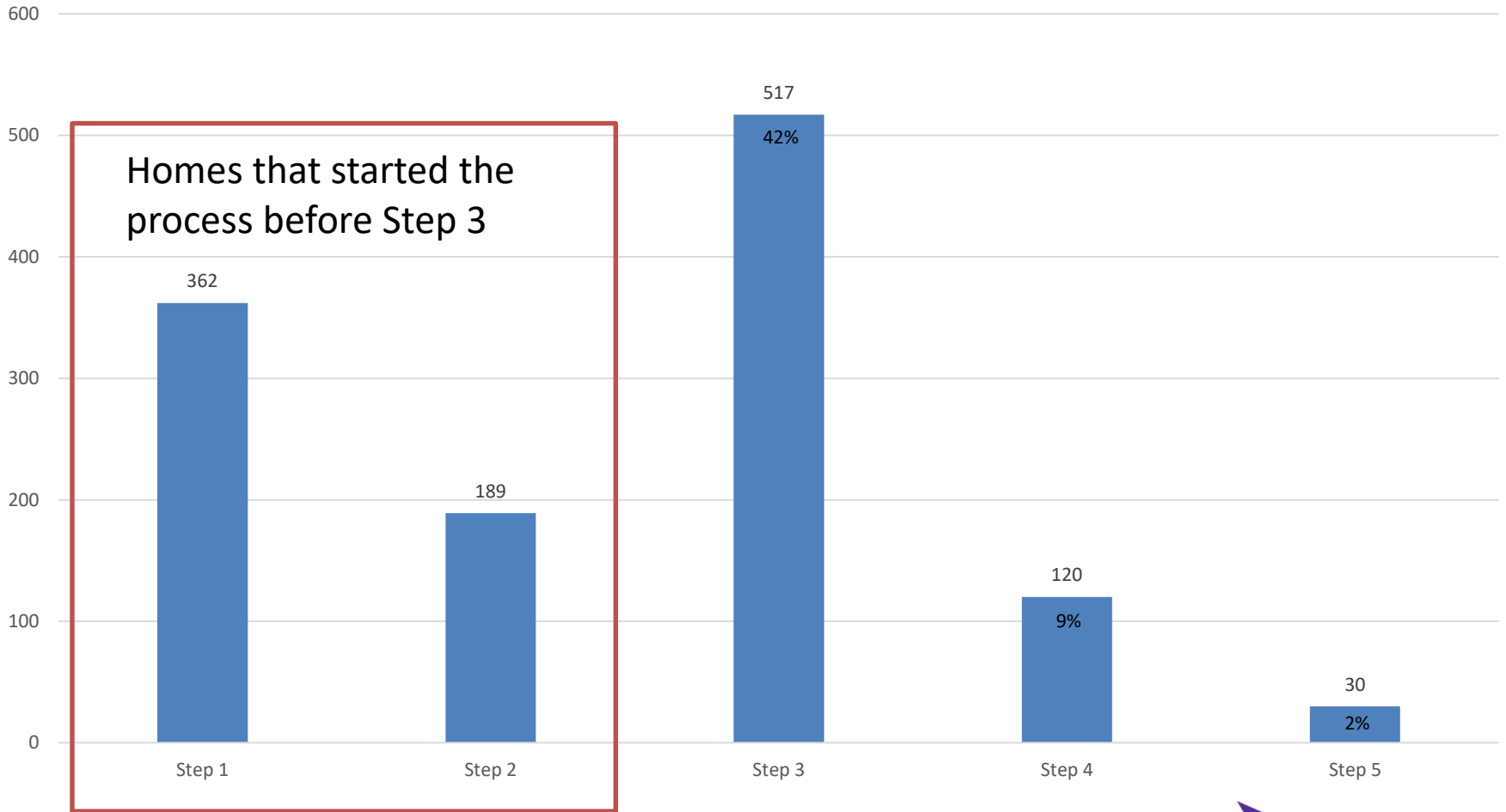


HIGH PERFORMANCE LOW CARBON

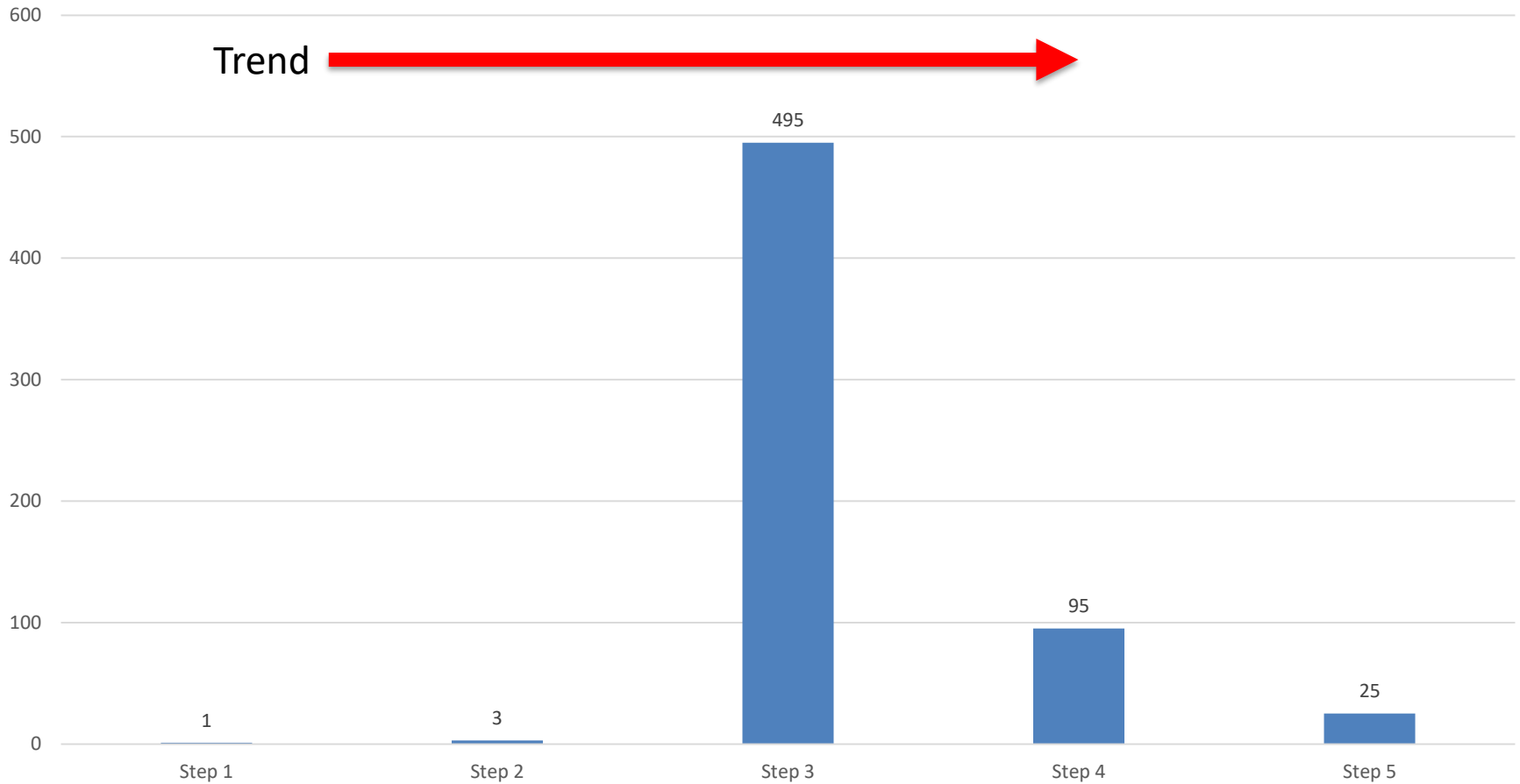
Spring 2022



Steps Reached Last 18 months



Steps Reached Last 6 months

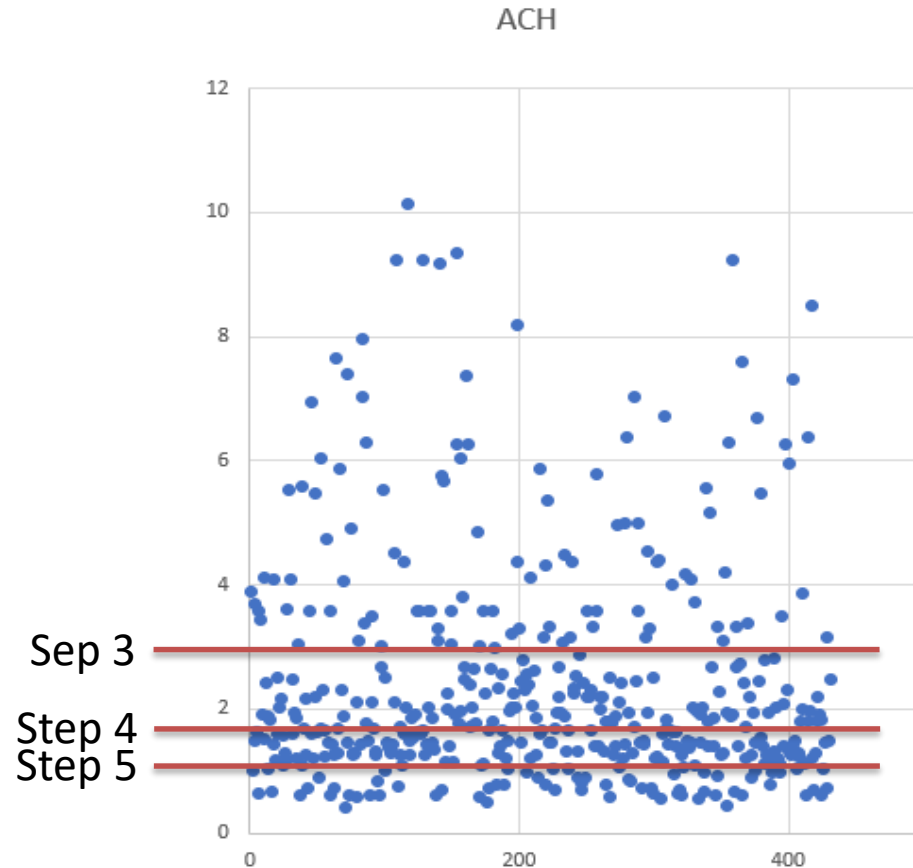


ACH

New Average As Built
2.4 ACH (Was 3.5 in 2018)

90% of tests are passing
the intended target

Most Common AB
Exterior Sealed Membrane

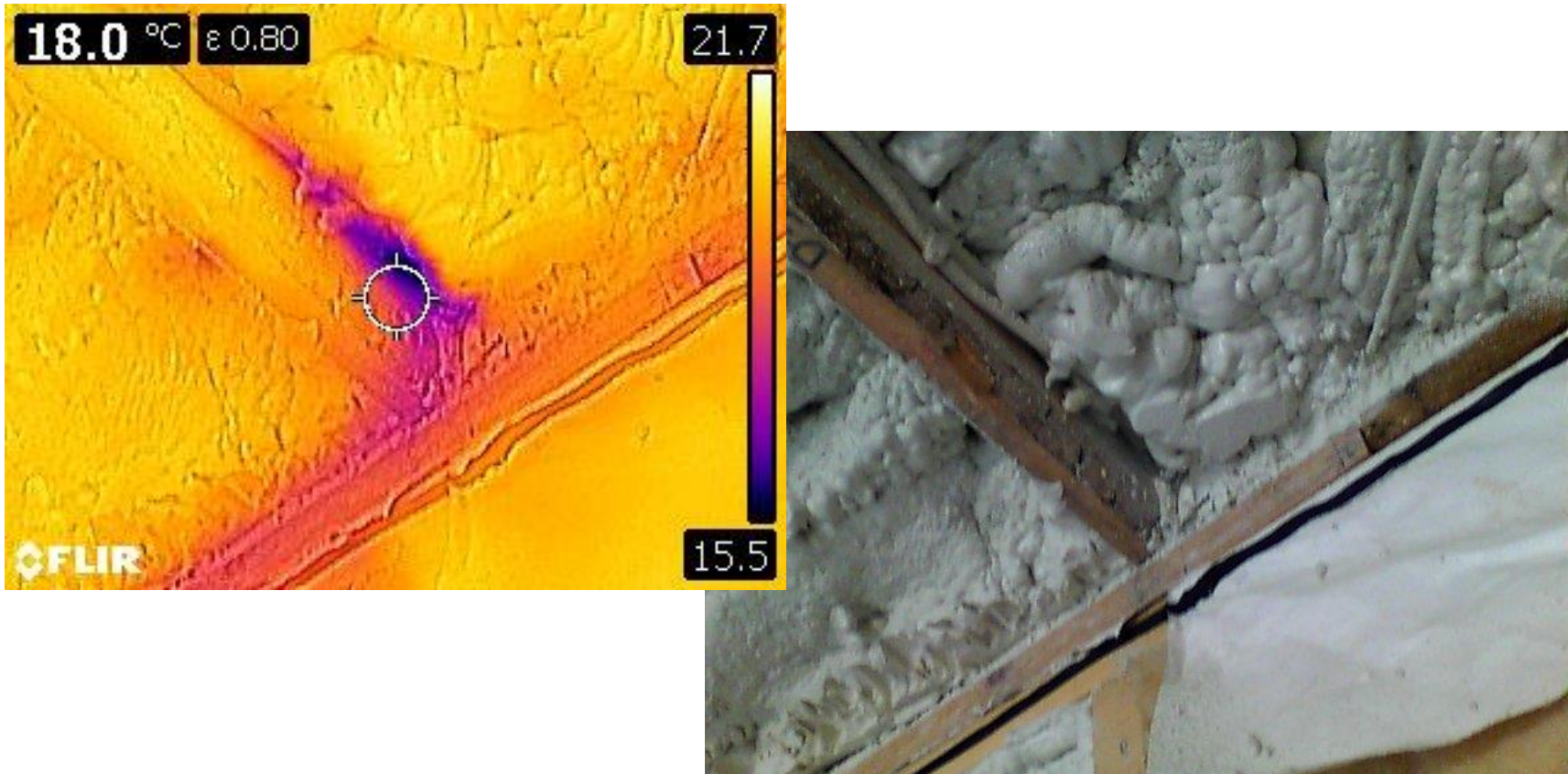


Of those that fail

“Prep is done, totally ready to test”

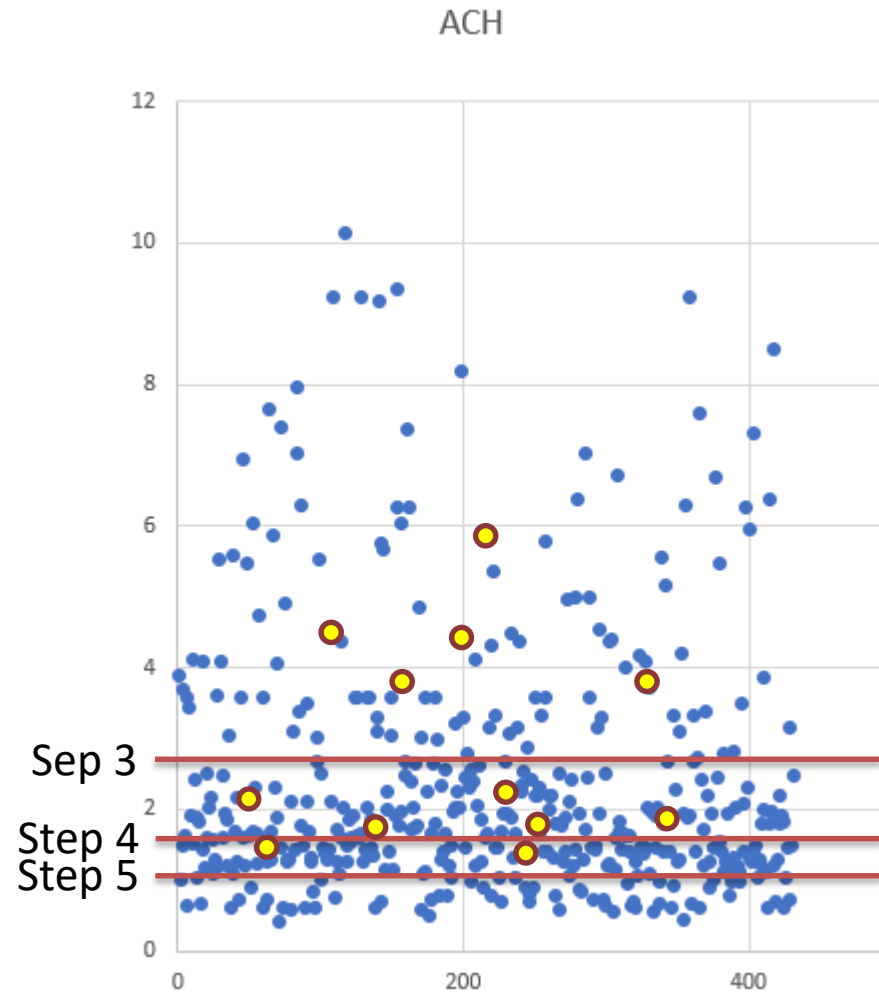


Spray Foam is NOT an air barrier



ACH

Homes that Use Spray foam



TEDI Targets

- Average TEDI 34 – Step 3 in most locations
- Most Common Wall System For Step 3
 - 2x6 @ 16 OC R22 Batt
- Most Common Wall System For Step 4
 - 2x6 @ 16 OC R22 Batt



Photo 0.8 ACH with poly at mid con

TEDI Targets

- Most Common Window System For Step 3
 - U 1.5 0.3 SHGC
- Most Common Window System For Step 4
 - U 1.5 0.3 SHGC

Photo 0.8 ACH with poly at mid con



Russ - Practical Application

Air Barriers: Continuous is important

- All 3 alternative air barrier systems (shown next) all have same/similar ACH – so just adopt your favorite until it works.
- Recommend moving away from interior poly - just tape up existing WRB as AB. Easier. Better. No brainer.
- Combined WRB/AB layer means your WRB is being tested for water leaks before it's closed up. Carry less future risk on your 2-5-10.

Windows: Placement is important

- What the designer/architect needs to know: How to work with an EA. How to place windows on a plan. How to understand Mark's slides.
- What the builder needs to know: How to read the plans.



Typical Interior Air-Barrier (Poly)

PROS

- We've all done this before
- It's certainly better than nothing at all

CONS

- Acoustical Sealant (industry inside joke)
- So many penetrations to deal with
- Destroyed by minor renovations (and trades)
- Rarely made truly **continuous**

What are other airtight & effective alternatives?



1) Air-Barrier Method - W.R.B as Air-Barrier

- Taped Siga Majvest WRB/AB with Roxul batts over top
- Taped OSB at underside of roof structure
- Taped subfloor over unsealed crawlspace
- Roxul carbon footprint debatable
- 0.37 ACH





2) Air-Barrier Method - S.A.M. Behind Cellulose

- Exterior SAM air-barrier under Dense-pack
- Cellulose between TJI strapping.
- Taped OSB at underside of roof structure
- ICF Foundation with slab
- Cellulose is Carbon Negative
- 0.38 ACH





3) Air-Barrier Method - Self-Adhered W.R.B. as A.B.

- Sopraseal VP exterior air-barrier with Roxul batts over top
- Exterior SAM membrane below roof insulation package
- ICF Foundation with slab
- Roxul carbon footprint debatable
- 0.37 ACH





Air-Barrier & Component Methods – Whole House

- Taped Siga Majvest exterior WRB/AB
- Taped Plywood at underside of roof structure (could be membrane instead)
- Slab on grade above spray foam
- Various insulation products of different carbon footprints
- Result: 0.22 ACH



Other Continuity Details – Wall to Roof



Lessons Learned

- Pre-Blower Door Test - Check all components and penetrations!



MEUI

It is Very Hard to Fail The MEUI Targe

- Only 5 homes in the data base are noted as failing only the MEUI at design
- 1 failed at final but was rescued



Gas Systems are More Expensive

Gas Water Heating Systems (Using 100% Renewable Natural Gas) vs. Electric Water Heating Systems					
	100% Renewable Natural 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	\$516	\$348	\$499	\$488	\$126 - \$191
25-Year Cost Projection Results* (Includes purchase costs, operation and maintenance costs. Does not include rebates)	7 yr. Tank \$18,971 10 yr. Tank \$17,150	\$16,200	7 yr. Tank \$15,689 10 yr. Tank \$14,725	\$13,500	Mid-Efficiency (UEF2.3): \$13,044 High-Efficiency (UEF3.5): \$11,419

Source: CityGreen SOLUTIONS

Russ – Home Heating & Cooling

- How are you heating homes? What's working & what is not?
 - Electric resistance is cheap, easy, and can be distributed around the home
 - Split systems are ideal if you also need cooling, but you likely need more heads than the total heating demand requires
 - Whole-home hydronic in-floor heat will be hard to keep balanced – it won't be on most of the time and cooling likely an issue.
 - Electric resistance mats that don't normally work as heating load will functionally contribute in a high-Step home.
 - Heat Pumps are hard to beat regardless of what system you connect them to.



Coming Soon To a Step Code Near You

Green House Gas Limits

An Energy Efficient Home Is not Necessarily a Low Carbon Home

GREENHOUSE GAS EMISSIONS BY HEATING TYPE



Step 1 = Home built to code
Step 5 = Home built 80% more efficient than code

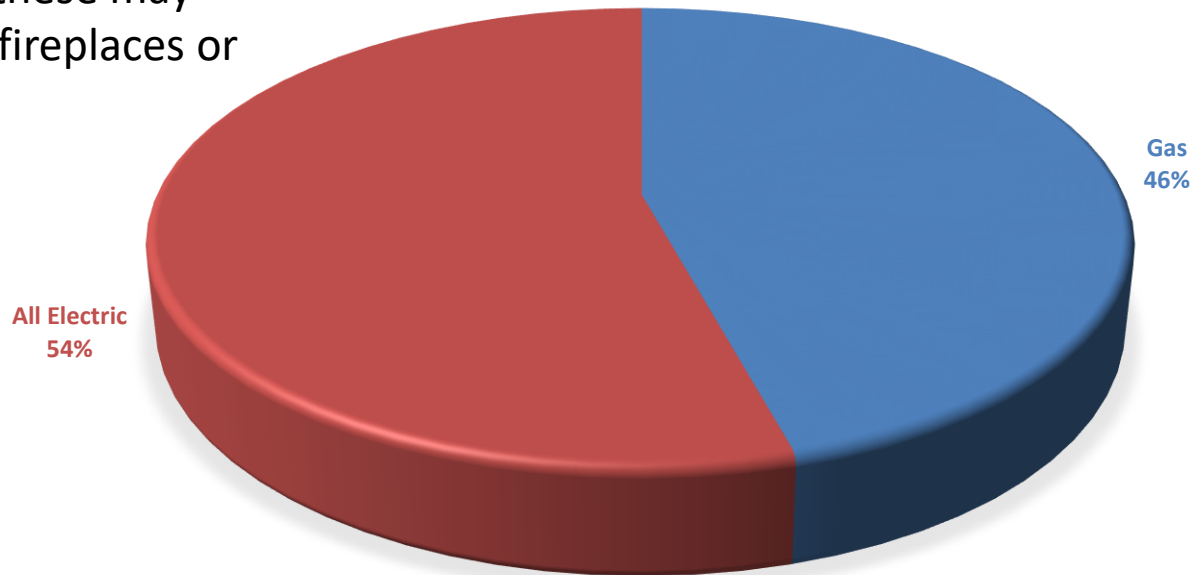
[Metro Vancouver: CLIMATE 2050 Roadmap/ Buildings/ A Pathway to Zero Emissions and Resilient Buildings, October 2021](#)

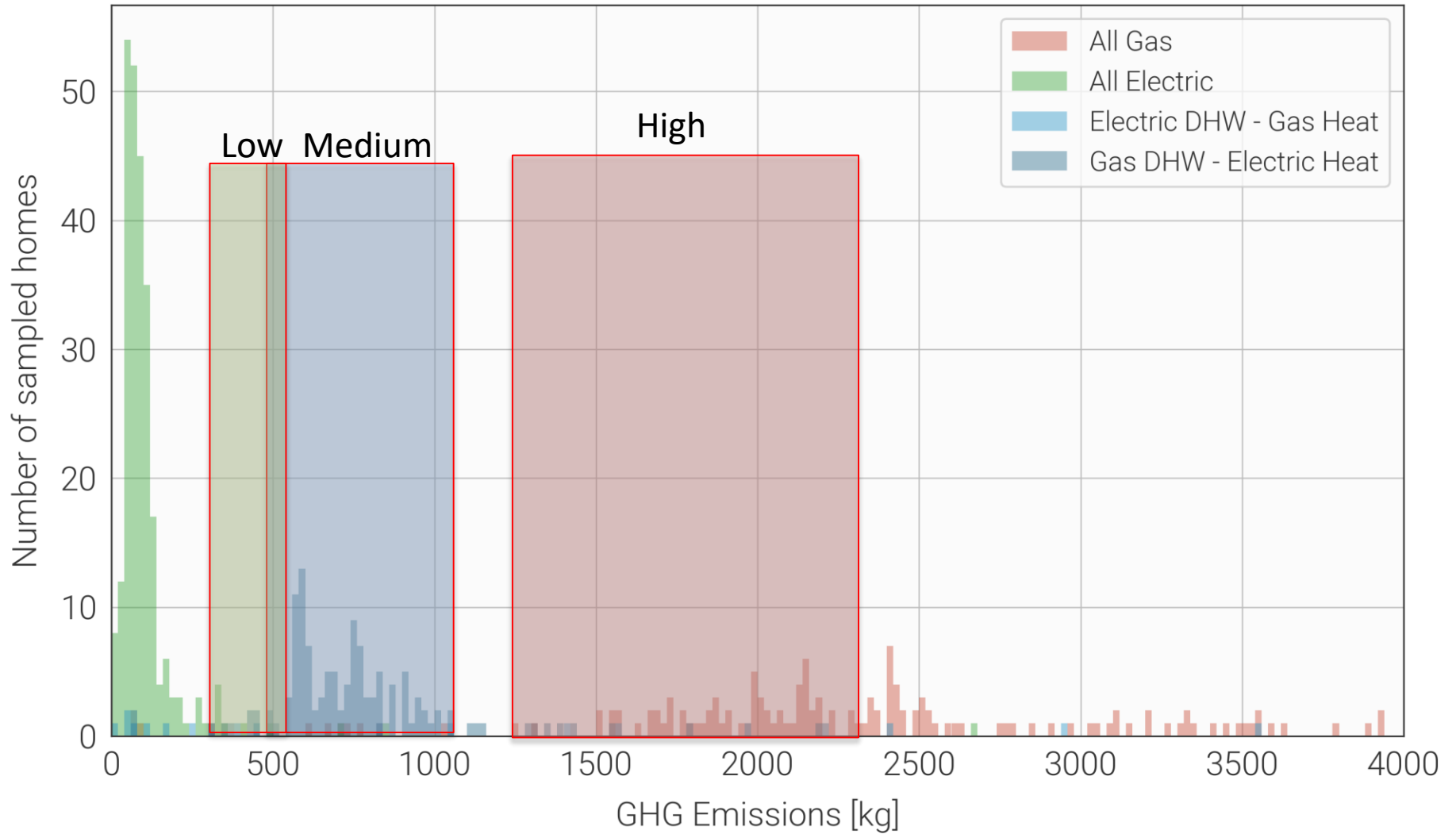
CityGreen

Fuel Type

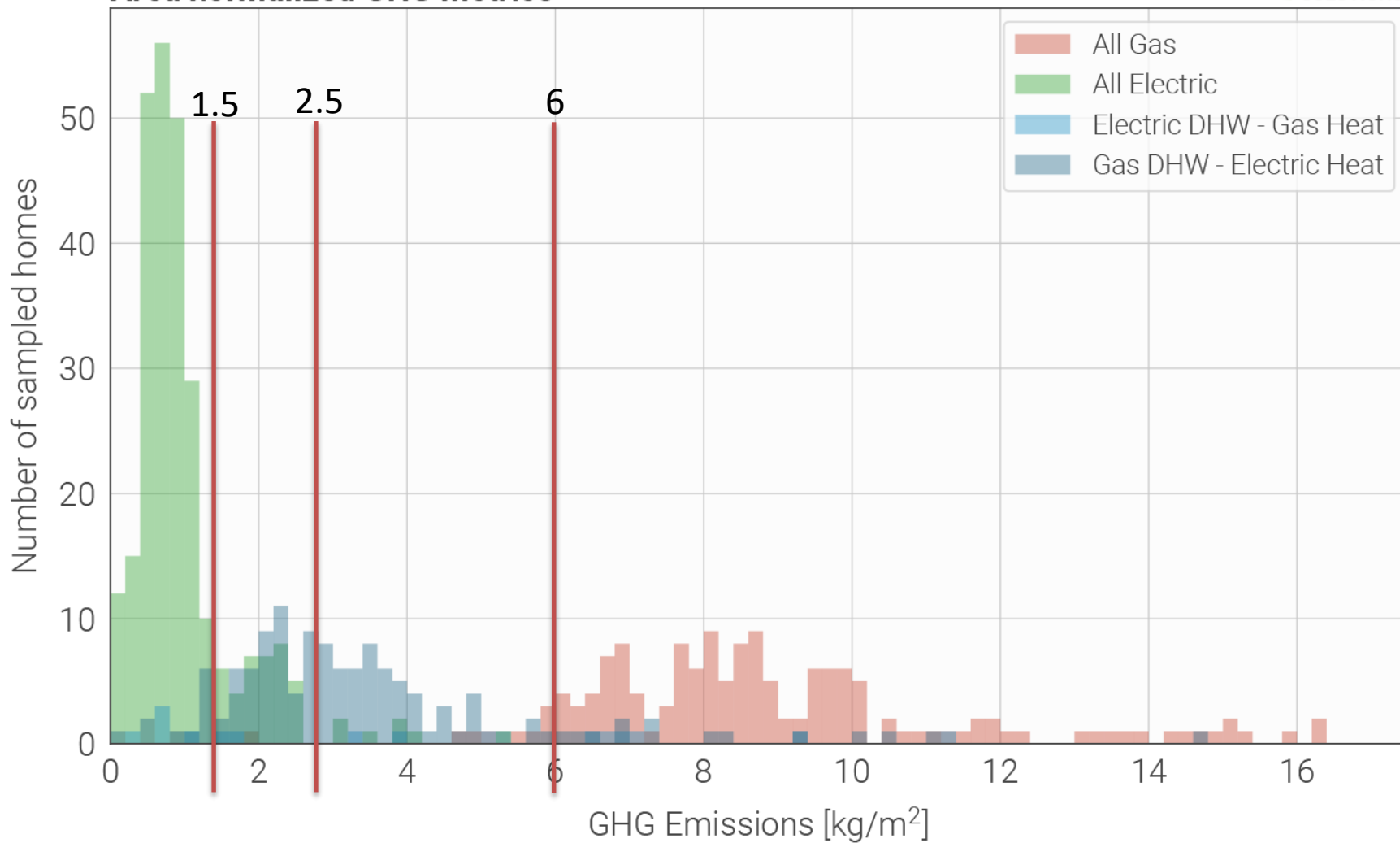
GAS VS ALL ELECTRIC

Some of these may have gas fireplaces or cooking





Area normalized GHG metrics



Russ – Industry Implications? Barriers?

- How do you think this will affect the industry? Do you see any barriers?
 - See no effect at all on custom home industry - we install every/any system anyways.
 - May affect costing calculations for developers but who doesn't already have multiple possible systems optioned out already?
 - I see zero impact on the physical construction side.
 - Open for discussion.

“Do or do not. There is no Try”
- Yoda