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Top 6 Net Zero Technical Challenges

CANADIAN HOME BUILDERS' ASSOCIATION

Net Zero Home Labelling Program

Agenda

- Program Update
1. Achieving 0 GJ in MURBs
2. PV Challenges for MURBs
3. Airtightness in Renovations
4. Fireplace Renovation Strategies
5. Air Distribution & Duct Sealing
6. Sourcing Suitably Sized Mechanical Systems
- Stump the Chump Q&A

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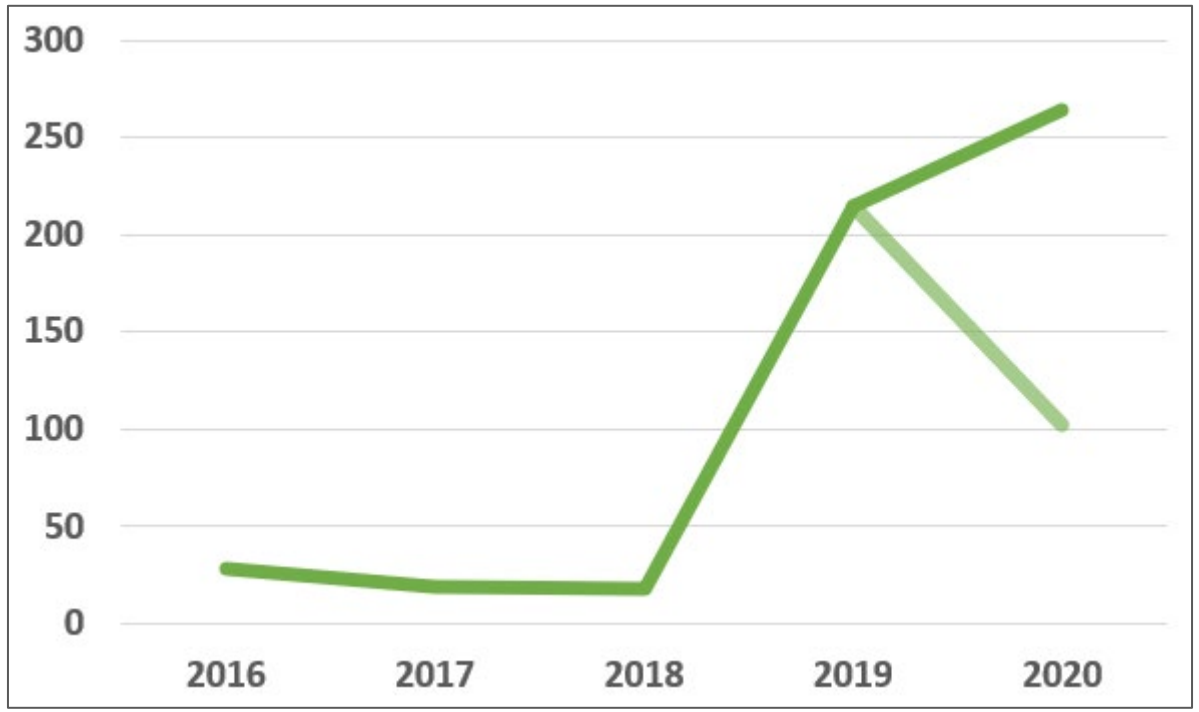
Program Update: Labels to Date

NZ/r Labelled Homes by Year



Qualified NZ Participants

- 12 Service Organizations
- 29 Energy Advisors
- 6 Trainers
- 56 Builders

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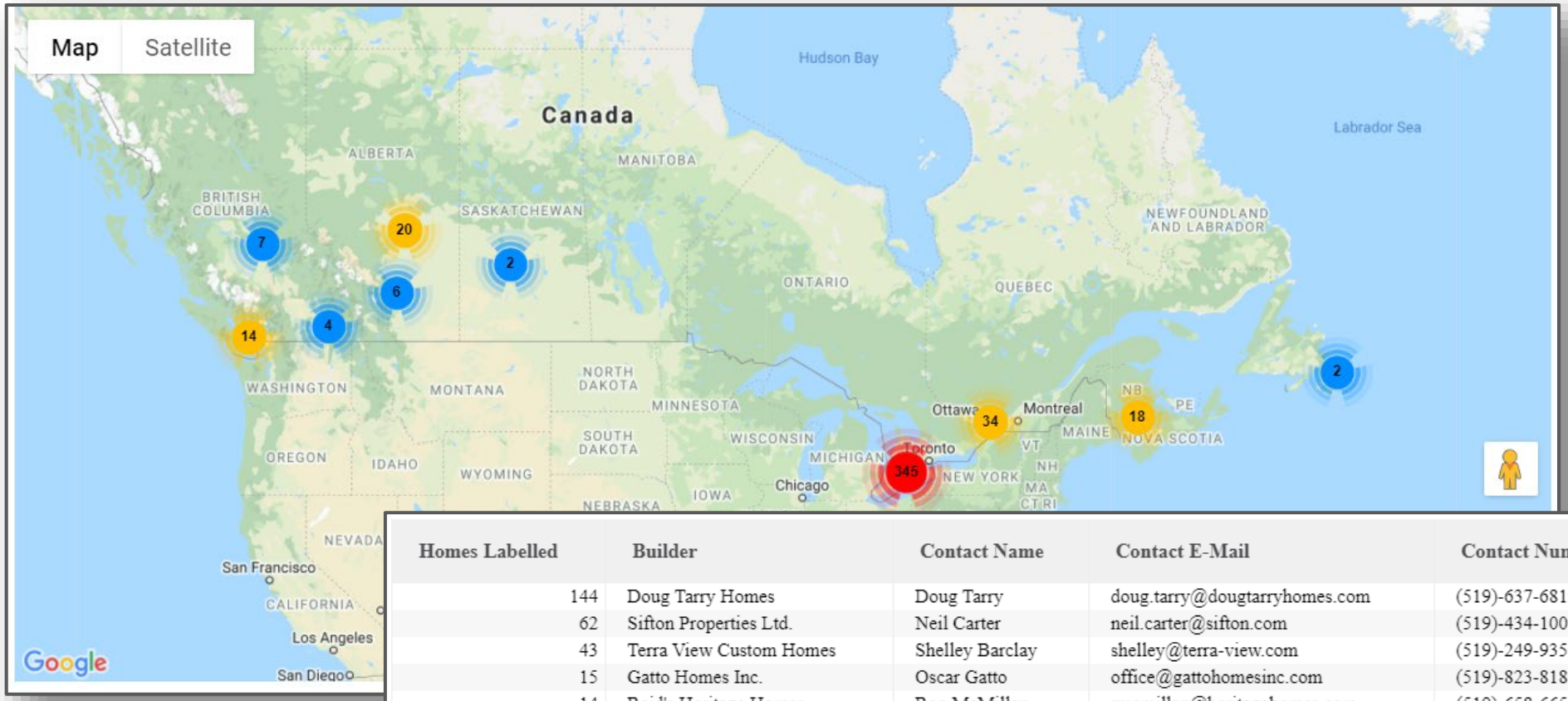
www.NetZeroHome.com



Homes Labelled	Builder	Contact Name	Contact E-Mail	Contact Number	Website
144	Doug Tarry Homes	Doug Tarry	doug.tarry@dougtarryhomes.com	(519)-637-6819	http://www.dougtarryhomes.com/
62	Sifton Properties Ltd.	Neil Carter	neil.carter@sifton.com	(519)-434-1000	http://sifton.com/
43	Terra View Custom Homes	Shelley Barclay	shelley@terra-view.com	(519)-249-9356	http://www.terra-view.com/
15	Gatto Homes Inc.	Oscar Gatto	office@gattohomesinc.com	(519)-823-8183	http://www.gattohomesinc.com/
14	Reid's Heritage Homes	Ron McMillan	rmcmillan@heritagehomes.com	(519)-658-6656	http://www.reidsheritagehomes.com/
12	Dunsire Developments Inc.	Shawn Keeper	shawn.keeper@dunsire.com	(888)-519-2346	https://www.dunsire.com/
9	Hill Bros. Ltd.	Darren Hill	darren@hillbros.nb.ca	(506)-450-3344	http://www.hillbros.nb.ca/.
7	Steve Snider Construction	Stephen Snider	info@stevesnider.ca	(905)-985-8201	http://www.stevesnider.ca/
7	Gemini Homes Inc.	Jason Fabbian	jason@geminihomes.ca	(519)-824-0789	https://www.geminihomes.ca/
6	Minto Communities	Paul Sagriff	PSagriff@minto.com	(613)-782-2935	https://www.minto.com/

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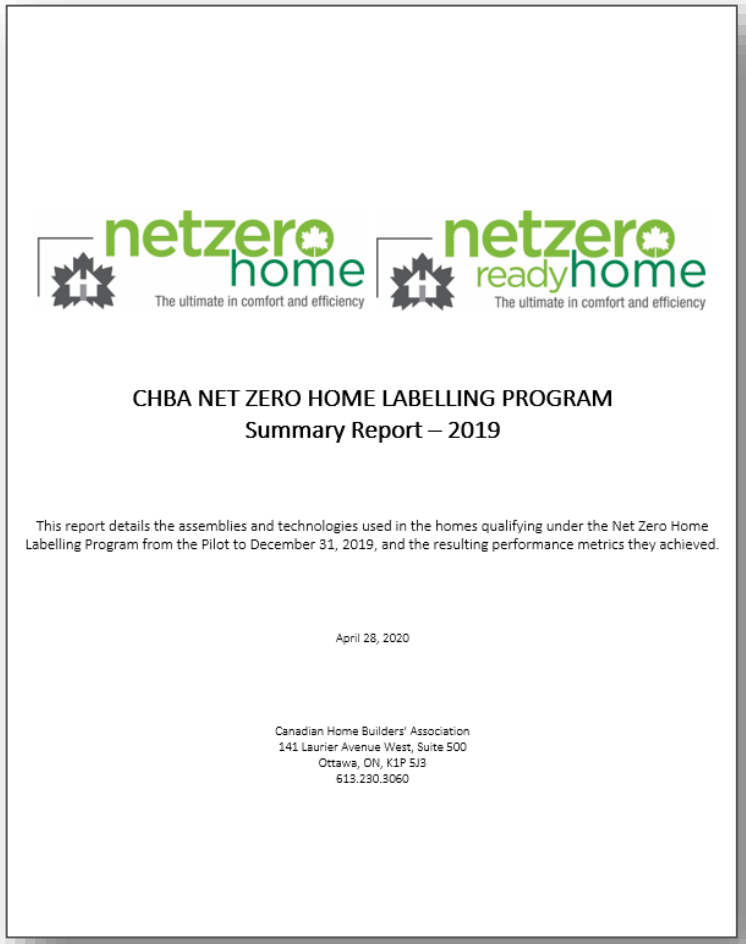
Net Zero Performance Data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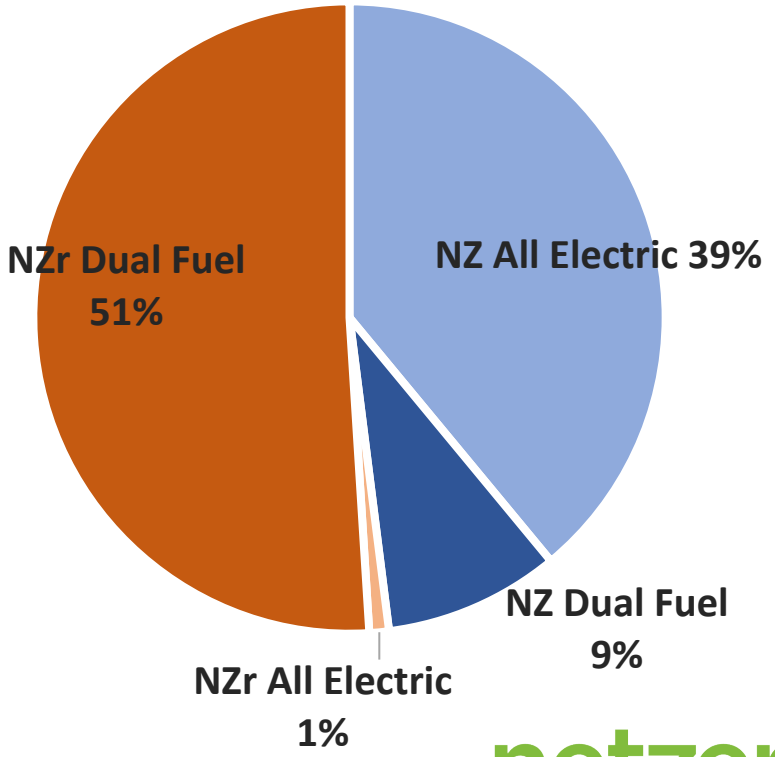
CHBA NET ZERO HOME LABELLING PROGRAM
Summary Report – 2019

This report details the assemblies and technologies used in the homes qualifying under the Net Zero Home Labelling Program from the Pilot to December 31, 2019, and the resulting performance metrics they achieved.

April 28, 2020

Canadian Home Builders' Association
141 Laurier Avenue West, Suite 500
Ottawa, ON, K1P 5J3
613.230.3060

Percentage of all NZ and NZr Homes by Fuel Source Configuration



www.chba.ca/NZHLPsummaryreports

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Net Zero MURBs and Net Zero Renovations

LANDMARK HOMES

avalon MASTER BUILDER

bigBLOCK construction

innovative residential

ZIRNHELT TIMBER FRAMES

DOUG TARRY CUSTOM HOMES LTD.

Sean.ca PASSIONFORWARD

www.chba.ca/NZMURBs

SOLARHOMES INC

RENOMARK RENOVATORS MARK OF EXCELLENCE

www.chba.ca/NZRenos

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1. Achieving 0 GJ in MURBs

- ✓ **Multi-unit residential buildings**
- ✓ **Renovations**
- ✓ **New Homes**

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Achieving 0 GJ in MURBs

Issue: It can be challenging for some smaller footprint homes to achieve Net Zero Energy consumption.

Challenges:

1. Baseload assumptions make it difficult to achieve 0 GJ because the builder can only improve about 30-60% of the energy consumption.
2. Roof space to heated floor volume does not favour net zero.

Solutions:

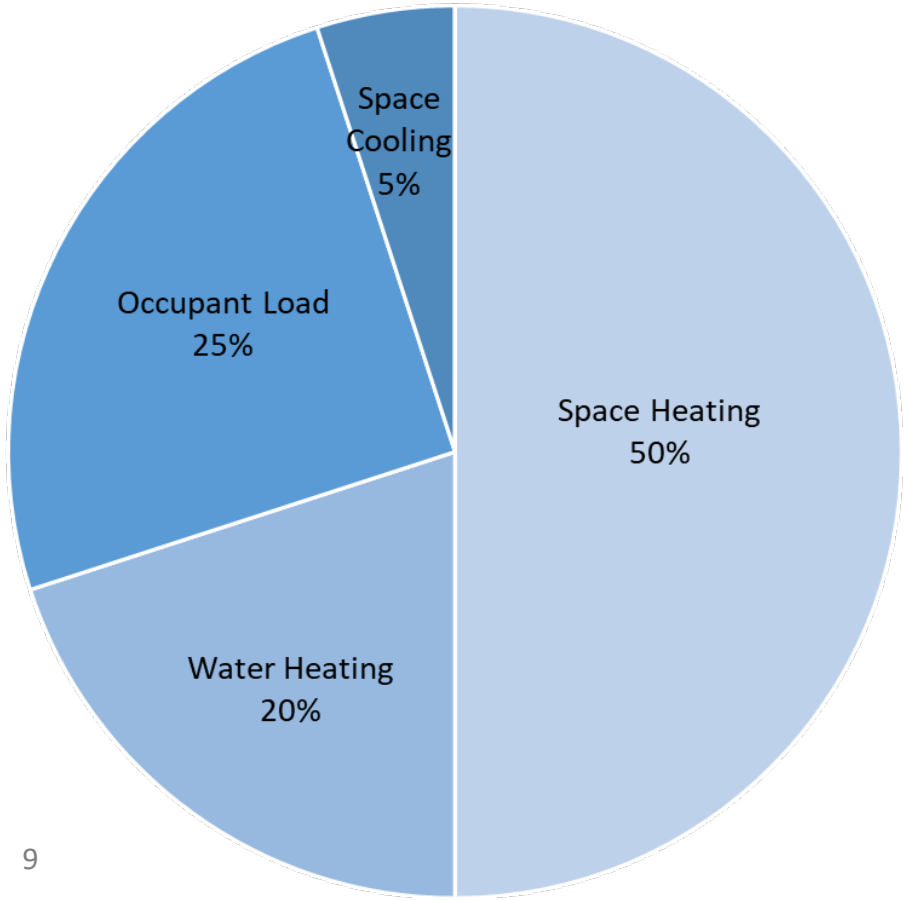
- Net Zero MURB Pilot

Baseload Assumptions

SFD 9.36 Home

Source: NRCan

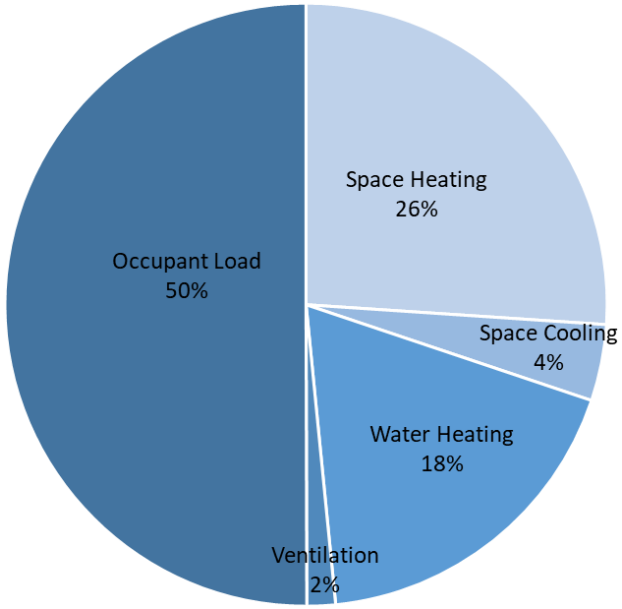
Average 100 GJ



Net Zero SFD

Average 3,220 sqft

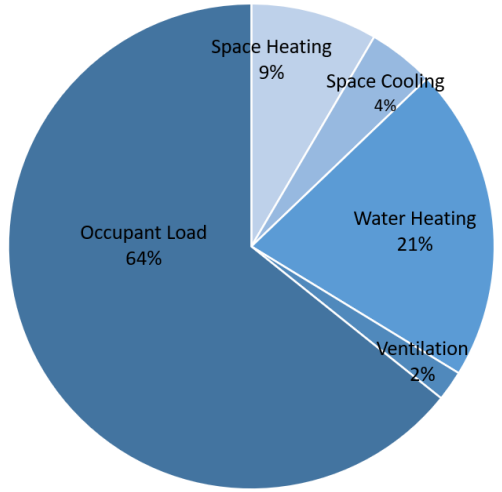
Average 48 GJ



Net Zero MURB Unit

Average 1,200 sqft

Average 26 GJ



Occupant load = 16 GJ

Operational Load = 10 GJ

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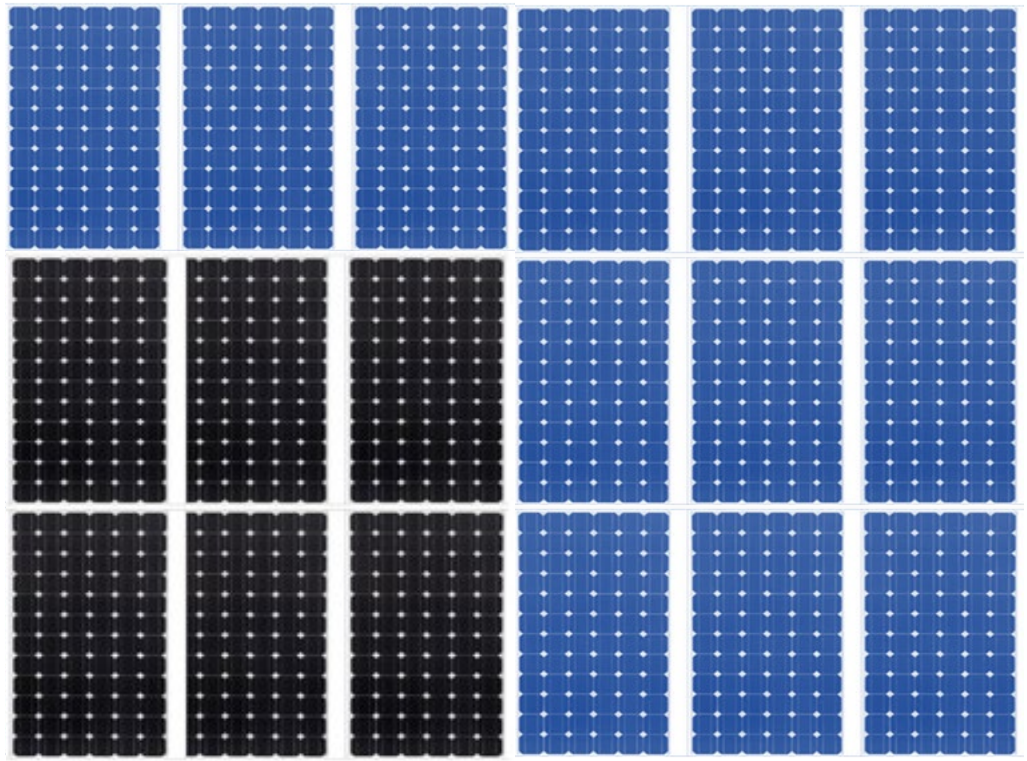
Achieving 0 GJ in MURBs

Occupant Load PV



Operational Load PV

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Roof Space versus Floor Area

Single Family Home

- 2,000 - 3,500ft^2 floor area
- 10-12 KWpv
- 550-650ft^2 of solar
- More than enough roof space for solar

Townhome

- 1,300 - 2,000ft^2 floor area
- 7-10 KWpv
- 450-550ft^2 solar
- Roof space planning is important

MURB (8 unit)

- 700 - 1,400ft^2 floor area per unit
- 5-7 KWpv/unit = 40-56 KWpv
- 350-450ft^2/unit = 2,800-3,600ft^2
- Solar optimization and architectural design is essential

PV Optimization in MURBs

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2. PV challenges for MURBs

- ✓ **Multi-unit residential buildings**

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PV Challenges in MURBs

Issue: How do we net meter solar in a multi-unit buildings where one array is installed.

Challenges:

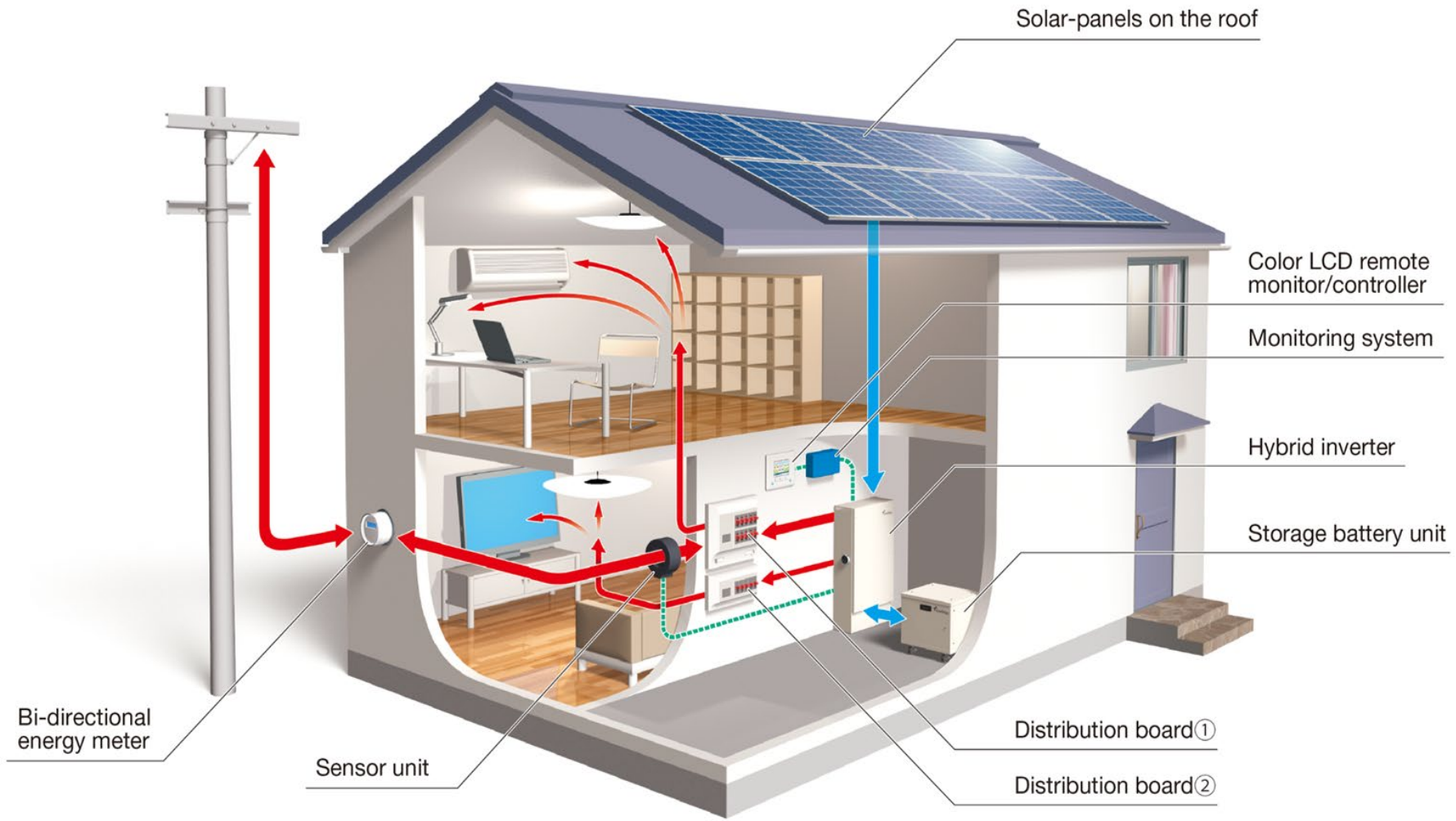
1. Buildings typically have one point of connection for net metering.
2. Utility Readiness.

Solutions:

- Third-party professional solar assessment
- Net Zero MURB Pilot

Net Metering in MURBs

Panasonic
ECO SOLUTIONS CANADA



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Suite Metering in MURBs

Direct Metering: Each unit is billed directly from the utility with individual meters.

Bulk Metering: Single meter and one bill for entire building. The condo will bill residence based on a formula (ex. Square footage).

Suite Metering: Single main meter. Residence have individual accounts. Also able to have meters throughout common areas (HVAC, lighting, solar).

Third Party PV Design for MURBs

The Net Zero MURB Pilot Requires a professional solar design - even for Net Zero Ready buildings.

- Plan for optimization
- Account for shading
- Account for sub arrays

3. Airtightness in Renovations

- ✓ **Multi-unit residential buildings (compartmentalization)**
- ✓ **Renovations**

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Airtightness in Renovations

Issue: Projects renovating to Net Zero can have trouble meeting the 1.5 ACH@50 target that the program has for airtightness.

Challenges:

1. Is the entire envelope of the home being renovated?
2. Is aerosol air sealing an option?

Solutions:

- Education - Understand strategies for airtightness in the design phase.
- Net Zero Renovations Pilot

Why does a NZ Renovation need to be airtight?

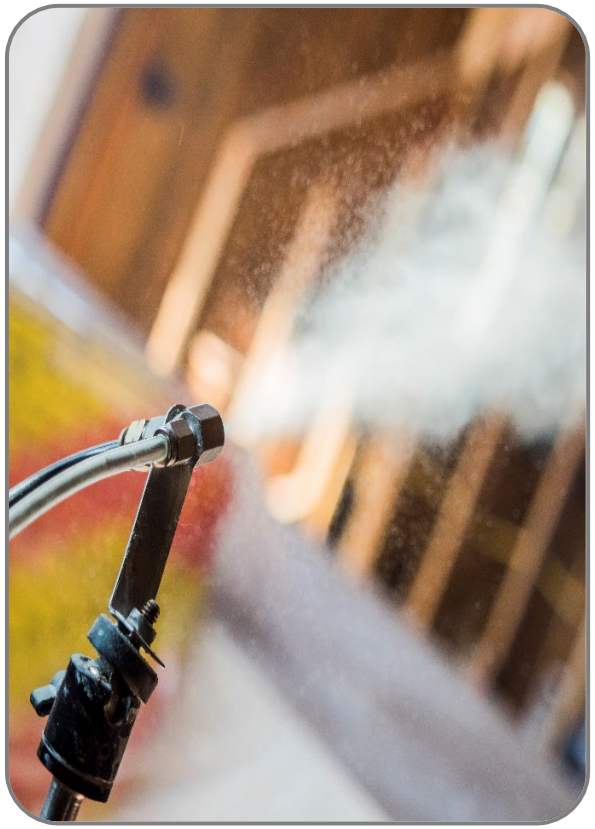
Energy

- Most cost-effective energy saving measure (20-30% savings).
- Environmental benefits because we are not wasting energy.

Comfort

- Makes homes quieter and cleaner.
- Makes homes more “comfortable”.
- Makes homes healthier – can control air quality.

Aerosol Air Barrier Systems



AEROBARRIER™
Breakthrough Envelope Sealing Technology

Aerosol applied air barriers are a convenient, cost effective approach that seals homes in less than 3 hours.

Air change rates of under 1.0 are commonly achieved.

Changing the Way Homes are Built with:

- Consistently tighter building envelopes
- Verified and documented results
- A single process
- Time saving

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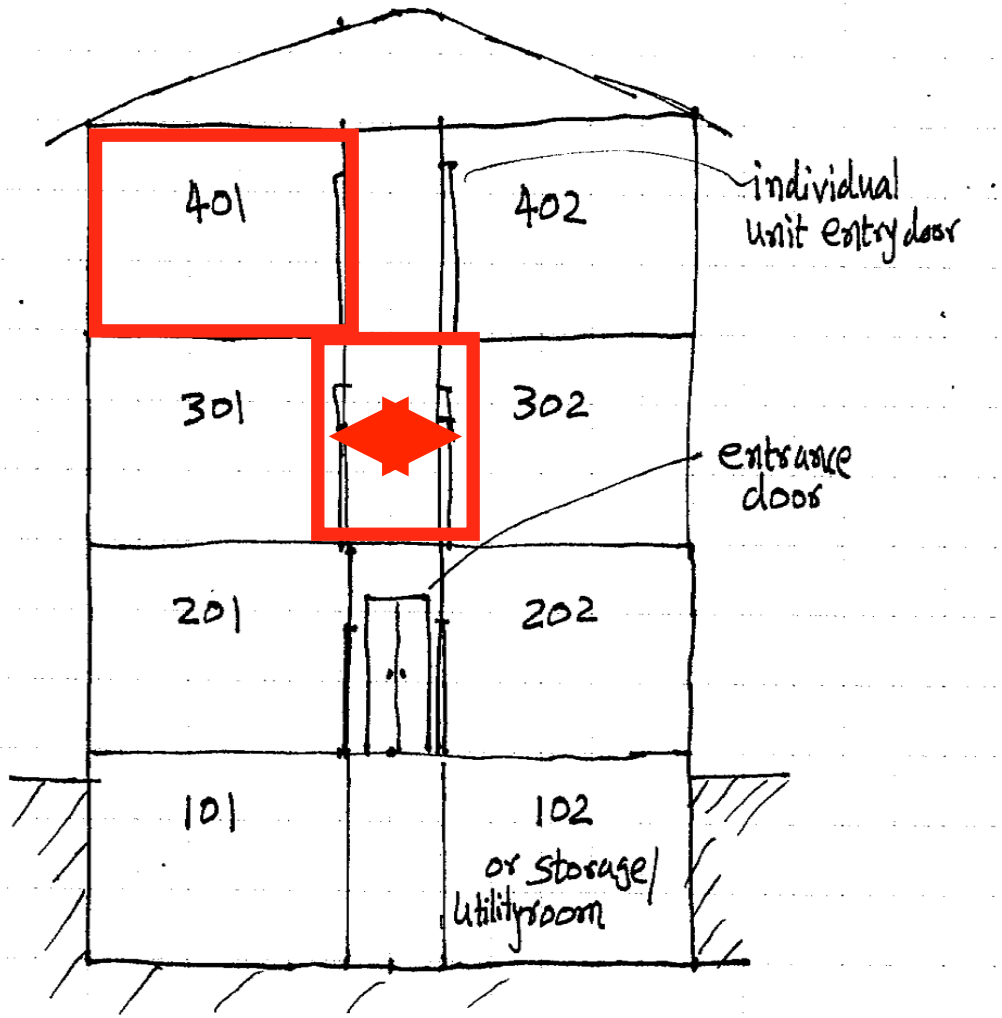
Compartmentalization in MURBs



- "Compartmentalize" suites
- Seal all exterior wall, ceiling, floor penetrations
- Seal all common wall, ceiling, floor penetrations
- Seal penetrations to common spaces

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4. Fireplace Renovation Strategies

- ✓ **Renovations**

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Fireplace Renovation Strategies

Issue: Renovating existing fireplaces must be carefully considered to mitigate the risk of combustion back-drafting.

Challenges:

1. Air leakage is drastically reduced in a Net Zero Renovation.
2. Many homeowners want to keep their existing fireplace.
3. Some homeowners want appliances with large exhausts.

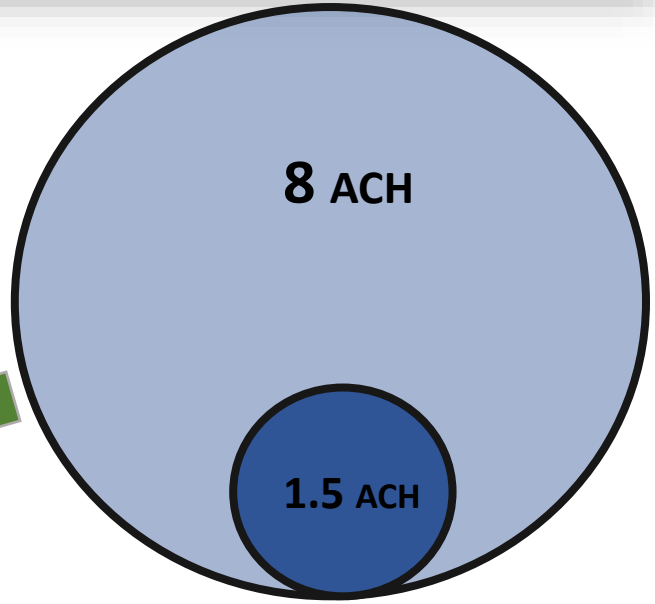
Solutions:

- Net Zero Renovations Pilot Technical Requirement
- Education – Net Zero Renovations Training

Fireplace Renovation Strategies

Decreased air pressure in the home caused by exhaust devices can result in back-drafting from the fireplaces.

- A depressurization test must be completed.
- Make up air should be considered.
- Large exhaust devices should be avoided.



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Net Zero Renovations Technical Requirements

RENOVATION REQUIRMENT

1. If indoor manually fueled appliances, including stoves, fireplaces, fireplace inserts, and central furnaces and boilers, are in the home they shall be either decommissioned or comply with the following requirements:
   - (a) it shall be a solid fuel burning appliance certified to,
     - i. CSA B415 "Performance Testing of Solid-Fuel-Burning Heating Appliances", or
     - ii. U.S. Environmental Protection Agency (EPA) wood-burning appliance standards 40 Code of Federal Regulations (CFR) Part 60 Subpart AAA,
   - (b) have no barometric dampers,
   - (c) the home undergoes the exhaust devices depressurization test as per EnerGuide Rating System Technical Procedures Version 15 with results showing a pressure difference of less than 5 pascals, and
   - (d) carbon monoxide alarms shall be installed in the room containing the appliance; and within each bedroom, or alternatively, outside each bedroom, but within 5 m of each bedroom door measured following corridors and doorways. At least each floor or level in the dwelling must be equipped with a carbon monoxide alarm. Local codes may have more stringent requirements for carbon monoxide detectors that must be met in addition to these requirements.

NOTE:

1. Because solid-fuel-burning appliances present a risk to health and safety through spillage of combustion gases, and that changes to building systems as part of a renovation can increase this risk, it is important to emphasize that local building codes and standards must be adhered to.
2. The CHBA's *"Fireplaces Information Sheet"* and NRCan's *"Combustion Gases in Your Home – Things You Should Know about Combustion Spillage"* shall be provided by the renovator to a homeowner electing not to decommission an existing site-built fireplace in a renovation.

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5. Air Distribution & Duct Sealing

- ✓ **Renovations**

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Air Distribution & Duct Sealing

Issue: Renovations that are using existing ductwork may struggle to provide the required airflow to all rooms.

Challenges:

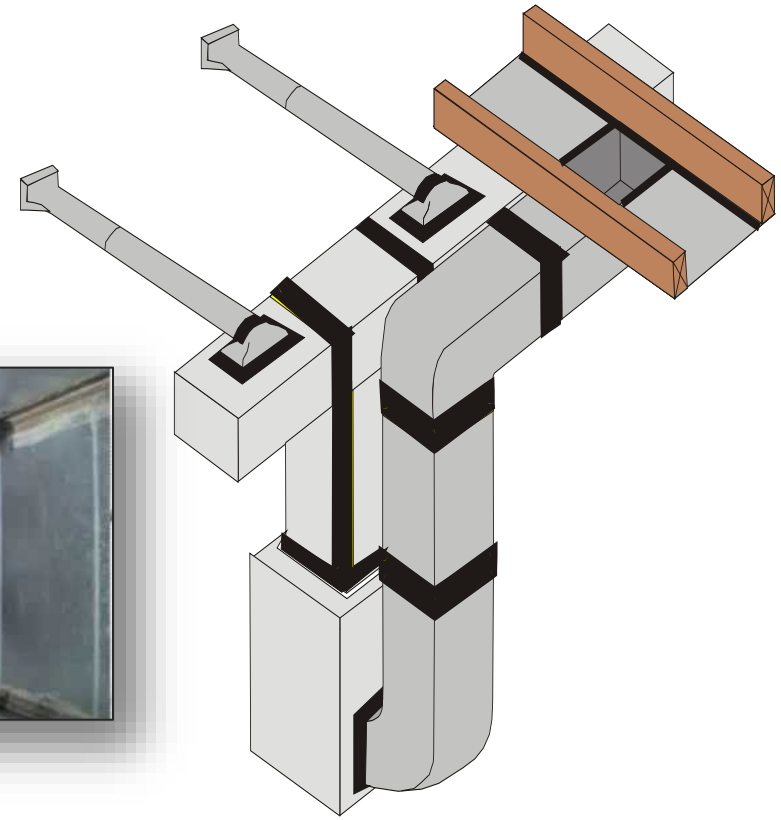
1. Existing ducts are leaky.
2. Ducts are oversized and are not optimized in design.

Solutions:

- Net Zero Renovation Pilot Requirement
- Education – Net Zero Renovations Training

Why Duct Sealing Matters

- Maintains system “pressure”
- Getting air where you need it
- Allow balancing and seasonal adjustment to work
- Is an aerosol sealant an option?



RENOVATION

1. If the pre-renovation ductwork system is not completely replaced, then only accessible portions of ductwork must be sealed as per Section 4.8.2 provided each duct run can deliver the appropriate amount of air as calculated by CSA F280-12 “Determining the required capacity of residential space heating and cooling appliances”.

6. Sourcing Suitably Sized Mechanical Systems

- ✓ **Multi-unit residential buildings**
- ✓ **Renovations**
- ✓ **New Homes**

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Sourcing Suitably Sized Mechanical Systems

Issue: Builders may struggle to find mechanical systems that are suitably sized.

Challenges:

1. When optimized, heating loads and cooling loads can be surprisingly low.
2. Oftentimes, Net Zero homes are sized based on cooling loads.

Solutions:

- Net Zero Council
- Education – Net Zero Builder Training

HVAC Planning & Design

NZ/r Homes are LOW LOAD - Typical 2,300 sqft house:

	1997 Code	2017 Code	Net Zero/Ready
Heat Loss	86,000 BTUs	41,000 BTUs	27,000 BTUs
Heat Gain	39,500 BTUs (3.5 Ton)	26,000 BTUs (2.5 Ton)	16,000 BTUs (1.5 Ton)
Air Flow	1450 CFM	750 CFM	450 CFM
Duct Sizes Mains Branch	 8"x30" 5-6"	 8"x18" 5"	 8"x10" 3-4"
Annual Energy $$$	$4,900	$2,650	$1,950

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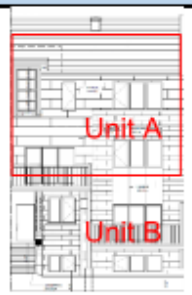
Heating and Cooling Systems Selection

- RIGHT SIZED systems
  (and part load with modulation)
- Natural gas or all-electric?
- Fan and Motor Efficiency
- Simplicity of controls
  (key for fuel switching and backup systems)
- Smart controls

Three-storey, town	Two-storey, detached	Single-storey, detached	Two-storey stacked back-to-back town
 Image used with builder's permission	 Image used with builder's permission	 Image used with builder's permission	 Image used with builder's permission
Description: • 1,600 sf on 3 floors plus basement • Front facing E (highest cooling) • Energy Star certified	**Description:** • 1,400 sf on 2 floors plus basement • Front facing W (highest cooling) • Energy Star certified	**Description:** • 1,300 sf bungalow plus basement • Front facing NW (highest cooling) • Energy Star certified	**Description:** • 1,100 sf on 2 floors • Front facing SW (highest cooling); Units A & B share an entrance • Energy Star certified
Design Loads: (for mid unit)	**Design Loads:**	**Design Loads:**	**Design Loads:** (for upper-mid unit)
Greater Toronto Area, ON DHL: 15,786 Btu/h DHG: 19,192 Btu/h	**Greater Toronto Area, ON** DHL: 16,547 Btu/h DHG: 18,556 Btu/h	**Greater Toronto Area, ON** DHL: 20,335 Btu/h DHG: 19,354 Btu/h	**Greater Toronto Area, ON** DHL: 6,901 Btu/h DHG: 13,850 Btu/h
Ottawa, ON DHL: 17,721 Btu/h DHG: 18,807 Btu/h	**Ottawa, ON** DHL: 18,573 Btu/h DHG: 18,147 Btu/h	**Ottawa, ON** DHL: 22,862 Btu/h DHG: 18,655 Btu/h	**Ottawa, ON** DHL: 7,984 Btu/h DHG: 14,067 Btu/h
Calgary, AB DHL: 19,817 Btu/h DHG: 18,118 Btu/h	**Calgary, AB** DHL: 20,738 Btu/h DHG: 17,375 Btu/h	**Calgary, AB** DHL: 25,601 DHG: 18,851 Btu/h	**Calgary, AB** DHL: 8,775 Btu/h DHG: 14,468 Btu/h
Saskatoon, SK DHL: 21,991 Btu/h DHG: 18,822 Btu/h	**Saskatoon, SK** DHL: 22,879 Btu/h DHG: 18,169 Btu/h	**Saskatoon, SK** DHL: 28,249 Btu/h DHG: 19,899 Btu/h	**Saskatoon, SK** DHL: 9,779 Btu/h DHG: 14,841 Btu/h

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Questions

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NB Power

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Bluewater Energy

Toby Smith
Building Knowledge Canada Inc.

Andy Oding
Building Knowledge Canada Inc.

Peter Darlington
Solar Homes Inc.

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