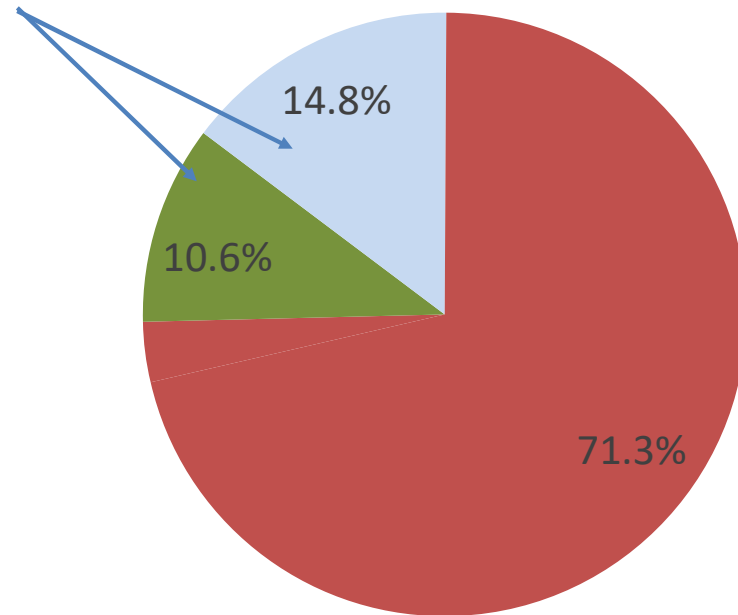
Hot Water



■ Gas ■ Electric

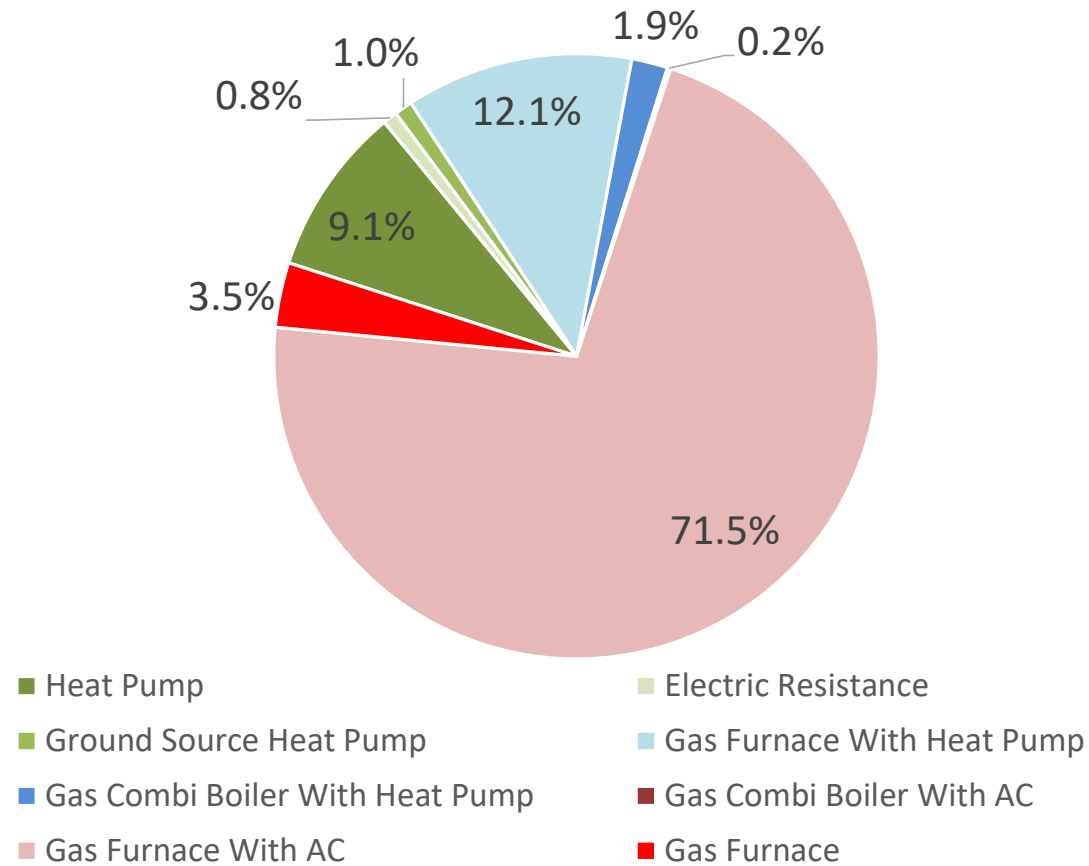
About 1/4 EL-4 Ready

Heating



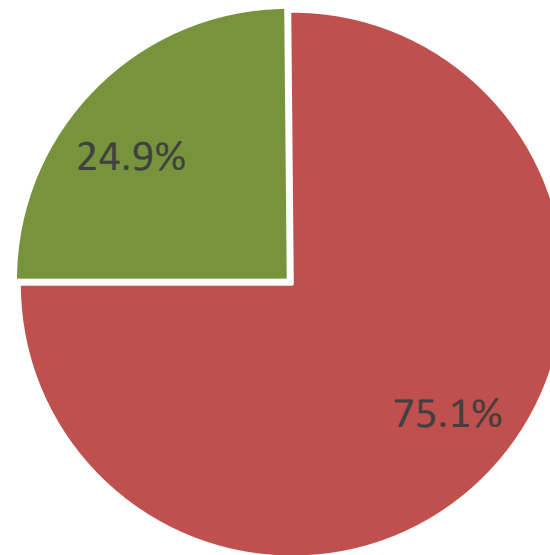
■ Gas Only ■ Fully Electric ■ Dual Energy ■ Gas Furnace with AC

Details of Kelowna Heating



Kelowna Heating and EL 4

1/4 EL-4 Ready



■ EL-4 Ready ■ Not EL-4 Ready

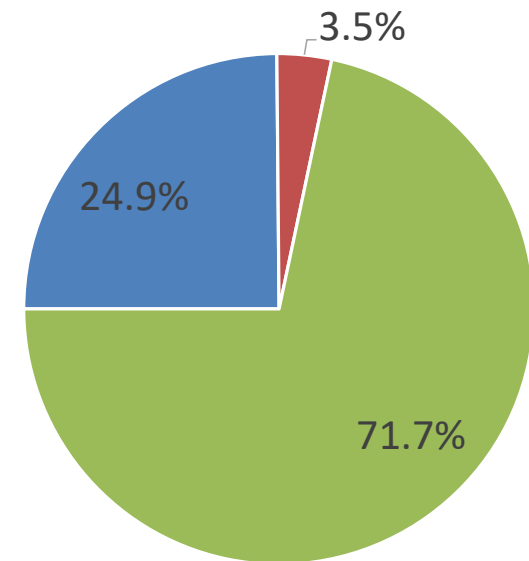
Low Hanging Fruit

71 % of Homes are “EL-4 Close”

- In some cases, these homes are EL-4 ready but are modeled as cooling only. Equipment model numbers indicate a fully functional heat pump.
- Changing from AC to Heat Pump
 - Already have the trade
 - Already paying at least most of the money
 - Already have the power
 - Already have the outside unit space and connections

With this Change 97% of homes are EL-4 Ready for heating

Fun Fact: that is higher than Victoria



■ EL-4 Ready ■ Not EL-4 Ready ■ EL-4 Close

Heat Pumps in Cold Climates

Any trade or contractor who thinks heat pumps do not work in cold climates has not kept up with training and tech.

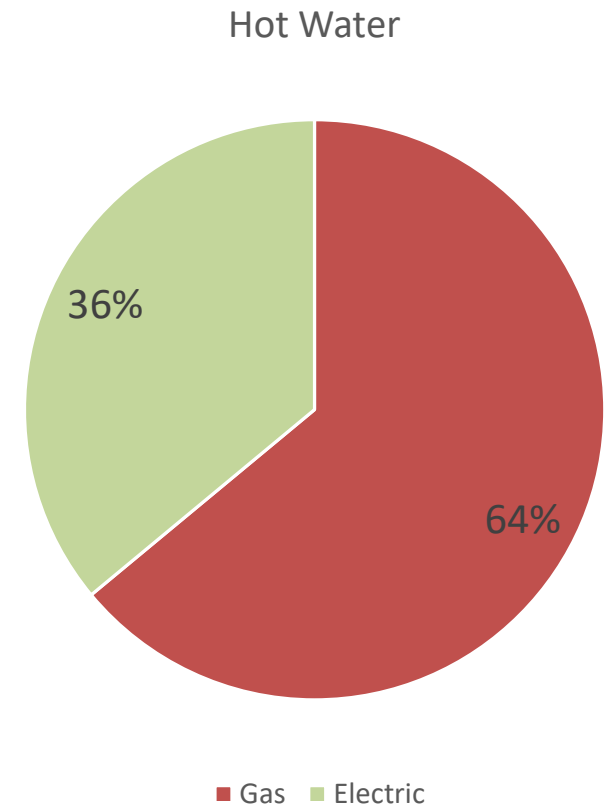
- High off the ground to prevent ice build up
- Covered to protect from deep snow



Hot Water Systems

36% of Homes are EL-4 Ready For Hot water

- The rest of the homes may still be able to Meet EL-3 depending on their heating system and overall efficiency
- Changing to an Electric Hot water system is often very cost effective and would be the only change required to be EL-4 Ready
- Cheap contractor grade hot water tanks are well past the requirements for EL-4; Fancy high-end equipment is not needed



Case studies

Purpose: To look at future requirements of different housing types in Kelowna and offer cost effective options for reaching step 4 and 5 and EL-3 and EL-4

All Located in Kelowna

In real life all reached higher levels than the “base case” step code level shown. Most are Zero Carbon EL-4 and step 4-5 as built

No design changes were considered

- Design changes would make all homes reach higher steps with fewer upgrades



Case studies: Simple SFD

Step Reached	3
SCSC	El-2
Size	188.6
Wall Assembly	2x6@ 16" OC R22
Floor/ Basement	Foundation Wall R20, No slab insulation
Roof	Truss @24" OC R 40
Windows	U1.5 SHGC 0.3
Air Barrier	Poly and Caulk
ACH	2.5
Heating	Gas Furnace / AC
Hot Water	Gas Boiler
Surface area	377.3
Volume	466
S/V Ratio	0.81





Case studies: Simple SFD



Energy Step	EL – 1	EL - 2	EL- 3	EL - 4
Step 3	This Homes Base Case Full Gas System is ok	Electric Hot water (Cannot Use full Gas System)	Electric Hot water Low End Air source heat pump replaces AC (Dual Energy)	Electric Hot Water Low End Air source heat pump replaces AC (Dual Energy)
Step 4	ACH to 1.5 Full Gas System is ok	ACH to 1.3 Full gas System is ok	ACH to 1.5 Low End Air source heat pump replaces AC (Dual Energy)	ACH to 1.5 Electric Hot Water Low End Air source heat pump replaces AC (Dual Energy)

Case studies: Large SFD

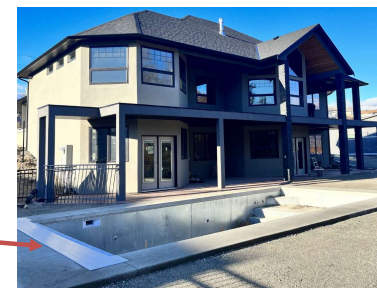
Step Reached	3
SCSC	EI-1
Size	366.9
Wall Assembly	2x6 @ 16" OC R24
Floor/ Basement	R12.5 full slab, ICF walls 14" TJIs @ 24" OC R28 Truss @ 24" OC R50
Roof	
Windows	U 1.4 SHGC 0.25
Air Barrier	Poly and Caulk
ACH	2.5
Heating	Gas Furnace / AC Gas combo boiler
Hot Water	Gas combo boiler
Surface area	781.6
Volume	1083.3
S/V Ratio	0.72





Case studies: Large SFD

Side Note: Pool is not counted at all
Neither is the shop or heated driveway



Energy Step	EL – 1	EL - 2	EL- 3	EL - 4
Step 3	This Homes Base Case No Change Full Gas System is ok	Electric Hot Water Gas boiler can remain for in floor heating	Electric Hot Water Dual Energy or All Electric Heating Gas boiler can remain for in floor heating	Electric Hot Water Dual Energy or All Electric Heating Gas boiler can remain for in floor heating
Step 4	ACH to 1.3 Low End Heat Pump (Dual Energy) Gas boiler can remain for in floor heating	ACH to 1.3 Electric Hot Water Low End Heat Pump (Dual Energy) Gas boiler can remain for in floor heating	ACH to 1.3 Electric Hot Water Low End Heat Pump (Dual Energy) Gas boiler can remain for in floor heating	ACH to 1.3 Electric Hot Water Low End Heat Pump (Dual Energy) Gas boiler can remain for in floor heating

Case studies: 4 Plex / Town Home

Step Reached	3
SCSC	EL-3
Size	494
Wall Assembly	2x6 @ 16" OC R22
Floor/ Basement	R12.5 full slab
Roof	Truss @ 24" OC, R50
Windows	U 1.5 SHGC 0.3
Air Barrier	Poly and Caulk
ACH	2.5
Heating	NG Furnace
Hot Water	Electric HWT
Surface area	941.6
Volume	1346
S/V Ratio	0.700



*** Small Units with high surface area often have problems with the MEUI, TEDI Passes easily, all upgrades are for MEUI



Case studies: 4 Plex / Town Home



Energy Step	EL – 1	EL - 2	EL- 3	EL - 4
Step 3	No Change Full Gas System is ok	No changes Requires Electric Hot Water	This Homes Base Case No change	Low End Heat Pump (Dual Energy)
Step 4	ACH to 1.5 Low End Heat Pump (Dual Energy)	ACH to 1.5 Low End Heat Pump (Dual Energy)	ACH to 1.5 Low End Heat Pump (Dual Energy)	ACH to 1.5 Low End Heat Pump (Dual Energy)

Energy Step Code: Higher Steps Readiness

Homes are reaching Step 3 today, with 20% reaching Step 4 or higher Since June 2021

To reach step 4, most cost-effective changes include:

- Airtightness improvements
 - 40% of homes are already step 4 or could get there with just ACH improvements.
 - ACH improvements to step 4 offer cost-effective path to higher steps. In our case studies, ACH improvements lead to Step 4 TEDI/MEUI targets with no upgrades, or minor upgrades (e.g. dual-fuel system).
 - Reaching step 4 will likely require mid-construction blower door testing as standard practice rather than just best practice
- Simplified Designs
 - Reducing the complexity of a design is bar far the cheapest and easiest way to reach higher steps



With these changes homes in Kelowna can / will reach Step 4 with low or no costs.



Zero Carbon Step Code: Higher Steps Readiness

Homes are mostly reaching EL - 1 today

To Reach Higher steps of ZCSC, two changes are required:



- Using Heat pumps as primary heating system (all-electric or dual-fuel)
 - Most Homes have cooling already so this is a no/ low-cost change for builders
 - Training for HVAC contractors may be required to improve industry knowledge.
- Switch fuel types for Hot Water system
 - 36% of homes already use an electric water system. Electric is less expensive

With these two changes to homes in Kelowna can / will reach EL 4 with low or no costs.