

# Now House<sup>®</sup>

One small house.

One million opportunities.

## NET ZERO ENERGY HOME RETROFITS

What if your home had an energy bill of zero?

**Lorraine Gauthier**

President, The Now House Project Inc.

**Sustainable Building/Renovating Housing Forum 2013**

**Kamloops Convention Centre**

February 7, 2013

# Now House Your Home

What if your house  
was a Now House?

for Nuit Blanche on Saturday, October 2nd sta

[www.nowhouseproject.com](http://www.nowhouseproject.com)



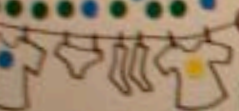
HOW HOUSE YOUR HOME™?

energy saving choices by placing  
each item:

powerbar \*\*

CFL / LED  
lights \*\*

slime \*\*



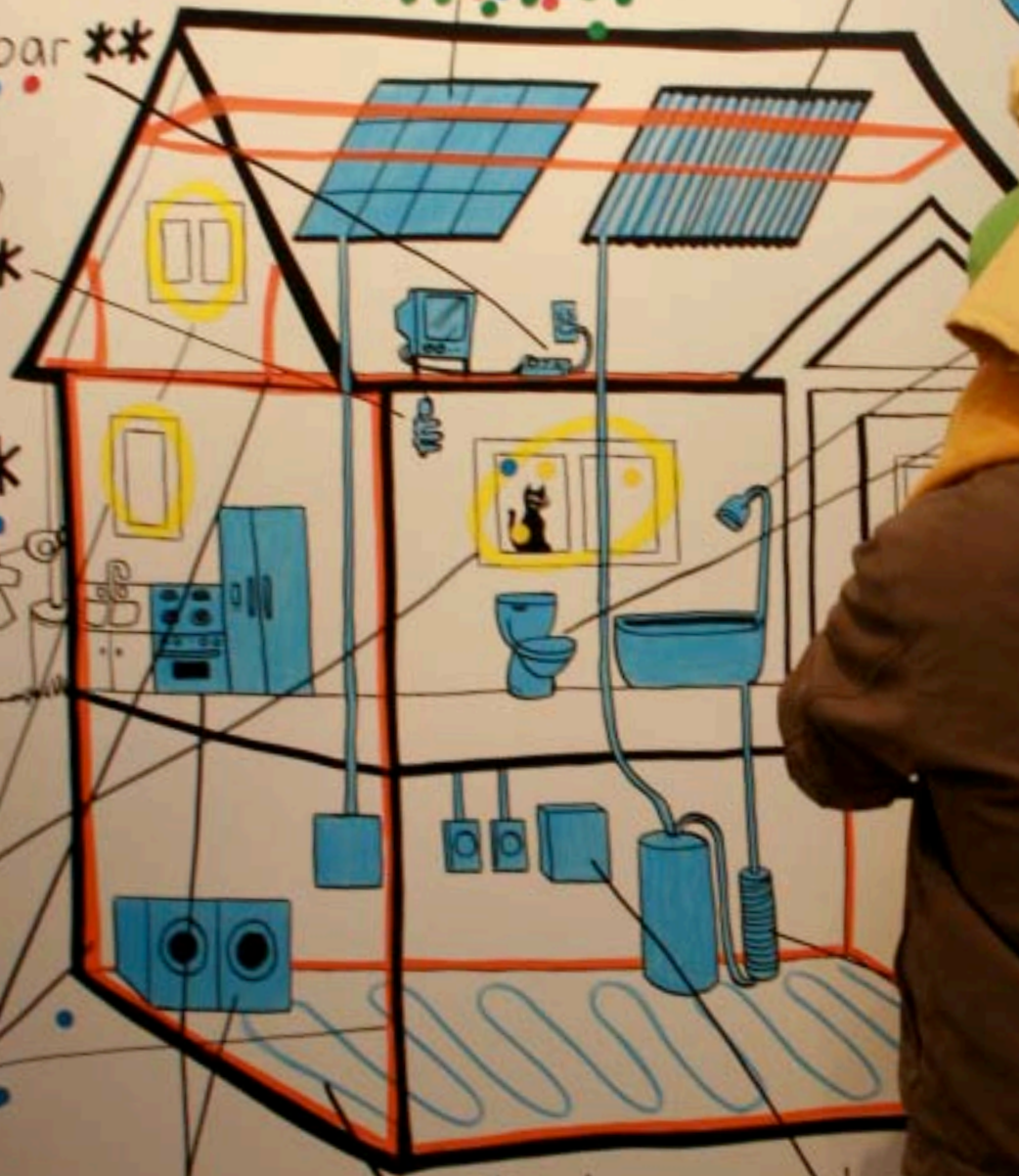
cient  
ws \*\*

on \*\*

energy efficient  
appliances \*\*\*

solar  
photovoltaics  
(electricity) \*\*

solar thermal  
(hot water) \*\*



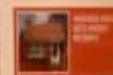
radiant  
floor heating  
\*\*\*

tankless  
water heater \*\*

efficient  
\*\*

er  
very \*\*





Webb's letter and the IRS's letter of audit. He was told a copy of the letter was in a box at the IRS.

[illegible]

See also: *Journal of the American Medical Association*, 1997, 277, 10, 1231-1232.



doi:10.1017/S0022292412001916



Urbanist, Jane Jacobs once said: "New buildings." The hundreds of visitors to the new building are a testament to her

Although the many features of a fine insulation, the solar thermal system, heated radiant floor, and...



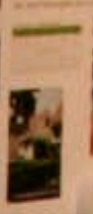
On an  
mild  
day



Full access to extreme network! Free access. No other free access to Energy Conservation Week 2006.

...the way we look at them, we're not looking at them as people, we're looking at them as objects.

...the world of...



SEVEN





What if your house was a Now House?



ARC

ARC

ARC

CYD

I love Paul Robby NG

I am a happy home

Tasha

my house would be full of love

CYD

My House

CYD

Time

**1700 visitors  
in 3 hours**





# **Now House<sup>TM</sup>**

**One small house.**

**One million opportunities.**

Proposal for CMHC's EQUilibrium<sup>TM</sup> Housing Initiative

Solicitation File #: 0981-305

**1**

**Our first Now House**

**5**

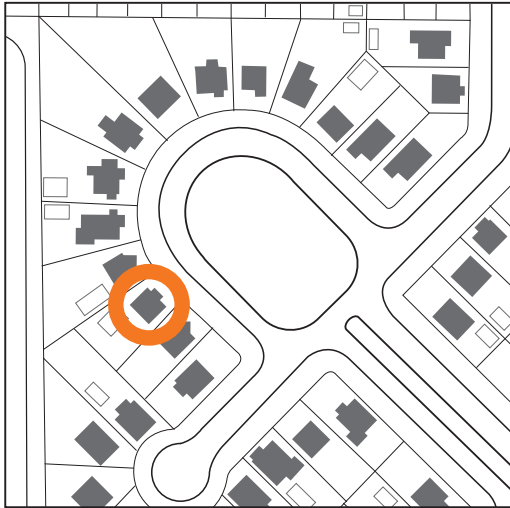
**Now House Windsor 5**

**95**

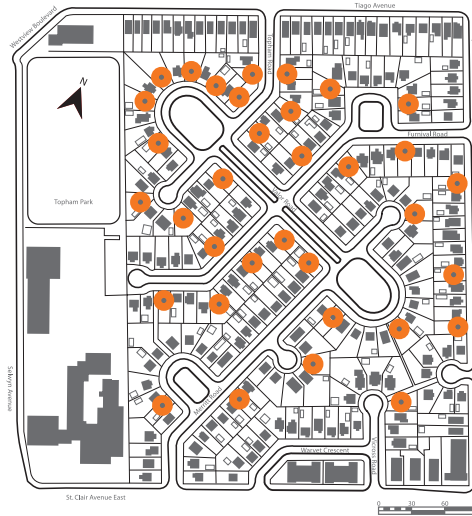
**The Windsor 95**



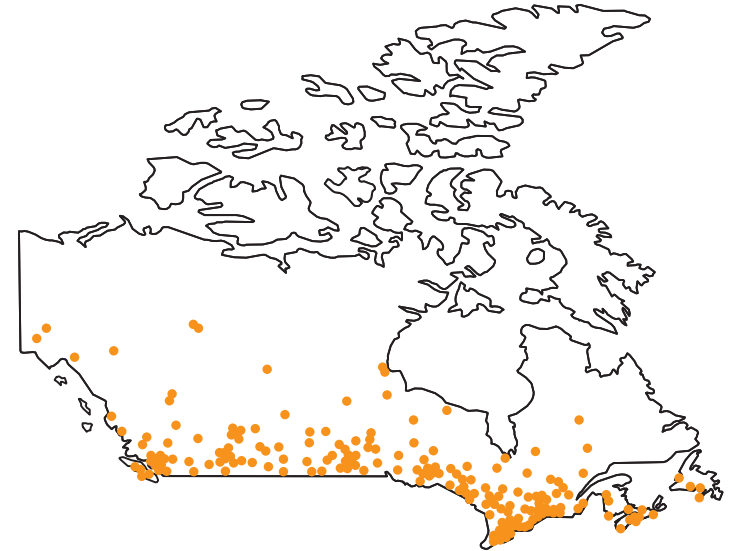
# OUR VISION: ZERO ENERGY HOME RETROFITS



**One house**



**One community**



**One million houses  
across Canada**

**Why...**

**Because reducing home energy use is one of our best opportunities to save energy and meet Canada's GHG emissions targets.**



**In Canada, the residential sector accounts for:**

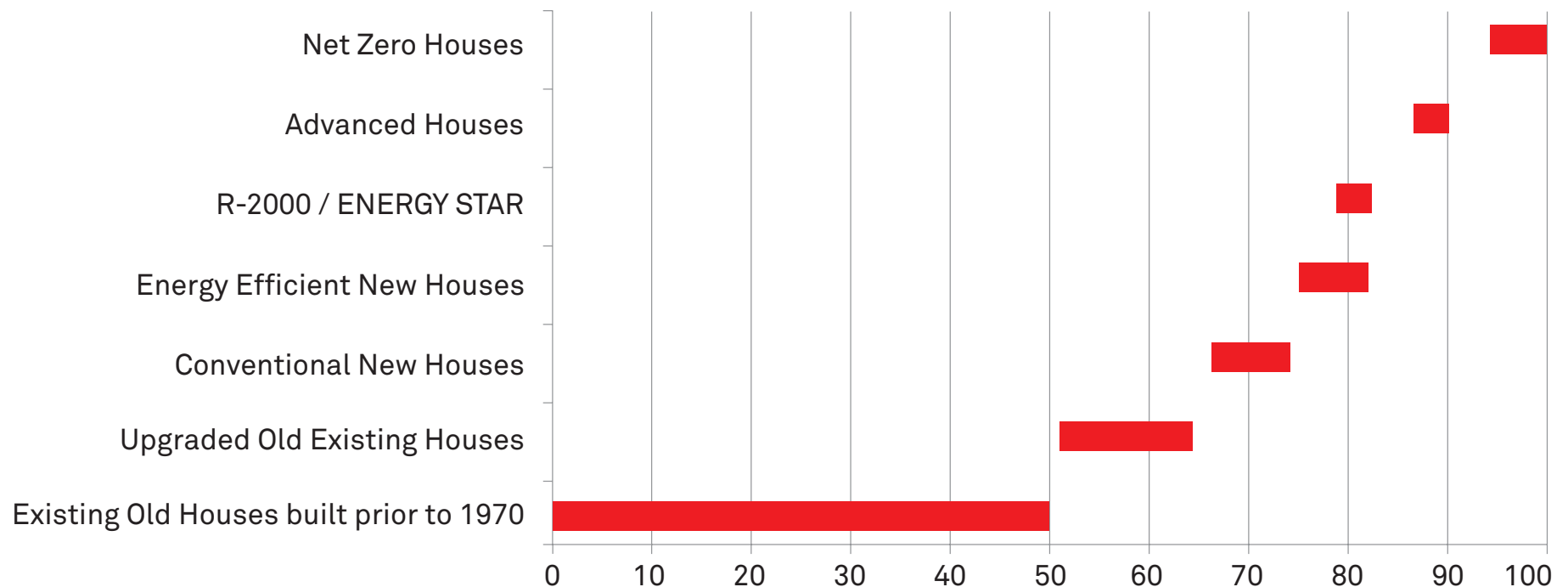
**17%**  
**of energy use**

**15%**  
**of greenhouse gas emissions.**

Source: Natural Resources Canada

# Typical EnerGuide (EGH) Ratings for Homes

## How energy efficient is your home?



Source: Natural Resources Canada.  
EGH = EnerGuide for Houses is a Canadian Standard for home energy efficiency; on a scale of 1–100, higher scores indicate higher efficiency.



**Are new, more energy efficient  
houses the answer?**

# **13 million**

**Number of housing units in Canada**

# **200,000**

**Average number of new houses built in  
Canada annually**

# **65 years**

**Time it would take to replace existing stock.**

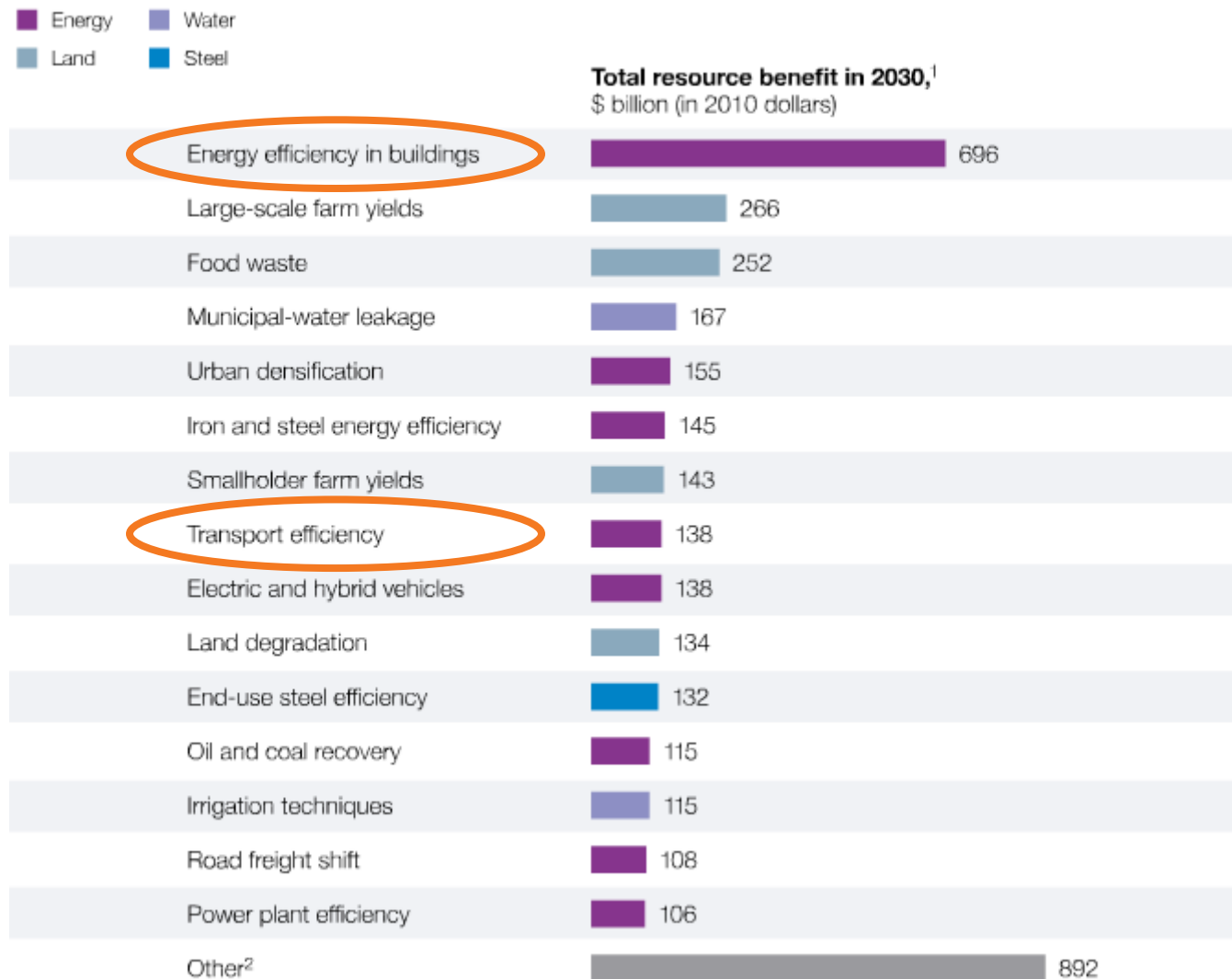


# 66%

**The number of houses that will exist in 2050 that are already standing.**

Source: National Round Table on the Environment and Economy

# Fifteen areas of opportunity represent 75 percent of the resource prize



Source: McKinsey Quarterly; Mobilizing for a resource revolution

**1**

**Our first Now House**

**5**

**Now House Windsor 5**

**95**

**The Windsor 95**

# Competition



Equilibrium Sustainable Housing  
Demonstration Initiative 2007.





We proposed to turn a 60-year-old WWII house into a net zero energy home – one that produces as much energy as it uses.



Why retrofit a wartime house?



During WWII thousands of these houses were built for munitions workers and veterans.



Many more were built after the war.

Today there is an estimated one million wartime houses and post-war bungalows still standing in Canada.





Why retrofit a wartime house?

Scalable: A million similar houses across Canada

Accessible: Make sustainable housing accessible  
to mid and lower income families



Now House is one of 12 winning teams from across Canada in CMHC's competition for the EQuilibrium Sustainable Housing Initiative.

**And the only team doing a zero energy retrofit.**

Equilibrium™  
HEALTHY HOUSING  
FOR A HEALTHY ENVIRONMENT



**GREEN DREAM HOME, Kamloops**



The first Now House.  
Before the retrofit.





## **The Community**

Topham Park, Toronto is a post-war housing community with street names such as 'Warvet' and 'Valor'.

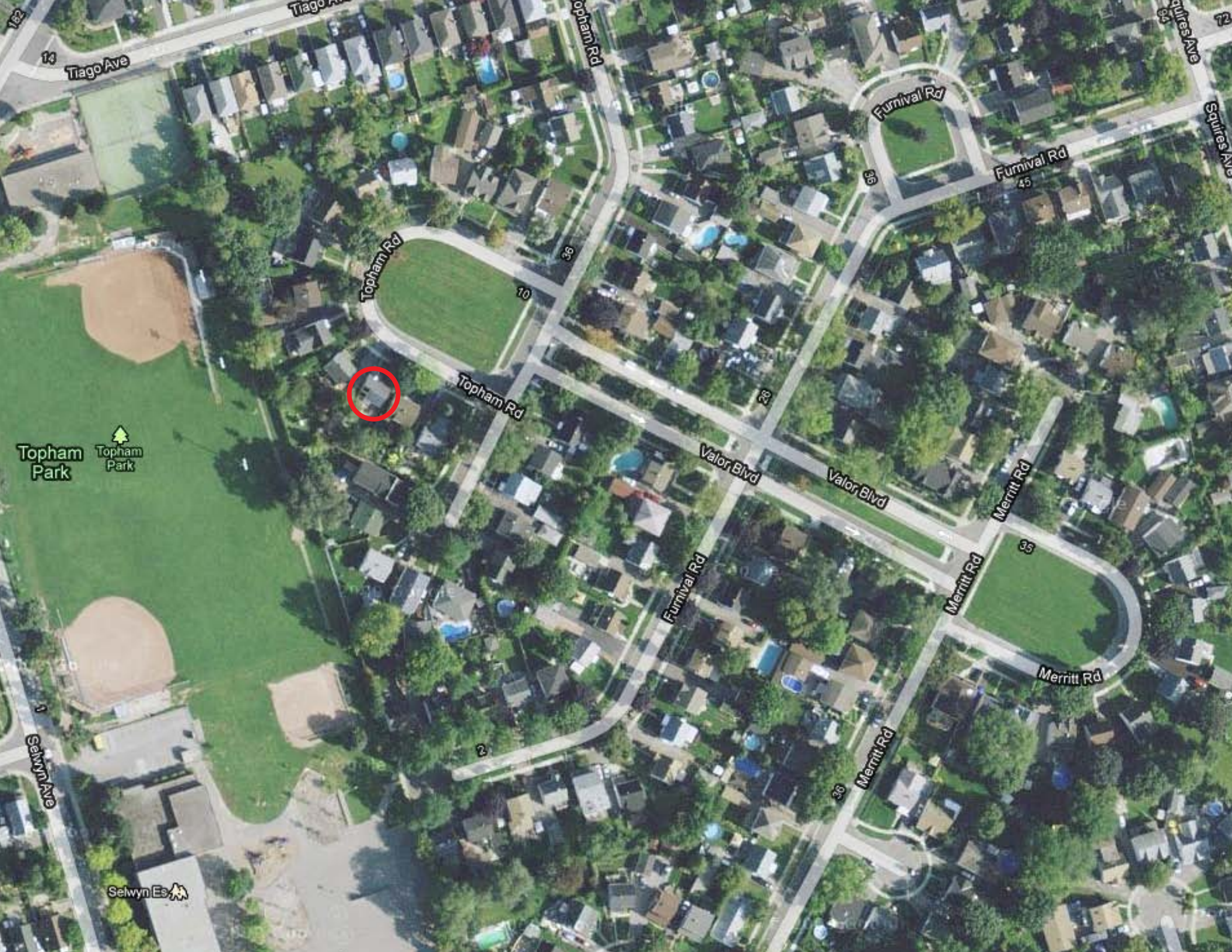
Built in 1946.





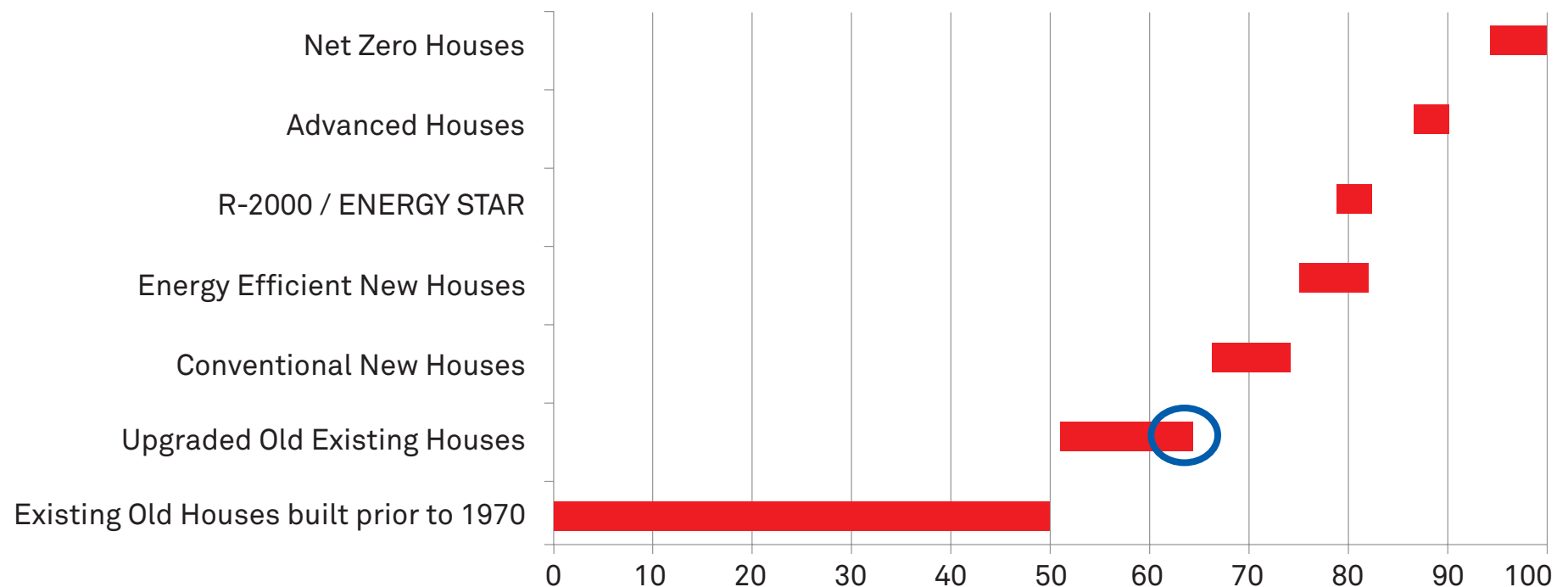
Topham Park, 1946





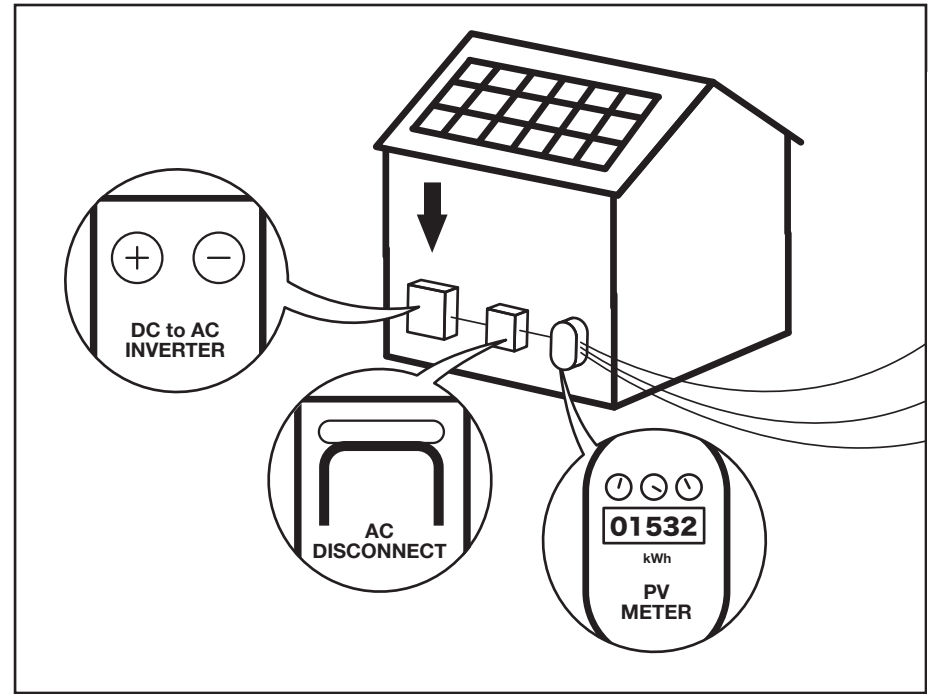


# Typical EnerGuide (EGH) Ratings for Homes



Source: Natural Resources Canada.  
EGH = EnerGuide for Houses is a Canadian Standard for home energy efficiency; on a scale of 1–100, higher scores indicate higher efficiency.

Now House achieved EGH 68 in the “before” energy analysis.



## Now House Design Process

Social/Technical



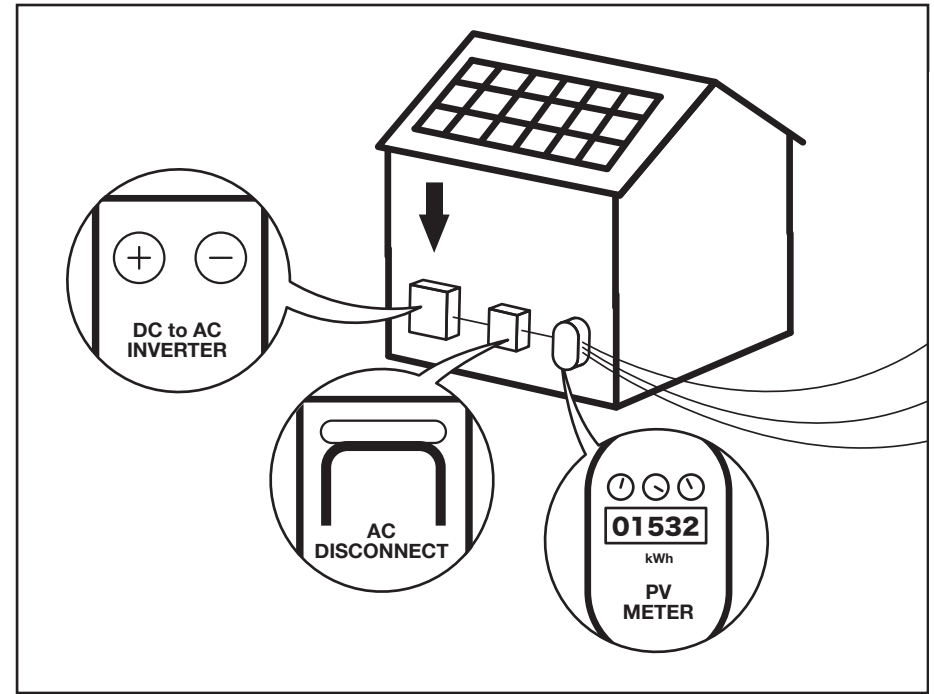
A photograph of a community event on a grassy lawn. In the foreground, a man in a maroon shirt and blue jeans is talking to a woman in a black shirt and white pants. To their left is a green pop-up tent with a table underneath holding pumpkins and other items. In the background, there are more people, another green tent, and a large white tent. Trees with autumn foliage are visible behind the tents. A large white house is partially visible in the distance. In the foreground on the right, there are two large black boards with white chalk drawings of houses and trees. One board has the text "WHAT DO YOU NOT LIKE?" written on it. The word "COMMUNITY" is overlaid in large white letters across the center of the image.

COMMUNITY



A photograph of a man and a woman shaking hands outdoors. The man, on the left, is wearing a dark suit, white shirt, and a blue and orange striped tie. The woman, on the right, is wearing a black blazer and a bright orange scarf. They are both smiling. In the background, there are other people, including a man in a blue hoodie with 'OLD NAVY' on it, and a building with a blue roof. The text 'PARTNERSHIPS & SPONSORSHIPS' is overlaid in the center in white, bold, sans-serif font.

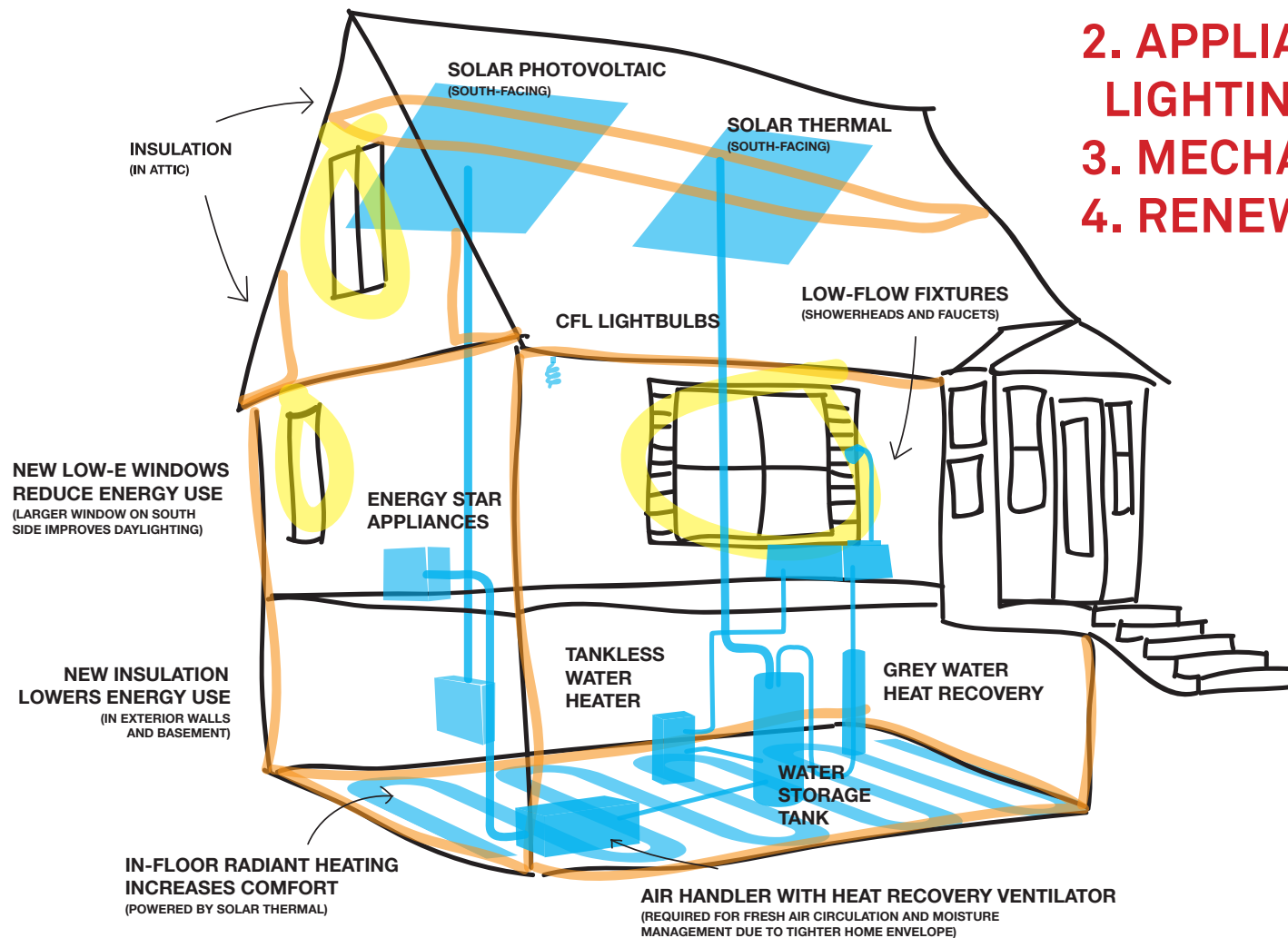
# PARTNERSHIPS & SPONSORSHIPS



# Now House Design Process

## Social/Technical

1. ENVELOPE
2. APPLIANCES,  
LIGHTING, WATER
3. MECHANICALS
4. RENEWABLES



## Now House Retrofit Overview





## 1. IMPROVE ENVELOPE

We waterproofed and insulated the exterior foundation walls.

Insulated the basement floor, and installed radiant floor heating.





## **1. IMPROVE ENVELOPE**

Removed aluminum siding and asbestos siding which was underneath.



## 1. IMPROVE ENVELOPE

Replaced existing windows with fiberglass, double glazed, low-e, ENERGY STAR windows.



## 1. IMPROVE ENVELOPE

Enlarged south facing window to increase light and passive solar gain.





## 1. IMPROVE ENVELOPE

Insulated the exterior walls, roof, and attic with 5.5" of spray foam insulation.



## **2. APPLIANCES, LIGHTING, WATER**

Install Energy Star appliances, CFL lighting and low flow water fixtures.





### **3. IMPROVE MECHANICALS**

Installed a new HVAC system including:  
an air handler with variable speed motor,  
heat recovery ventilator, hot water  
storage tank, tankless water heater.



#### **4. ADD RENEWABLE ENERGY**

Evacuated tube solar thermal collectors produce heat for DHW and heating.



#### **4. ADD RENEWABLE ENERGY**

Installed solar photovoltaic (PV) panels.



Solar thermal system (left) provides heat for domestic hot water, home heating and radiant floor.

Solar PV system (right) is grid connected to local utility which under Ontario's FIT will pay 80 cents/ kWh for 20 years.





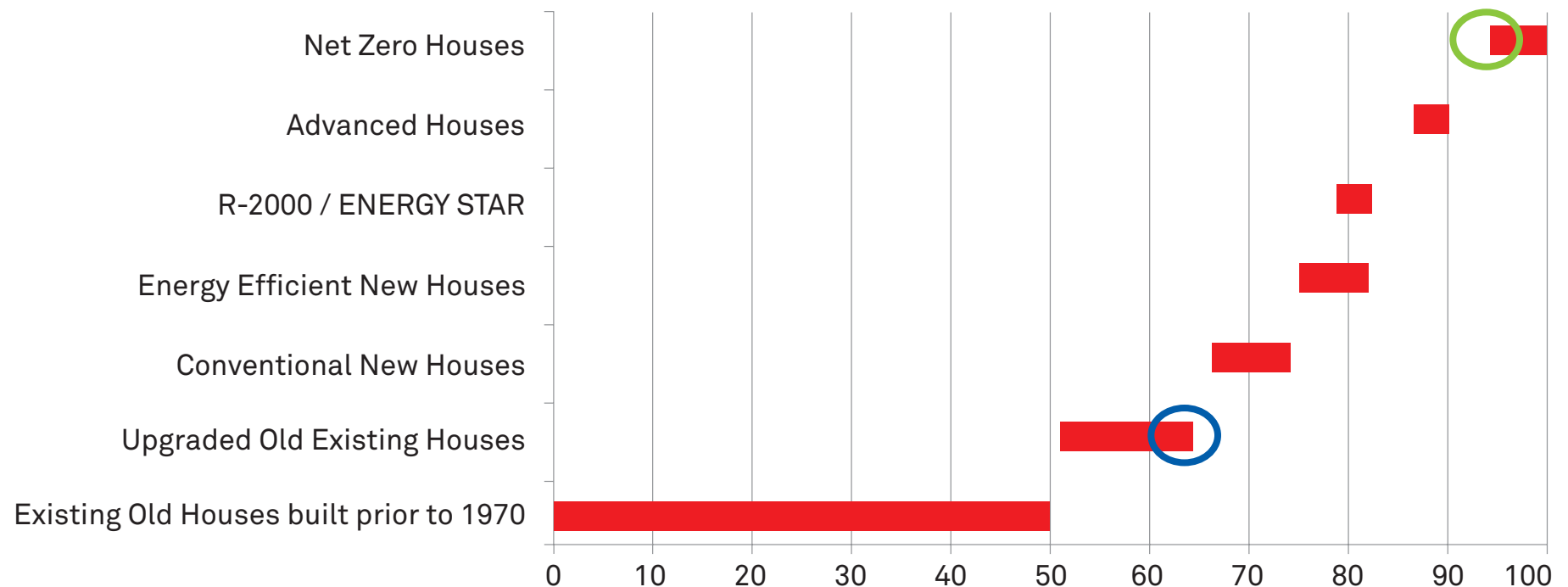
Now House Before



Now House After



# Typical EnerGuide (EGH) Ratings for Homes



Source: Natural Resources Canada.  
EGH = EnerGuide for Houses is a Canadian Standard for home energy efficiency; on a scale of 1–100, higher scores indicate higher efficiency.

Now House achieved EGH 89 and with solar 97.3.



## Project Timeline & Cost:

Partner and sponsor development: 2007

Retrofit: April – September 2008

Cost: \$85,000

Tours: September 2008 – January 2009

CMHC monitoring.



A photograph of an open house event at a mid-construction house. The house has a blue metal roof and exposed wooden framing. A blue pop-up tent is set up on the right, and a striped patio umbrella is in the background. Several people are gathered on the lawn, including a woman in a red jacket in the foreground and a man in a white shirt in the center. The text "MID-CONSTRUCTION OPEN HOUSE" is overlaid in white.

# MID-CONSTRUCTION OPEN HOUSE



# POST-RETROFIT OPEN HOUSE

New ideas need  
old buildings

New House is retrofitting a 60-year-old WWII house, built in 1945, into a near zero energy home – one that will produce almost as much energy as it uses on an annual basis.

New House is one of the 12 winning teams from across Canada in Canada Mortgage and Housing Corporation's (CMHC) Equilibrium Sustainable Housing Demonstration Initiative.

Thank you







A photograph of a family (a woman, a man, and a child) standing in a utility room, looking at a complex solar water heating system. The woman on the left is wearing a black jacket and a large black bag. The man on the right is wearing a blue hoodie. The child in the center is wearing a red hoodie and a red cap. The system features several red pipes, black pipes, and two control units with gauges. Labels on the pipes include "FROM SOLAR TO TANK" and "FROM TANK TO SOLAR". A tank in the background is labeled "EXPANSION TANK". The woman is holding a white cylindrical object with text that includes "How to Retrofit".

# POST-RETROFIT OPEN HOUSE

# SMALL HOUSE = BIG RESULTS

The first Now House achieved these post-retrofit measured results:

68 to 89 - Improved EGH

5.4 tonnes - GHG reduction

79% - gas reduction

35% - electricity reduction

\$2,400 - annual earnings from solar PV

Net zero energy cost.



# NET ZERO ENERGY COST

Now House Annual Energy Cost 2012

Electricity                \$779

Gas                        \$506

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\$1,285

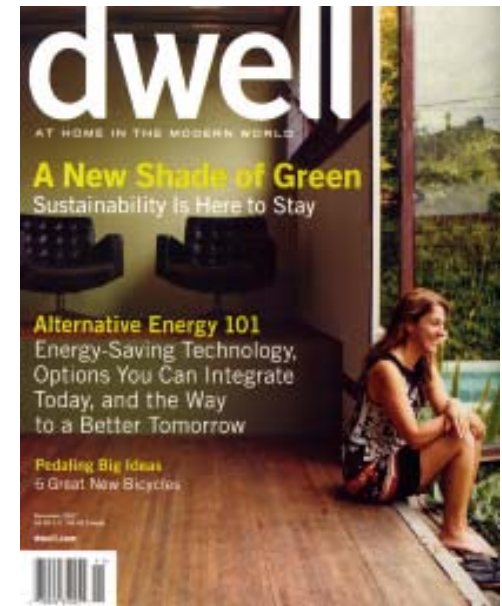
Solar PV Rebate: \$2,396

Net income \$2,396 - \$1,285 = \$1,111

# LESSONS LEARNED

- Tankless water heater failure first winter
- Poor performance from solar thermal energy system
- Higher than expected electricity use from continuous use of HRV fan
- Heating and solar contractor(s) unable to solve solar thermal issues
- Solar PV panels unplugged by mistake.

# LESSONS LEARNED



MEDIA



# Now House®

One small house  
One million opportunities

[About](#)[Our Work](#)[Our Services](#)[Press & Media](#)[News](#)

## Now House Your Home™

Now House wins  
Retrofit Project of  
the year! [Click Here](#)

[Click here](#) to tour the Now  
House Windsor 5 demo  
home.



### Latest News

Now House named Zero Hero

11.12.09

Become a Now House thought leader.  
Click here to join the conversation.

10.22.12

Now House Windsor 5 Schedule of Open  
Houses 2010

10.01.13

Now House Opens Windsor Near Zero  
Energy Home

09.19.27

Do the Watt Watt Tusi

09.05.12

Four houses, four cities four weeks

09.05.12

Now House Wins Green Toronto Award

09.24.24

### Press Coverage

Now House Project promotes idea of  
reducing energy use

HALIFAX CHRONICLE HERALD

Don't knock down that 50-year-old building;  
re-skin it

THE GLOBE AND MAIL REPORT ON BUSINESS

Now House Wins Zerofootprint Award

TREKHUGGER

Now House Windsor 5

WINDSOR CBC NEWS

Energy Star

OTTAWA CITIZEN

Wartime houses get energy refit

THE WINDSOR STAR

Canada's wartime homes go green

BDO AND PRI

We received hundreds of queries  
from across the country

**The major obstacles to NZE retrofits are:**

- > the cost to the homeowner**
- > lack of information**
- > limited expertise in the field.**

**1**

**Our first Now House**

**5**

**Now House Windsor 5**

**95**

**The Windsor 95**





Now House Windsor 5

Now House and Windsor Essex  
Community Housing Corporation

An opportunity to solve the cost problem

# PARTNERSHIPS

## Project Partners



## Sponsors





## House Windsor 5

Community Housing Corporation teamed up with the Windsor Housing Project to bring sustainable retrofit practices to older war-time homes in their portfolio.



House Windsor 5 will test five different energy reduction measures for potential application to 625 Windsor. Essex Community Housing Corporation war-time homes. Expected completion: Fall 2020.

## Energy Conservation Week

Four houses, four cities, four weeks.



The Essex Housing Project team conducted energy conservation audits on four houses belonging to Community Housing Corporation in four cities for conservation.

## Now House Your Home

43 Steps to New 5th Energy



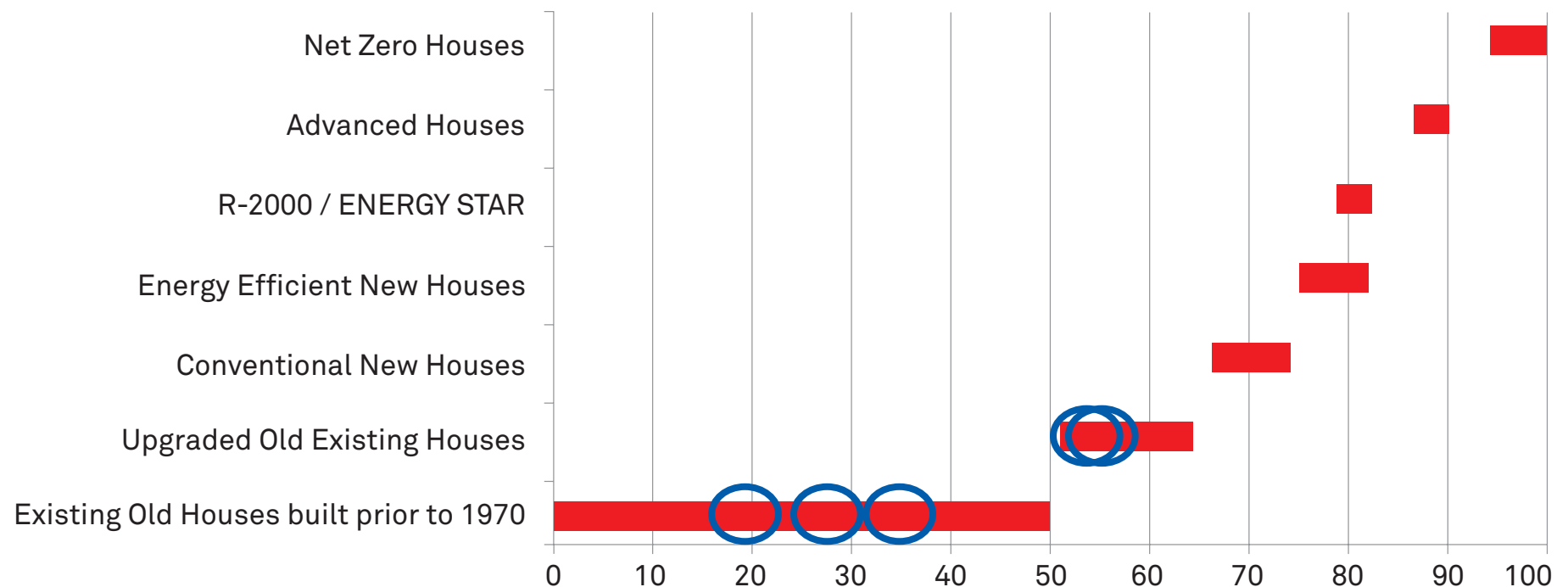
# RESIDENT EDUCATION



# COMMUNITY OUTREACH



# Typical EnerGuide (EGH) Ratings for Homes

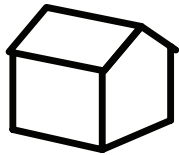


Source: Natural Resources Canada.  
EGH = EnerGuide for Houses is a Canadian Standard for home energy efficiency; on a scale of 1–100, higher scores indicate higher efficiency.

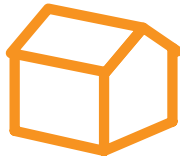
Now House Windsor 5 EGH before retrofit.

## Technical Models

### Windsor 5 Status Quo Average



### Now House Base Model



#### What's in it?

Air seal and insulation  
Condensing furnace EF=94%  
Hot water EF=86%

Dual flush toilet  
HRV  
CFL light bulbs

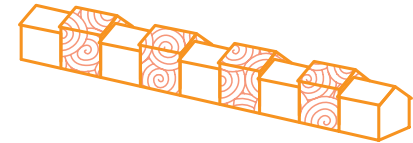
### Now House Near Zero Energy Model



#### What's in it?

All base model changes  
Low E Windows  
2 kW solar photo-voltaic system  
2 panel solar thermal system

### Now House Windsor 9



#### What's is it?

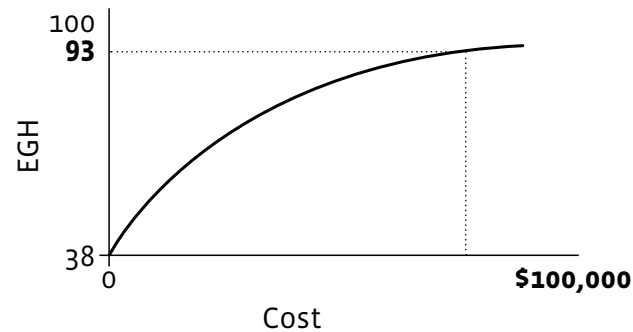
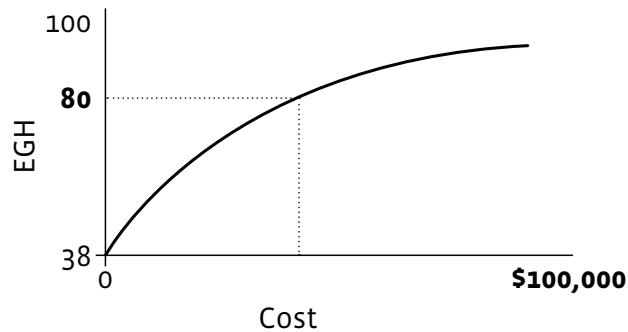
A 9 family multi-unit building created by filling in between the 5 current homes.

#### What are the benefits?

- > Centralized mechanical and power production system
- > Eligible for extra grants
- > More rental units
- > The "fill-in" house can be attached to other homes, increasing them to net zero Now Houses.

#### What are the issues?

- > By-laws
- > Timeliness





# Now House Windsor 5: Testing 5 different approaches to deep energy reduction and zero energy to determine best approach for 95 similar house in WECHC portfolio.



## MODEL ONE

- > Base Model +
- > High efficiency hydronic heating system
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator

## MODEL TWO

- > Base Model +
- > High efficiency forced air gas furnace
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator
- > 2.1 kW solar photovoltaic system

## MODEL THREE

- > Base Model +
- > High efficiency hydronic heating system
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator
- > New energy efficient windows
- > Solar thermal system
- > 2.1 kW solar photovoltaic system

## MODEL FOUR

- > Base Model +
- > High efficiency forced air gas furnace
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator

## MODEL FIVE

- > Base Model only

# **Now House Windsor 5**

## **Base model consisted of:**

- › Air sealing and insulation
- › CFL lighting
- › Low flow fixtures (shower head, toilet, aerators)
- › ENERGY STAR refrigerator, front-loading washer
- › Gas range and dryer.



## **INSULATION FROM INSIDE**

- Exterior walls, cavity fill insulation
- Spray foam in basement and attic



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## MODEL FIVE

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# Now House Windsor 5 EGH rating before and after retrofit

	Before	After
Model One:	18	77
Model Two:	35	79
Model Three:	28	79
Model Four:	55	81
Model Five:	55	74

New ENERGY STAR houses = EGH 80



A photograph of a two-story house with a brown shingled roof and tan horizontal siding. Several solar panels are mounted on the roof. A large evergreen tree stands in the foreground, partially obscuring the house. The house has white-trimmed windows and a white front door. A black metal railing is on the steps leading to the door. The yard is green with some landscaping rocks and plants. The text "NOW HOUSE WINDSOR 5" is overlaid in the center.

NOW HOUSE WINDSOR 5





CELEBRATION



# DEMONSTRATION





## tilation

ing and cooling  
was greatly reduced  
to determine the size

referred to as a clean air  
includes a built-in heat recovery  
unit. The purpose of the  
unit is to pre-heat the incoming  
air by using the heat from the  
exhaust air. This helps to reduce  
the energy needed to heat the  
house in the winter months. The  
unit is also designed to ensure  
that the air is clean and free  
of contaminants.

high electricity demand from  
the air conditioning system  
conditioners, a high-efficiency  
air conditioner, a high-efficiency  
air conditioner, a high-efficiency  
air conditioner.



air conditioning system  
and central air conditioning



Photo: Solar Energy International

## Solar Energy

To achieve net-zero energy use, as we try to do on these House  
retrofits, the house has to become an energy producer, not  
just an energy user. The definition of net-zero energy use is  
a home that produces as much energy as it uses on an  
annual basis. To do that requires the use of a renewable  
energy source. In our case, we used the sun.

### Solar thermal system for home heating and hot water

We installed a solar thermal system in addition to the hot  
water tank. The solar thermal system  
uses a collector to heat the water. The  
collector is a flat plate collector that  
uses a glass cover to trap the heat from  
the sun. The water is heated by the  
collector and then circulates through  
the house to heat the water tank and  
the radiators.

We also installed a solar thermal system  
to heat the water tank. The solar thermal  
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Photo: Solar Energy International



Photo: Solar Energy International



### Windows, Doors, and Exterior Siding

The three types of windows that we used in this house are  
double-pane windows. Double-pane windows have two layers of  
glass, with a space between them that is filled with a gas that  
helps to insulate the house. This helps to reduce the amount of  
heat that escapes from the house in the winter and the amount of  
heat that enters the house in the summer.

### Appliances, Lighting, and Water Use

We installed energy-efficient appliances, including a refrigerator,  
dishwasher, and washing machine. We also installed energy-efficient  
lighting, including compact fluorescent lights (CFLs) and light-emitting  
diode (LED) lights. We also installed a low-flow showerhead and  
a low-flow toilet to reduce water use.

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We installed energy-efficient appliances, including a refrigerator,  
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USER FRIENDLY







The image shows two men in a workshop or lab setting. They are standing in front of a large wooden panel that serves as a control interface. On the left, there is a white digital display unit with a screen and several buttons. To its right, there are two large, black, vertical touchscreens mounted on the panel. The man on the left, wearing glasses and a dark jacket, is pointing at the rightmost touchscreen. The man on the right, wearing a brown leather jacket, is looking at the same screen. A bundle of black cables is connected to the bottom of the touchscreens. The background shows a window and some other equipment.

HIGH TECH HIGH TOUCH



## time houses in Canada

time houses in Canada



# HISTORY





# LOCAL GREEN JOBS



Without Related Other Charges	M 5			M 4			M 3			M 2			M 1		
	KWH	Cost		KWH	Cost		KWH	Cost		KWH	Cost		KWH	Cost	
		Inc. GST			Inc. GST			Inc. GST			Inc. GST			Inc. GST	
Electric															
Aug-08	991.210		\$55.73	914.320		\$50.97	1,461.870		\$ 84.89	1,085.760		\$ 61.59	792.760		\$ 43.44
Sep-08	1,128.350		\$64.23	703.400		\$37.91	1,229.140		\$ 70.48	890.420		\$ 49.49	697.170		\$ 40.30
Oct-08	889.380		\$49.42	152.730		\$8.02	807.300		\$ 44.34	523.660		\$ 27.49	568.330		\$ 29.84
Nov-08	853.020		\$47.67	162.080		\$8.68	696.130		\$ 38.05	385.470		\$ 20.64	650.410		\$ 35.22
Dec-08	983.930		\$57.86	199.490		\$11.73	734.570		\$ 43.20	413.520		\$ 24.32	675.350		\$ 39.71
Jan-09	1,437.980		\$88.69	280.530		\$16.50	949.650		\$ 55.84	599.500		\$ 35.25	868.600		\$ 51.07
Feb-09	1,277.970		\$77.77	249.360		\$14.66	887.310		\$ 52.17	481.060		\$ 28.29	800.030		\$ 47.04
Mar-09	1,108.610		\$66.21	238.970		\$14.05	732.500		\$ 43.07	415.600		\$ 24.43	662.880		\$ 38.98
Apr-09	998.480		\$58.71	355.340		\$20.90	732.500		\$ 43.07	403.130		\$ 23.71	681.580		\$ 40.08
May-09	276.360		\$16.32	282.600		\$16.68	725.190		\$ 43.10	253.510		\$ 14.97	701.290		\$ 41.64
Jun-09	693.180		\$42.37	256.310		\$15.34	655.830		\$ 39.77	183.670		\$ 10.99	524.040		\$ 31.36
Jul-09	805.260		\$50.14	45.660		\$2.73	33.210		\$ 1.98	161.880		\$ 9.69	128.670		\$ 7.70
Aug-09	979.590		\$62.21	99.620		\$5.96	194.050		\$ 11.61	102.730		\$ 6.15	132.830		\$ 7.95
Sep-09	988.930		\$55.99	112.070		\$6.71	194.050		\$ 11.61	227.260		\$ 13.60	233.480		\$ 13.98
Oct-09	896.570		\$56.46	254.240		\$15.21	269.800		\$ 16.15	314.420		\$ 18.82	394.330		\$ 23.60
Nov-09															
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Feb-10															
Mar-10															
Apr-10															
May-10															
Jun-10															
Jul-10															
Aug-10															

Monitoring for 12 months post-retrofit

# Now House Windsor 5

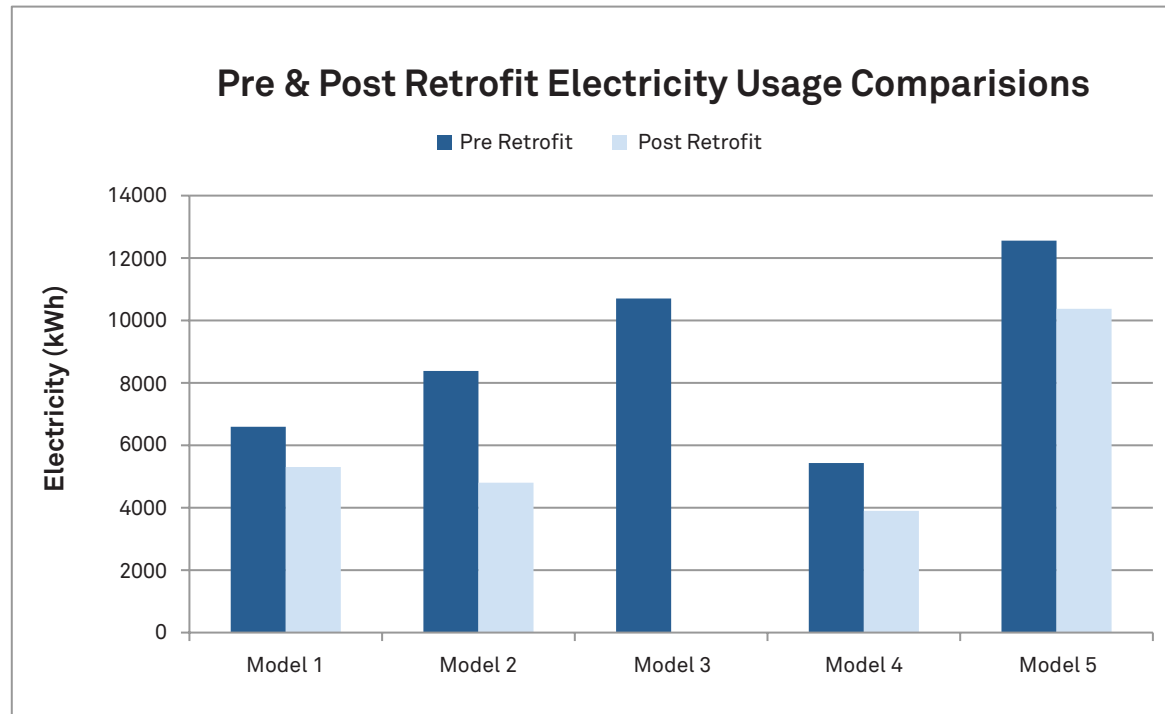
## 12-Month Resource Analysis

Compares the pre-retrofit period of November 2007–October 2008  
to the same post retrofit period of 2009/10.

Model	Electrical Reduction	Gas Reduction	Water Reduction
1	19.5%	43.2%	52.2%
2	42.7%	60.1%	63.8%
3	–	–	–
4	28.2%	55.6%	-17%#
5	17.4%	47.9%	27.7%

# Negative value represents an increase in usage. Model 3 was unoccupied during monitoring period.

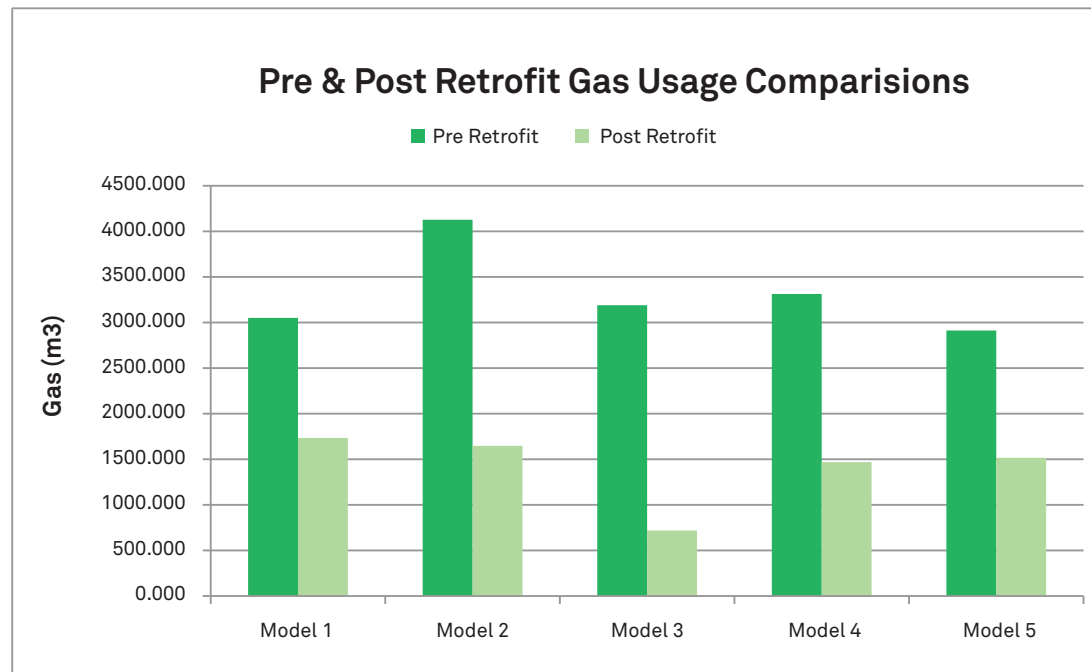
# Now House Windsor 5



Electricity savings ranged from 17% to 42%. The addition of solar PV to Models 2 and 3 will result in zero energy cost on an annual basis.

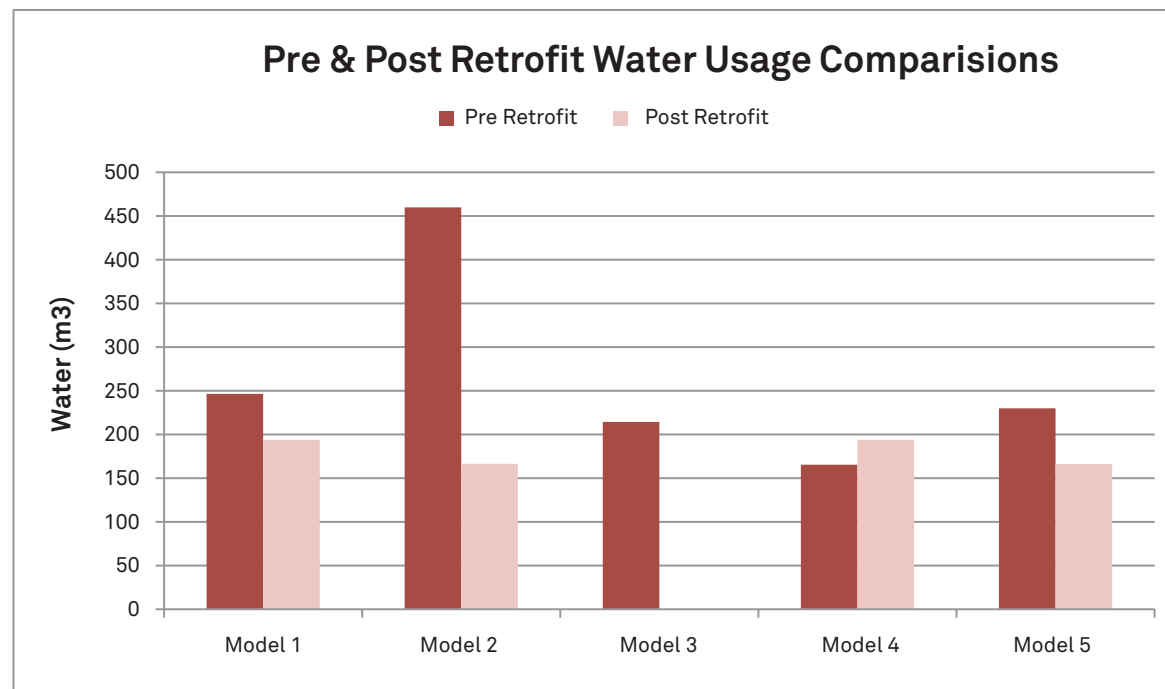


# Now House Windsor 5



Gas savings ranged from 43% to 60%.

# Now House Windsor 5



Water savings ranged from -17% to 63%.

# Now House Windsor 5: Testing 5 different approaches to deep energy reduction and zero energy to determine best approach for 95 similar houses in WECHC portfolio.



## MODEL ONE

- > Base Model +
- > High efficiency hydronic heating system
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator

Cost: \$41,000

EGH Before **18**  
EGH After **77**

## MODEL TWO

- > Base Model +
- > High efficiency forced air gas furnace
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator
- > 2.1 kW solar photovoltaic system

Cost: \$66,000

EGH Before **35**  
EGH After **79**

## MODEL THREE

- > Base Model +
- > High efficiency hydronic heating system
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator
- > New energy efficient windows
- > Solar thermal system
- > 2.1 kW solar photovoltaic system

Cost: \$80,000

EGH Before **28**  
EGH After **79**

## MODEL FOUR

- > Base Model +
- > High efficiency forced air gas furnace
- > Tankless water heater
- > High efficiency central A/C
- > Heat Recovery Ventilator

Cost: \$41,000

EGH Before **55**  
EGH After **81**

## MODEL FIVE

- > Base Model only

Cost: \$31,000

EGH Before **55**  
EGH After **74**

Model 3 unoccupied during monitoring period



# MODEL 2 MOST COST EFFECTIVE

Factors measured:

- › EGH Improved
- › Operating costs saved
- › Energy saved
- › CO2 emissions reduced.

# LESSONS LEARNED

- Economies of scale are possible with even five houses
- Control of the construction schedule is key to keeping the cost down
- West facing solar performed better vs both sides
- Engaging utility partners reduces roadblocks
- Hiring qualified local trades is possible.



Now House Windsor 5 was a success for the community and the WECHC who proceeded with the retrofit of 95 homes.



**1**

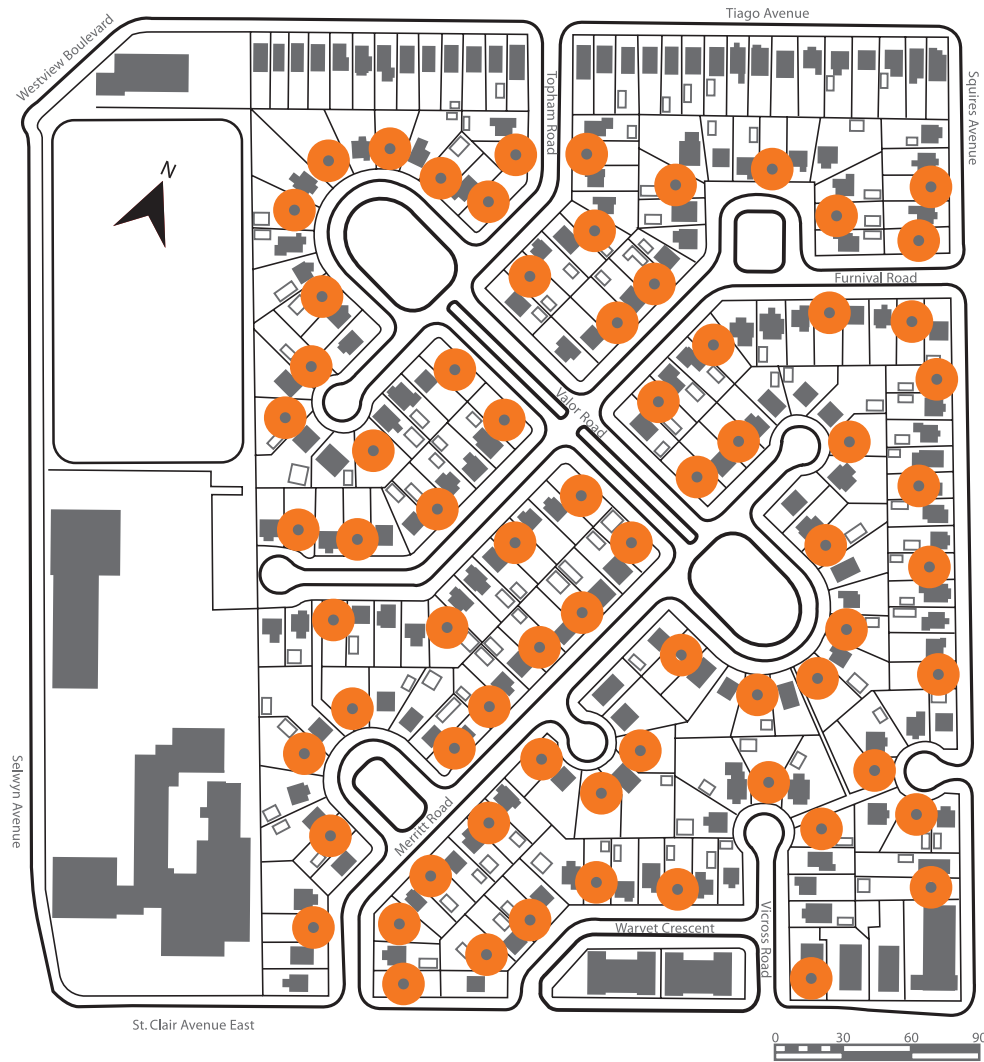
**Our first Now House**

**5**

**Now House Windsor 5**

**95**

**The Windsor 95**



**MODIFIED MODEL 2 APPLIED TO 95 HOUSES**

## **MODIFIED MODEL 2**

Retrofits included:

- › Exterior wall insulation
- › Basement wall insulation
- › Furnace replacement
- › Windows and doors.

Achieved an average of 48% EGH improvement.



## **LESSONS LEARNED**

An integrated package of technologies:

- › Can be applied in the same way
- › To similar houses
- › Simplifying the “know-how” issue
- › Achieving economies of scale.

## LESSONS LEARNED

Retrofits are affordable at a community scale:

2008 – Now House proof-of-concept house \$85K

2010 – Now House Windsor 5 Model 2 \$66K

2011 – Modified Model 2 applied to 95 similar homes in Windsor \$10.7K. (+ solar).

# **WINDSOR 95**

**Demonstrated that cost and knowledge barriers can be addressed with a multi-home, single-payer (housing agency) business model.**



**Is there a business model that would work in a multi-home, multi-payer context such as a community-scale retrofit project including dozens of homeowners?**

**What would it take to succeed?**



## **LEADERSHIP**

A catalyst to bring one of  
these projects into being...

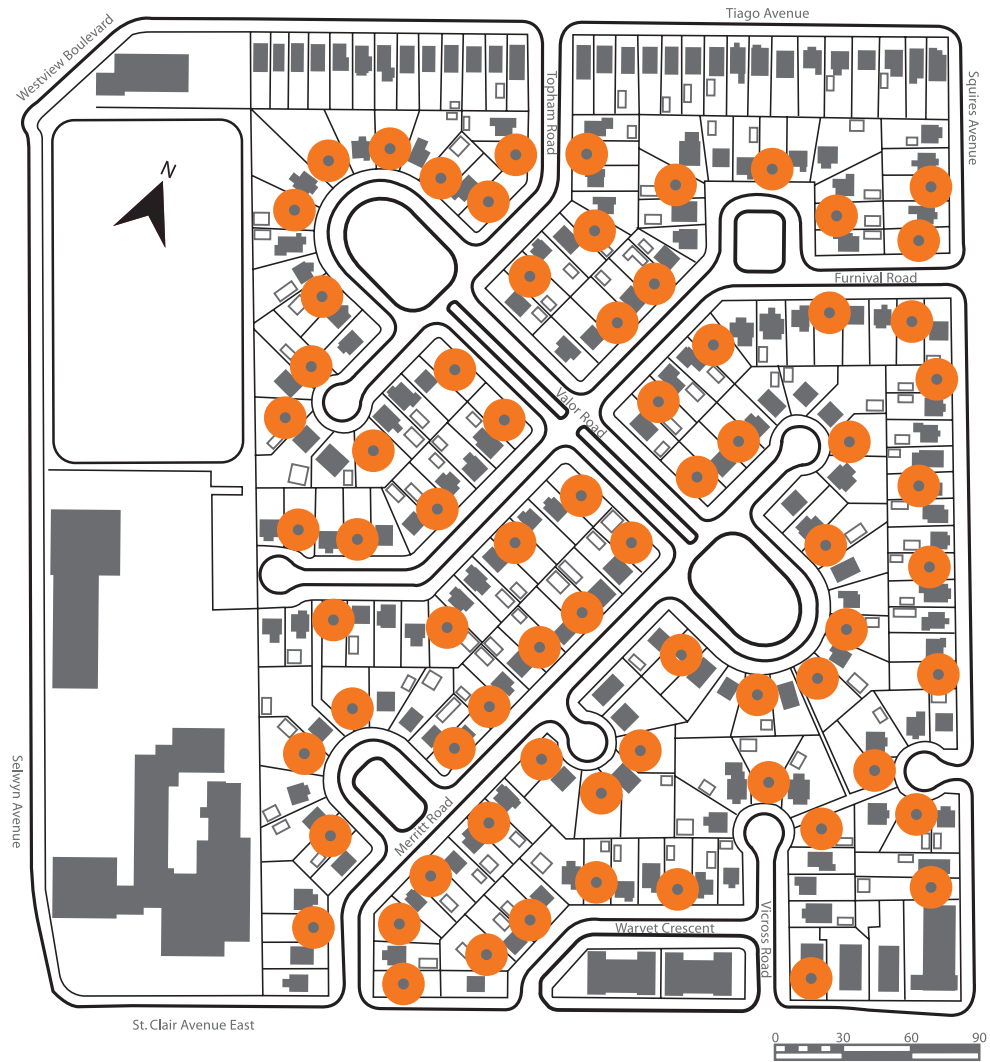
From builders, communities, homeowners,  
municipalities, utilities.





## **WILLING PARTNERS**

A coalition of homeowners, municipal government, builders, utilities, distributors/retailers, academics, regulators and financial institutions.

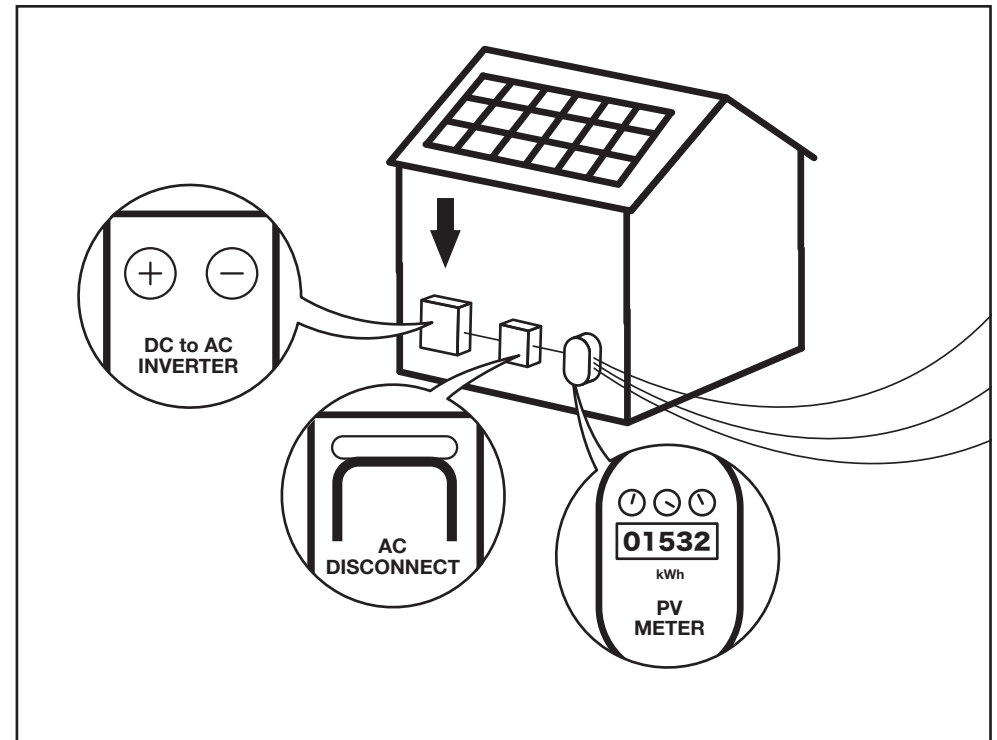
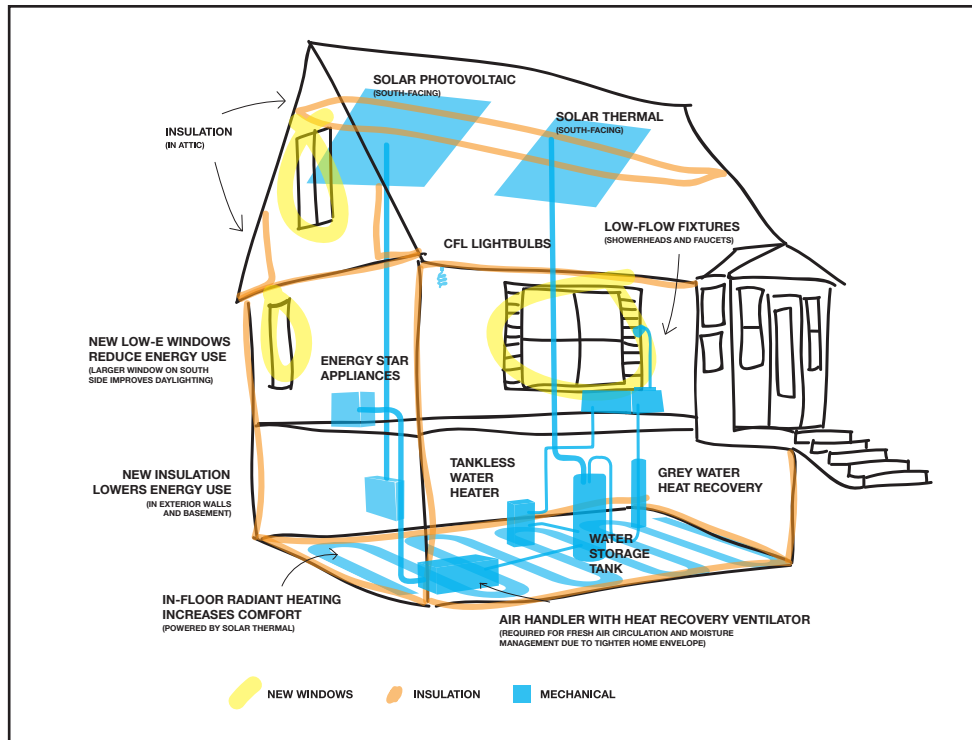


## GROUPINGS OF SIMILAR HOUSES



A photograph of a two-story house undergoing renovation. The roof is covered in corrugated metal. The front porch has white trim and a small gabled roof. The side of the house is exposed wooden siding with large white 'X' marks painted on it. A window with a green frame is visible on the upper floor. A black trash can is in the foreground. The text 'IN CONCLUSION...' is overlaid in the center.

IN CONCLUSION...

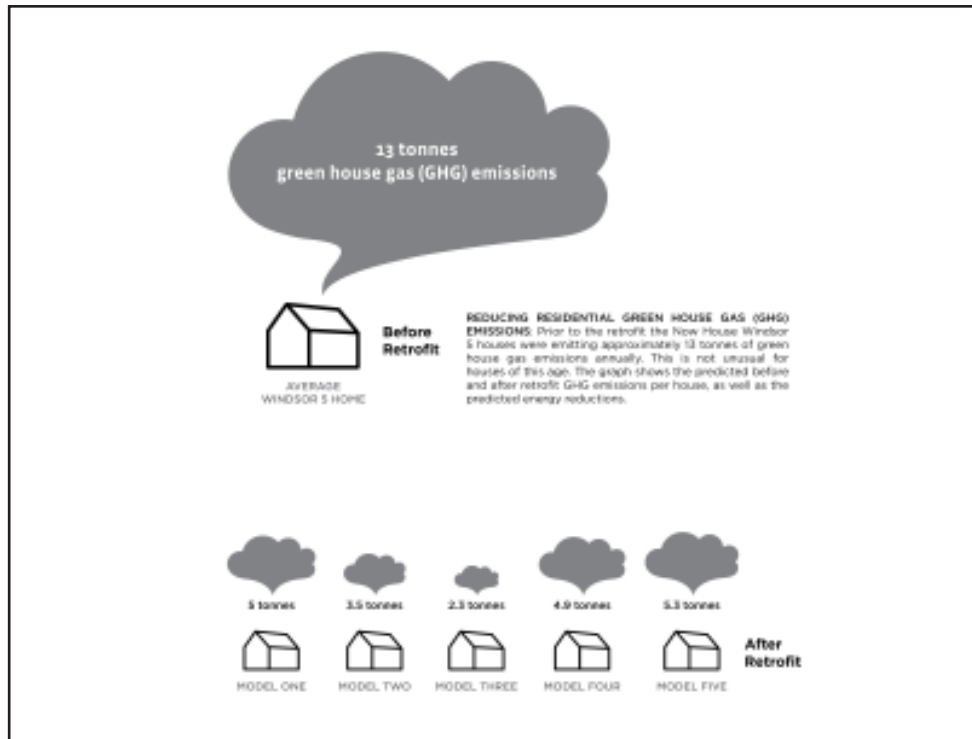


We started this journey  
thinking we had  
a technical problem.





**Turns out we have a business and social engineering problem.**



# SOLVING THIS CAN HELP US ALL

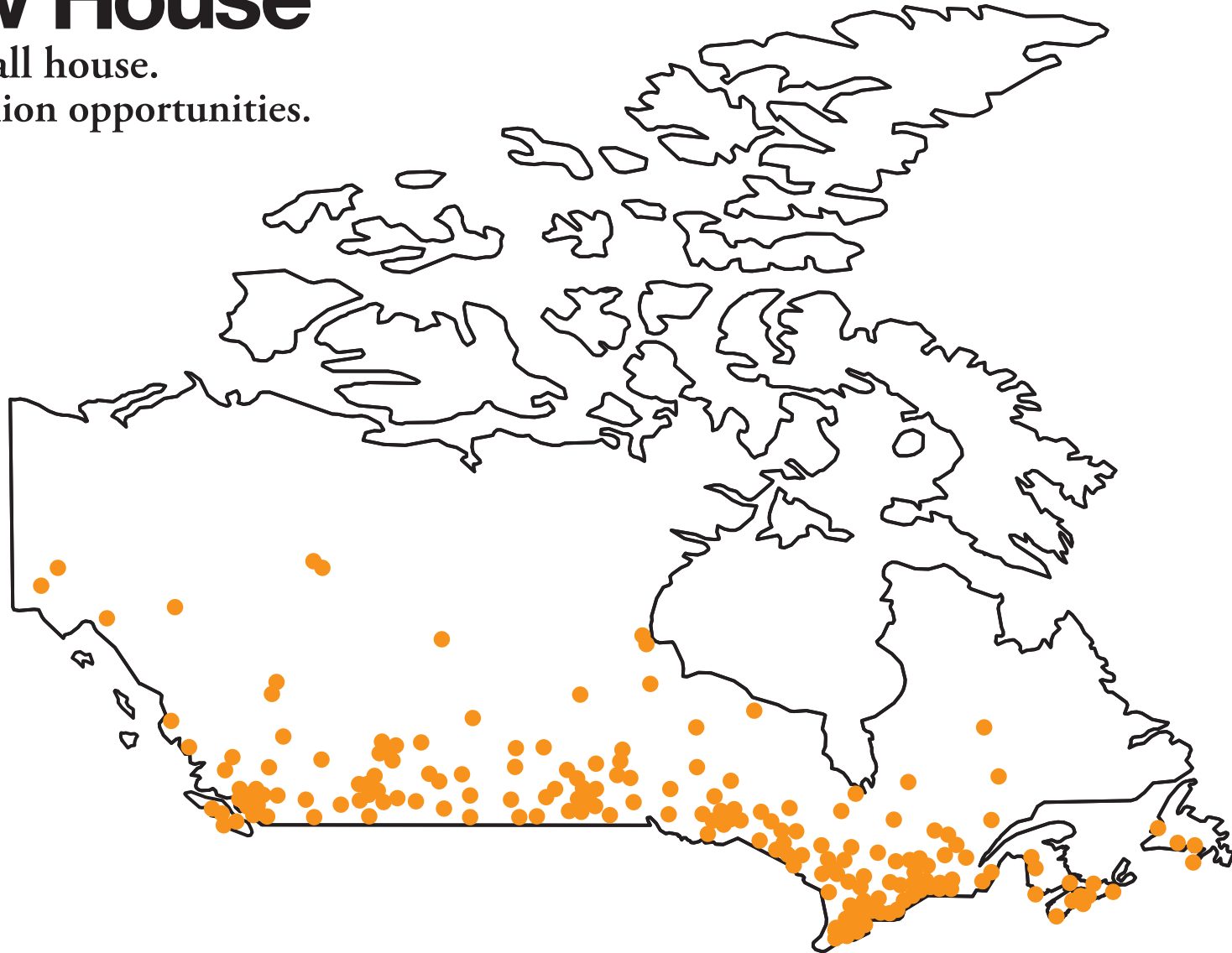
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