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1000 Homes and Counting: 5+ Years of Lessons Learned

CANADIAN HOME BUILDERS' ASSOCIATION

1. By the Numbers
2. Mechanicals System Performance
3. Envelope Performance
4. Energy Performance
5. Performance of Homes by Province
6. Industry Challenges Ahead

Agenda

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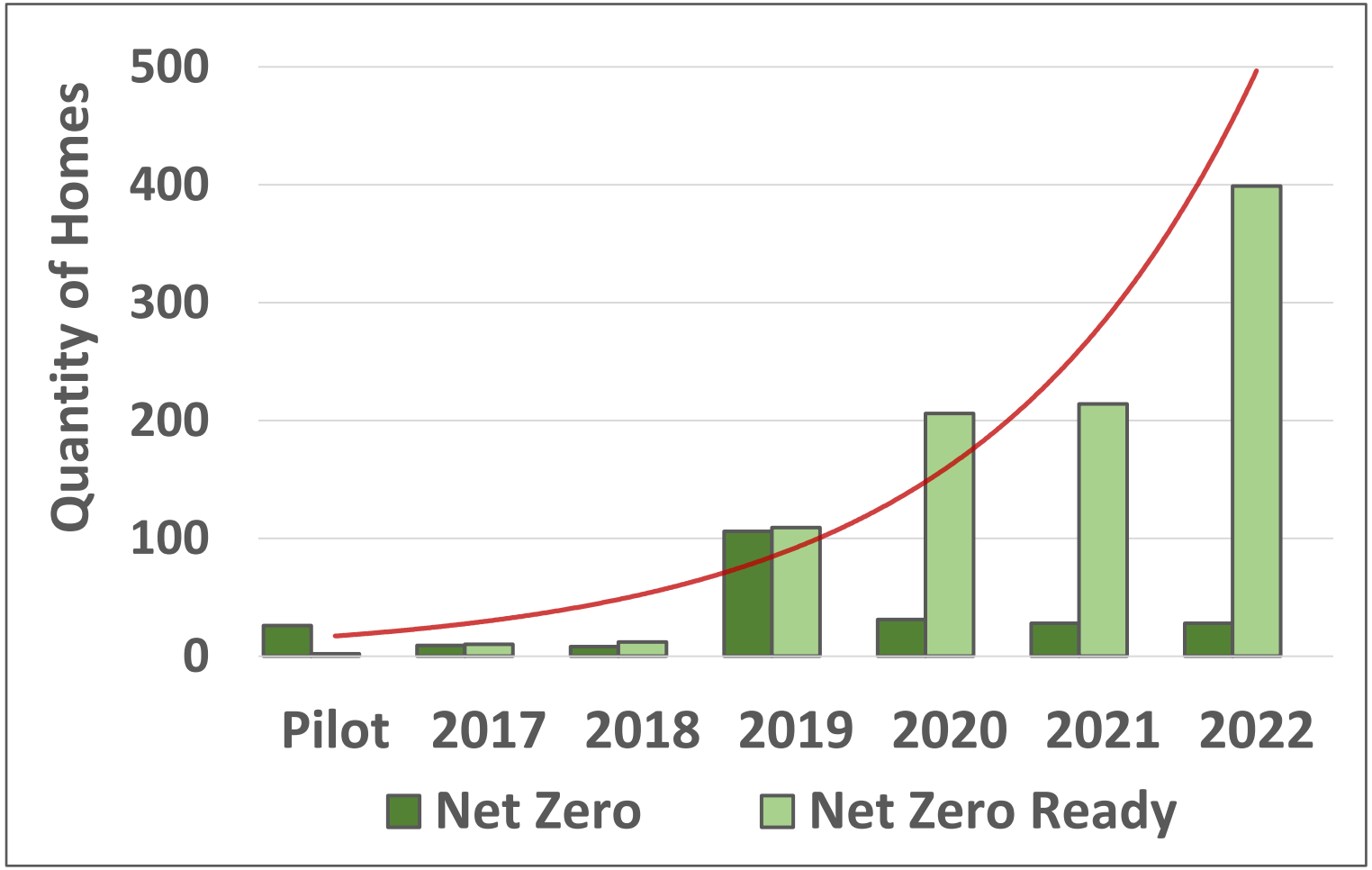
CHBA Net Zero / Net Zero Ready Homes



1,117

64 units

7

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By The Numbers

Qualified Net Zero Participants

BUILDER

91

RENOVATOR

7

EA

48

SO

13

Mechanical Systems

- Space Heating & Cooling
- Domestic Hot Water

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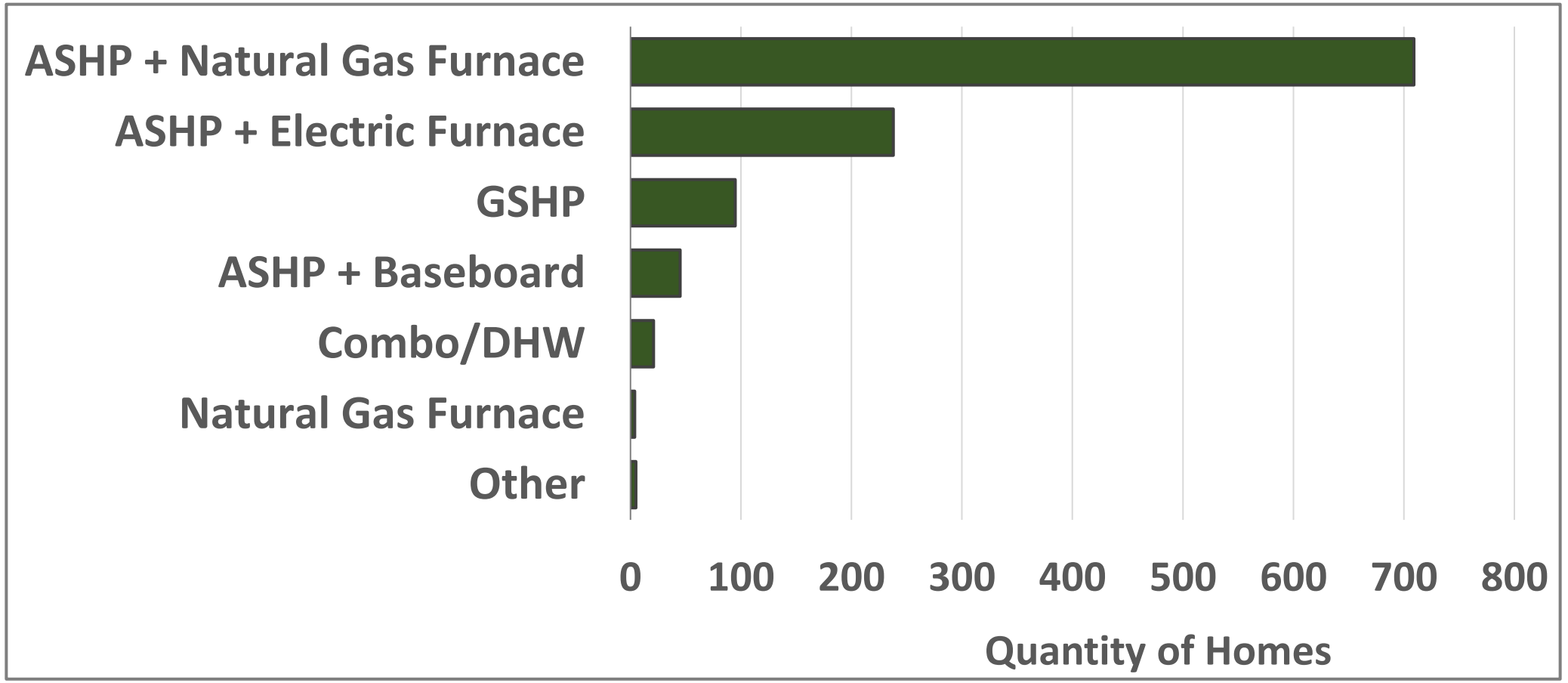
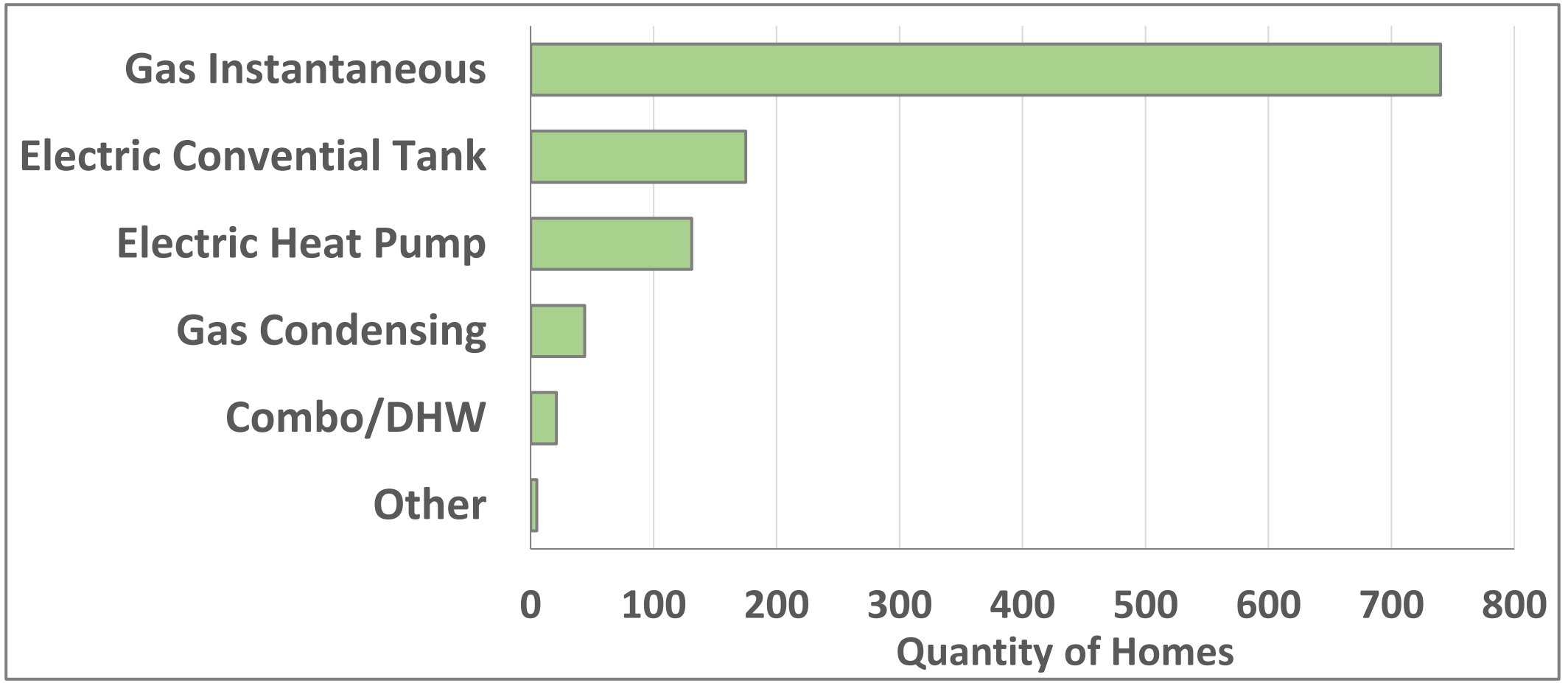
Mechanical Systems

Space Heating Configurations of NZ/NZr Homes



Mechanical Systems

Water Heating Configurations of NZ/NZr Homes



Envelope Performance

- Airtightness
- Envelope Improvement Percentage
- Building Assemblies

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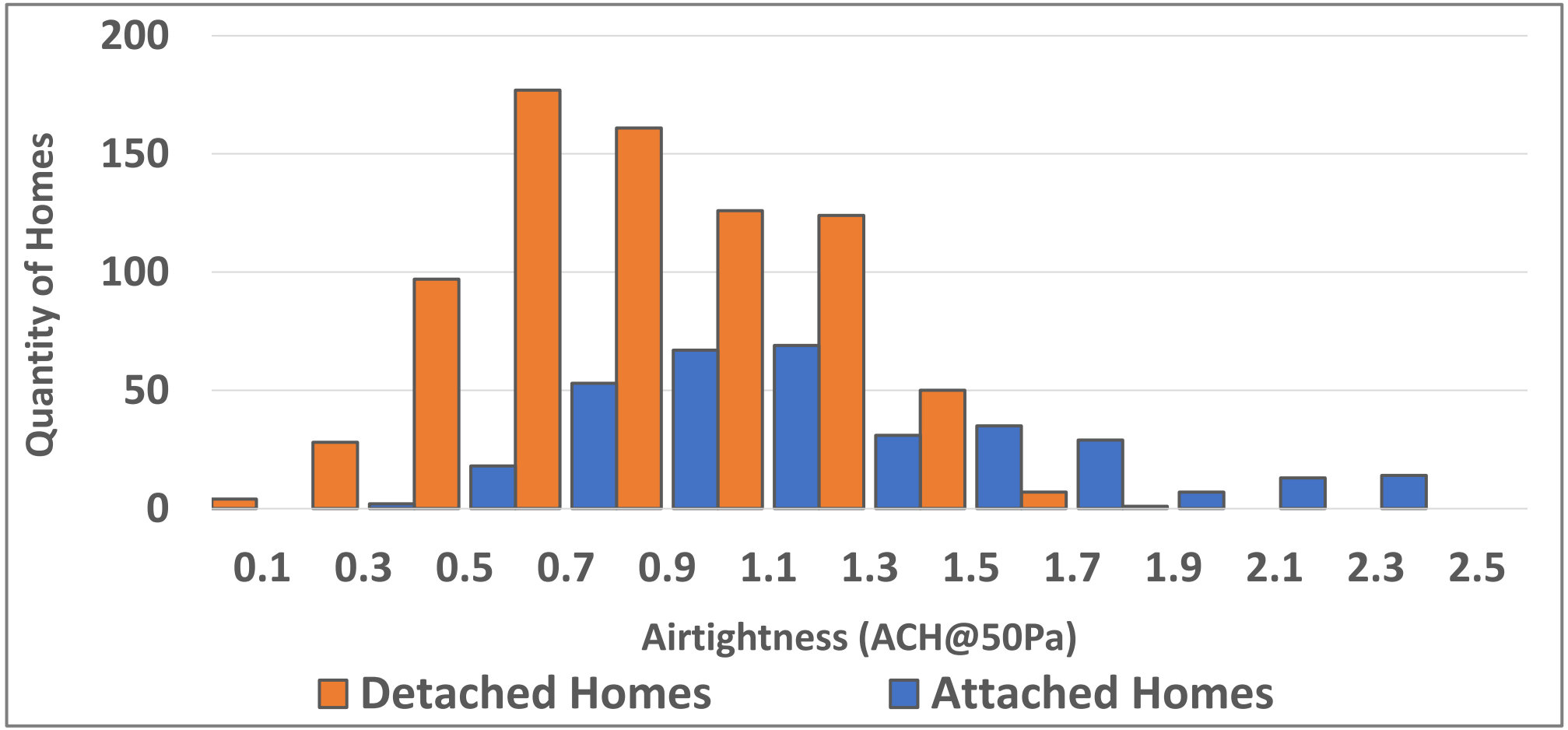
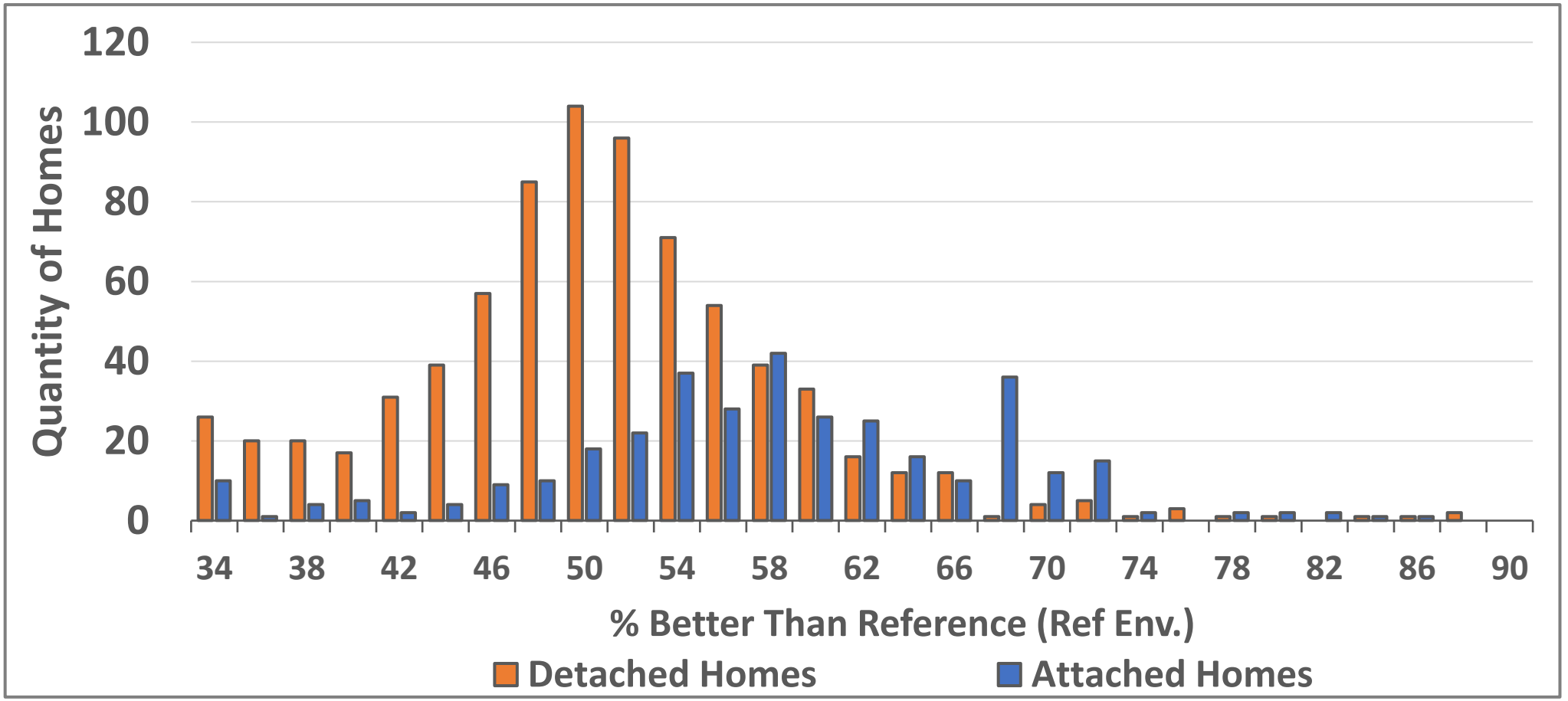
Envelope Performance

Airtightness



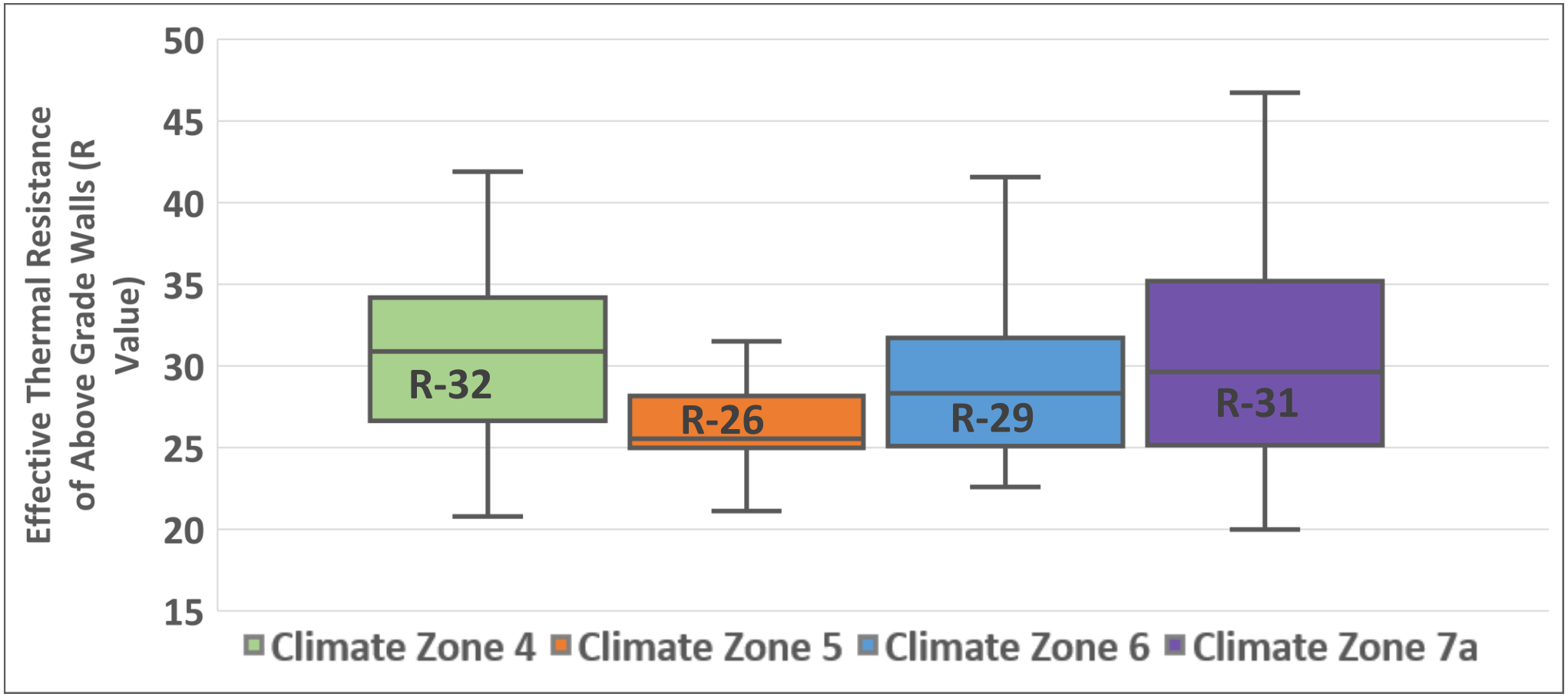
Envelope Performance

Envelope Improvement over Reference House



Envelope Performance

Thermal Resistance of Above Grade Wall Assemblies by Climate Zone



Envelope Performance

R Values in Ceilings

Energy Performance

- Energy & Envelope
- Mechanicals & Renewable Energy
- Operational Carbon Emissions

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Energy Performance

General NZ vs Code Energy Values

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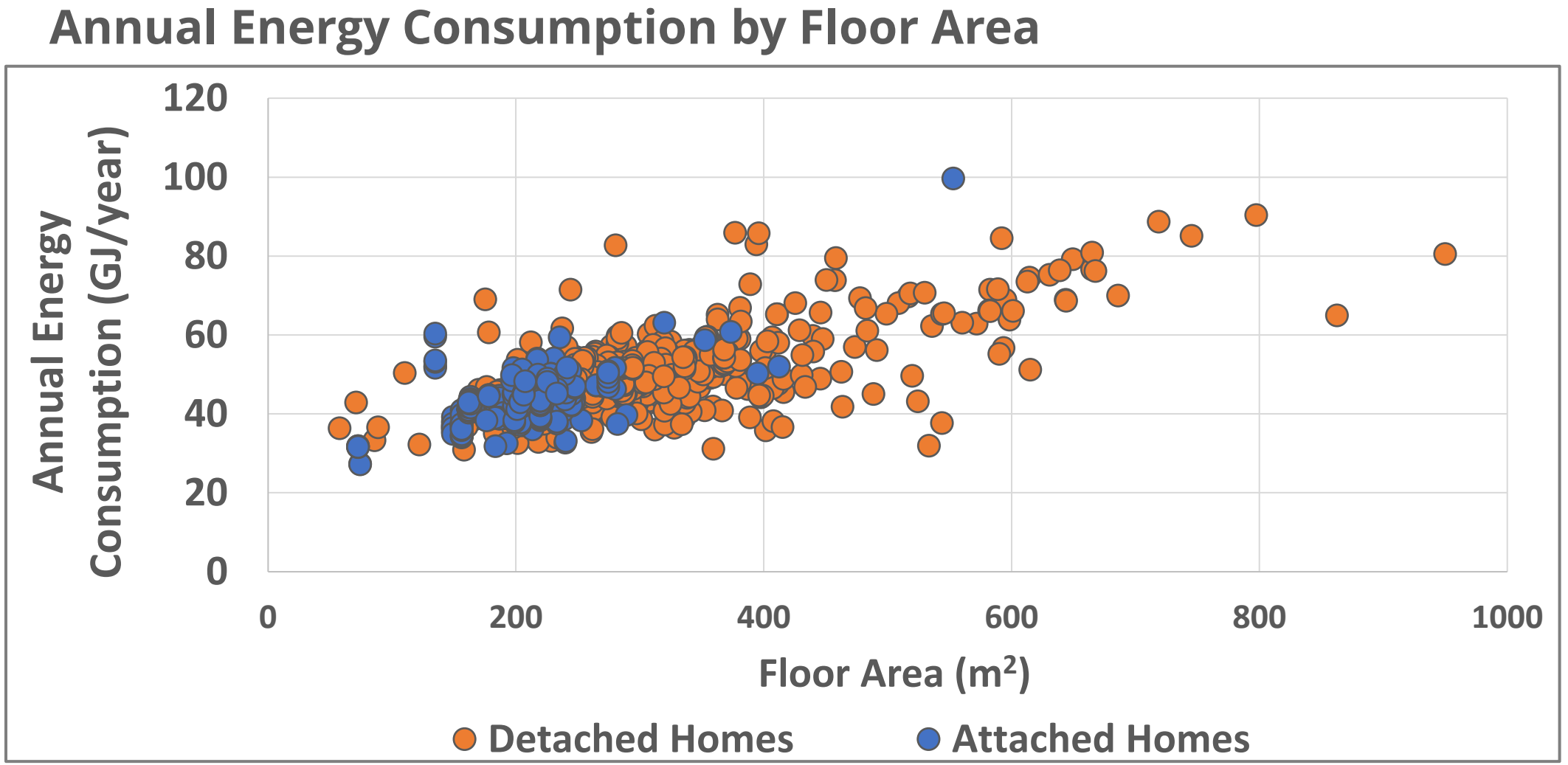
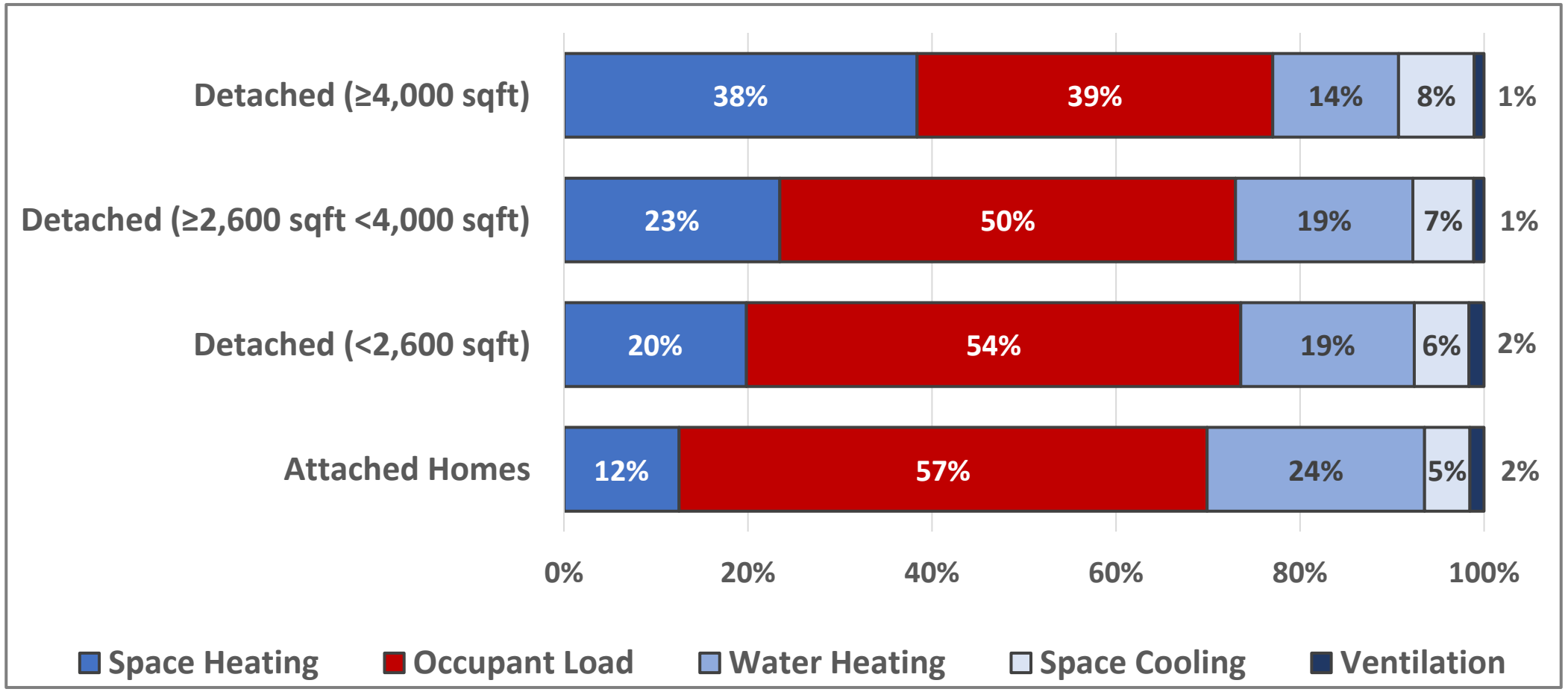
Energy Performance



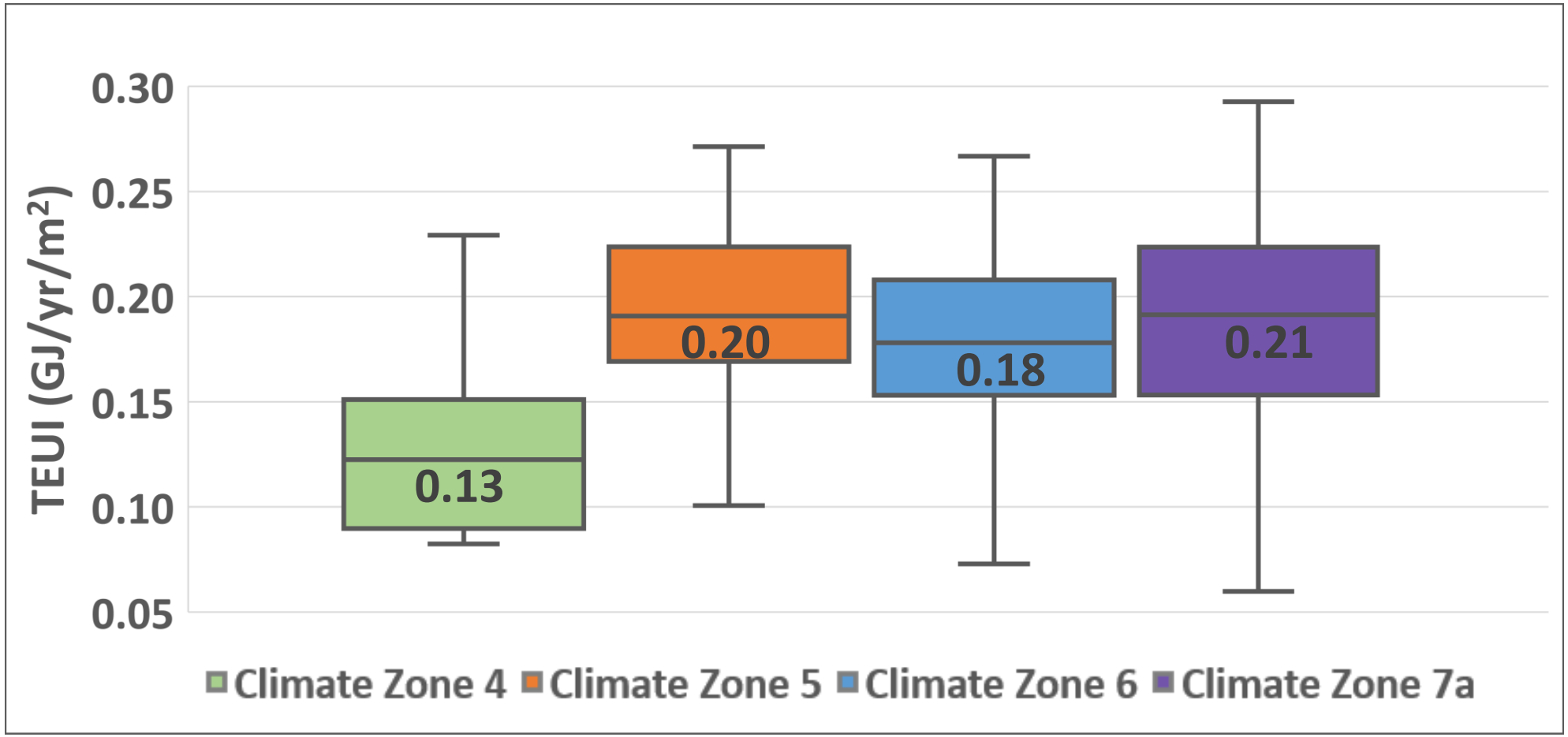
Energy Performance

Average Load Distribution of Annual Energy Consumption by Floor Area



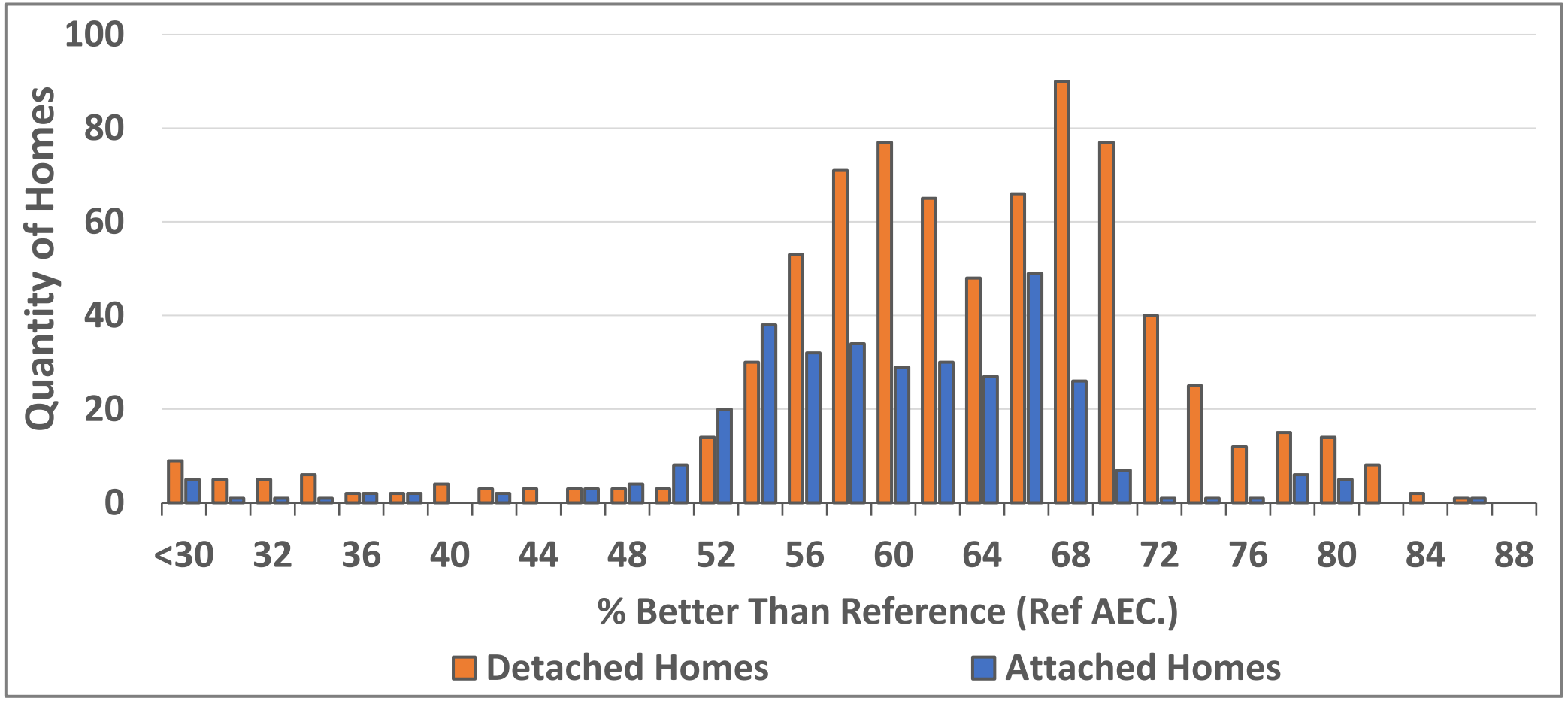
Energy Performance

Total Energy Use Intensity by Climate Zone (TEUI)



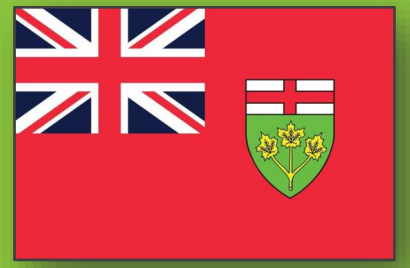
Energy Performance

Energy Consumption Improvement over Reference House



Performance of Homes by Province

- Energy & Envelope
- Mechanicals & Renewable Energy
- Operational Carbon Emissions



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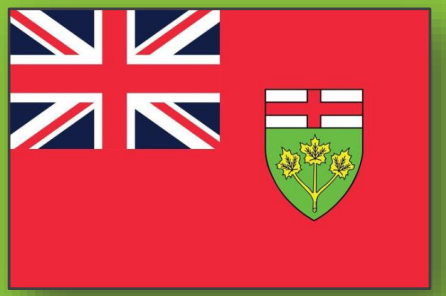
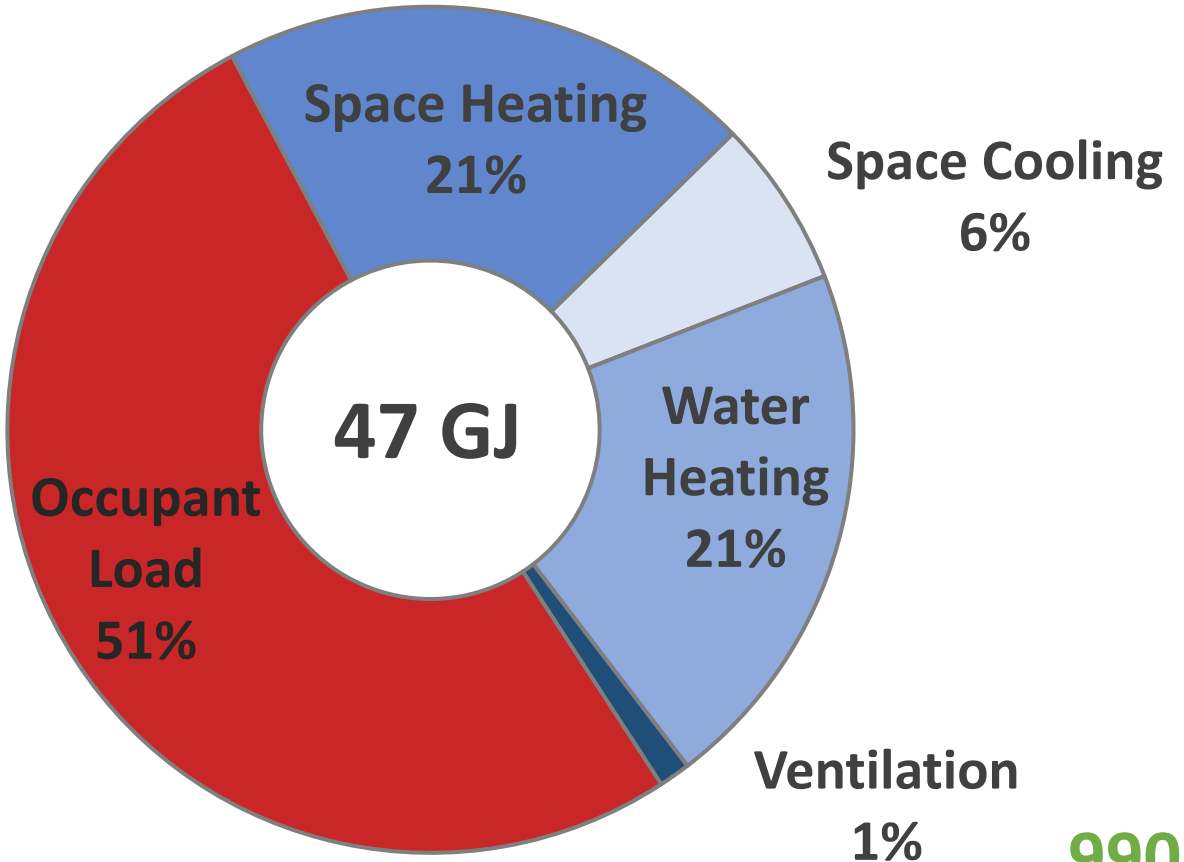
Average NZ/NZr Home in Ontario



Energy



990 Homes

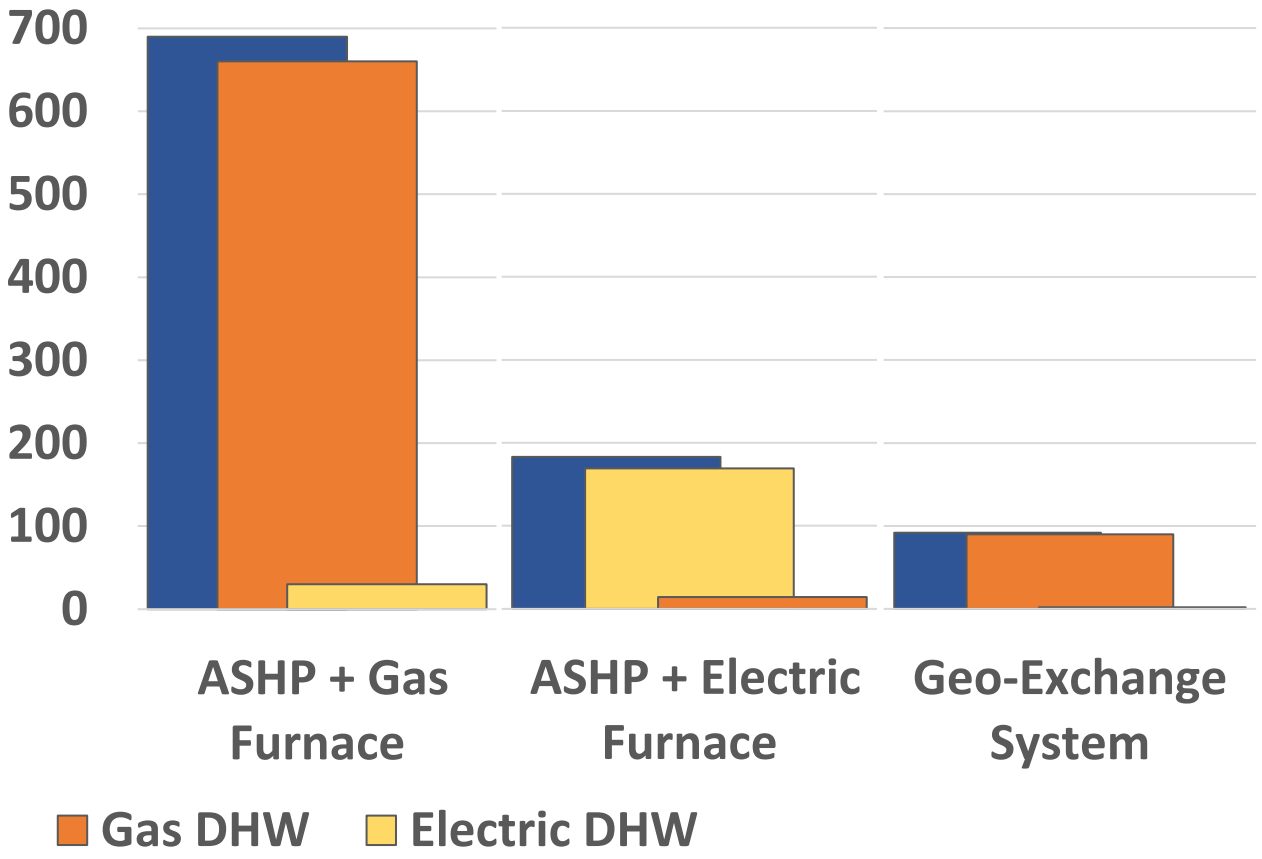
Envelope

Ceiling Insulation	R 58
Wall Insulation	R 27
Foundation Insulation	R 23
Airtightness	1.1 ACH@50
Envelope % Better	53%

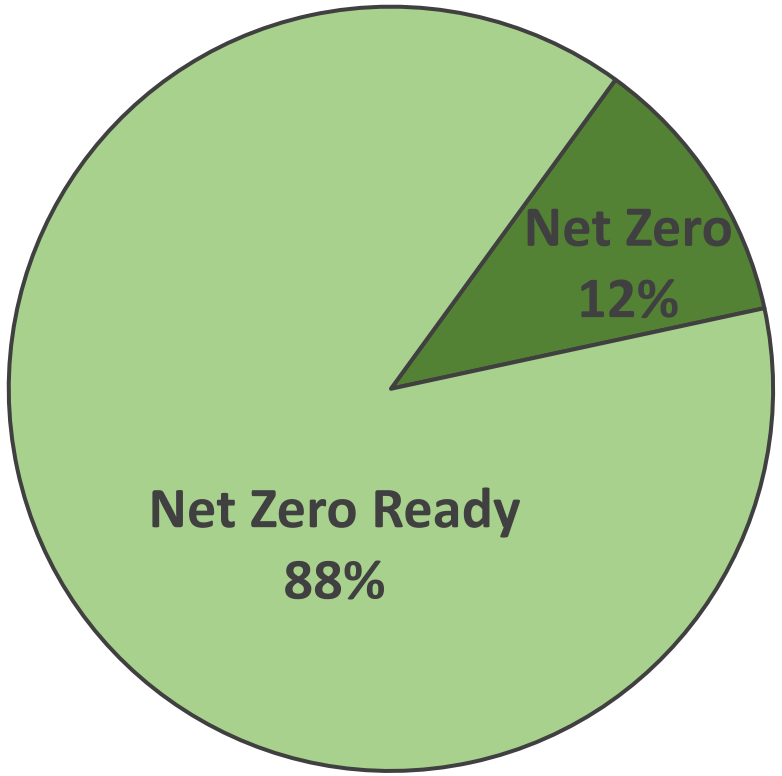
Avg.
2,850 ft^2

Average NZ/NZr Home in Ontario

Mechanical Systems

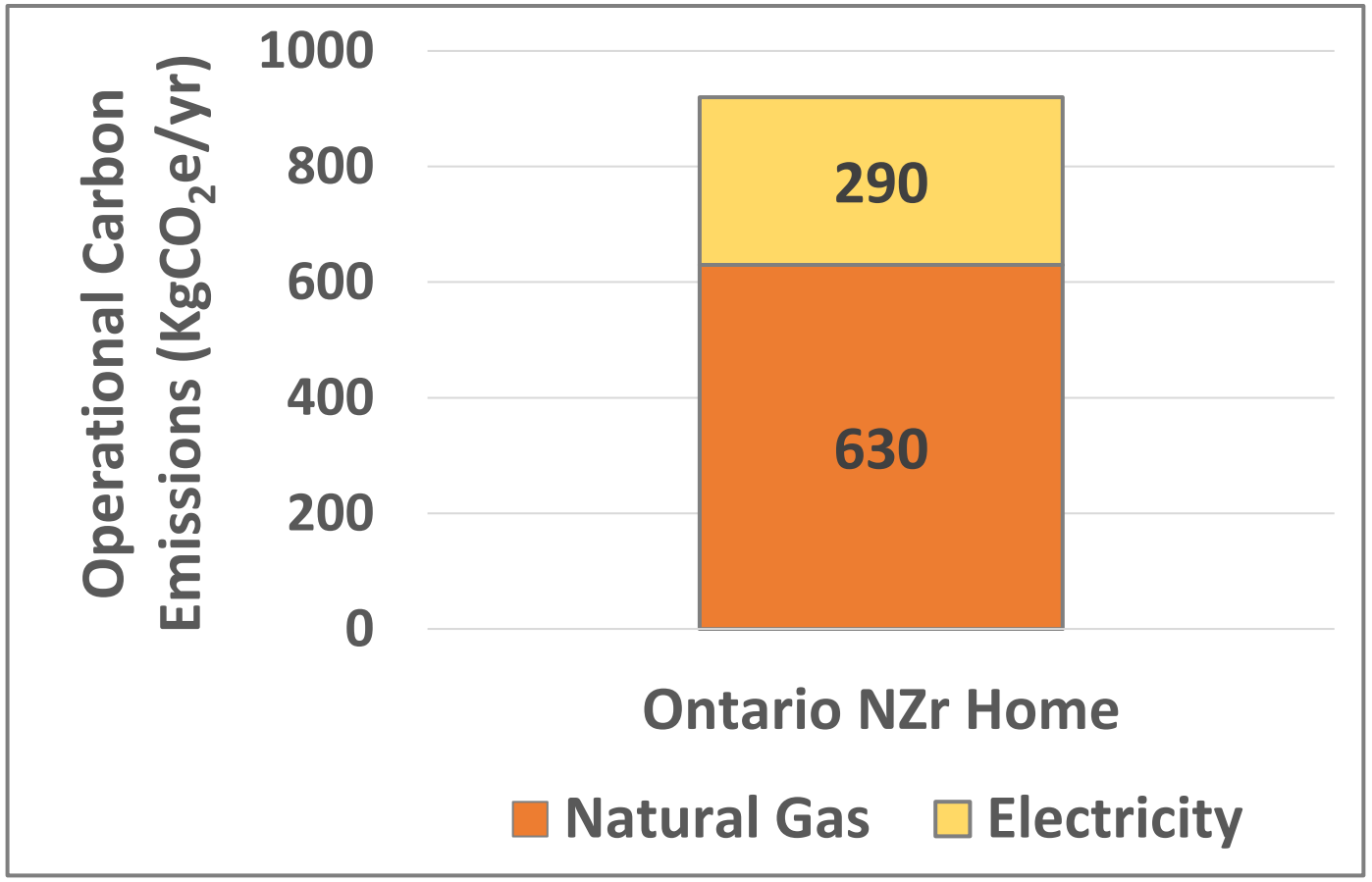


Net Zero vs Net Zero Ready



Average NZ/NZr Home in Ontario

Operational Carbon Emissions



Average Spec

- Net Zero Ready
- ASHP + Gas Furnace
- Gas DHW
- Hybrid Fuel
- Floor area = 2,850sq.ft

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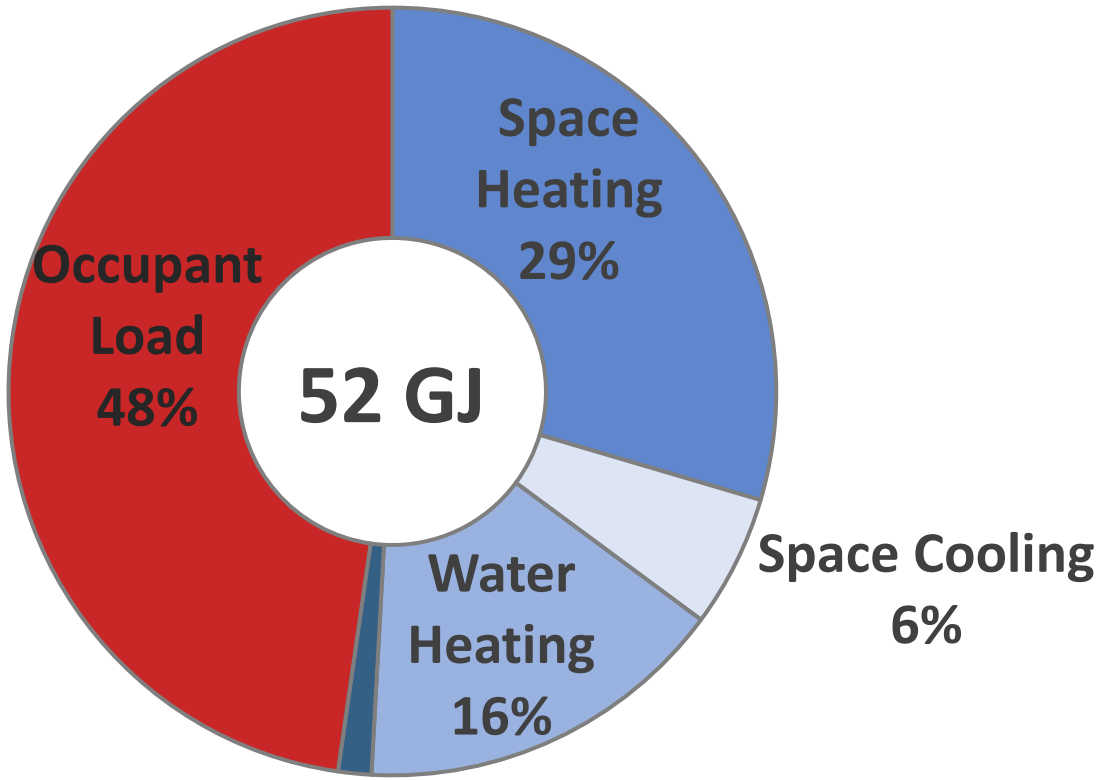
Average NZ/NZr Home in British Columbia

Energy



Envelope

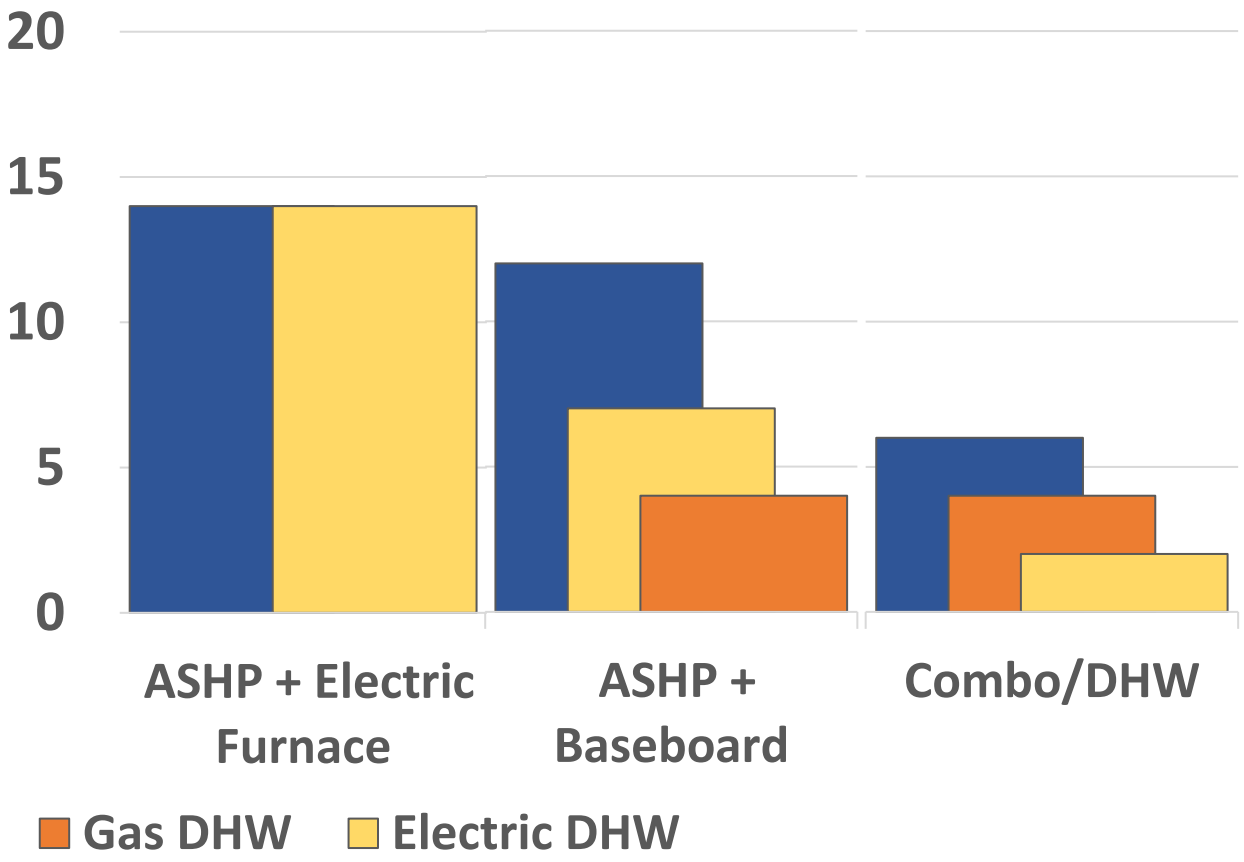
Ceiling Insulation	R 56
Wall Insulation	R 32
Foundation Insulation	R 22
Airtightness	0.87 ACH@50
Envelope % Better	59%

37 Homes

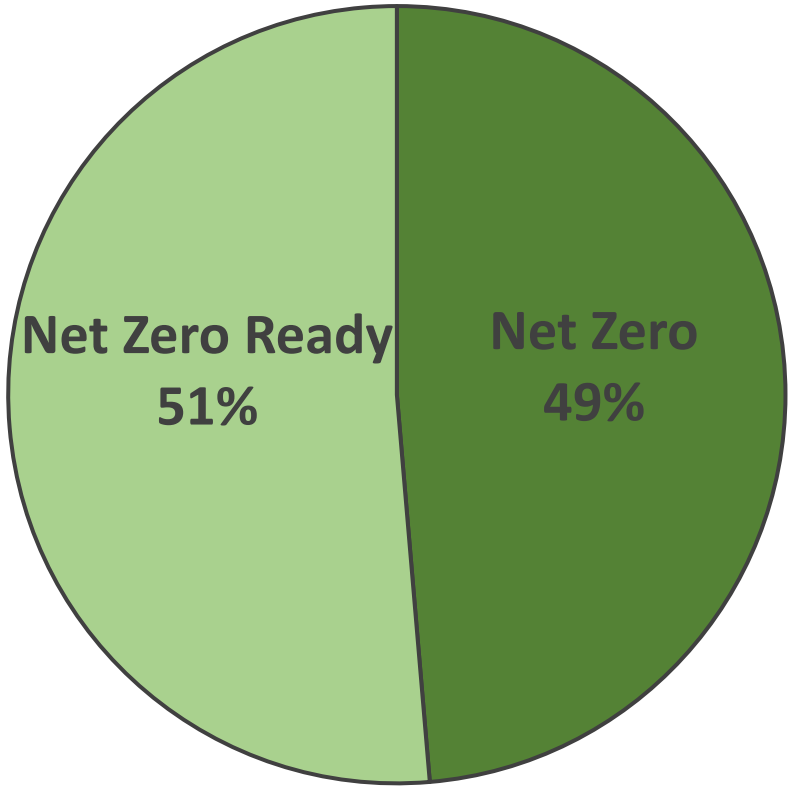
Avg. 3,760 ft²

Average NZ/NZr Home in British Columbia

Mechanical Systems

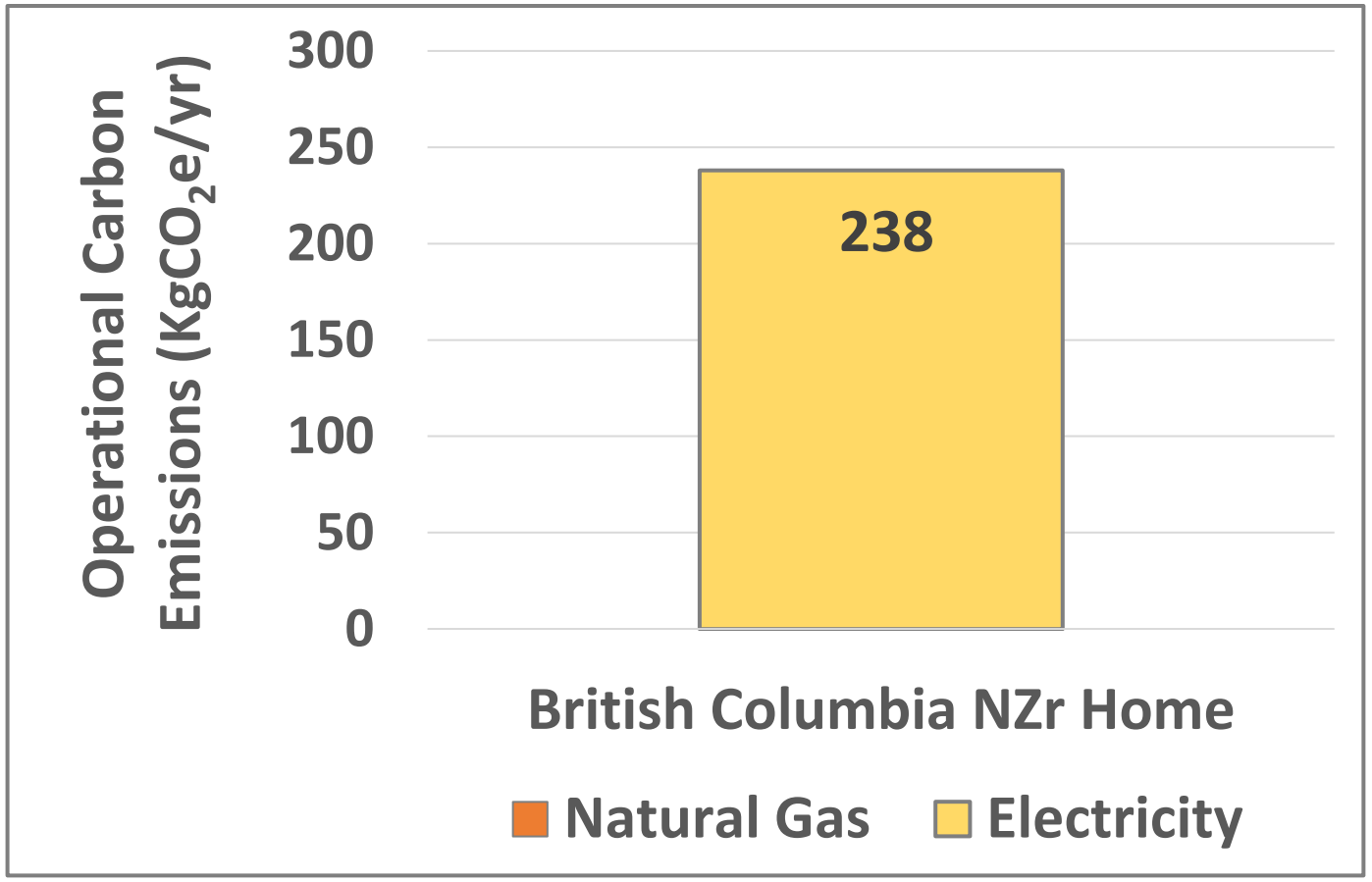


Net Zero vs Net Zero Ready



Average NZ/NZr Home in British Columbia

Operational Carbon Emissions



Average Spec

- Net Zero Ready
- ASHP + Electric Furnace
- Electric DHW
- All-Electric
- Floor area = 3,760sq.ft

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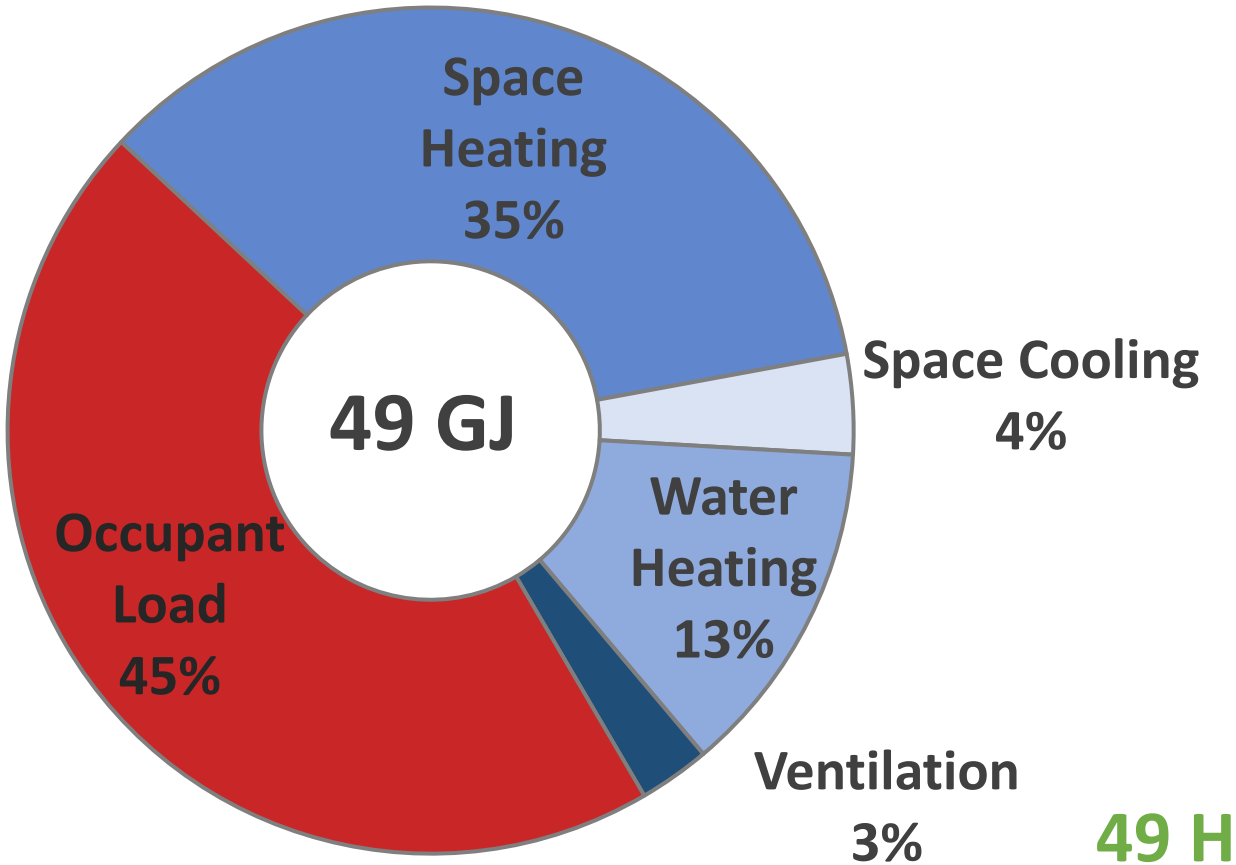
Average NZ/NZr Home in Alberta

Energy



Envelope

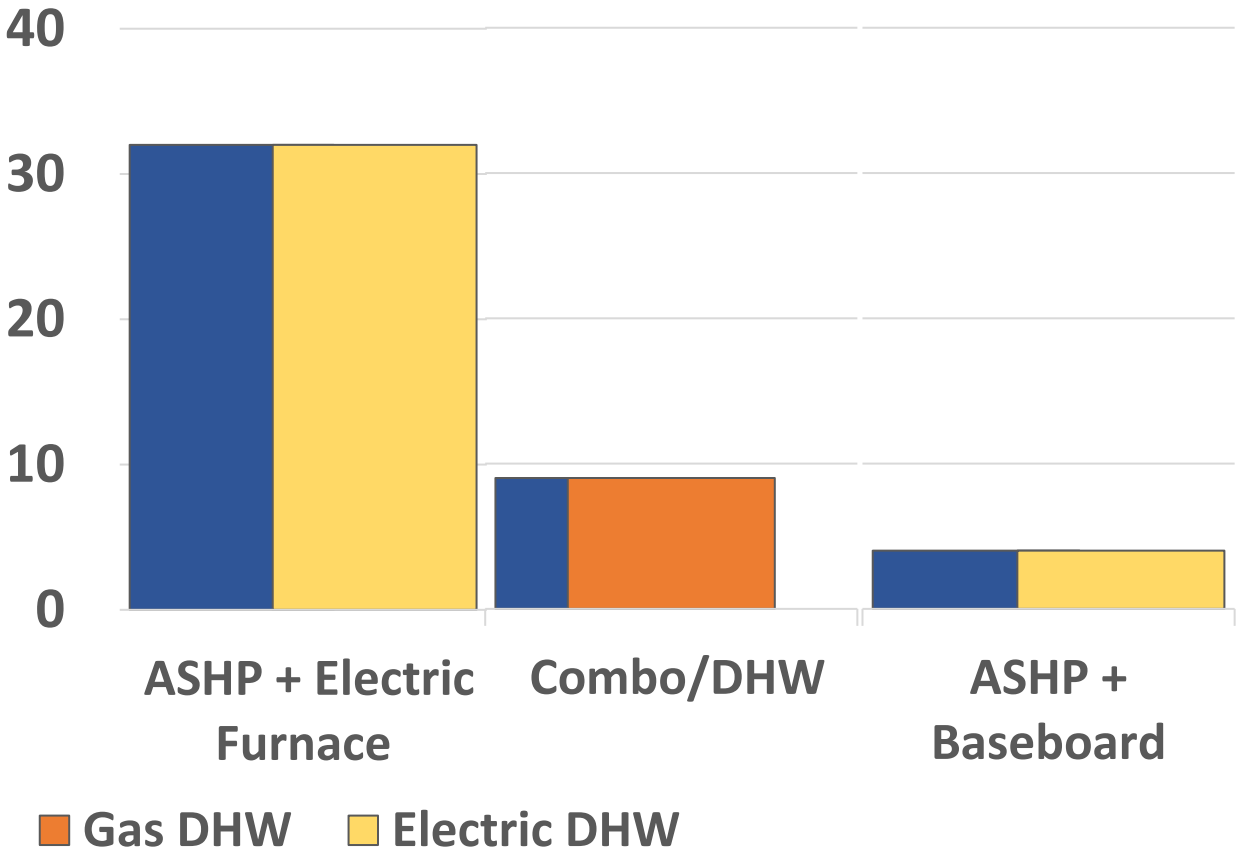
Ceiling Insulation	R 66
Wall Insulation	R 31
Foundation Insulation	R 27
Airtightness	0.98 ACH@50
Envelope % Better	59%

49 Homes

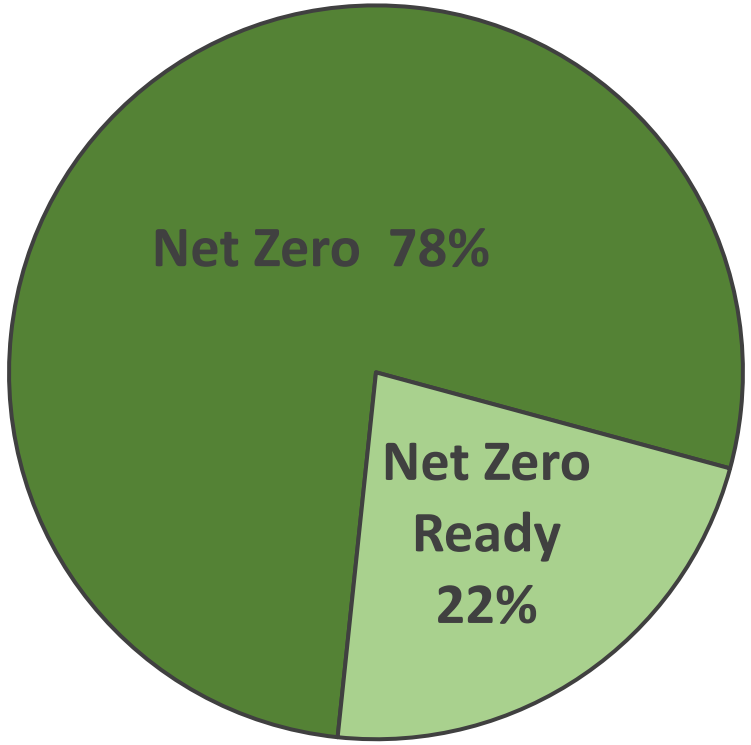
Avg. 2,980 ft²

Average NZ/NZr Home in Alberta

Mechanical Systems

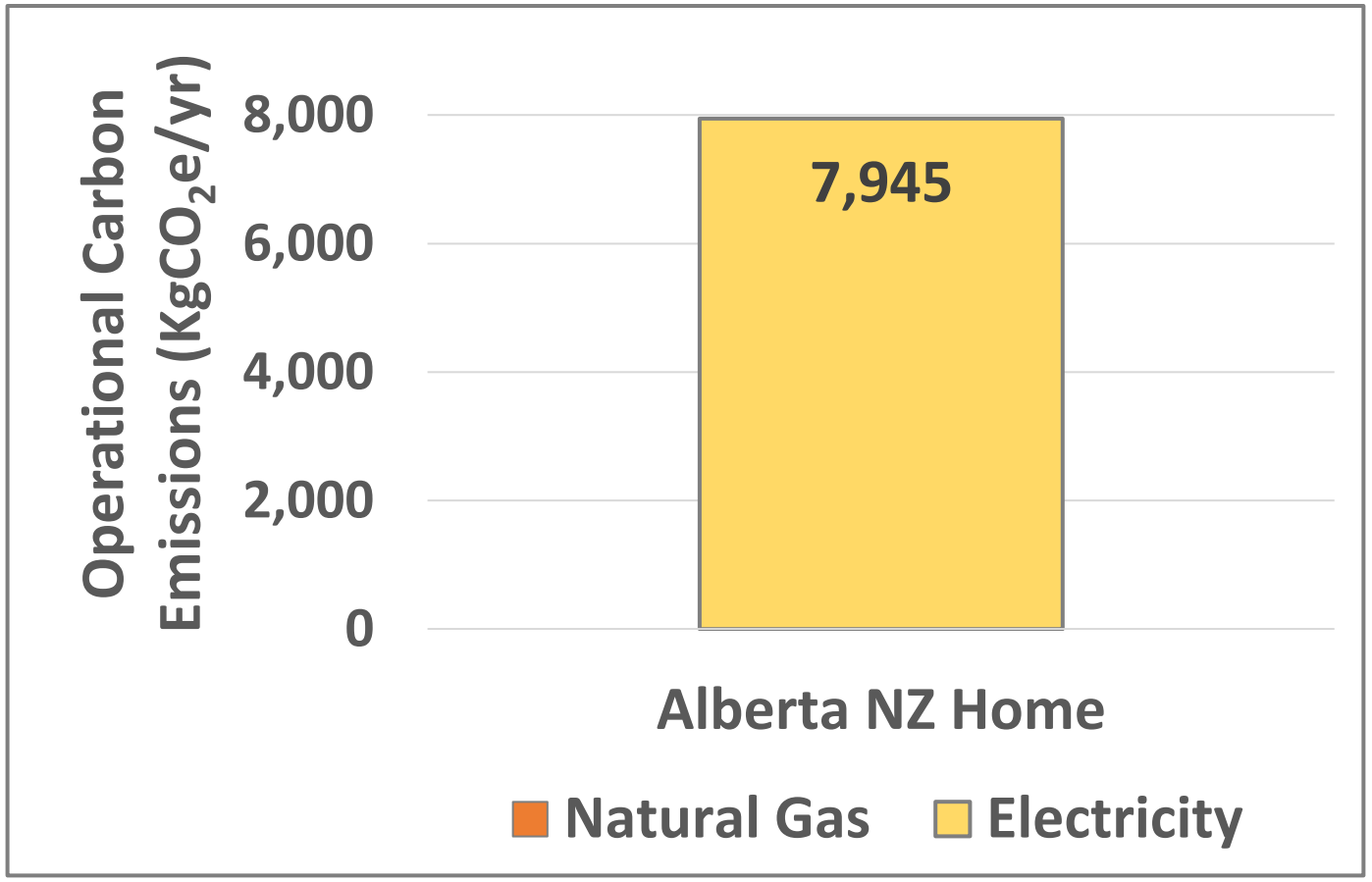


Net Zero vs Net Zero Ready



Average NZ/NZr Home in Alberta

Operational Carbon Emissions



Average Spec

- Net Zero
- ASHP + Electric Furnace
- Electric DHW
- All-Electric
- Floor area = 2,980sq.ft

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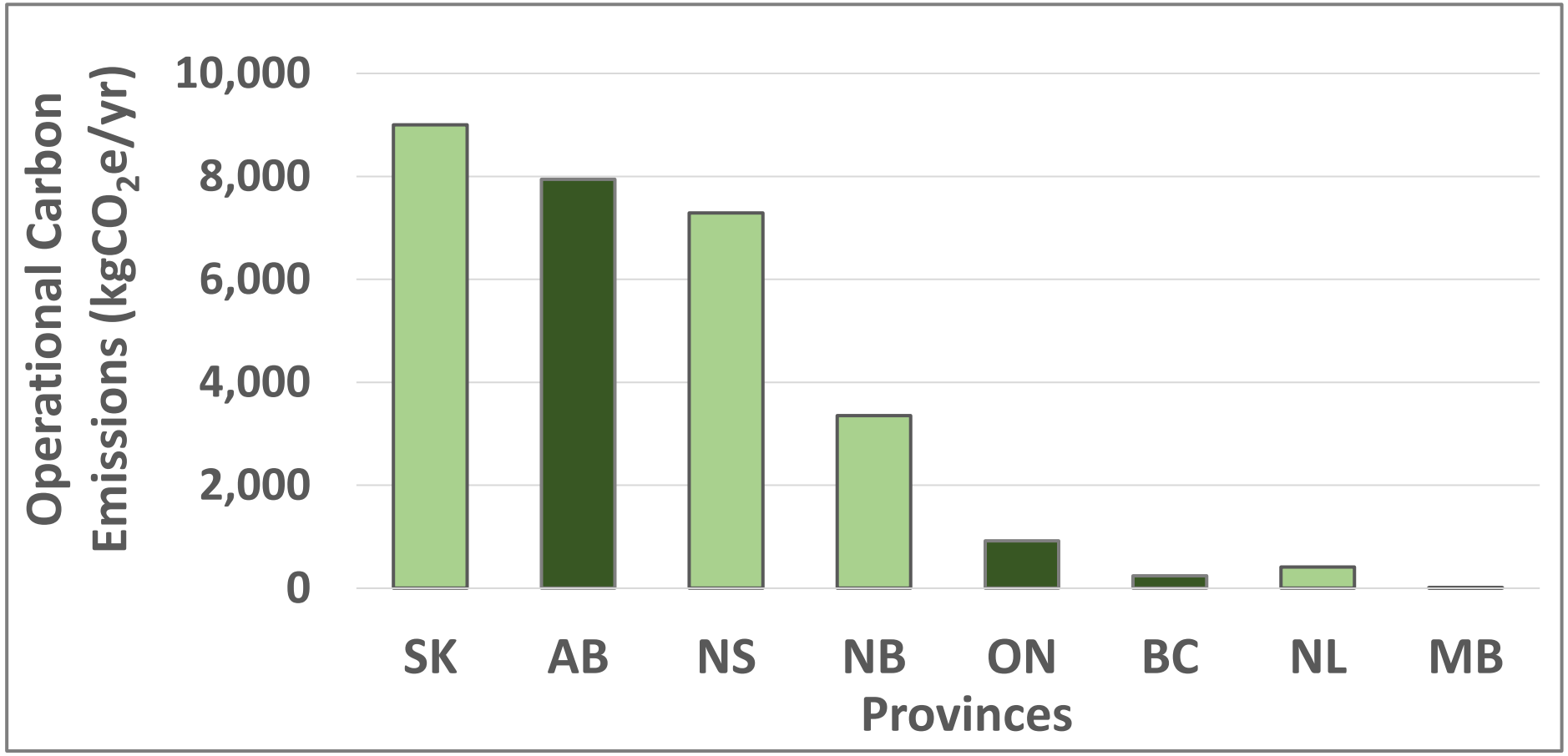
Operational Carbon Emissions

Average Operational Carbon Emissions of NZr Homes by Province



2022 Summary Report

Coming Soon – April 2023!

Available for download at
www.chba.ca/nzhlpsummaryreports

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Industry Challenges Ahead

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Industry Challenges Ahead

1. **Small technical details with big impacts.**
    - Managing SHGC so it does not contribute to overheating.
    - Airtightness testing “reference house” assumption is overstated and prescriptive requirements are penalized.

2. **Building Science risks associated with higher performing buildings.**
    - Window detailing.
    - Balancing of ventilation systems not well understood.
    - Increased airtightness and non-optimal ventilation may increase IAQ risks such as radon.

Industry Challenges Ahead

3. **High Performance HVAC requires high performance design.**
    - Risks of short cycling, discomfort, lack of humidity control.
    - Currently F280 is not being utilized uniformly across Canada.

4. **NBC 9.36 Performance Path not widely understood by building officials and majority of builders (across the country) prefer prescriptive requirements.**
    - Some provinces are only starting to enforce 2015 9.36 for the first time.

Industry Challenges Ahead

Solutions that the Net Zero Home Labelling Program is helping to address:

1. Industry Education
2. Optimization of building approaches.
3. New IAQ Guidelines will help address potential issues.

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Program Update – Version 1.4

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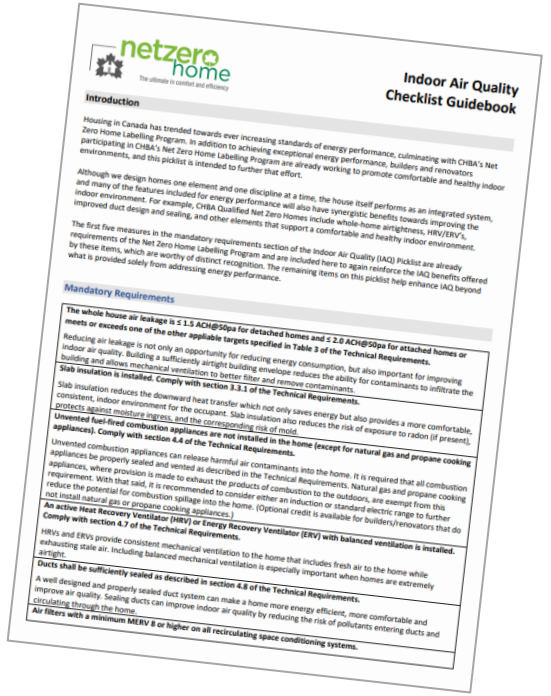
v1.4 Technical Requirements Update

1. **Indoor Air Quality Checklist** – implemented in a phased approach.
   - **Jan 1, 2023 – Dec 31, 2023** the IAQ Checklist is optional.
   - **Jan 1, 2024** onward completion of the IAQ Checklist is mandatory.



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Indoor Air Quality Checklist Guidebook

Introduction

Housing in Canada has trended towards ever increasing standards of energy performance, culminating with CHBA's Net Zero Home Labelling Program. In addition to achieving exceptional energy performance, builders and renovators participating in CHBA's Net Zero Home Labelling Program are already working to promote comfortable and healthy indoor environments, and this picklist is intended to further that effort.

Although we design homes one element and one discipline at a time, the house itself performs as an integrated system, and many of the features included for energy performance will also have synergistic benefits towards improving the indoor environment. For example, CHBA Qualified Net Zero Homes include whole-home airtightness, HRV/ERV's, improved duct design and sealing, and other elements that support a comfortable and healthy indoor environment.

The first five measures in the mandatory requirements section of the Indoor Air Quality (IAQ) Picklist are already requirements of the Net Zero Home Labelling Program and are included here to again reinforce the IAQ benefits offered by these items, which are worthy of distinct recognition. The remaining items on this picklist help enhance IAQ beyond what is provided solely from addressing energy performance.

Mandatory Requirements

The whole house air leakage is ≤ 1.5 ACH@50pa for detached homes and ≤ 2.0 ACH@50pa for attached homes or meets or exceeds one of the other appliable targets specified in Table 3 of the Technical Requirements.

Reducing air leakage is not only an opportunity for reducing energy consumption, but also important for improving indoor air quality. Building a sufficiently airtight building envelope reduces the ability for contaminants to infiltrate the building and allows mechanical ventilation to better filter and remove contaminants.

Slab insulation is installed. Comply with section 3.3.1 of the Technical Requirements.

Slab insulation reduces the downward heat transfer which not only saves energy but also provides a more comfortable, consistent, indoor environment for the occupant. Slab insulation also reduces the risk of exposure to radon (if present), protects against moisture ingress, and the corresponding risk of mold.

Unvented fuel-fired combustion appliances are not installed in the home (except for natural gas and propane cooking appliances). Comply with section 4.4 of the Technical Requirements.

Unvented combustion appliances can release harmful air contaminants into the home. It is required that all combustion appliances be properly sealed and vented as described in the Technical Requirements. Natural gas and propane cooking appliances, where provision is made to exhaust the products of combustion to the outdoors, are exempt from this requirement. With that said, it is recommended to consider either an induction or standard electric range to further reduce the potential for combustion spillage into the home. (Optional credit is available for builders/renovators that do not install natural gas or propane cooking appliances.)

An active Heat Recovery Ventilator (HRV) or Energy Recovery Ventilator (ERV) with balanced ventilation is installed. Comply with section 4.7 of the Technical Requirements.

HRVs and ERVs provide consistent mechanical ventilation to the home that includes fresh air to the home while exhausting stale air. Including balanced mechanical ventilation is especially important when homes are extremely airtight.

Ducts shall be sufficiently sealed as described in section 4.8 of the Technical Requirements.

A well designed and properly sealed duct system can make a home more energy efficient, more comfortable and improve air quality. Sealing ducts can improve indoor air quality by reducing the risk of pollutants entering ducts and circulating through the home.

Air filters with a minimum MERV 8 or higher on all recirculating space conditioning systems.

www.chba.ca/nzprogramrequirements

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v1.4 Technical Requirements Update

2. **Building Envelope Performance Target** – implemented in a phased approach.
    - **Jan 1, 2023 – Dec 31, 2023** optional compliance with either target
        - ≥ 33% improvement over reference house using space heating energy load.
        - ≥ 25% improvement over reference house using gross space heat loss.
    - **Jan 1, 2024** compliance must be achieved with:
        - ≥ 30% improvement over reference house using gross space heat loss.

www.chba.ca/nzprogramrequirements

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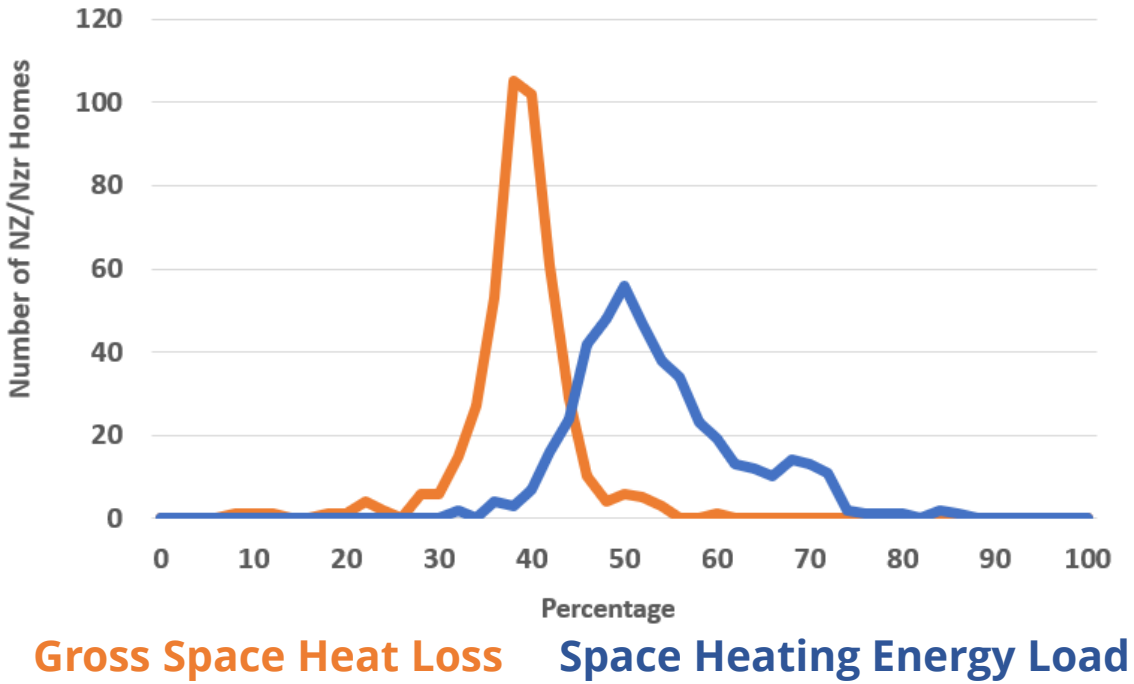
Why The Envelope Update?

- Reduced workload for energy advisors.
- Alignment with other industry metrics.
- Truer measure of envelope efficiency.
- Metrics do not create a lateral comparison.



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Where to Find Us

www.CHBA.ca/NZE

- About the Program
- How to Become Qualified
- How to Label your Home
- Training
- Program Fees
- Marketing Resources

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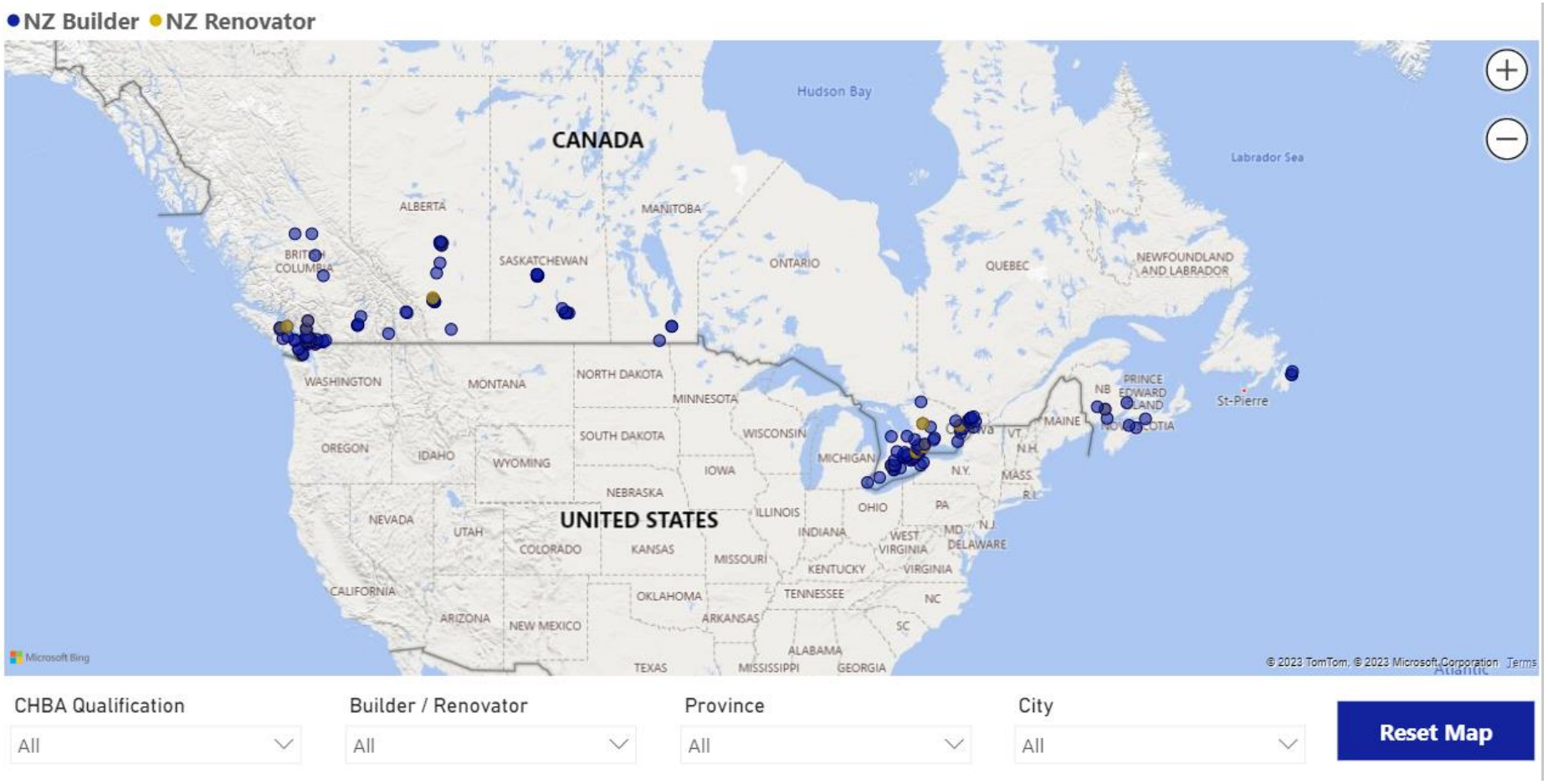
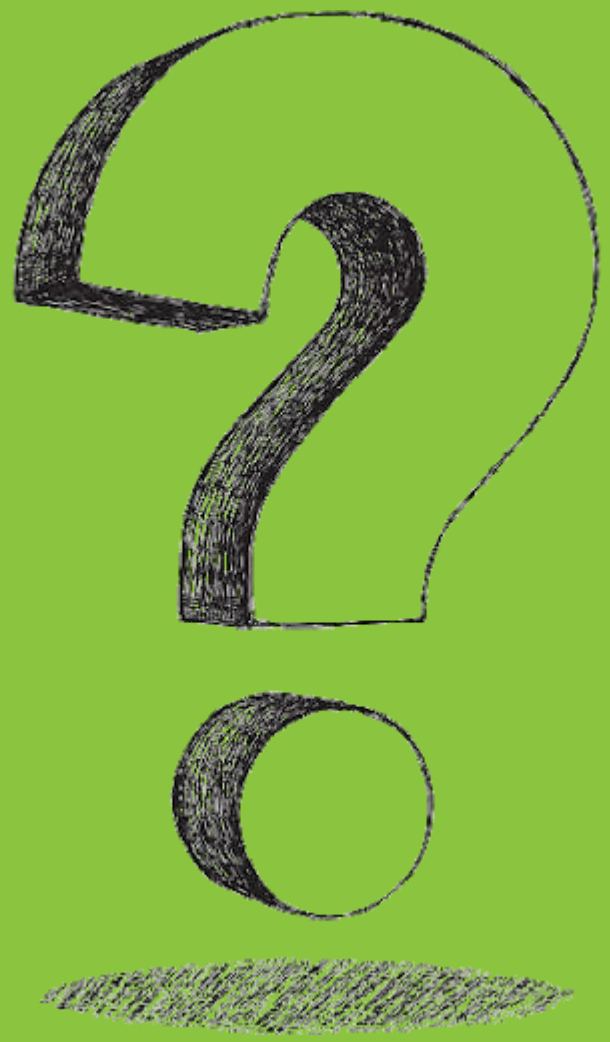
Where to Find Us

www.NetZeroHome.com





POLL

Questions & Discussion

@CHBANetZero

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