



Realtor Energy Efficiency Toolkit

June 10, 2019

Introduction Overview and Objectives



Introduction



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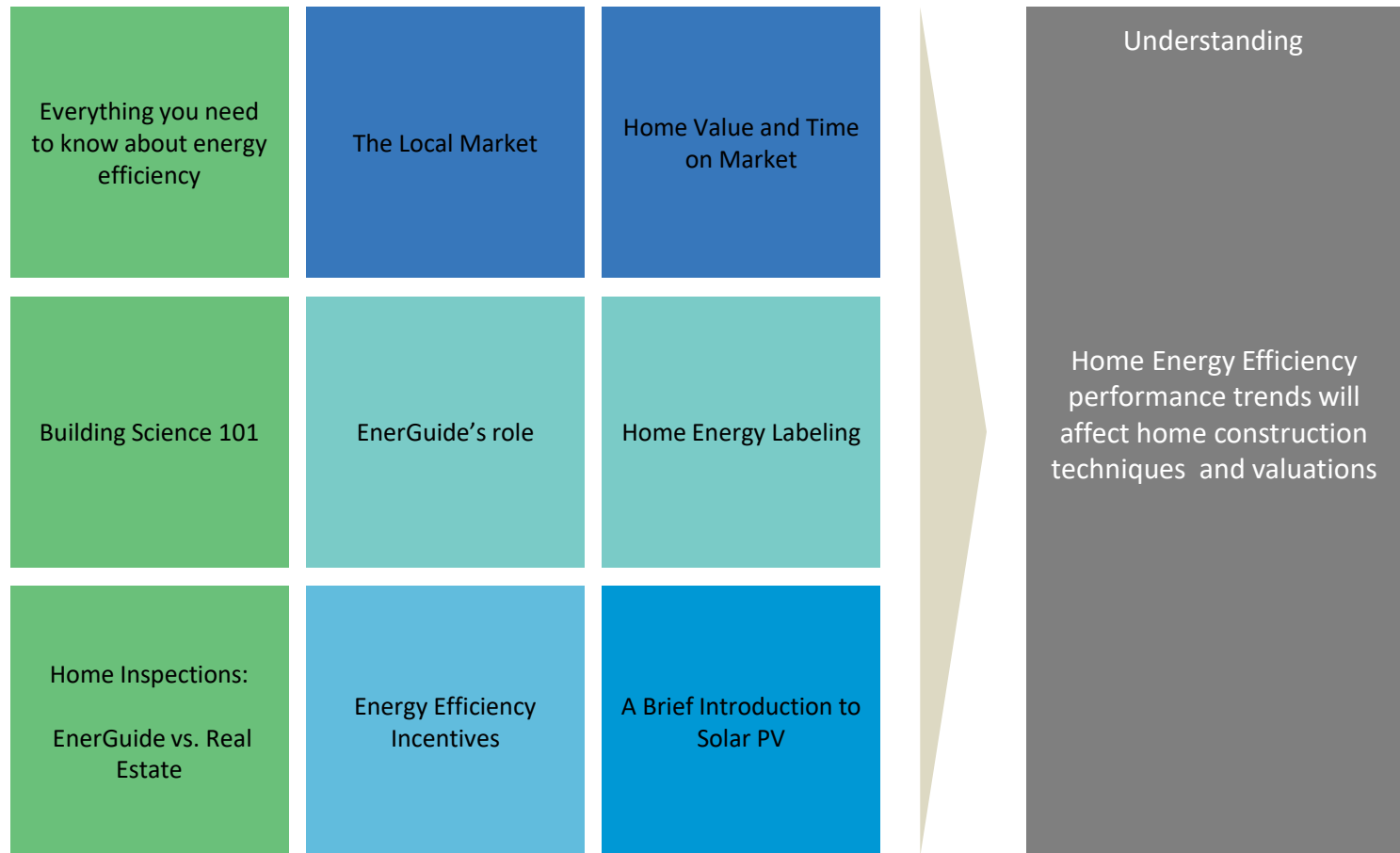
Director, Strategic Partnerships, Enervision



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Overview

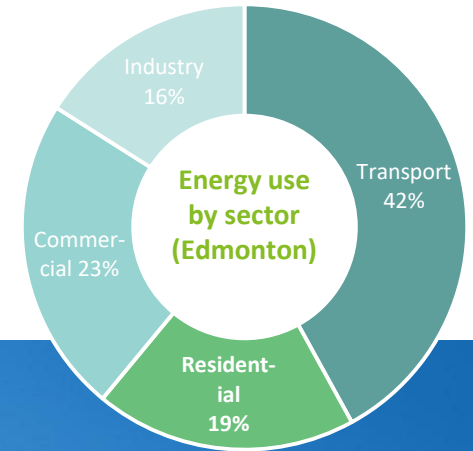


Overview

Our homes have a significant impact on the city's long-term sustainability and we are in a position to guide the change

73% of Edmontonians
believe we need to take action on Climate Change

**CHANGE
FOR
CLIMATE**



**CHANGE
HOMES
FOR
CLIMATE**

19%
of GHG emissions from
residential properties

Realtors are in a unique position to influence the perception of energy efficiency among the general public as they are viewed as trusted advisors

Everything you need to know about Energy Efficiency

CHANGE FOR CLIMATE

Background

*Why are we
doing this?*

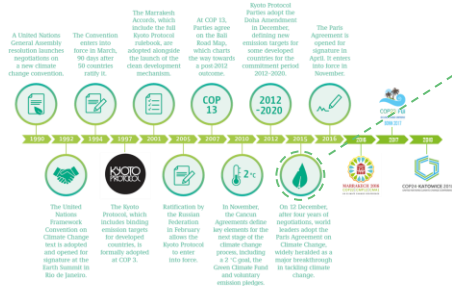
Background

Climate change is the defining challenge of our time and global commitments have been made on the world stage



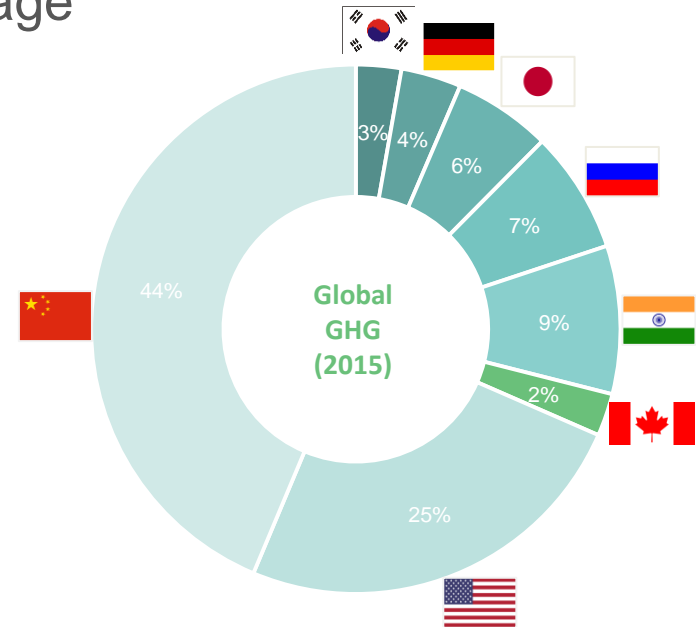
United Nations
Framework Convention on
Climate Change

Over 26 years of development



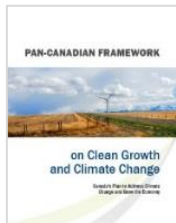
**Signed by
194 states
and the EU**

Temperature goal
Limit the global rise to as
close as possible to 1.5 °C.



Natural Resources Canada Ressources naturelles Canada

Canada



2030
30% reduction of GHG emissions
below 2005 levels

Build Smart
Canada's Buildings Strategy
A Key Driver of the Pan-Canadian Framework
on Clean Growth and Climate Change



2019
Mandatory energy
use labelling and
disclosure for
existing buildings

2022
National model
codes for new and
existing homes
(inc Net Zero
Energy Ready)

2030
Net Zero Energy
Ready Adoption



\$2B
Low Carbon Economy Fund

\$150M
Alberta

\$21.9B
Green Infrastructure

\$182M
Home energy efficiency

\$82.5M
Existing retrofit
\$99M
NZR codes and R&D

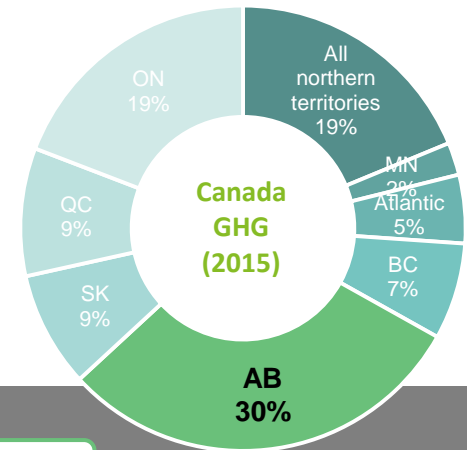
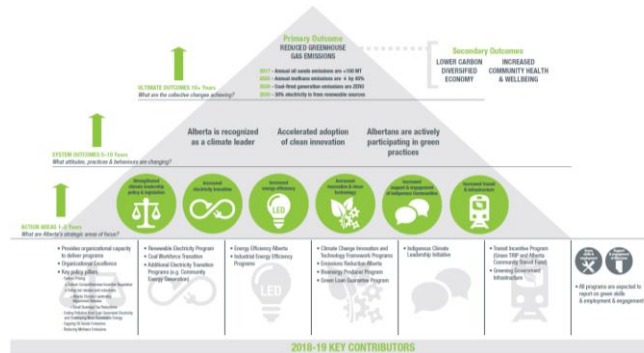
Background

Did you know?
The cost of inaction is greater than the cost of action: climate change could cost Canada \$21-\$43 billion per year by 2050

Alberta and the City of Edmonton are stepping up to the challenge with programs and funding to reduce GHG emissions in our backyards



Alberta Climate Change Office



\$1.72B
Climate Leadership Plan

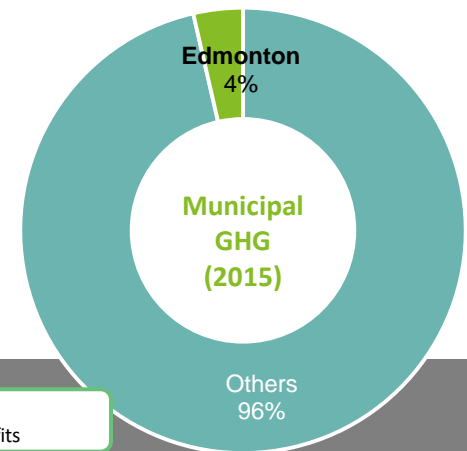
\$215M
Energy Efficiency Alberta

\$80M
Consumers and Households

\$77M
Residential incentives and admin



- GOAL**
Edmonton's sources and uses of energy are sustainable.
- GOAL**
Edmonton is resilient to disturbances that could affect its energy supplies and distribution systems.
- GOAL**
Edmonton is a carbon-neutral city.



\$138M
Residential buildings programs

New homes

\$103M
Energy efficiency standards

\$3M
Renewable energy

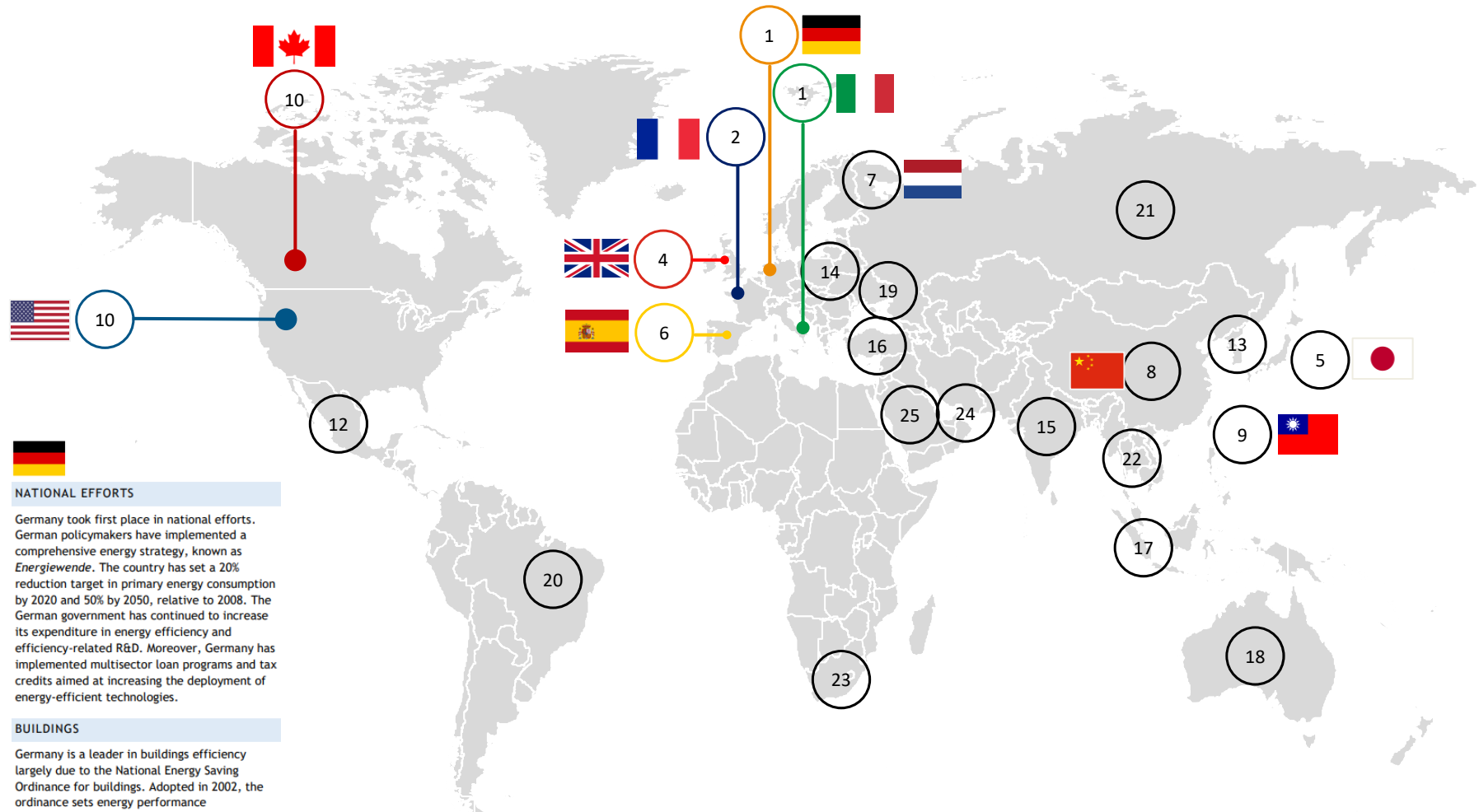
Existing homes

\$27M
Energy efficiency retrofits

\$8M
Renewable energy

Background

Other countries are already down the road on their GHG reduction journey with comprehensive policies and codes



NATIONAL EFFORTS

Germany took first place in national efforts. German policymakers have implemented a comprehensive energy strategy, known as *Energiewende*. The country has set a 20% reduction target in primary energy consumption by 2020 and 50% by 2050, relative to 2008. The German government has continued to increase its expenditure in energy efficiency and efficiency-related R&D. Moreover, Germany has implemented multisector loan programs and tax credits aimed at increasing the deployment of energy-efficient technologies.

BUILDINGS

Germany is a leader in buildings efficiency largely due to the National Energy Saving Ordinance for buildings. Adopted in 2002, the ordinance sets energy performance requirements for new and existing buildings undergoing major renovations. Germany could improve its score by setting compliance dates for its retrofit policies.

Background

These countries are recognized for their leadership in National efforts and building standards



NATIONAL EFFORTS

Spain's mandatory energy savings goal under the EU Energy Efficiency Directive has a target of 20% energy savings by 2020. The country's Institute for the Diversification and Saving of Energy is implementing this objective with a focus on improving final energy intensity by 2% each year until 2020. Spain could help achieve this target by increasing its investments in energy efficiency R&D and broadening its energy efficiency loan programs and tax incentives to include more sectors of its economy.

BUILDINGS

Spain earned first place in the buildings section, largely because its buildings have low energy intensity. Spain has strong mandatory building codes for both residential and commercial buildings, which cover a broad range of technical elements. Furthermore, Spain has renovation requirements in place for all buildings as part of its construction code. Spain is also one of just a handful of countries with a



NATIONAL EFFORTS

France did well in the national efforts section largely due to their participation in EU actions. France has made a commitment under the EU's Energy Efficiency Directive to reduce energy consumption 20% by 2030 relative to 2012. France's National Energy Efficiency Action Plan contains energy efficiency provisions that go beyond those implemented by other members of the EU. This includes the White Certificates Trading program, which requires suppliers of energy to meet government-mandated targets for energy savings.

BUILDINGS

France came in second place in the buildings section with a score of 21 points. The country's Energy Efficiency Action Plan outlines aggressive policies to increase the number of low energy buildings and also commits to the deep renovation of 500,000 dwellings per year. France also has the most ambitious building retrofit program of the countries evaluated in this report but could still benefit from the creation of implementation regulations.



NATIONAL EFFORTS

The United Kingdom (UK) has made significant commitments to energy reduction through its national policies. The country has set its energy efficiency target under the EU Energy Efficiency Directive, which amounts to an 18% reduction from the UK's 2007 business-as-usual projection for 2020. The country has highly efficient thermal power plants having built many new, more-efficient plants recently. The United Kingdom also makes significant investments in energy efficiency programs and R&D activities. The United Kingdom could further improve by promoting the market expansion of its ESCOs.

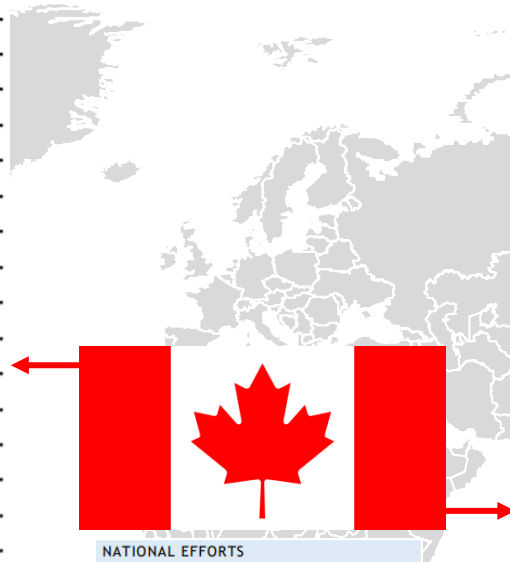
BUILDINGS

The United Kingdom tied for second place in the buildings section of our analysis with a score of 21 points. Comprehensive residential and commercial building codes that have a number of ¹ technical requirements are in place, as is a building energy labeling program. Additionally, there are stringent retrofit requirements in place for existing building stock. The UK also has mandatory appliance and equipment standards for 41 products, as well as mandatory labeling requirements for 20 appliance groups.

Background

Canada scores middle of the pack when it comes to building codes and disclosure (with variances by province and municipality)

Residential building codes				
Australia	Mandatory	1	2	3
France	Mandatory	1	2	3
Germany	Mandatory	1	2	3
Italy	Mandatory	1	2	3
Netherlands	Mandatory	1	2	3
Poland	Mandatory	1	2	3
South Africa	Mandatory	1	2	3
South Korea	Mandatory	1	2	3
Spain	Mandatory	1	2	3
UK	Mandatory	1	2	3
Canada	Mixed	0.5	2	2.5
China	Mixed	0.5	2	2.5
Indonesia	Mandatory	1	1.5	2.5
Japan*	Voluntary	0.5	2	2.5
Mexico	Mandatory	1	1.5	2.5
Taiwan	Mandatory	1	1.5	2.5
US	Mixed	0.5	2	2.5
Russia	Mandatory	1	1	2
Turkey**	Mandatory	1	1	2
Saudi Arabia	Mandatory	1	0.5	1.5
UAE	Mixed	0.5	1	1.5
Brazil	Voluntary	0	1	1
Ukraine**	Mixed	0.5	0.5	1
India	Voluntary	0	0	0
Thailand	None	0	0	0



NATIONAL EFFORTS

Canada does well in the national efforts category. The country's Intended Nationally Determined Contribution (INDC) plan to the UNFCCC aims to achieve an economy-wide target to reduce greenhouse gas emissions 30% below 2005 levels by 2030. Investments in energy efficiency are among the highest of the countries analyzed. Moreover, national tax incentives and loan programs exist in multiple sectors to help reach efficiency targets.

BUILDINGS

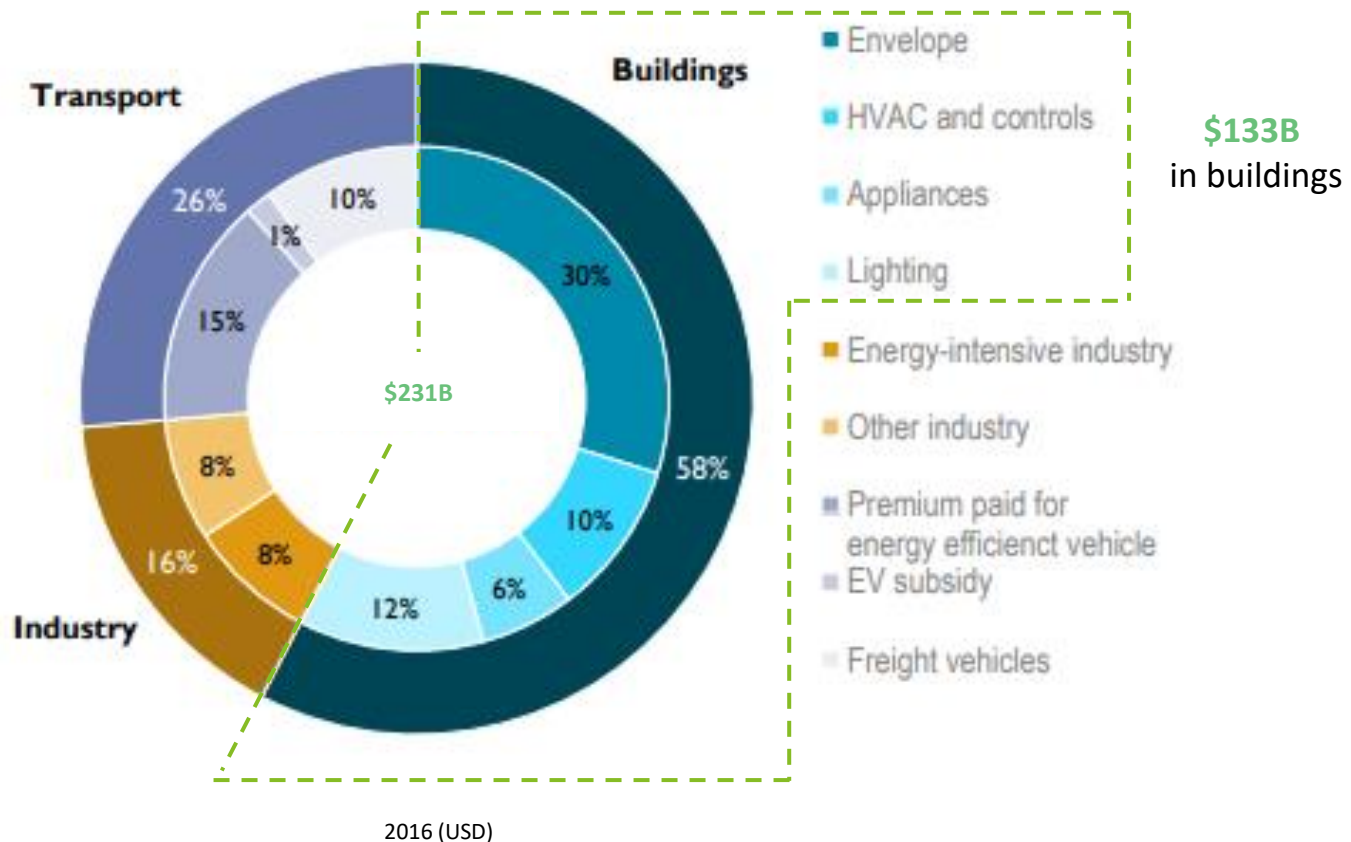
Canada is in the middle of the pack for its building energy efficiency policies, due in part to its appliance and equipment standards, which cover a large number of products, and to the adoption of its mandatory "EnergGuide" labeling for new and/or renovated homes by some municipalities. Canada has taken steps to improve benchmarking and labeling of energy use in buildings through a new benchmarking portfolio manager that marks building energy performance against similar buildings.

Building rating and disclosure				
France	Mandatory	All	2	
Germany	Mandatory	All	2	
Italy	Mandatory	All	2	
Netherlands	Mandatory	All	2	
Poland	Mandatory	All	2	
Spain	Mandatory	All	2	
Turkey	Mandatory	All	2	
UK	Mandatory	All	2	
Australia	Mandatory	Some	1	
China	Mandatory	Some	1	
India	Mandatory	Some	1	
Russia	Mandatory	Some	1	
Brazil*	Voluntary	All	0.5	
Japan*	Voluntary	All	0.5	
Canada*	Voluntary	All	0.5	
US*	Voluntary	All	0.5	
UAE**	Mandatory	Some	0.5	
Taiwan	Voluntary	-	0	
Mexico	Voluntary	-	0	
South Korea	Voluntary	-	0	
Thailand	Voluntary	-	0	
Indonesia	None	-	0	
Saudi Arabia	None	-	0	
South Africa	None	-	0	
Ukraine	None	-	0	

Background

Significant global investments in energy efficiency continues to increase with investments in buildings capturing the lions share

Global investments increased by 9% with 58% invested in buildings



What is energy efficiency?



What is energy efficiency?

Get the same result with less effort (energy)

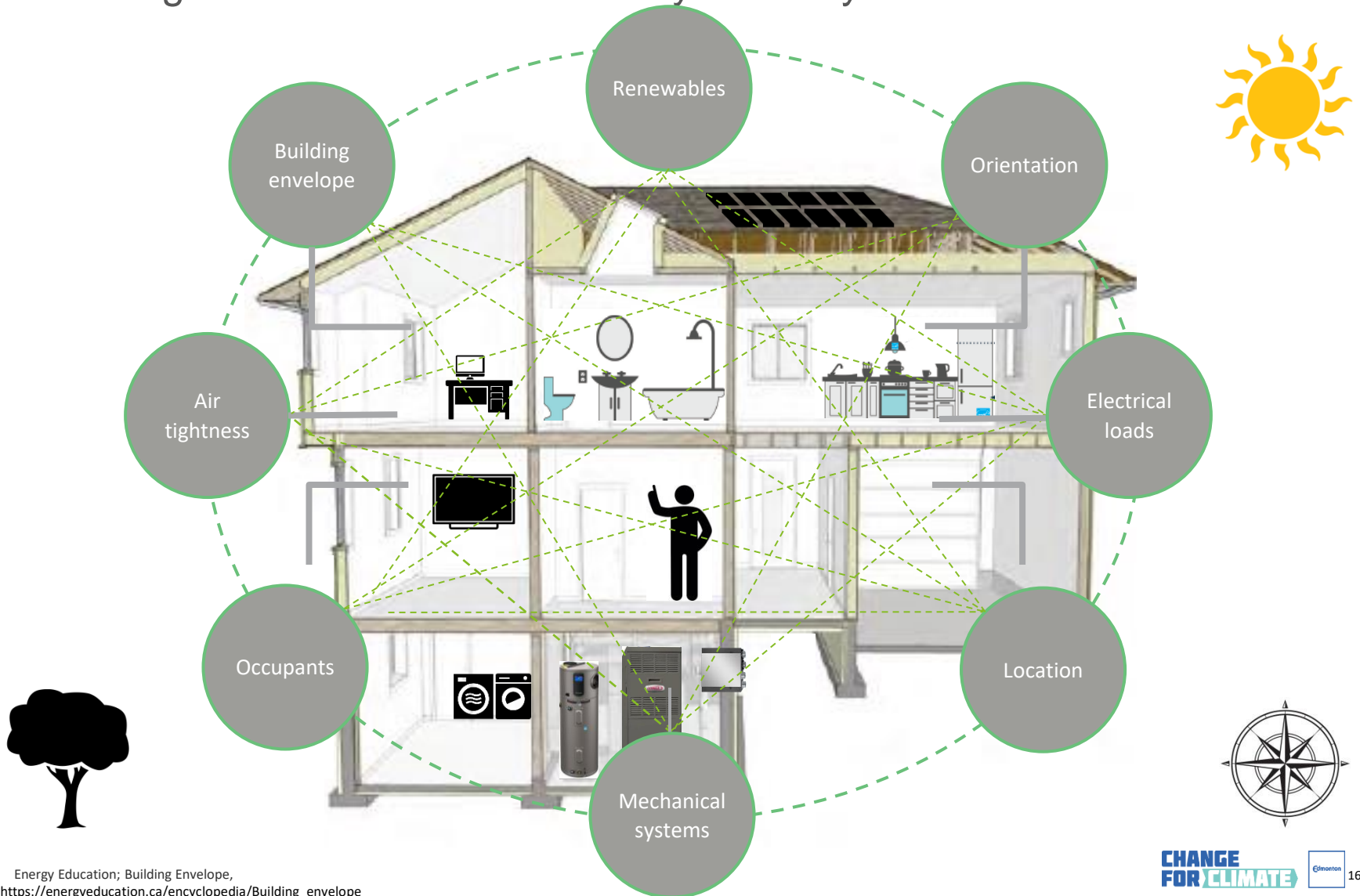
While energy use in Canada increased 31% between 1990 and 2014,
it would have increased 55% without energy efficiency improvements

Canadians saved over \$38 billion
on energy in 2014 as a result of energy efficiency improvements since 1990



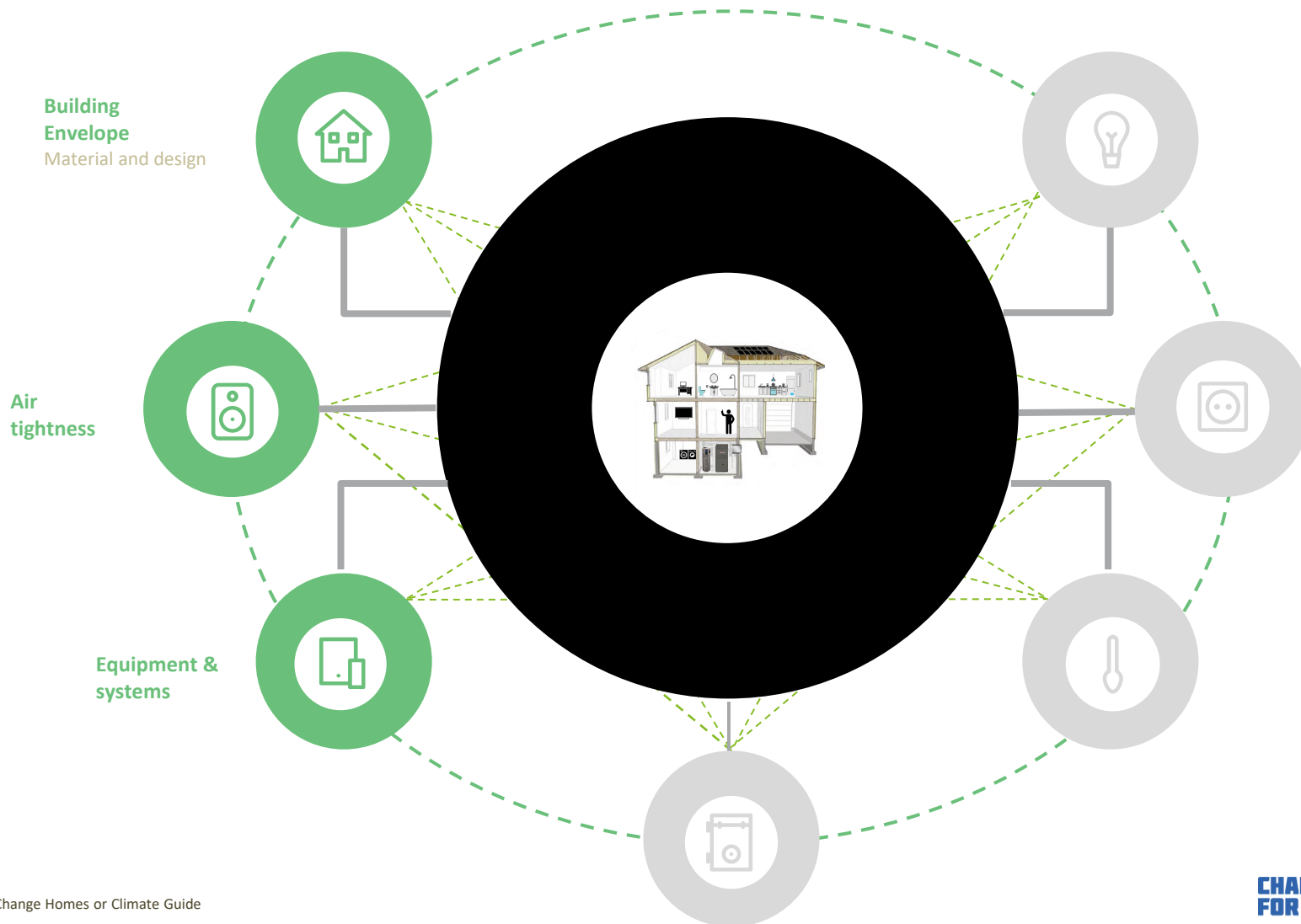
What is Energy Efficiency?

The environment, envelope, mechanical systems and occupant activities interact together to affect the efficiency of the system



What is Energy Efficiency?

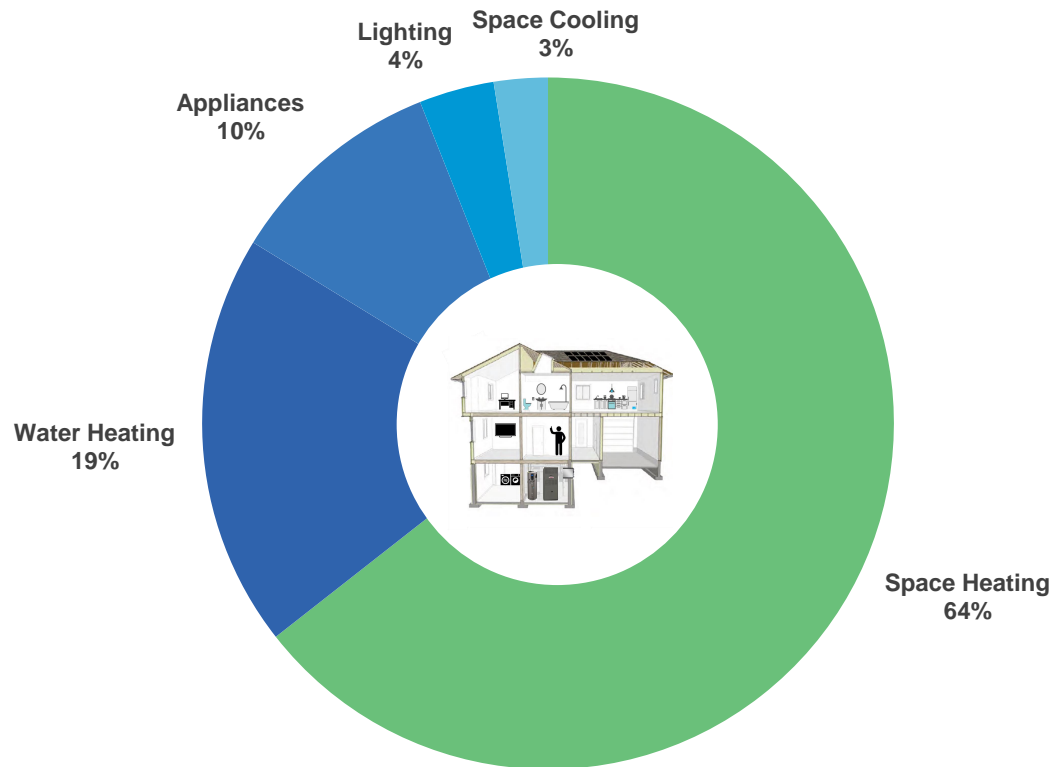
There are many factors that contribute to an energy efficient home... these are the 3 most significant components



What is Energy Efficiency?

Did you know?
Every \$1 Million invested in Energy Efficiency, generates \$3-4 Million of economic growth

As the largest contributors, improving space heating and water heating can have a significant impact on energy efficiency



Residential Single Detached GHG Emissions
by Energy Source and End Use (2016)

What is Energy Efficiency?

We are starting to get “smarter” with technology systems

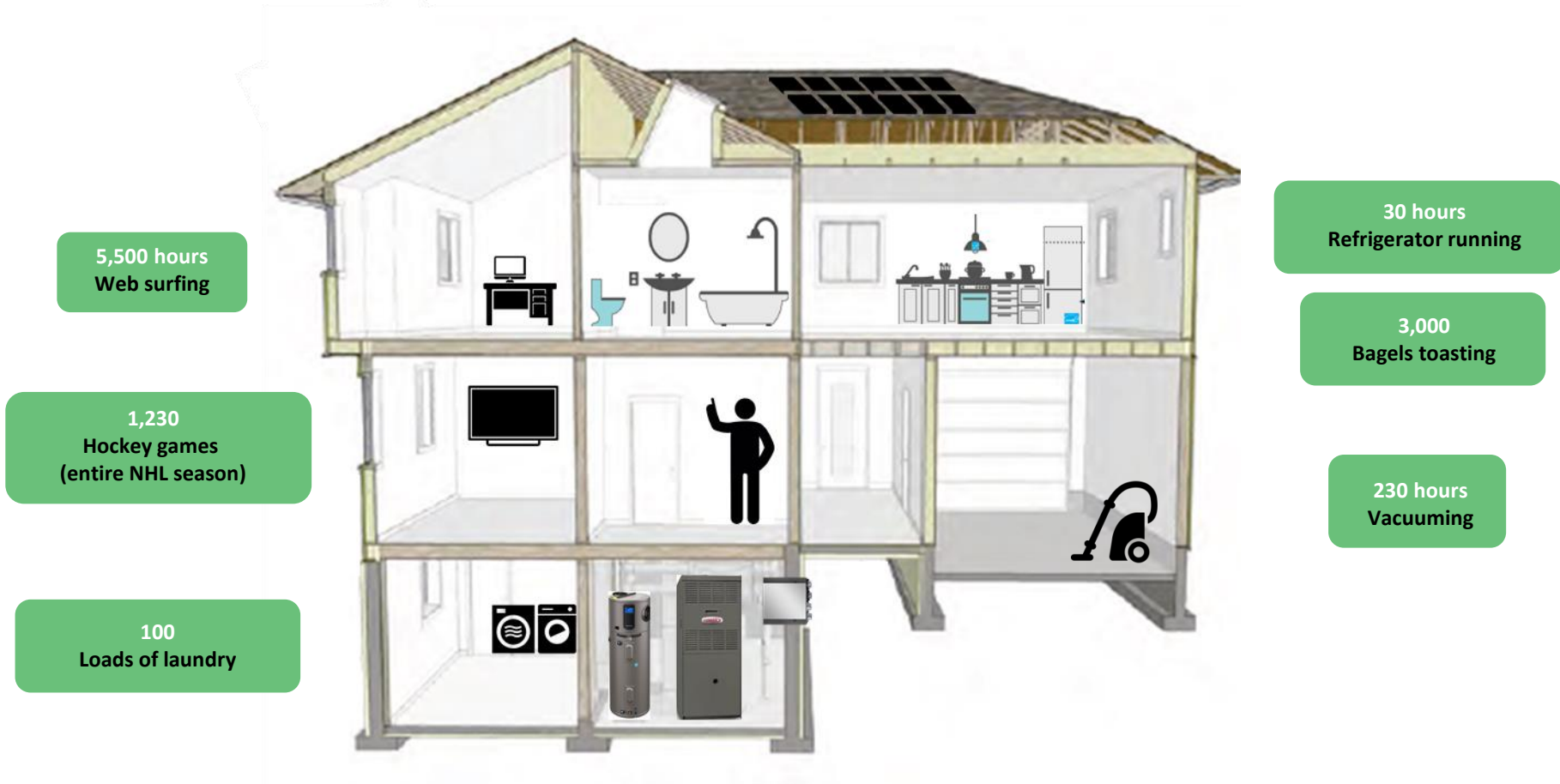
Did you know?
You can buy a simple Energy-Star mercury-free programmable thermostat for about \$30-\$80



What is Energy Efficiency?

The average household in Alberta uses 120 Gigajoule (GJ) of energy per year

So what exactly does 1 GJ of energy equate to?



What is Energy Efficiency?

To calculate how much energy a building uses, energy modelling software is used and blower door tests confirm their actual performance



Energy Model

The energy consumption can relate to space heating, hot water heating, ventilation, lighting, appliances, and plug loads.

The energy model accounts for the:

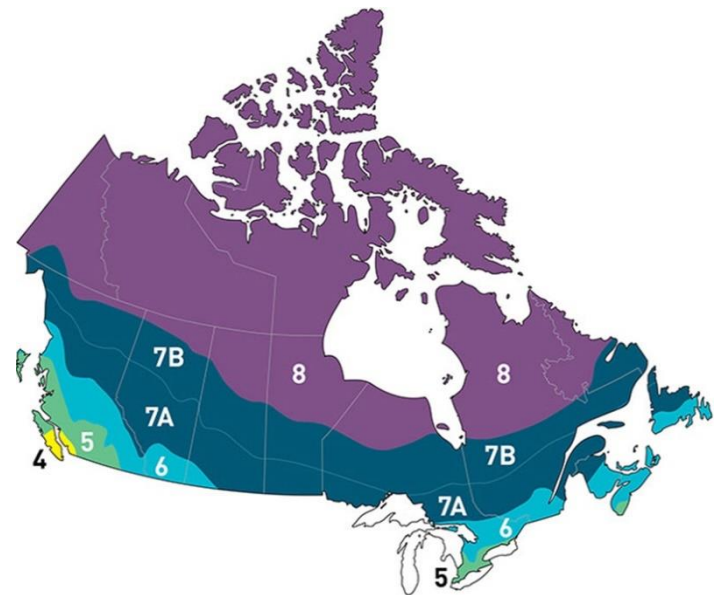
- **Effective insulation values of assemblies** such as walls, ceilings, and windows
- **Mechanical systems** that heat and ventilate the house
- **Size and geometry** of the building
- **Climate** location



Blower door test

A standardized test to measure how tightly a building is sealed against air leakage and heat loss

Energy modelling starts with climate zones to ensure appropriate solar radiation, wind, soil and air temperature data are applied



Canada is divided into 11 climate zones

What is Energy Efficiency?

Alberta has already defined the minimum energy efficiency standards for new homes in section 9.36 of the Alberta Building Code (ABC)

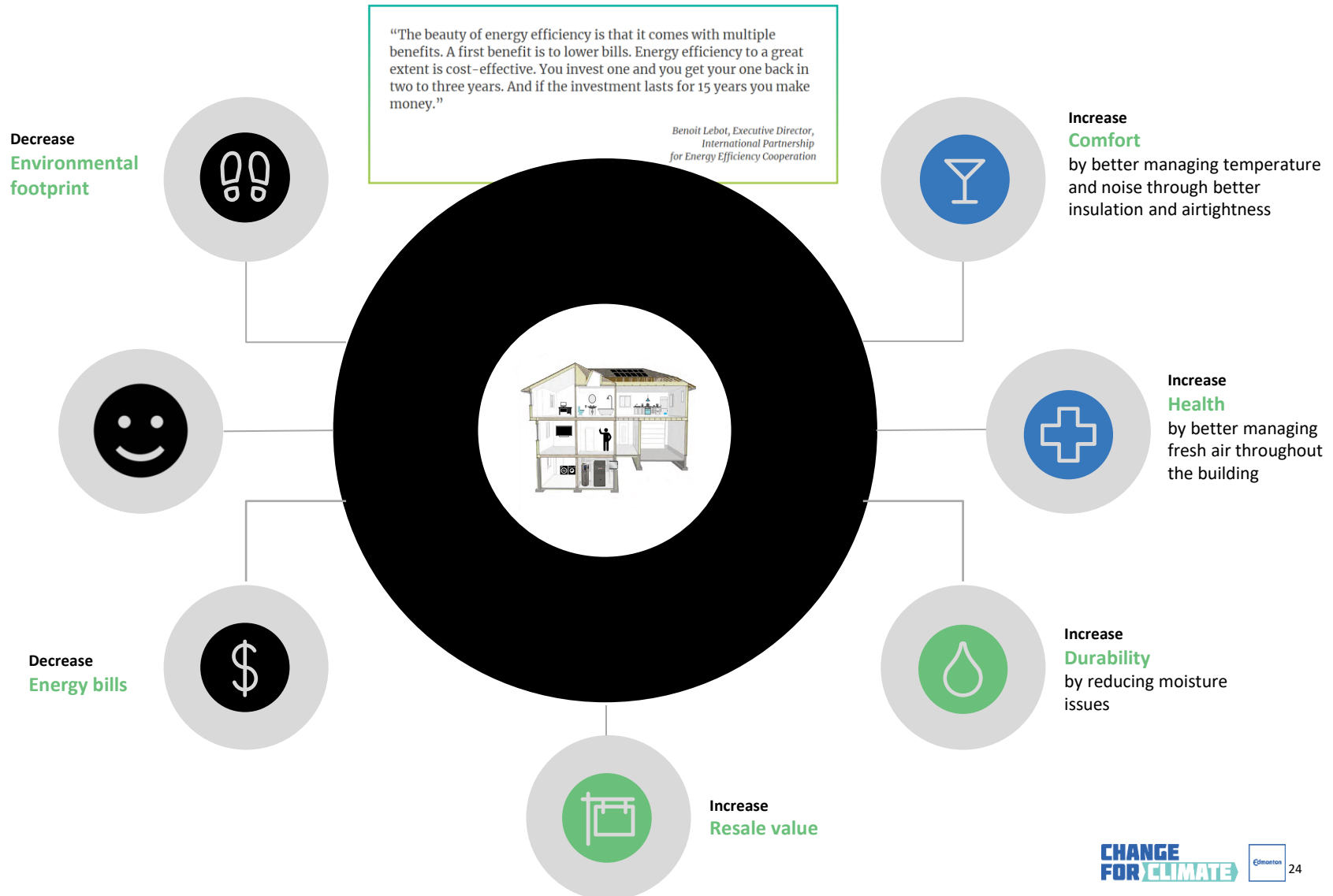


Energy Efficiency requirements of Section 9.36 of Alberta Building Code (ABC) 2014 have been introduced by the Government of Alberta as part of the greenhouse gas emission reduction strategy

Benefits of energy efficiency

Benefits of energy efficiency

The beauty of energy efficiency is that it comes with multiple benefits

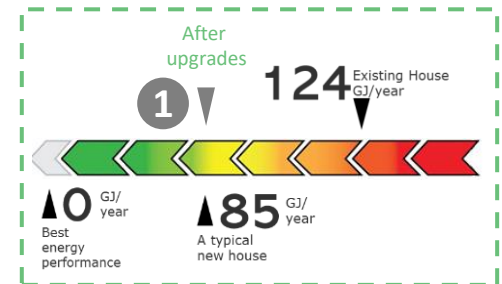


Benefits of energy efficiency

A case study: The Greens are going green and here is how much energy and money they can save



- Mrs. and Mr. Green bought a **1200ft²** home in downtown Edmonton that was **built in 1985**, surprisingly, with a finished basement which gave them an additional 600ft² and a detached garage.
- When they moved in, they decided they wanted to invest in some efficient upgrades to make their house more comfortable and save on their utility bill. They had a few options to consider but initially chose **option 1: ABC**
- The Greens contacted an **Energy Advisor** to have a pre-upgrade **EnerGuide Home Energy Evaluation** performed. This is their story



	0	1		
	Before upgrades	After upgrades (ABC)	Savings	Rebates
Upgrades				
Insulation				
Attic	R32 Batt	R50 Blown-in	3 GJ	\$225
Frost Wall	R8 Batt	R12 Batt	3 GJ	\$225
Windows				
Windows (U-Value)	Single Pane U-4	Dual Pane U-1.7		
Equipment and systems				
Ventilation (SRE)	Utility Fans	HRV 66%/60% SRE	4.5 GJ	\$350
Furnace (AFUE)	80% AFUE	95% AFUE	9 GJ	\$600
Material cost		\$11,300		
Results				
Energy Usage (GJ)	124 GJ/YR	85 GJ/Yr	39 GJ/year	-
EnerGuide evaluation	-	-	-	\$400
Bonus for 3 upgrades	-	-	-	\$1000
Air Change Rate (ACH)	4.5	3.2	1.3	\$1450
Total energy costs (and savings)	\$2,835	\$2,400	\$435	\$4,250

Benefits of energy efficiency

Case study: Now that the Greens are up to the minimum code in Alberta for new homes, they are thinking of going net zero

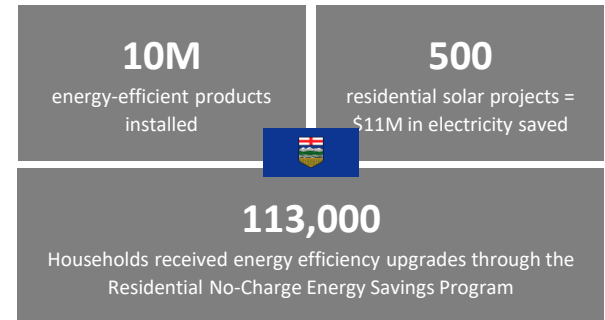
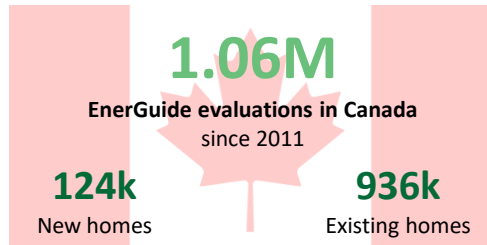
	0	1	2	3	4
	-30%	After upgrade #1 ABC	+10% better	+40% better	Net Zero
Upgrades					
Insulation					
Attic	R32 Batt	R50 Blown-in	R50 Blown-in	R80 Blown-in	R80 Blown-in
Exterior Walls	R20 Batt			R24 Batt	R24 Batt + 2" Rigid
Rims	R20 Batt			R24 Batt	R24 Batt + 2" Rigid
Frost Wall	R8 Batt	R12 Batt	R20 Batt	R22 Batt + 1"Rig.inside	R24 Batt + 1" Rig.inside
Under Slab	N/A			N/A	N/A
Windows					
Windows (U-Value)	Single Pane U-4	Dual Pane U-1.7	Dual Pane U-1.7	Triple Pane U-1.0	Triple Pane U-0.79
Equipment and systems					
Ventilation (SRE)	Utility Fans	HRV 66%/60% SRE	HRV 66%/60% SRE	HRV 78%/72% SRE	HRV 78%/72% SRE
Furnace (AFUE)	80% AFUE	95% AFUE	95% AFUE	97% AFUE	Elec. 100% AFUE + ASHP
DHW (EF)	HWT 0.6 EF		Tankles 0.95 EF	Tankles 0.95 EF	Elec.Tankles 2.0 EF
DWHR	N/A			Yes	Yes
Solar panels (including install)					~11,000 Kwh
Air Tightness					
Air Change Rate (ACH)	4.5	3.2	3	1	1
Material costs					
Upgrade Cost (\$)	-	\$11,200	\$12,450	\$20,480	\$58,220
Rebates Available (\$)	-	\$4,250	\$5,075	\$6,875	\$19,200
Annual energy use, costs and savings					
Energy Usage (GJ)	124 GJ/YR	85 GJ/Yr	74 GJ/Yr	50 GJ/Yr	0 GJ/Yr
Energy Savings (GJ)	Baseline	39 GJ/Yr	50 GJ/Yr	74 GJ/Yr	124 GJ/Yr
Total energy cost*	\$2,835	\$2,400	\$2,300	\$2,000	\$0
Natural gas	\$1,110	\$900	\$800	\$600	\$0
Electricity	\$1,725	\$1,500	\$1,500	\$1,400	\$0
Cost savings	Baseline	\$435	\$535	\$835	\$2,835

Edmonton and Home Energy Efficiency: The Local Market

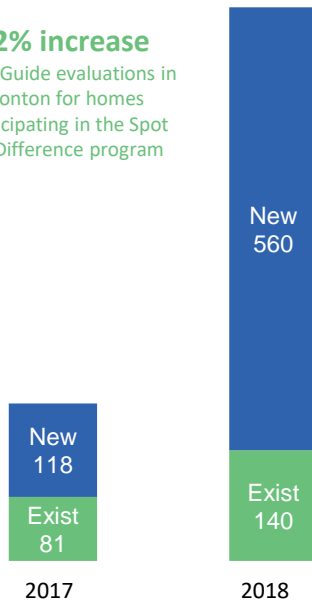


The Local Market

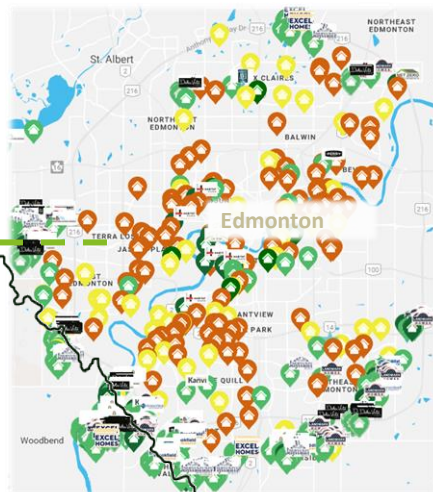
The demand for energy efficiency testing is already here with Canadians testing their homes at an increase rate



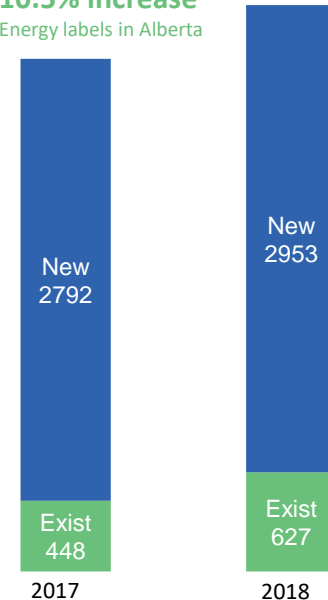
252% increase
EnerGuide evaluations in Edmonton for homes participating in the Spot the Difference program



EnerGuide labels of participating homes in Edmonton



10.5% increase
Energy labels in Alberta

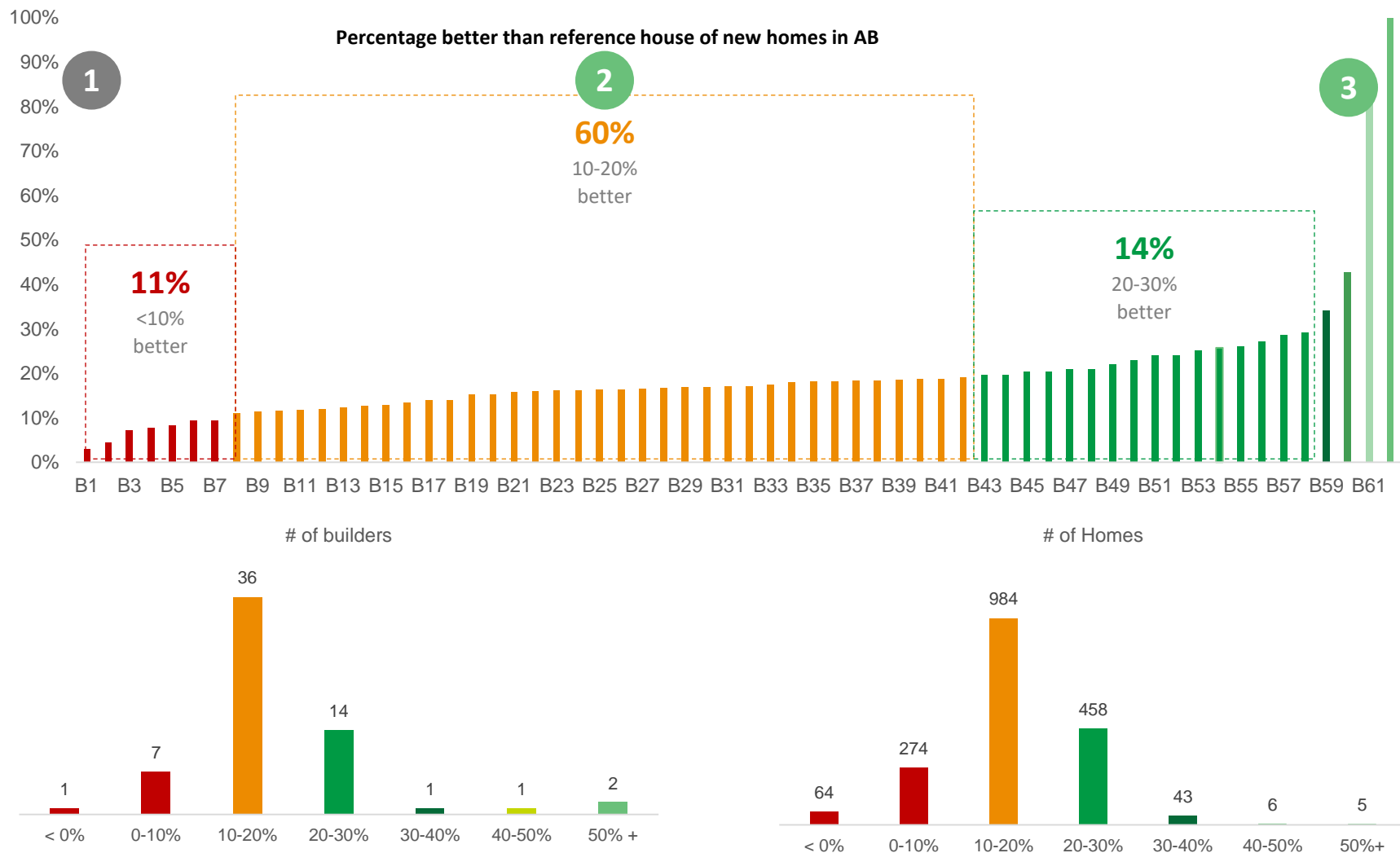


1 Natural Resources Canada (NRCan) Monthly Stats, Feb 2019

2 Change Homes for Climate, Energuide home energy map, <http://ace.edmonton.ca/energuide/home-energy-map>

The Local Market

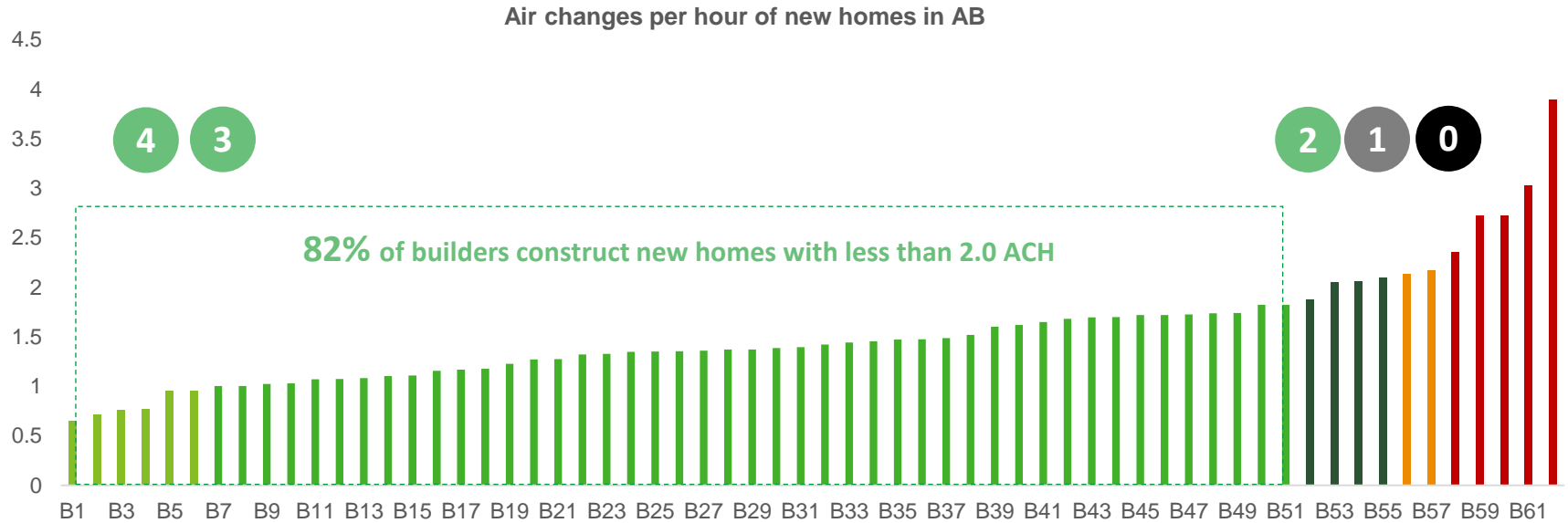
Not all new homes are built to the same level above the minimum standard (aka reference house)



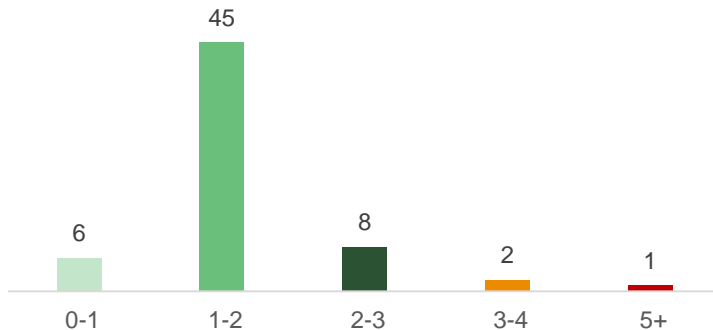
1 Envision client data, 2017

The Local Market

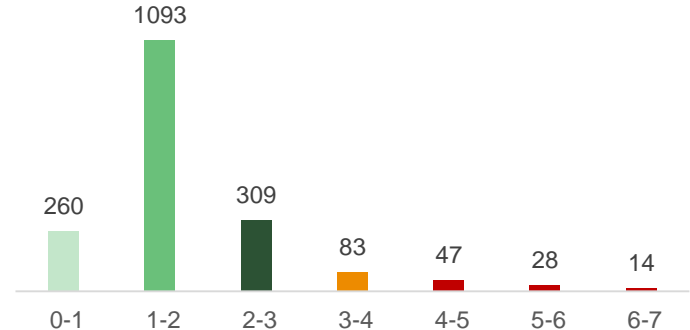
The majority of new homes are being constructed tight



of builders



of homes



The Local Market

There is rapid growth of Net-Zero energy buildings in North America and Edmonton builders are on trend

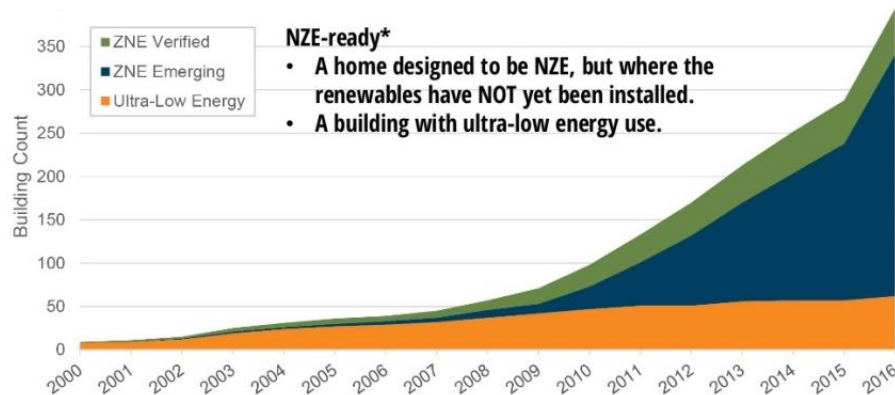
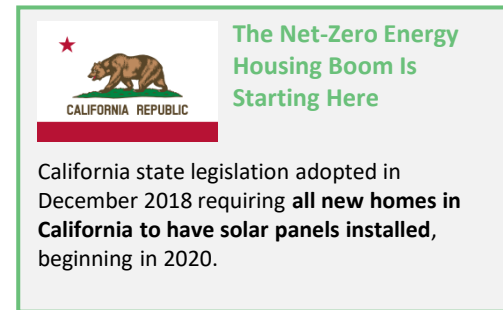


Figure: NBI

* Working definition; no consensus yet



Energy efficiency, home value and time on market

Energy efficiency, home value and time on market

Home buyer preferences suggest that an energy efficient home are the most important features



2015

1. Walk-in closets
2. **Energy efficient appliances**
3. **Overall energy efficient home**
4. **High-efficiency windows**
5. Kitchen islands
6. Linen closets
7. Open concept kitchens
8. Large windows
9. 2-car garage
10. Walk-in pantry

Energy efficient appliances

- **90%** must have or want
 - 68% must have

High efficiency windows

- **89%** must have or want
 - 63% must have

Energy efficient home

- **89%** must have or want
 - 64% must have

Home energy certification

- **78%** must have or want
 - 47% must have
 - 6% *not important*

2018

1. Walk-in closets
2. **High-efficiency windows**
3. **Energy efficient appliances**
4. **Overall energy efficient home**
5. Kitchen islands
6. Linen closets
7. Open concept kitchens
8. Large windows
9. **HRV/ERV air exchange**
10. **Certification by a designated program** (ie. EnerGuide, Built Green, ENERGY STAR)

1 2015 and 2018 Canadian Home Buyer Preference National Study

2 Consumers Council of Canada; Mandatory Home Energy Rating and Disclosure for Existing Houses, March 2018

Energy efficiency, home value and time on market

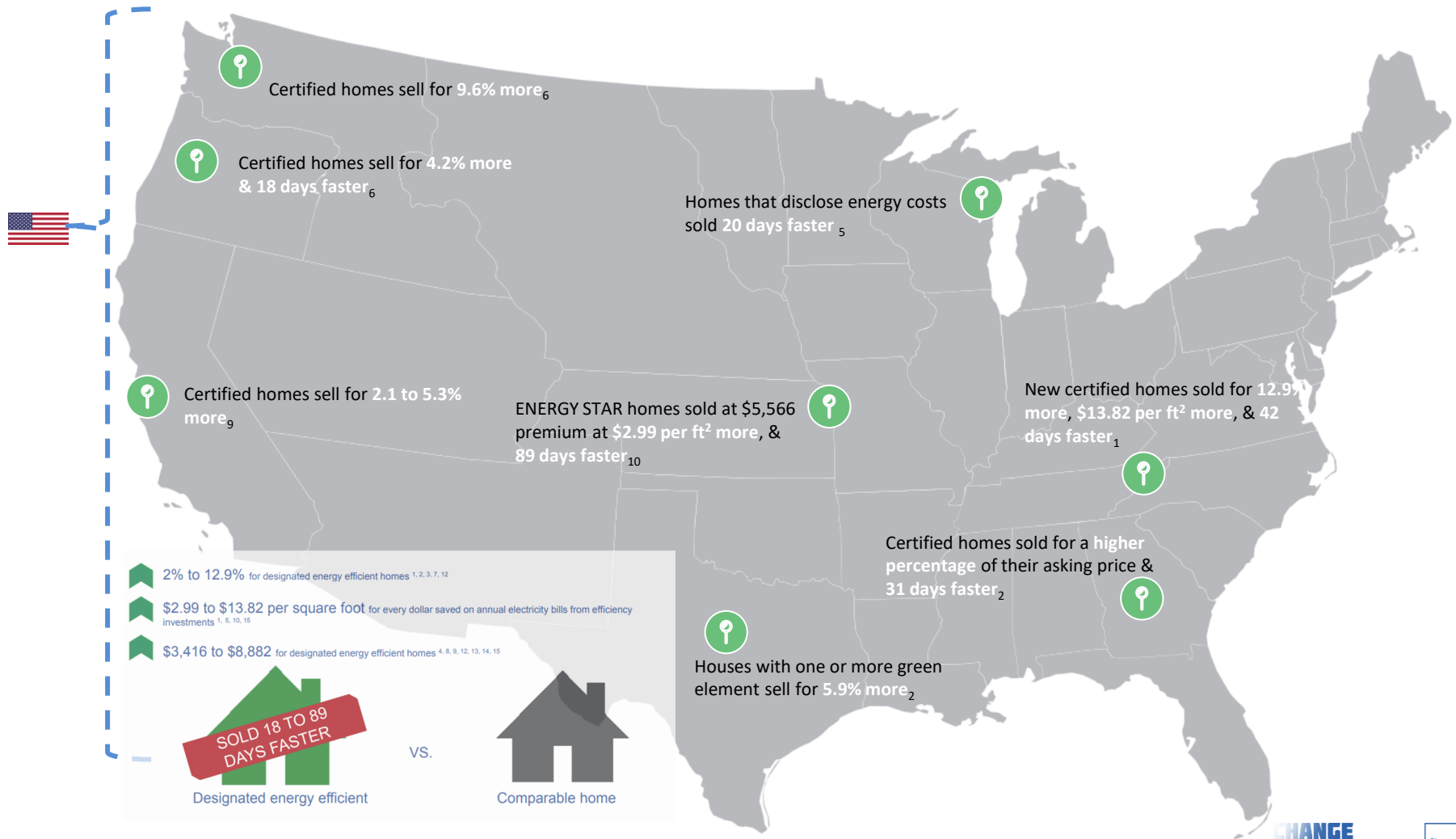
There is a significant, positive relationship between the transaction price of detached single-family homes and the presence of specific energy efficiency and renewable energy terms in the realtor's home description

**Estimated price premium associated with the presence of energy efficiency and renewable energy terms
in the realtor's description of homes**

Key term group	Average % impact	Average \$ premium	% of sample that included the term
Furnaces	+1.48	\$6,210	22.3
High-efficiency furnace	+2.44	\$10,240	8.1
Mid-efficiency furnace	-1.29		3.0
Water tanks	NA	NA	10.9
Heat recovery	NA	NA	1.0
Windows	+5.10	\$21,400	7.8
Insulation	+6.74	\$28,285	4.0
Any terms	+2.66	\$11,160	31.3

Energy efficiency, home value and time on market

Nationwide studies in the US show energy efficient homes sell for more, faster



1 AN MPG STICKER FOR HOUSES: HOME ENERGY LABELING, April 6, 2017, http://www.ncsl.org/Portals/1/Documents/energy/Webinar_Energy_Labeling_4_6_2017_go31177.pdf

Energy efficiency, home value and time on market

Summary of house price premiums relating to the energy performance of residential properties from other studies

Price premium	Location	Reference
+10% (rating A) to +2% (rating C) relative to D EPC rating	Netherlands	Brounen and Kok (2011)
+12.8% (rating A) to +3.5% (rating C) relative to (average) D EPC rating	Wales	Fuerst et al (2016)
+5% (rating A) to +1.8% (rating C) relative to (average) D EPC rating	England	Fuerst et al (2015)
+2.8 to +8.0% for 1-letter improvement in EPC rating	EU	Bio Intelligence (2013)
+9.8% for EPC ratings A, B or C relative to EPC ratings D, E, F or G	Spain	Ayala et al (2015)
+7.0% (for A EPC rating relative to C rating), +1.9% (for B EPC rating relative to C rating)	Netherlands	Chegut et al (2015)
+2% for 0.5 unit improvement on EE rating scale	ACT	Australian Gov (2008)
+ \$US 8.66 per ft² for ENERGY STAR home certification	Fort Collins, CO.	Bloom et al (2011)
+ 4.9% for ENERGY STAR home certification	Gainesville, FL.	Bruegge et al (2015)
+ 2% for ENERGY STAR home certification; +3% to +8% for local home certification	3 US cities	Walls et al (2016)
+ 1.1% for ENERGY STAR home certification	San Antonio, TX.	Cadena (2015)
+4.5% to +8.0% for ENERGY STAR home certification	Washington State	NEEA (2015)
+9% for 'green' labels, including ENERGY STAR	California	Kok and Kahn (2012)
EE program participants homes sell for +4.2%	Alaska	Pride et al (2018)
+3.5% for presence of solar panels on homes	San Diego, CA.	Dastrup et al (2012)

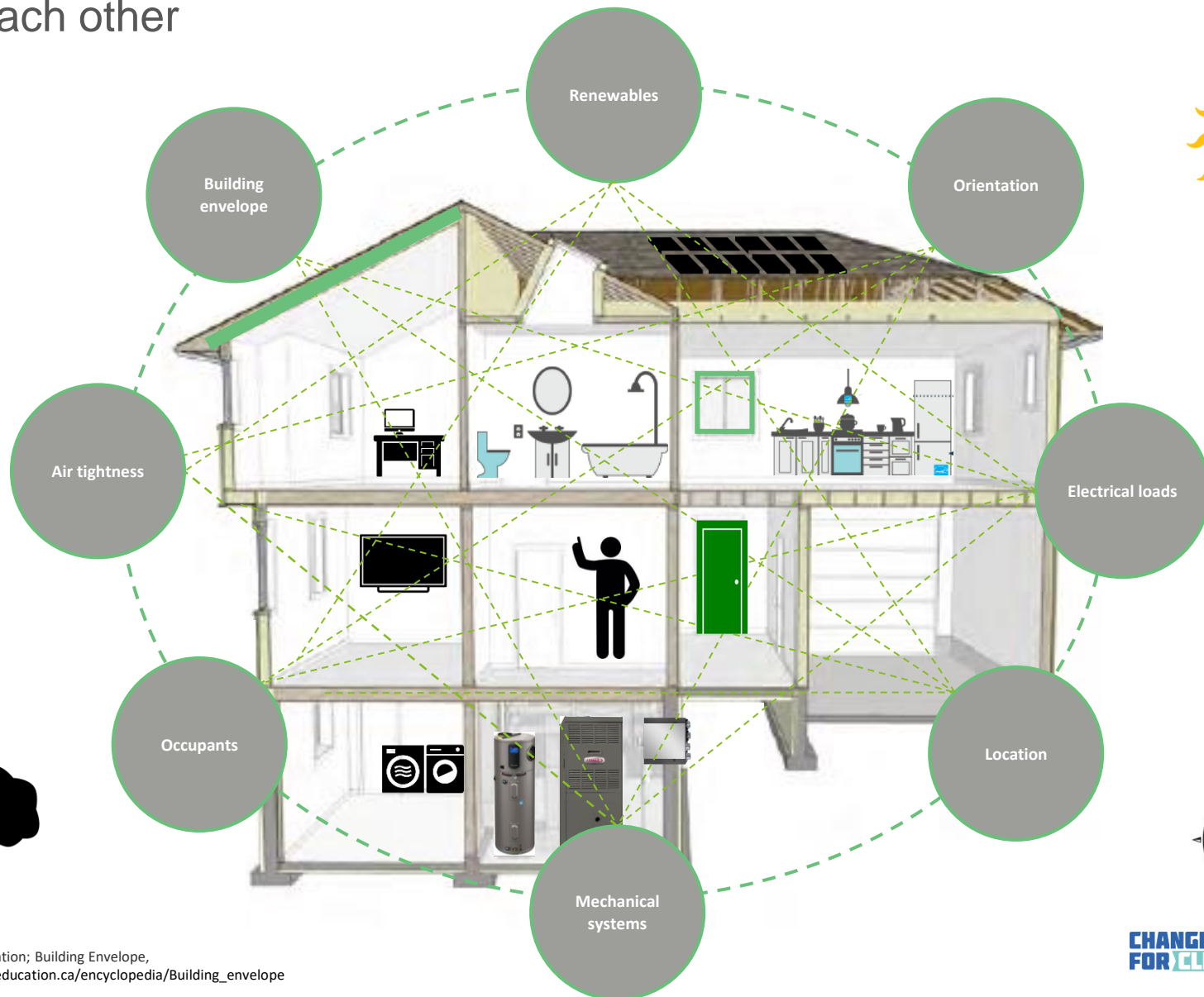
Energy efficient construction, simplified



Building science 101

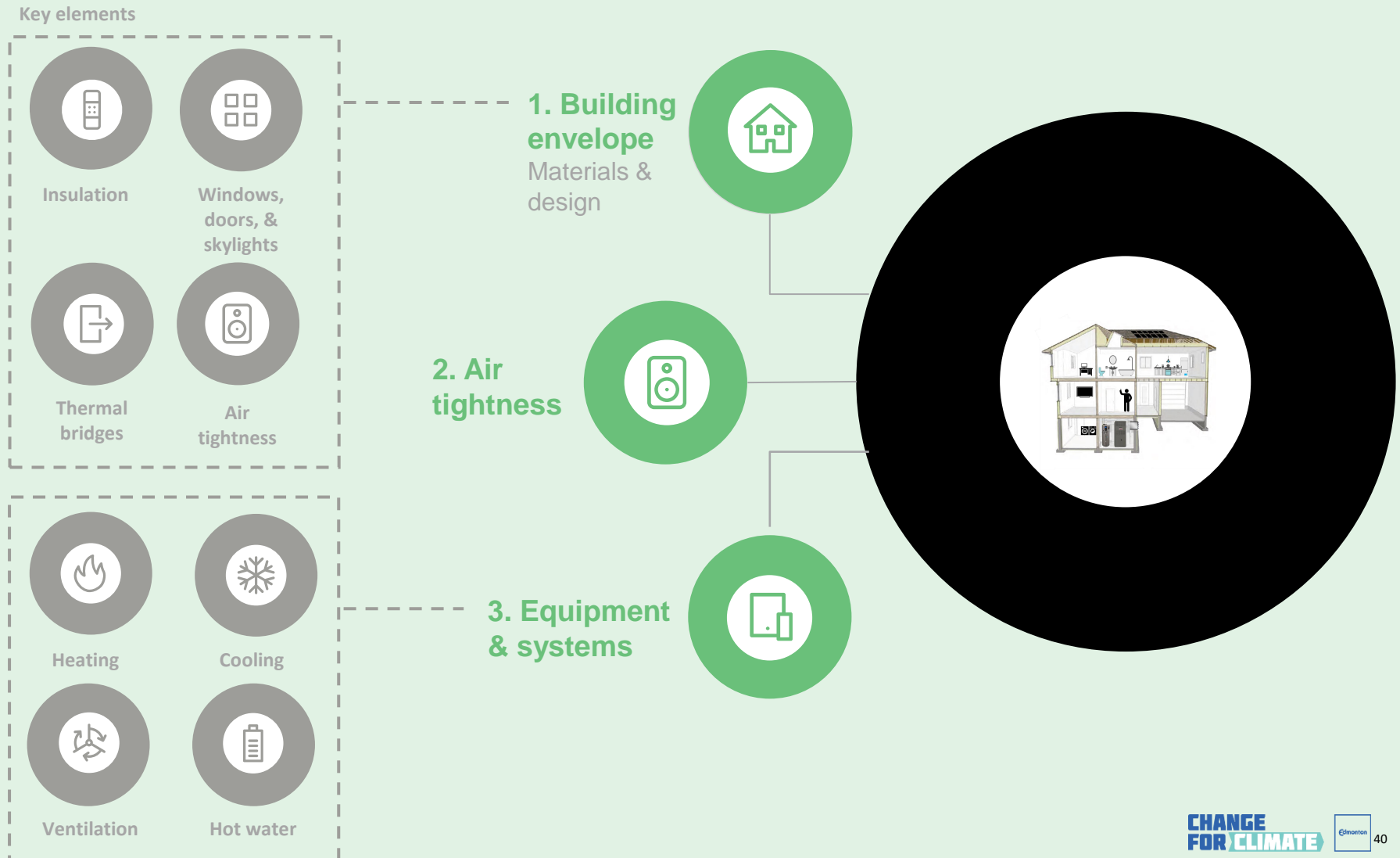
Building science 101

Homes function as a system with all components and factors interacting with each other



Building science 101

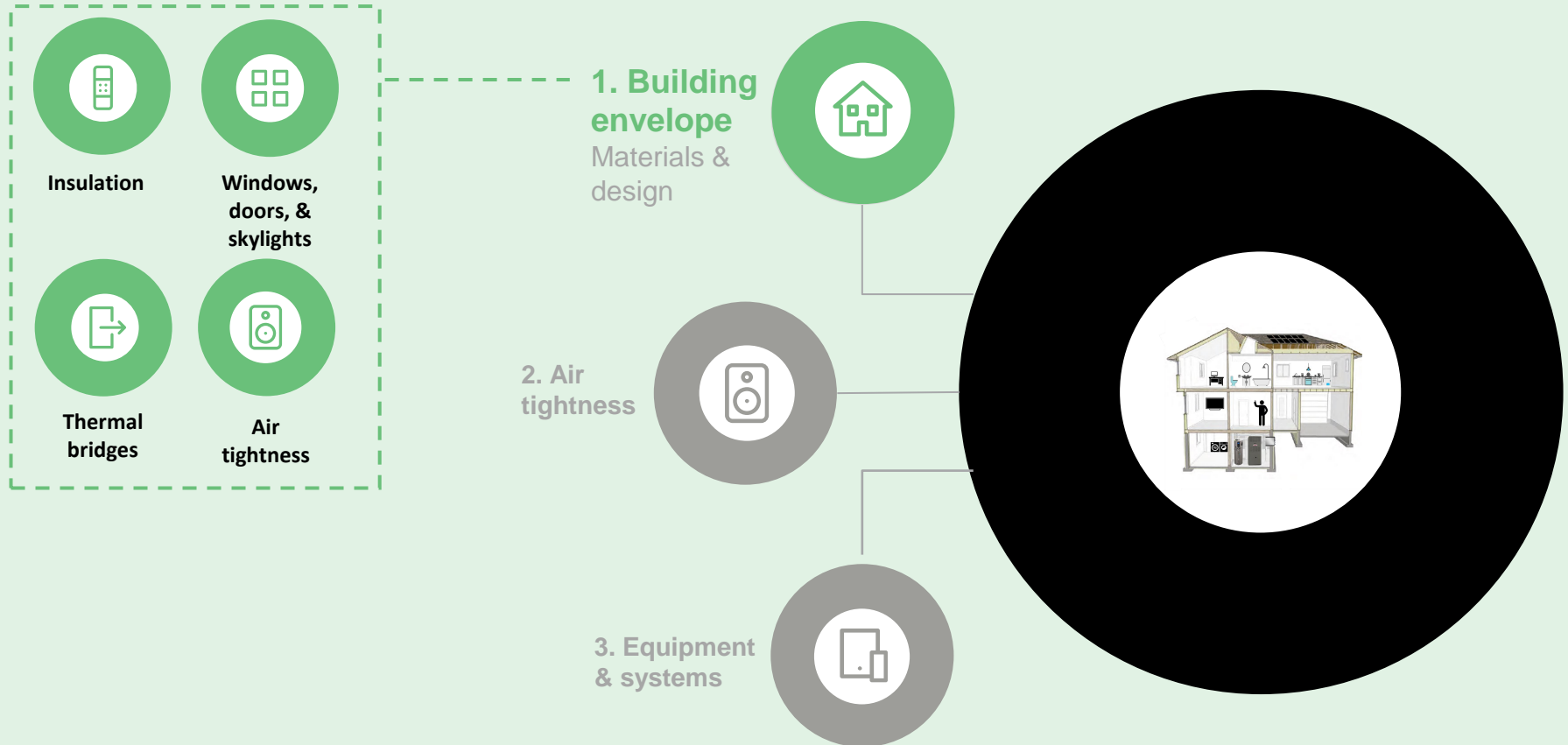
These 3 components have the most significant impact on the energy efficiency of a home



Building science 101

The home design and materials used in building envelope are a critical factor when determining a home's performance

Key elements of a high-performance building envelope



Benefits of energy efficiency

Throughout this presentation we will be referring back to the Green’s case study following their first upgrade to ABC

Rebates and savings are based on a **1200ft² home** (1825ft² including basement) using **124 GJ** of energy annually.

Note: Upgrades were decided based on minimal costs to get the home to the minimum new construction standards ABC. For example, windows were only upgraded to cheaper, double pane which do not constitute a rebate (window rebates are only for triple pane)

Component Ratings

Efficiency Rating		
Low	Medium	High



This is the best ratings in terms of energy efficiency

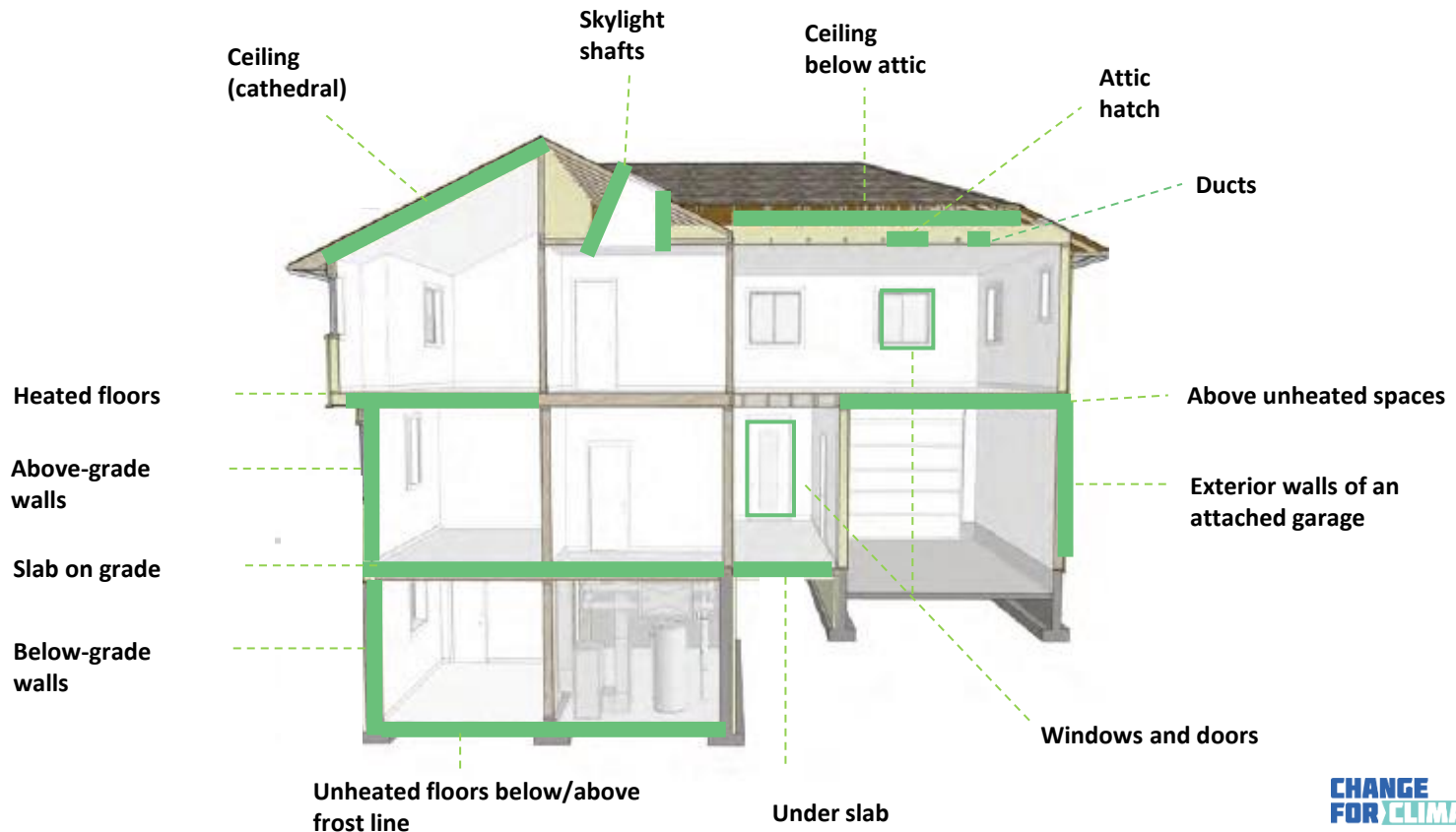
Initial component and rating before upgrades	Upgraded component rating to ABC option before upgrades	Annual GJ savings after upgrades to ABC	Approximate cost of materials based on <u>retail</u> prices	Approximate rebates through the Home Energy Program
Initial Rating	Upgrade Rating	Annual GJ Saving	Avg. Cost	Minimum Rebate
R12 Batt	R20 Batt	7.3 GJ/Yr	\$2,400	\$860

Building science 101

Insulation helps to slow the movement of energy and keeps the building at a comfortable temperature






Insulation



Building science 101

5 types of insulation are most commonly seen in Alberta



Insulation type	Material	Where applicable
Blanket: batts and rolls 	<ul style="list-style-type: none">• Fiberglass• Mineral (rock or slag) wool• Plastic fibers• Natural fibers	<ul style="list-style-type: none">• Unfinished walls, including foundation walls• Floors and ceilings
Foam board or rigid foam 	<ul style="list-style-type: none">• Polystyrene• Polyisocyanurate• Polyurethane	<ul style="list-style-type: none">• Unfinished walls, including foundation walls for new construction• Under concrete slabs in basements (heated and un-heated)
Insulating concrete forms (ICFs) 	<ul style="list-style-type: none">• Foam boards or foam blocks	<ul style="list-style-type: none">• Most commonly for foundation walls for new construction• Entire home – all exterior walls

Building science 101

Did you know?

Cellulose Insulation has the highest recycled content of any insulation available; composed of 75-85% recycled paper fiber, usually post-consumer waste news print

...continued, the other 2 common insulation types in Alberta

Insulation type	Material	Where applicable
Loose-fill and blown-in 	<ul style="list-style-type: none">• Cellulose• Fiberglass• Mineral (rock or slag) wool	<ul style="list-style-type: none">• Most commonly in flat Attic spaces• Enclosed existing wall or open new wall cavities• Other hard-to-reach places
Sprayed foam and foamed-in-place 	<ul style="list-style-type: none">• Cementitious• Phenolic• Polyisocyanurate• Polyurethane	<ul style="list-style-type: none">• Enclosed existing wall• Open new wall cavities• Unfinished attic floors• Rim joists / Floor headers• Cantilevered floors• Floor above unconditioned space

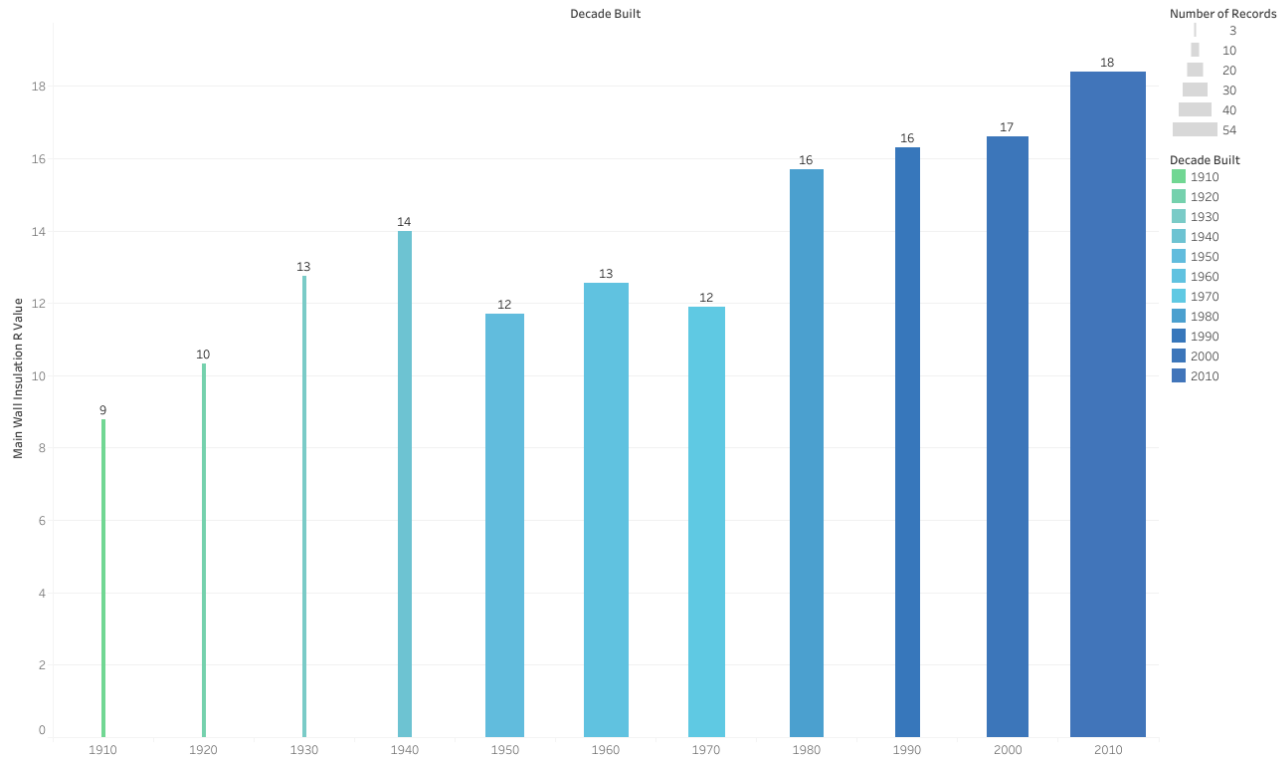
1 Calgary Herald, <https://calgaryherald.com/opinion/letters/your-letters-for-thursday-oct-3>

2 https://en.wikipedia.org/wiki/Cellulose_insulation

Building science 101

As you would expect, insulation levels (R-values) of main walls has increased over the years in Edmonton homes

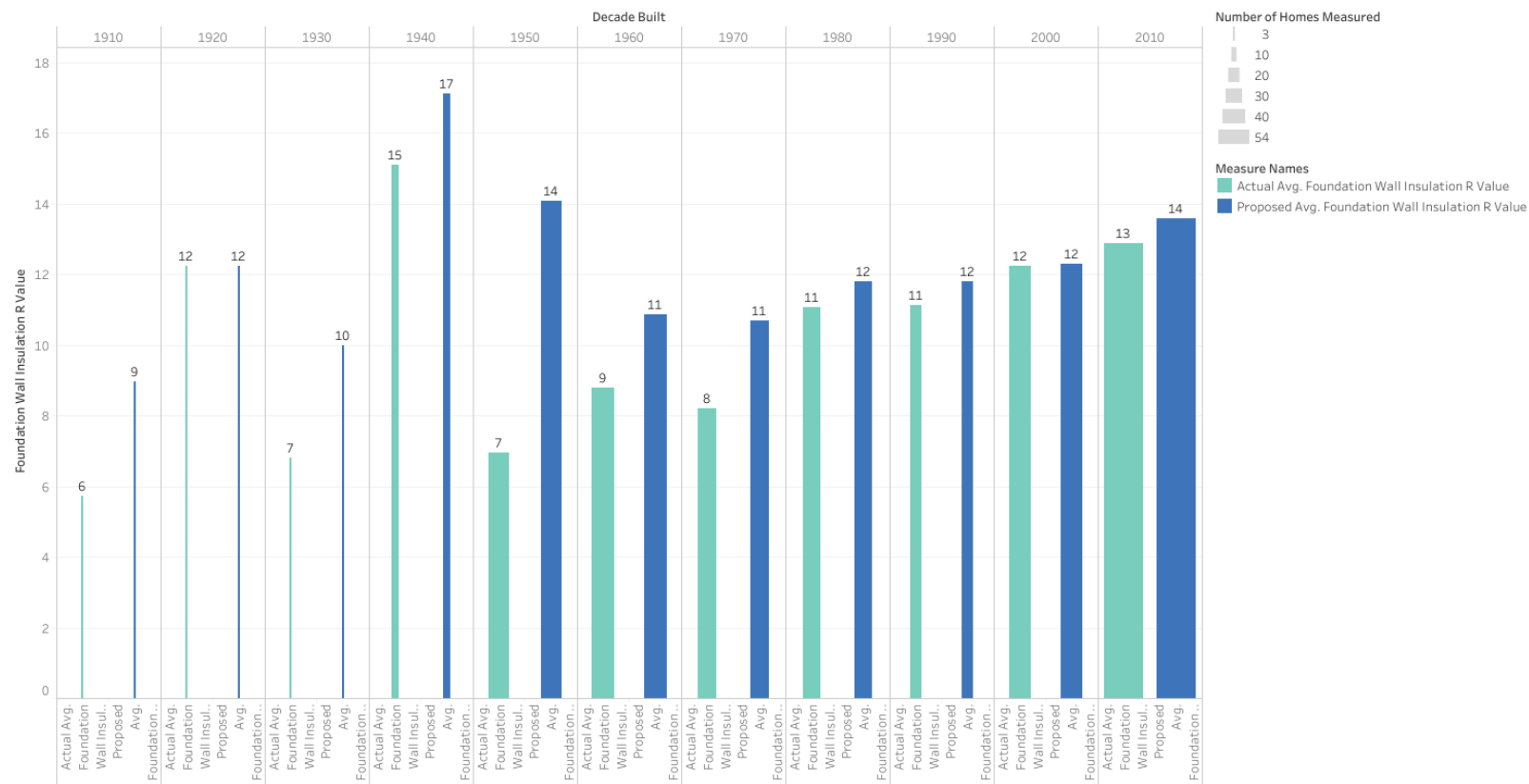
History of Main Wall Insulation R Values



Initial Rating	Upgrade Rating	Annual GJ Saving	Approx material cost	Minimum Rebate
R12 Batt	R20 Batt	7.3 GJ/Yr	\$2,400	\$860

Building science 101

The same, increasing trend applies to foundation wall insulation

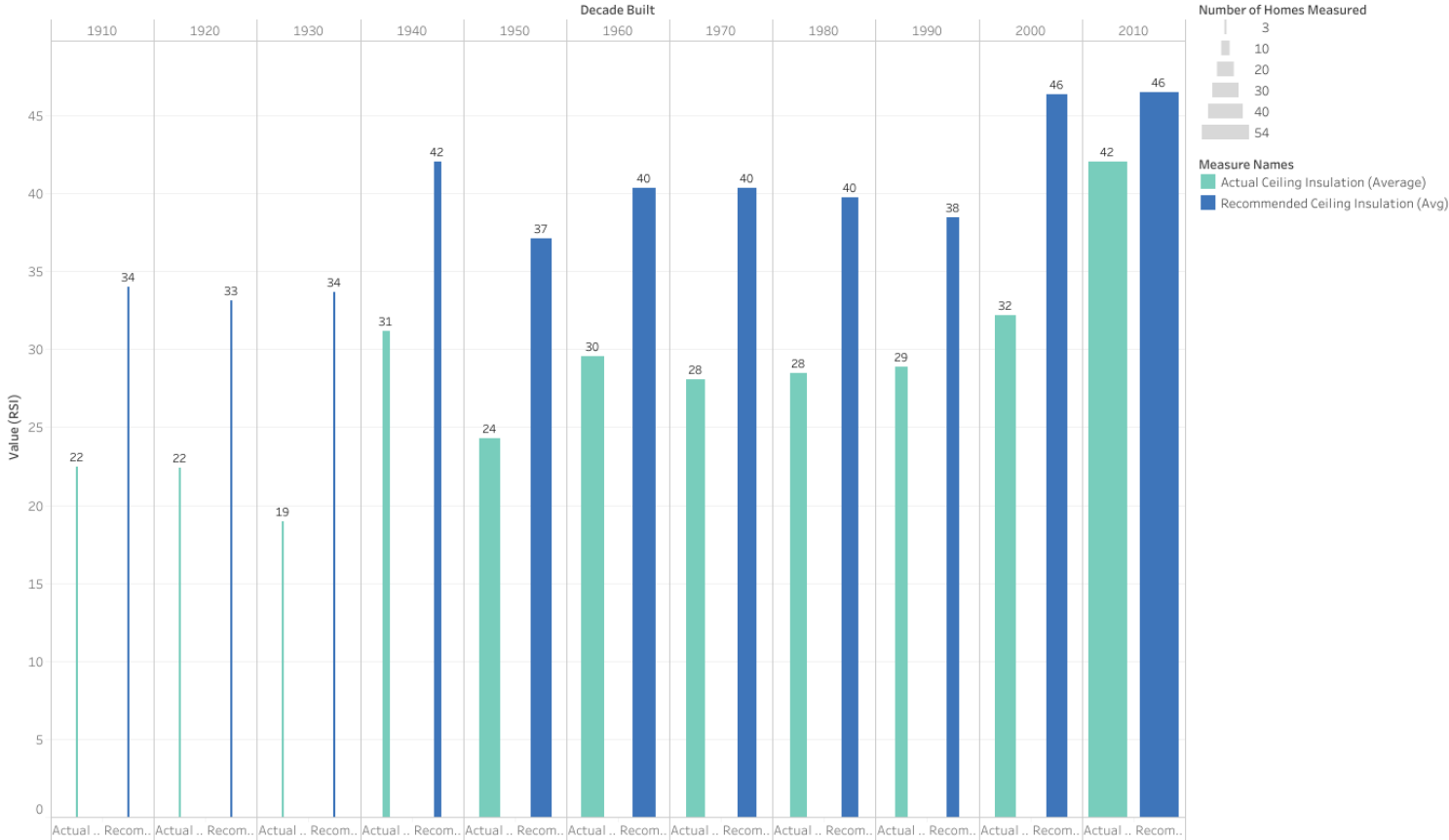


Initial Rating	Upgrade Rating	Annual GJ Saving	Approx material cost	Minimum Rebate
R8 Batt	R20 Batt	6 GJ/Yr	\$750	\$80

Building science 101

...and to ceiling insulation

Actual vs. Recommended Ceiling Insulation by Decade



Initial Rating	Upgrade Rating	Annual GJ Saving	Approx material cost	Minimum Rebate
R32 Batt	R50 Blown-in	3 GJ/Yr	\$700	\$80

Building science 101

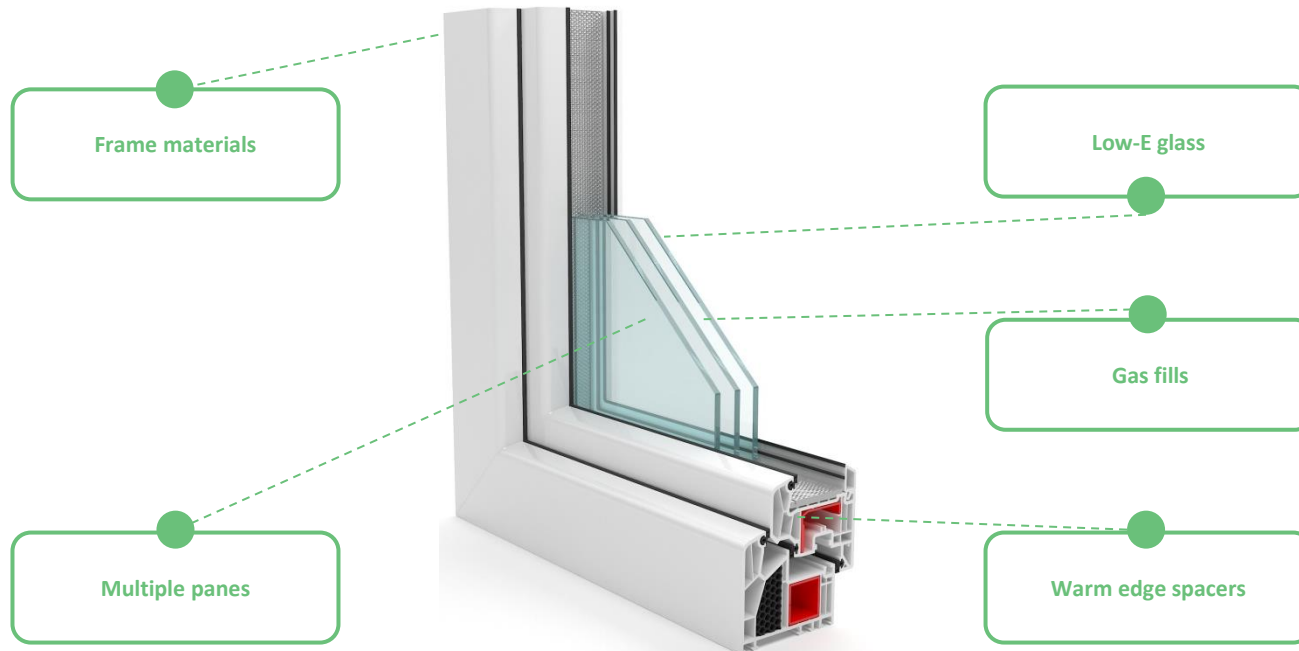
Energy efficient windows are important to homeowners and the various makeup of their components all affect energy efficiency



Windows, doors and skylights can be a significant source of energy loss in your home – up to 35%

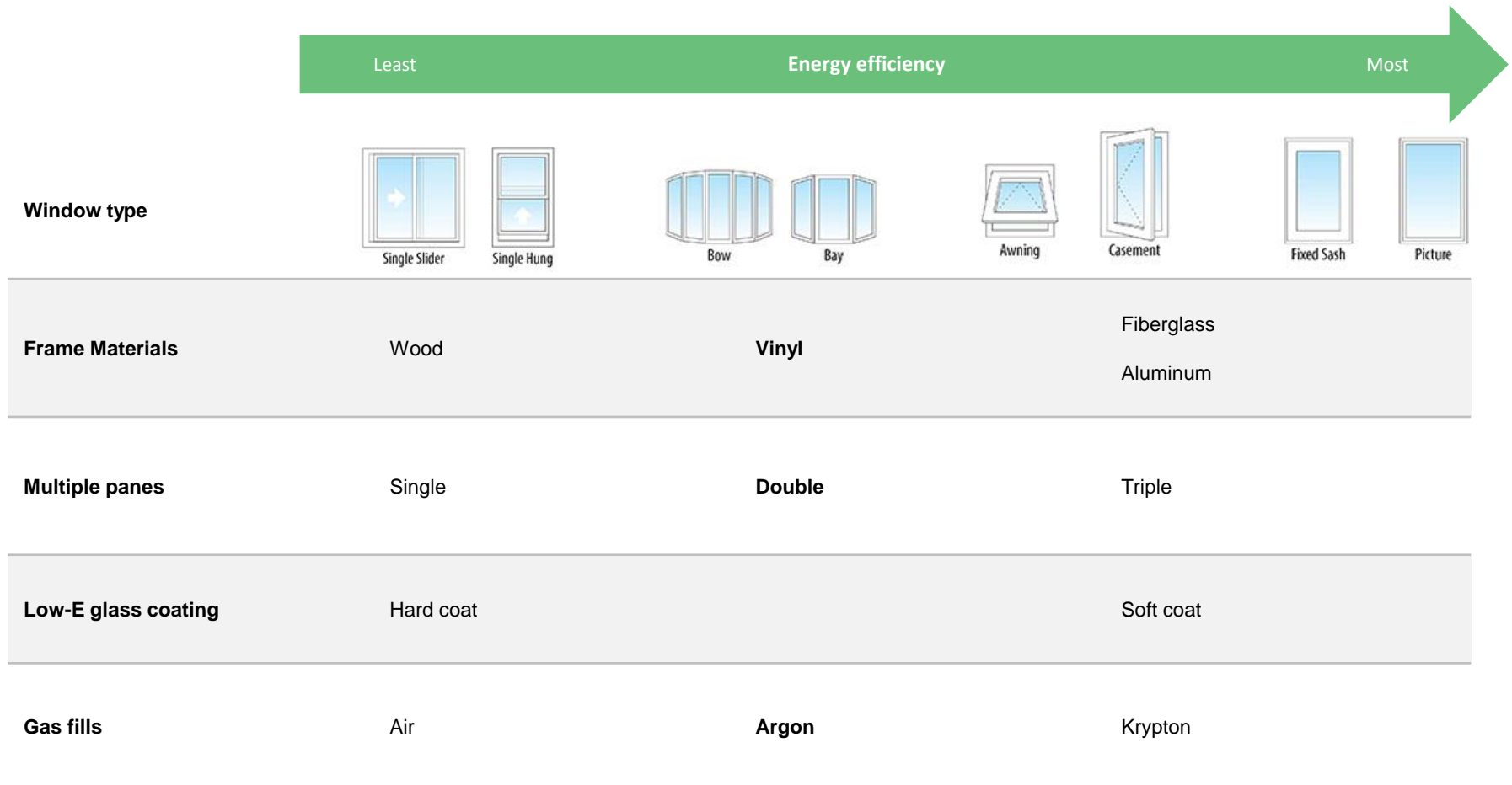
And don't forget about the installation. A poorly installed window, door or skylight may cause condensation, cold drafts or even allow water to leak into your home

Anatomy of an Energy-Efficient Window



Building science 101

Different combinations of window types and materials yield more energy efficient windows




Building science 101


ENERGYSTAR ratings are commonly used in Canada to depict energy efficiency

< 10	26	50 >
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ENERGY STAR® Certified in Highlighted Regions
Certifié ENERGY STAR dans les régions en surbrillance

Canada


energystar.gc.ca


■ = Zones 1 2 3

DO NOT REMOVE UNTIL FINAL INSPECTION/NE PAS RETIRER AVANT L'INSPECTION FINALE

Energy Performance Ratings
Évaluation des propriétés énergétiques

U-Factor
Facteur-U

1.10

W/m²·K

Solar Heat Gain Coefficient
Coefficient de gain de chaleur solaire

0.35


Energy Rating
Rendement énergétique

36

Visual Transmittance
Transmission visible

0.53

Window Company Ltd.
Triple X Operable Casement
Vinyl frame, triple glaze, Low-e coating (e=0.022, S3, S5)
Krypton/air filled (both cavities), Grills <=13mm
NR9999-9999999-ES



Energy performance and visual transmittance ratings certified to CSA A440.2-14. Ratings are determined for a fixed set of environmental conditions and a specific product. Certification agency does not recommend or warrant product for any specific use.

Les taux de performance énergétique et de transmission visible sont certifiés CSA A440.2-14. Les taux sont déterminés selon une série de conditions environnementales fixes et une taille de produit particulière. L'agence de certification ne recommande ni ne garantit le produit aux fins d'utilisation particulière.

Upgrade	Initial Windows	Upgrade Windows	Annual GJ Saving	Approx material cost	Minimum Rebate
10% better	Single Pane U - 4.0	Dual Pane U - 1.70	16 GJ/Yr	\$7,500	\$0
40% better	Single Pane U - 4.0	Triple Pane U - 1.0	25 GJ/Yr	\$8,250	\$400

Building science 101

The Energy Rating of windows and doors is calculated using a formula that balances U-value with SHGC and airtightness

Energy Rating (ER)

A value demonstrating the balance between **U-factor**, **SHGC**, **VT** and air leakage.

< 10

26

50 >

$$(57.76 \times \text{SHGC}_w) - (21.90 \times U_w) - (1.97 \times L_{75}) + 40$$

$$ER = \frac{[\text{SHGC}_w \times F_g \times H_i \times R] - [(T_{hi} - T_{ho}) \times U_w] - [(T_{hi} - T_{ho}) \times (PF/20) \times L_{75} \times \rho_C]}{DF} + SF$$

U-factor / U-value

Measures the rate of heat transfer and tells you how well the window insulates.

0.7

1.9 >

Note: U-value

The U-value is not part of the energy performance standards, but is often quoted by contractors.

- **Look for:** Low numbers

Air Leakage

Measures how much air will enter a room through a product. The lower the number, the fewer drafts you'll experience.

0.1

0.3

Solar heat gain coefficient

SHGC measures the fraction of solar energy transmitted and tells you how well the product blocks heat caused by sunlight.

0

0.5

1

Note: SHGC

SHGC is rated as a ratio. A SHGC of 0.5 means that 50% of the available solar heat is coming through the window.

Visible transmittance

VT measures how well a product is designed to effectively light your home with daylight, potentially saving you money on artificial lighting.

0

1



Heat

Light

Conductive heat

Building science 101

Did you know?

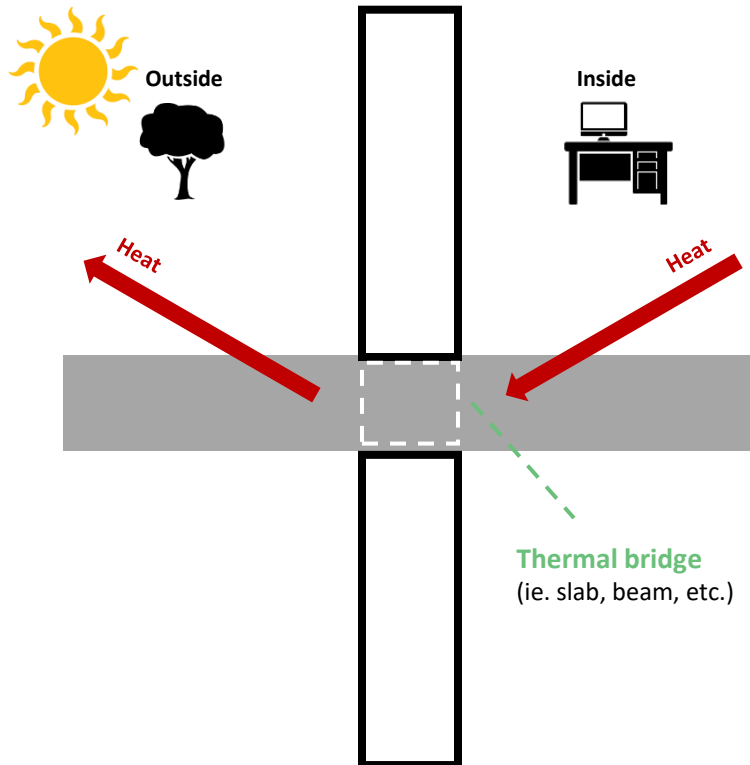
A metal-framed wall has a thermal bridge at each stud because metal transfers more heat than the insulation between the studs.

A thermal bridge is a spot in the building envelope that transfers heat more quickly than the rest of the building envelope



Minimizing thermal bridges

- High performance components
- Continuous insulation
- Airtightness
- Thermal bridge-free construction



Construction thermal bridges

These are the easiest type of thermal bridge to comprehend and visualize.

- **Rafters** that pass through the thermal envelope to support the eaves (or for decoration!)
- **Timber studs or joists** within the insulation zone
- **Cantilevered** structure passing through the thermal envelope
- **Lintels** that interrupt cavity insulation
- **Gaps** left between insulation boards

Geometric thermal bridges

These are where the geometry of the thermal envelope causes increased heat loss in specific locations.

- External **wall corners**
- Ground floor and external **wall junction**
- **Eaves junction**
- **Around window and door** openings

Building science 101

The restriction of air movement by the air barriers system is one of the most important functions of the building enclosure



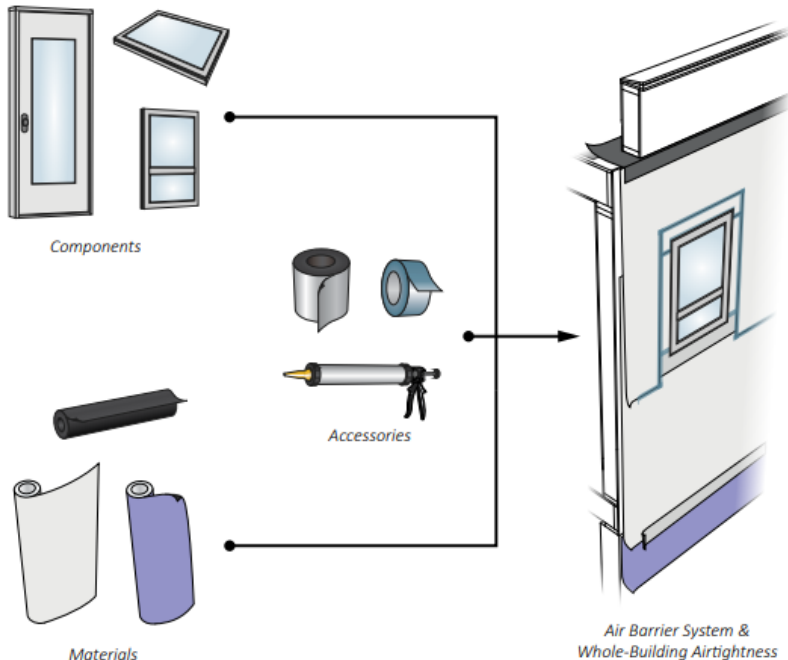
Air tightness

Air barrier systems can be:

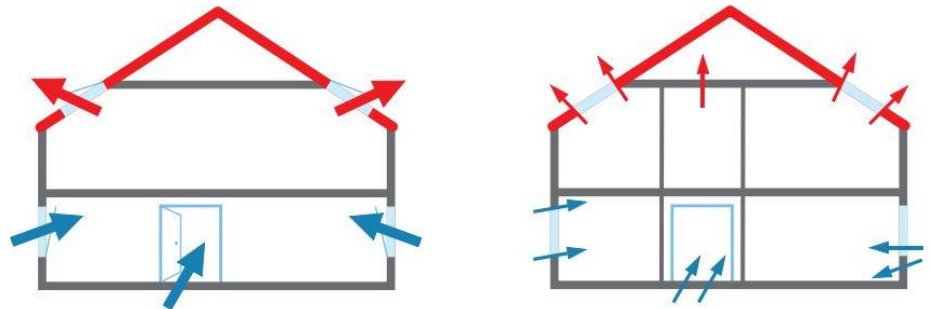
- Air-tight drywall
- Spray applied foam insulation
- Rigid panel materials
- Membrane sheets

Air barriers must be continuous

- Across construction, control and expansion joints
- Across junctions between different building materials and assemblies
- Around penetrations through all building assemblies.

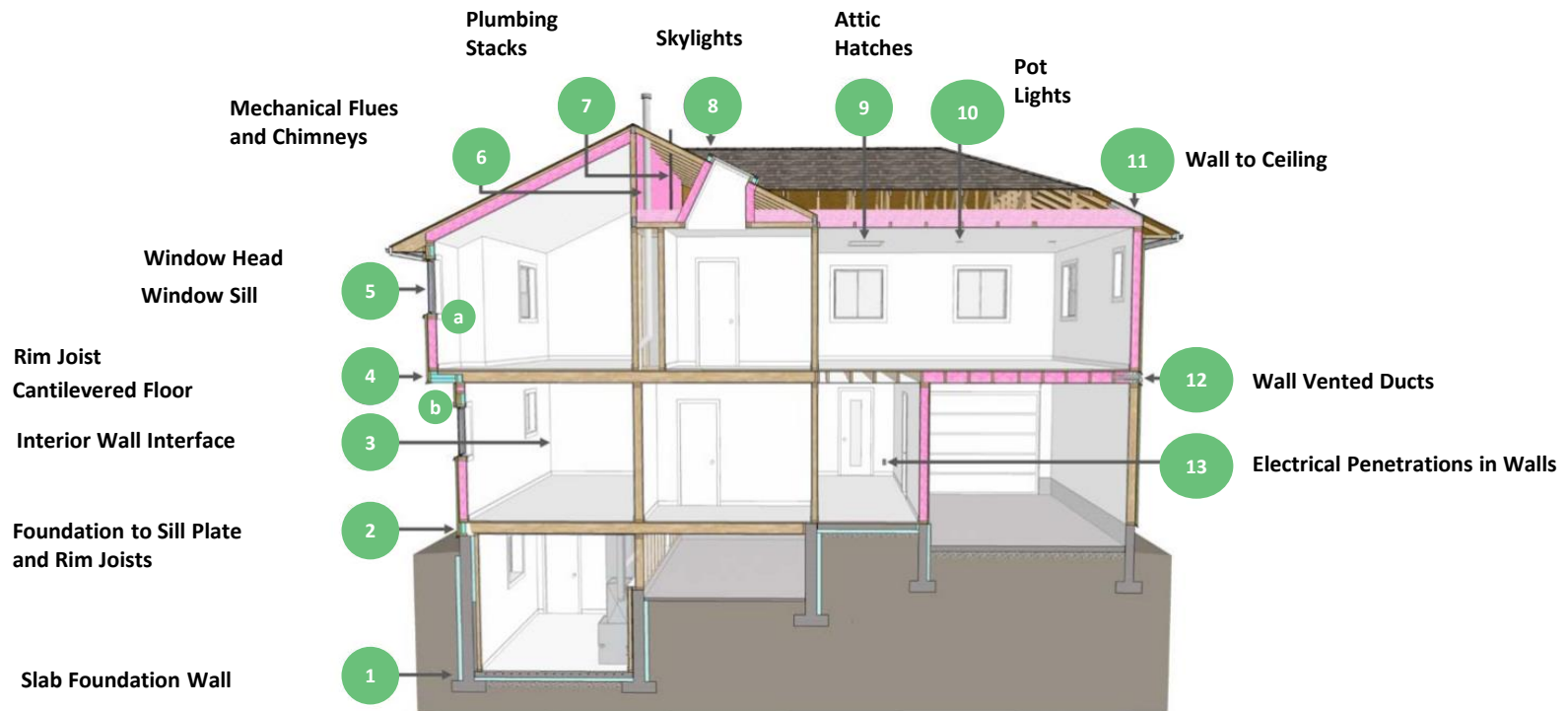


Hidden air leaks cause some of the largest heat losses in older homes



Building science 101

Airtightness is the fundamental building property that impacts infiltration and exfiltration and these are the common challenges



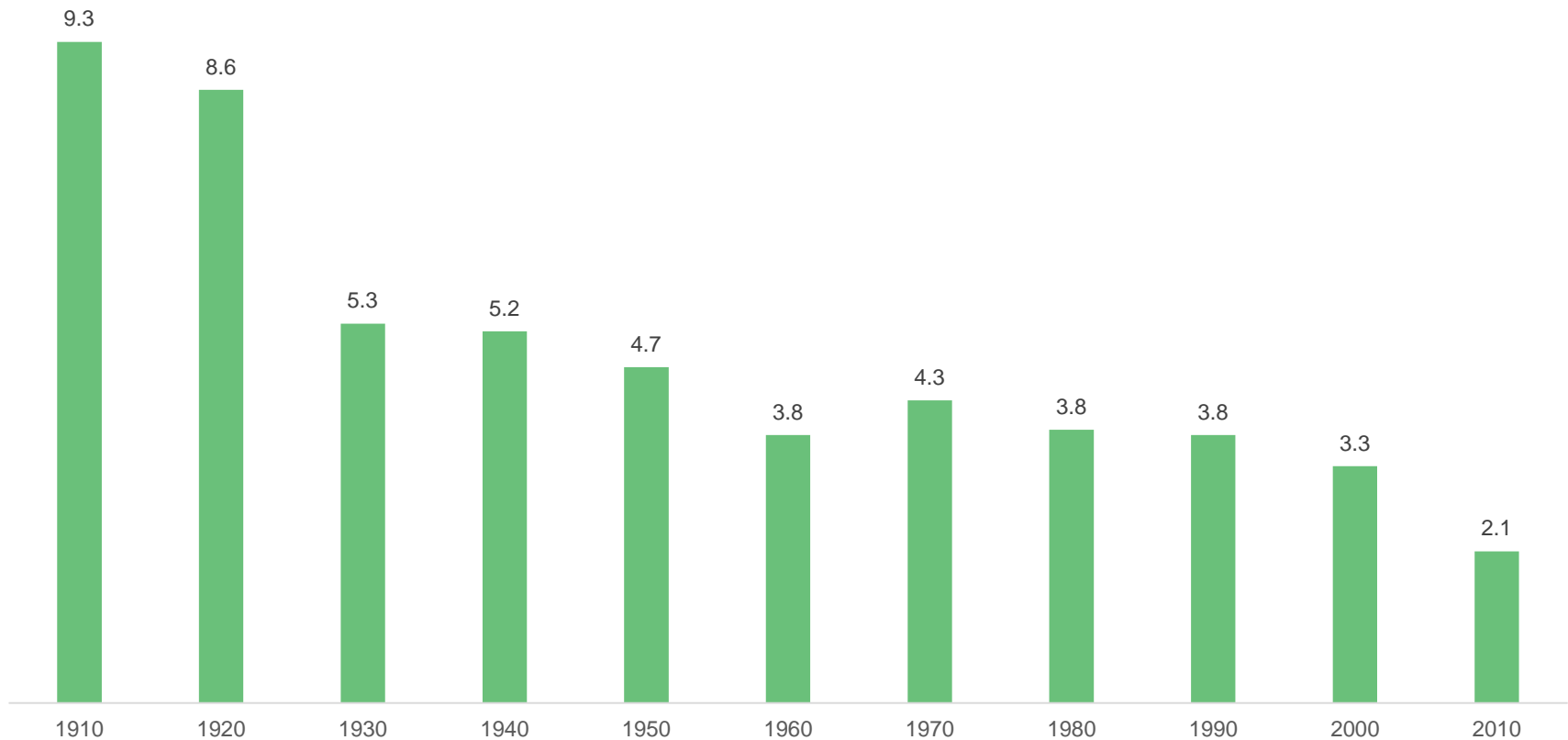
ACH		
< 4	3.2	1 >

Building science 101

Did you know?
Reducing air leaks could cut 10% from
an average households monthly energy
bill

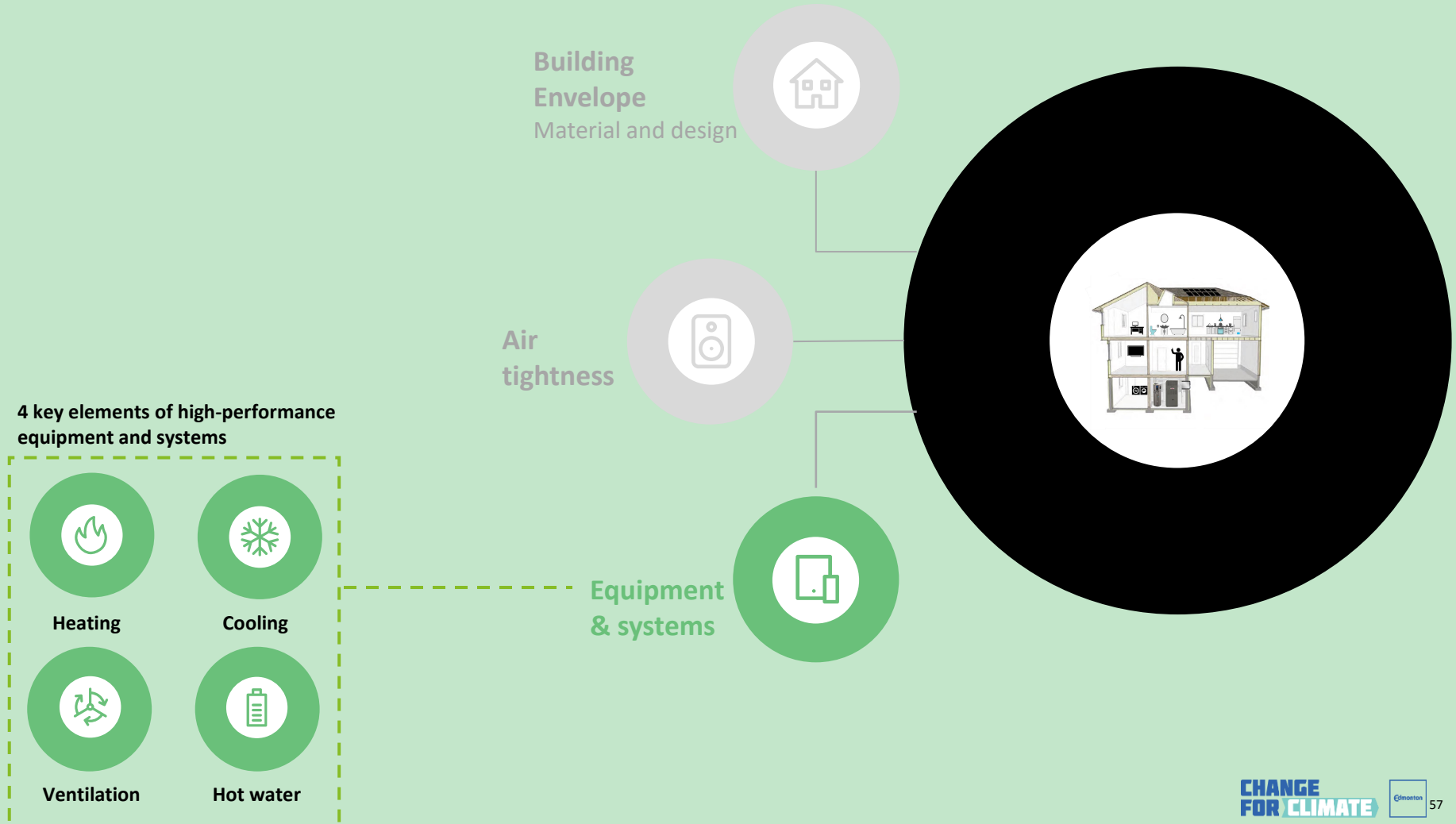
Air tightness of homes is continuing to decrease as time goes on due to improved construction techniques and building codes

Actual ACH in existing homes



Building science 101

Energy efficient equipment and systems will minimize the energy needed to run all equipment and systems



Building science 101

Did you know?
You can cut annual heating bills by as much as
10% a year by turning your thermostat back 10 to
15% for eight hours a day

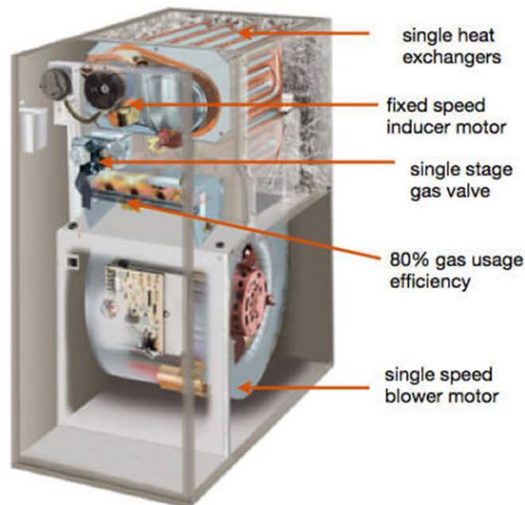
With space heating representing the highest home energy use, it offers the most potential for cutting your energy bill



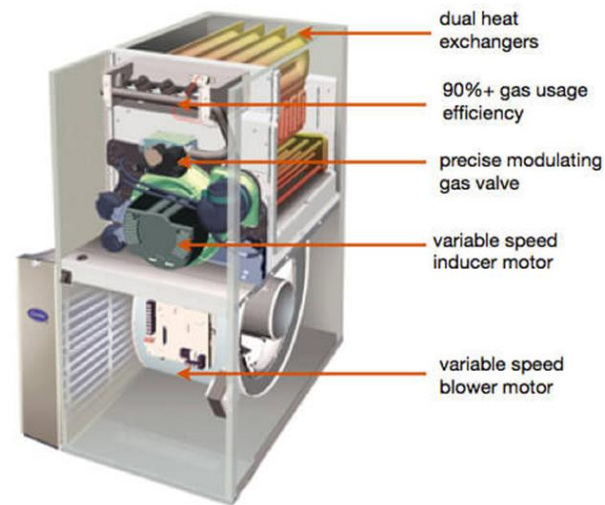
Heating

Canada's cold climate means that space heating accounts for a 61% of the energy used in the average Canadian home

Standard Efficiency



High Efficiency

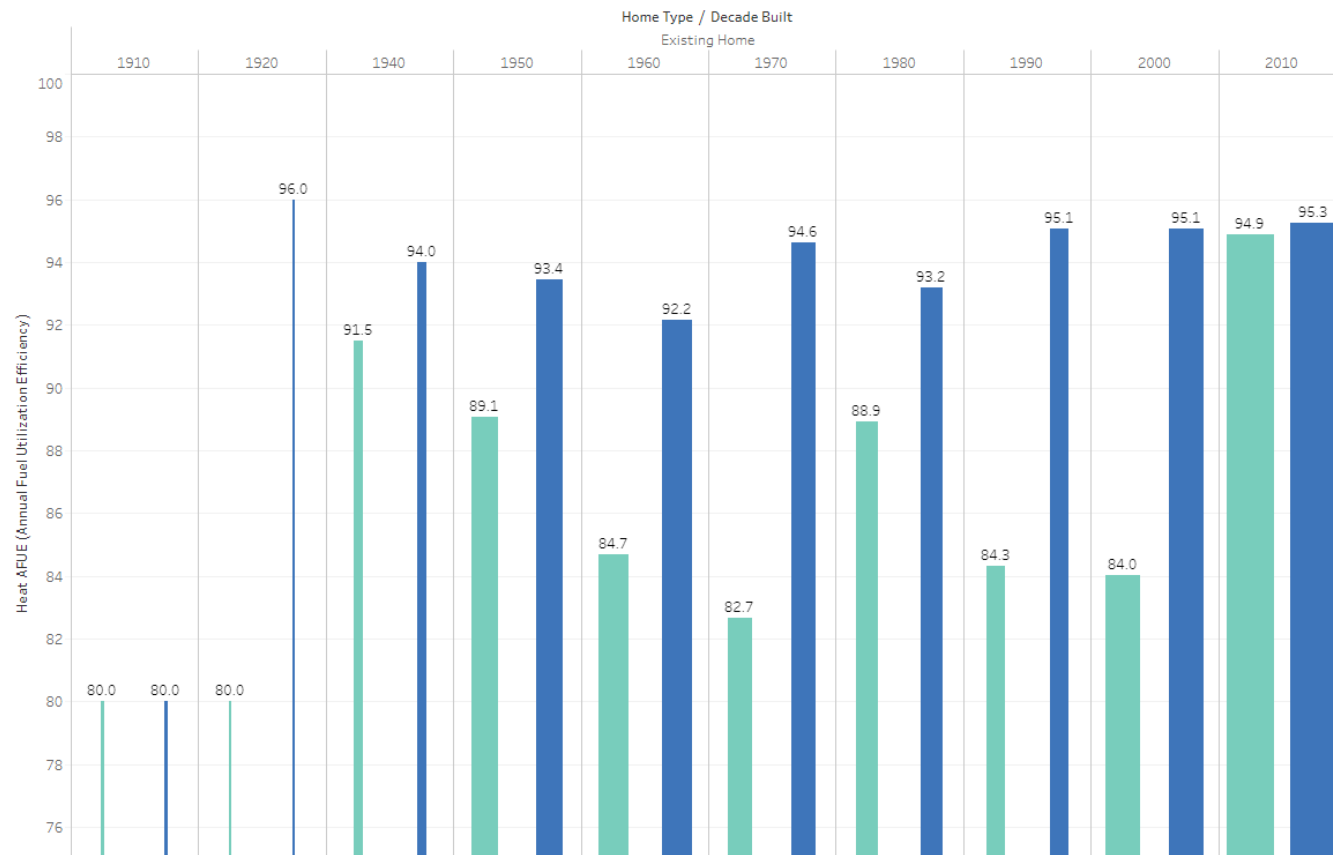


AFUE		
< 92	95	98 >

Building science 101

Actual AFUE ratings of heating systems of homes drastically increased in 2010 construction, others likely need an upgrade

Annual Heat Fuel Utilization Efficiency (AFUE) By Decade for Existing Homes - Actual vs. Recommended



Building science 101

Did you know?

The average home collects 40 pounds of dust every year. You can help filter out some of this dust by installing an efficient HVAC system

Ventilation is the least expensive and most energy-efficient way to cool buildings



Ventilation

Ventilation devices make for a healthier, cleaner, and more comfortable home by continuously replacing stale indoor air with fresh outdoor air.

New homes built since 1977 are more airtight, which helps save energy but can make the inside air stale.

Residential ventilating products



Heat/Energy Recovery Ventilator

SRE %

60/50

66/60

78/72



Ventilating fan



Ceiling fan



Dehumidifiers

Residential cooling and heating equipment



Central air



Room air

SEER

< 14

16

21 >



Air source heat pumps

HSFP

6.8

8.2

9.5



Smart/connecting

Building science 101

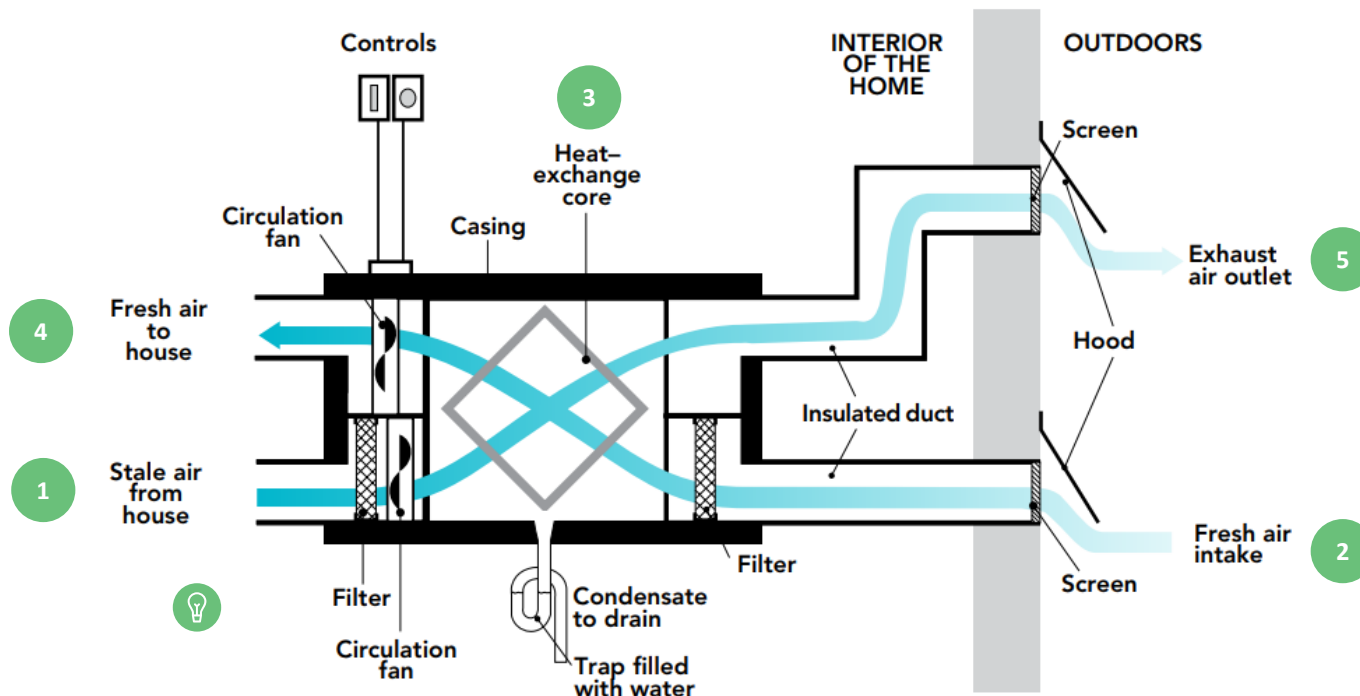
Did you know?
Every day we breath around
11,000 litres of air

Heat Recovery Ventilators (HRV) continuously replacing stale indoor air with fresh outdoor air



HRVs reduce the energy consumption associated with heating or cooling ventilation air and have a significant impact on meeting performance code requirements

How an HRV works (and its components)



1 Natural Resources Canada; Heat Recovery Ventilators,
https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/energystar/HRV_EN.pdf
2 <https://www.ambientedge.com/blog/3-things-you-dont-know-about-indoor-air-quality/>

SRE %		
60/50	66/60	78/72

Building science 101

Every energy-using appliance has two price tags:
The purchase price and the cost of energy

Did you know?

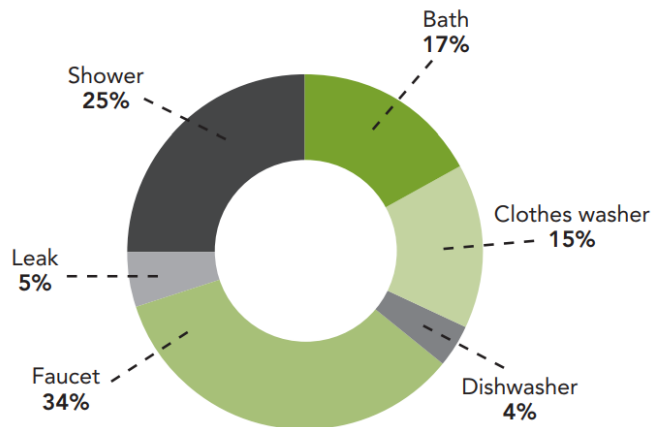
Canadians use an average of 75 Litres of hot water each at home every day—for washing dishes and clothing, cleaning and showering or bathing



Hot water

Water heaters account for 19% of the energy used in the average Canadian home

Main uses for household hot water



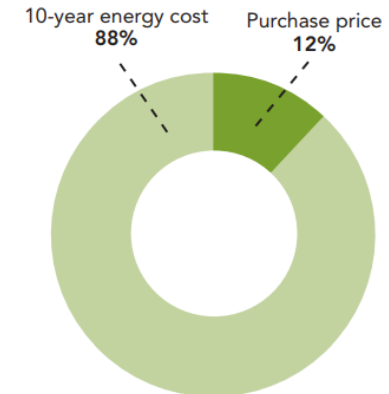
Source: Canadian Building Energy End-Use Data and Analysis Centre



Total cost of ownership

Electric hot water storage tank

Total energy costs are 7 times the initial purchase price.



Possible energy sources by water heater type

Water heater type	Electric	Gas*	Oil
Storage tank	Yes	Yes	Yes
Tankless	Yes	Yes	–
Heat pump	Yes	–	–
Solar domestic hot water system	Yes	Yes	Yes

* Gas refers to either natural gas or propane.

1 Natural Resources Canada; Water Heaters, <https://www.nrcan.gc.ca/energy/products/categories/water-heaters/13735>

2 Natural Resources Canada; Water Heater Guide, https://www.nrcan.gc.ca/sites/oe.nrcan.gc.ca/files/files/pdf/equipment/WaterHeaterGuide_e.pdf

Building science 101

Hot water use is the second largest portion of energy utility costs, after home heating



Storage Tank

These systems store heated water in a tank so a quantity of hot water is stored and available.



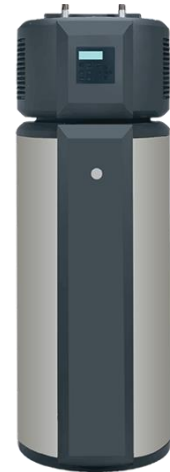
Tankless

This type of water heater consists of either an electric element or a gas burner that heats flowing water and does not have a storage tank.



Electric Water Heater

The upper element heats the water in the upper portion of the tank to quickly provide some hot water if most of the hot water has been used. After the upper portion of water is heated to the thermostat set point, the thermostat turns off the upper element and turns on the lower element



Heat Pump

Use electricity to transfer heat from the air instead of converting electricity directly to heat. Heat is taken from the air in the basement or utility room (or sometimes from outside) and transferred to a tank of water.

EF			EF			Standby loss (watts)			COP		
0.6	0.67	0.80+	< 0.80	0.82	0.95 >	25	70	180.5	3.2	4.5	5.2

1 Natural Resources Canada; Water Heaters, <https://www.nrcan.gc.ca/energy/products/categories/water-heaters/13735>

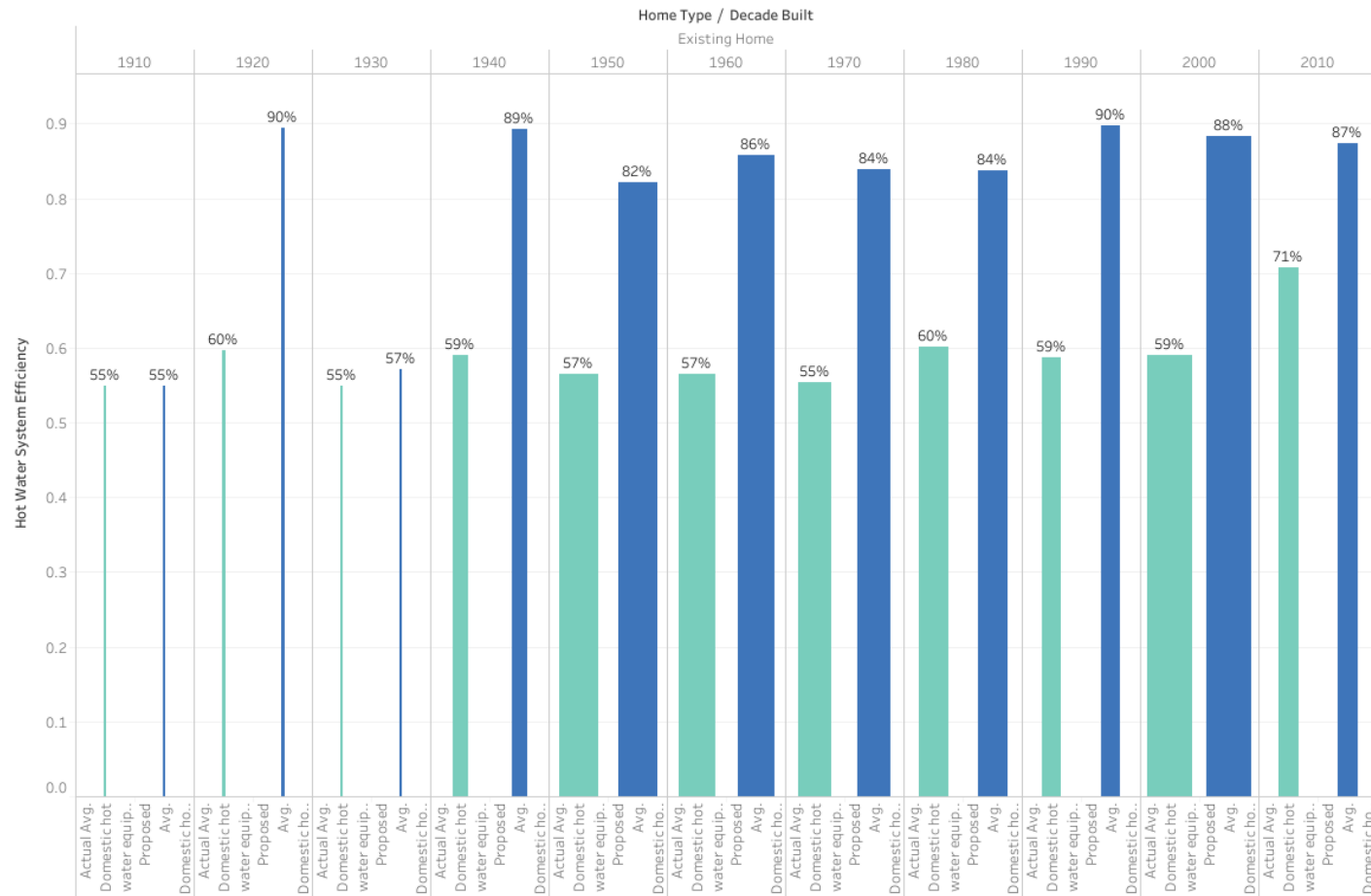
2 Natural Resources Canada; Water Heater Guide, https://www.nrcan.gc.ca/sites/oe.nrcan.gc.ca/files/files/pdf/equipment/WaterHeaterGuide_e.pdf

Building science 101

Did you know?
Tankless Water Heaters have a life expectancy of 20 plus years. That's 5-10+ more years than a Storage Tank Water Heater

Regardless of the year a home was built, hot water system upgrades should always be considered

Actual vs. Recommended Hot Water System Efficiency



Building science 101

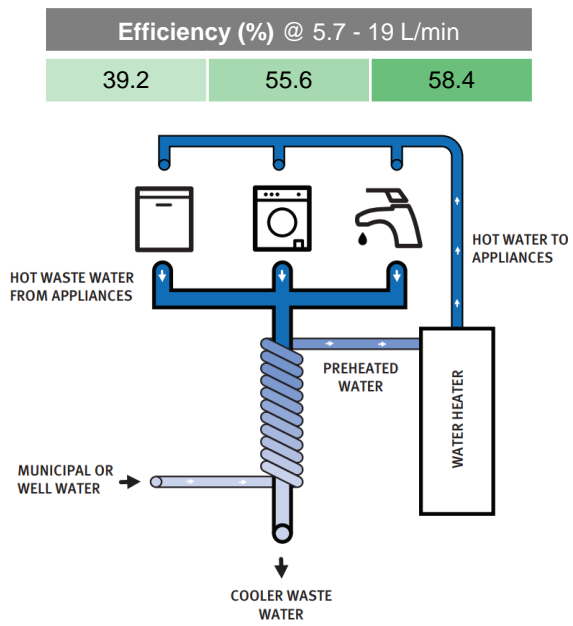
Did you know?
DWHR systems can reduce hot water requirements for showering by 40 to 60%

A drain water heat recovery (DWHR) pipe is a simple technology to save on energy used to heat water



DWHR pipes take advantage of the warm water flowing down the drains to preheat the water going into the hot water tank.

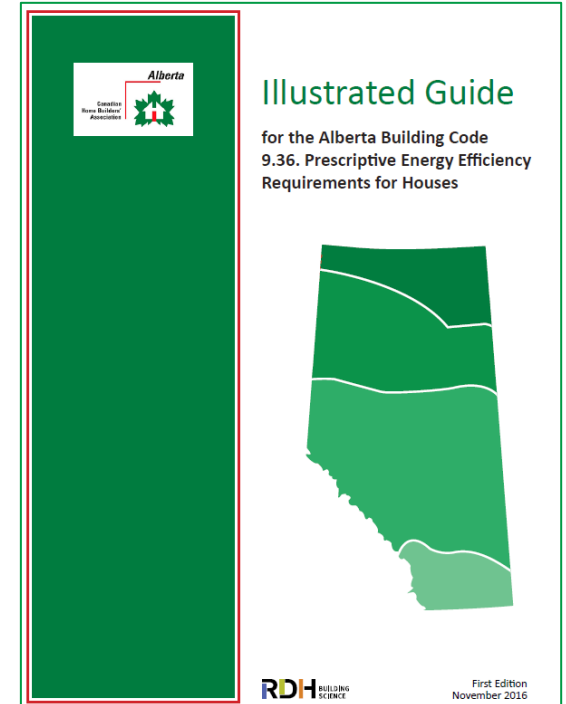
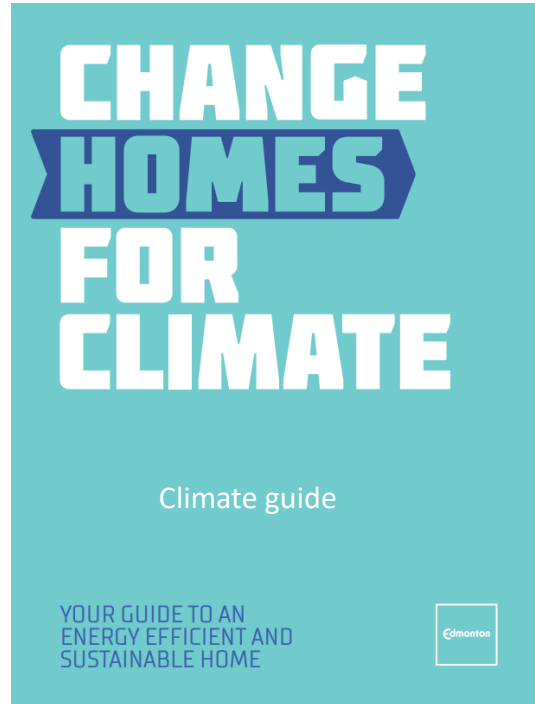
Preheating the water reduces the amount of energy needed to heat the water to the set temperature.



Initial DWHR	Upgrade DWHR	Annual GJ Saving	Avg. Cost	Minimum Rebate
N/A	9.5L/min @ 55.6% EF	4 GJ/Yr	\$600	\$214

Building science 101

Building science resources



Home Energy Labelling and EnerGuide's role in promoting energy efficient homes

EnerGuide for Homes

Canada's energy rating and labelling system that certifies the energy efficiency of new and existing homes

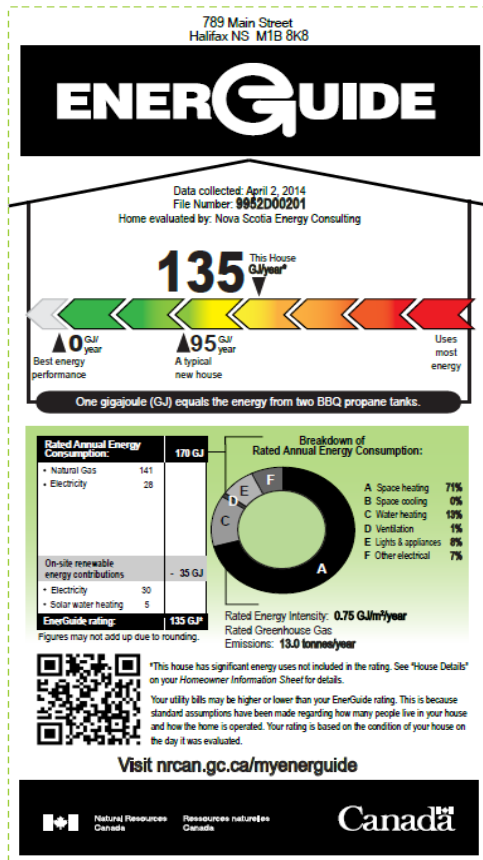
ENERG GUIDE

60+ programs and regulations
are delivered using EnerGuide



Home energy labeling

EnerGuide is Canada's energy rating and labelling system that certifies the energy efficiency of new and existing homes



Since 1998, a national brand for energy rating and labelling of homes

More than one million homes rated for energy performance

More than 60 programs and regulations are delivered using EnerGuide



Supporting homeowners and builders



Strong stakeholder support for EnerGuide as a national tool



Spring 2019 - Unprotected open data will be publicly available from over 1 million home evaluations

Winter 2019 – Online platform and framework for labelling and sharing energy use data

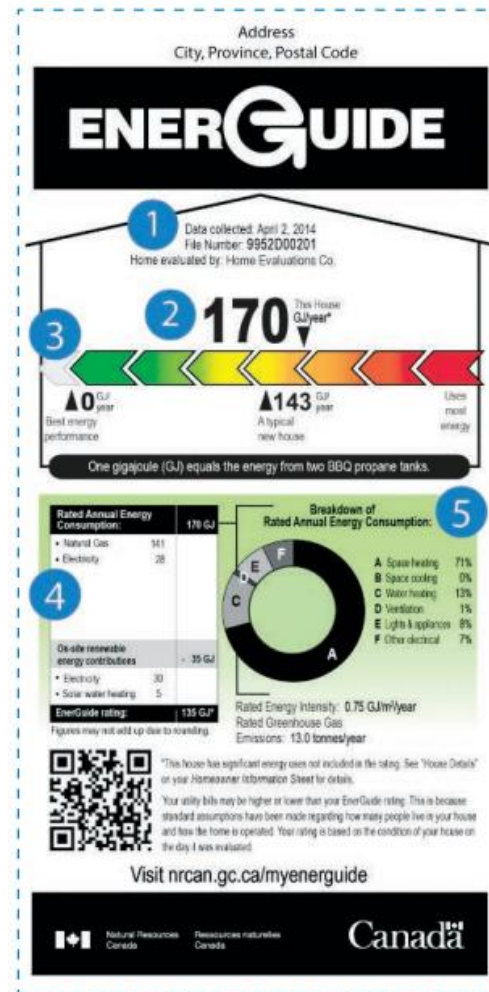
Note: Used for residential buildings that are up to 3 storeys above grade or 600m² (Part 9 of the National Building Code)

Home energy labeling

Administered by NRCAN licensed Service Organizations, EnerGuide is the official, Government backed, record of a home's energy performance

Did you know?

A one-point improvement on the EnerGuide rating scale typically reduces a home's energy consumption by 3-5%



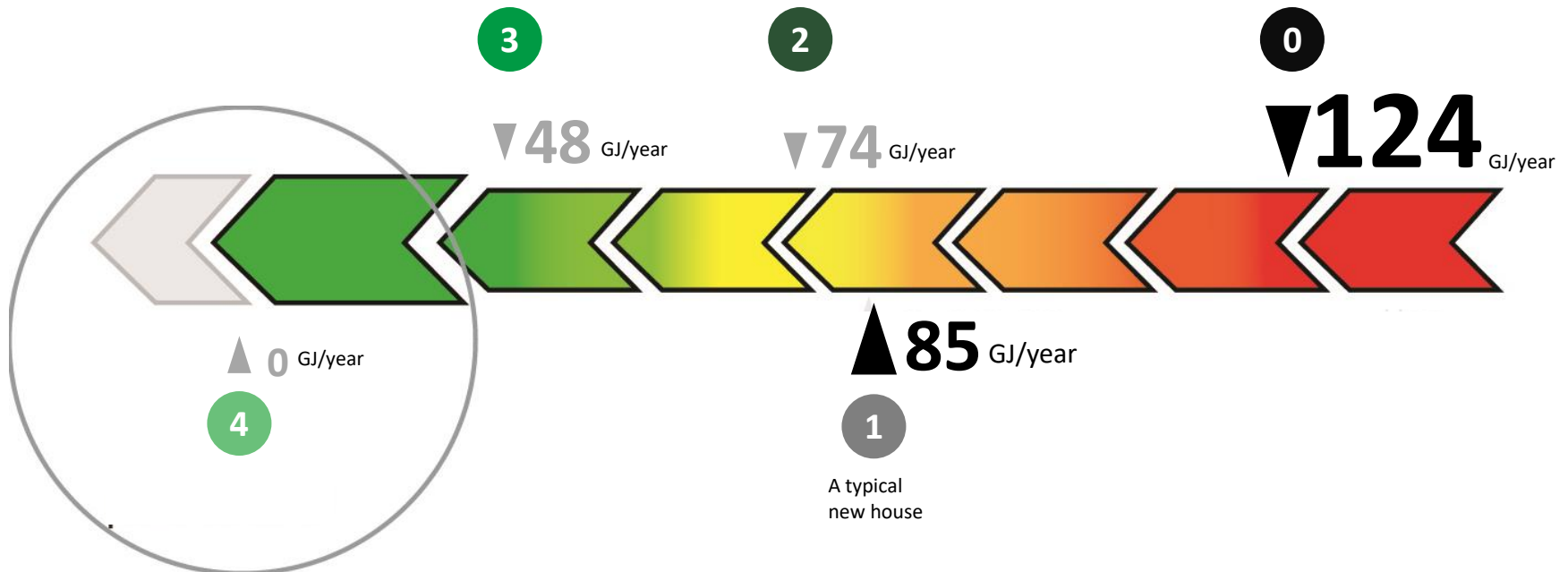
After an EnerGuide evaluation is performed on your home, an EnerGuide Label will be given to you to affix to your electrical panel.

- 1 Information about the evaluation for the homeowner
- 2 EnerGuide home rating
- 3 EnerGuide rating scale
- 4 Calculation of the rating
- 5 Breakdown of the rated annual energy consumption

Home energy labeling

The EnerGuide label shows you exactly how energy-efficient your home is and allows you to compare against similar homes

	0	1	2	3	4
	-30%	After upgrade #1 ABC	10% better	40% better	Net Zero
Energy Usage (GJ)	124 GJ/YR	85 GJ/Yr	74 GJ/Yr	48 GJ/Yr	0 GJ/Yr
Total energy cost	\$2,835	\$2,400	\$2,300	\$2,000	\$0



Home energy labeling

Canadians are already voluntarily having certified home energy evaluations on their homes



1,059,320

New and existing labels since 2011



3580

Labels in 2018

2953 New
627 Existing



EnerGuide home evaluations are mandatory for new homes and renovations in Vancouver

Renovation requirements

Total project cost	EnerGuide Home Evaluation and upgrades required?
Less than \$5,000	Not required
\$5000 to \$24,999	EnerGuide Home Evaluation
\$25,000 to \$49,999	EnerGuide Home Evaluation + air sealing
More than \$50,000	EnerGuide Home Evaluation + air sealing + improve attic insulation

By 2020 new homes must be carbon neutral and use 50% less energy than homes did in 2007

Home energy labeling

Energy Performance Certificates (EPC) are the EU's equivalent to Canada's EnerGuide rating and labelling system




Energy Performance of Buildings Directive is the key instrument to increase the energy performance of buildings across the European Union

- **2002 Introduced** (EPBD 2002/91/EC)
- **2010 Revised** (EPBD recast 2010/31/EU)
- **2016 Updated to promote “smart technology”** as part of the Clean Energy for All Europeans package to streamline existing rules
- **2016 New database** published to track the energy performance of buildings across Europe (EU Building Stock Observatory)
- **2018 Revised and entered into force**; Member States have 20 months to transpose its provisions into national law (namely until 10 March 2020).
- **2020, 31 December All new buildings must be nearly zero-energy buildings** (public buildings by 31 December 2018)

- Note: Implementation is largely left to each member state

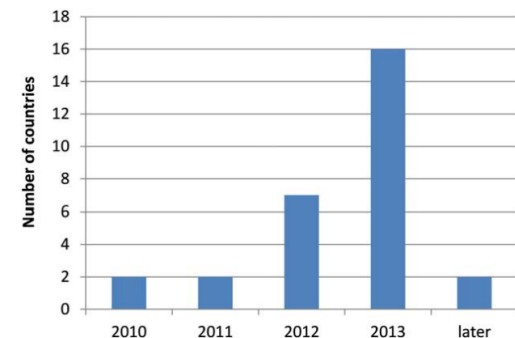
Energy Performance Certificate (EPC)

Report that assesses the energy efficiency of a property and recommends specific ways in which the efficiency of your property could be improved

Energy performance certificates must be issued when a building is sold or rented, and they must also be included in all advertisements for the sale or rental of buildings

- **2010 required** to be published when advertising a property
- **2012-2013** this requirement **came into force** into force in the majority of member states

Figure 9: Year when the requirement for the inclusion of the EPC in advertisements came into force in MSs.



1 United Nations Economic Commission for Europe; Mapping of Existing Energy Efficiency Standards & Technologies in Buildings in the UNECE Region

2 <https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>

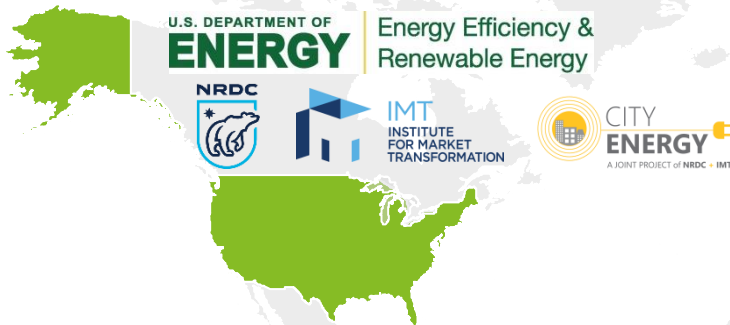
Home energy labeling

Cities in the US are leading the way with energy disclosure policies for existing homes



U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE)

EERE has set milestones for providing energy savings of 25%–50% by 2020–2030.



Energy Disclosure Policies for Existing Homes

Austin, Texas

Since 2011, all homes being sold within city limits to receive an energy audit by a certified energy auditor using a standardized audit form

Berkeley, California

Building Energy Saving Ordinance (BESO) requires Public reporting of energy assessment and disclosure of energy information prior to sale

Portland, Oregon

As of January 1, 2019, any real-estate listing for a home in Portland, Oregon, must include the Home Energy Score.

Montgomery County, Maryland

Since January 1, 2009, home sellers must provide an energy cost and consumption history along with information on the benefits of home energy audits and energy efficiency improvements.

Chicago, Illinois

Since 1987, heating bill disclosure is required for residential sales. In 2013 it was updated to include digital disclosure - A requirement to make the of data online for residential sales transactions

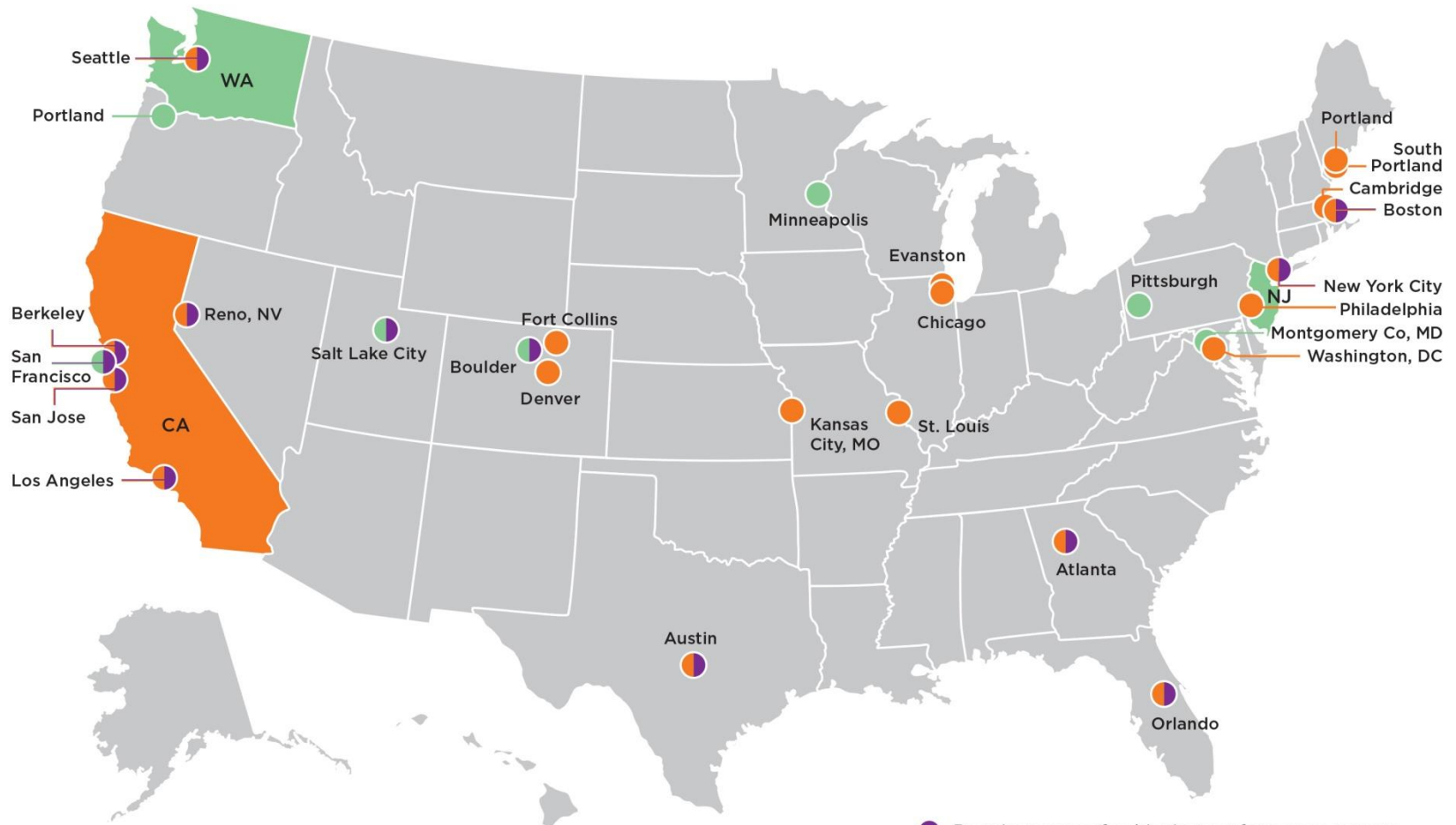
	Legislation				Disclosure			Trigger		Building stock
	Jurisdiction	Short name	Enacted	Effective	Efficiency Checklist	Utility Data	Evaluation/Audit	Sale	Rental	New Homes Only
Cities & Counties	Austin, TX	ECAD Ordinance	2008	2011	-	-	✓	✓	-	-
	Berkeley, CA	Building Energy Saving Ordinance	2015	2016	-	✓	✓	✓	-	-
	Chicago, IL	Ordinance No. 02013-1645	2013	2013	-	✓	-	✓	✓	-
	Montgomery County, MD	Bill No. 31-07	2008	2008	-	✓	-	✓	-	-
	Santa Fe, NM	Ordinance No. 2007-38	2007	2008	-	-	✓	✓	-	✓
States	Alaska	AS 34.70.101	2008	2008	-	✓	-	✓	-	-
	Hawaii	\$508D-10.5	2009	2009	-	✓	-	✓	-	-
	Kansas	HS 2036	2007	2007	✓	-	-	✓	-	✓
	Maine	H.P. 1468 - L.D. 2074	2006	2006	✓	-	†	†	✓	-
	New York	Truth in Heating Law	1980	1981	-	✓	-	✓	✓	-
	South Dakota	SB 64	2009	2009	✓	-	-	✓	-	✓

1 United Nations Economic Commission for Europe; Mapping of Existing Energy Efficiency Standards & Technologies in Buildings in the UNECE Region

2 Transforming the Market for Energy Efficiency in Minneapolis, <https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>

Home energy labeling

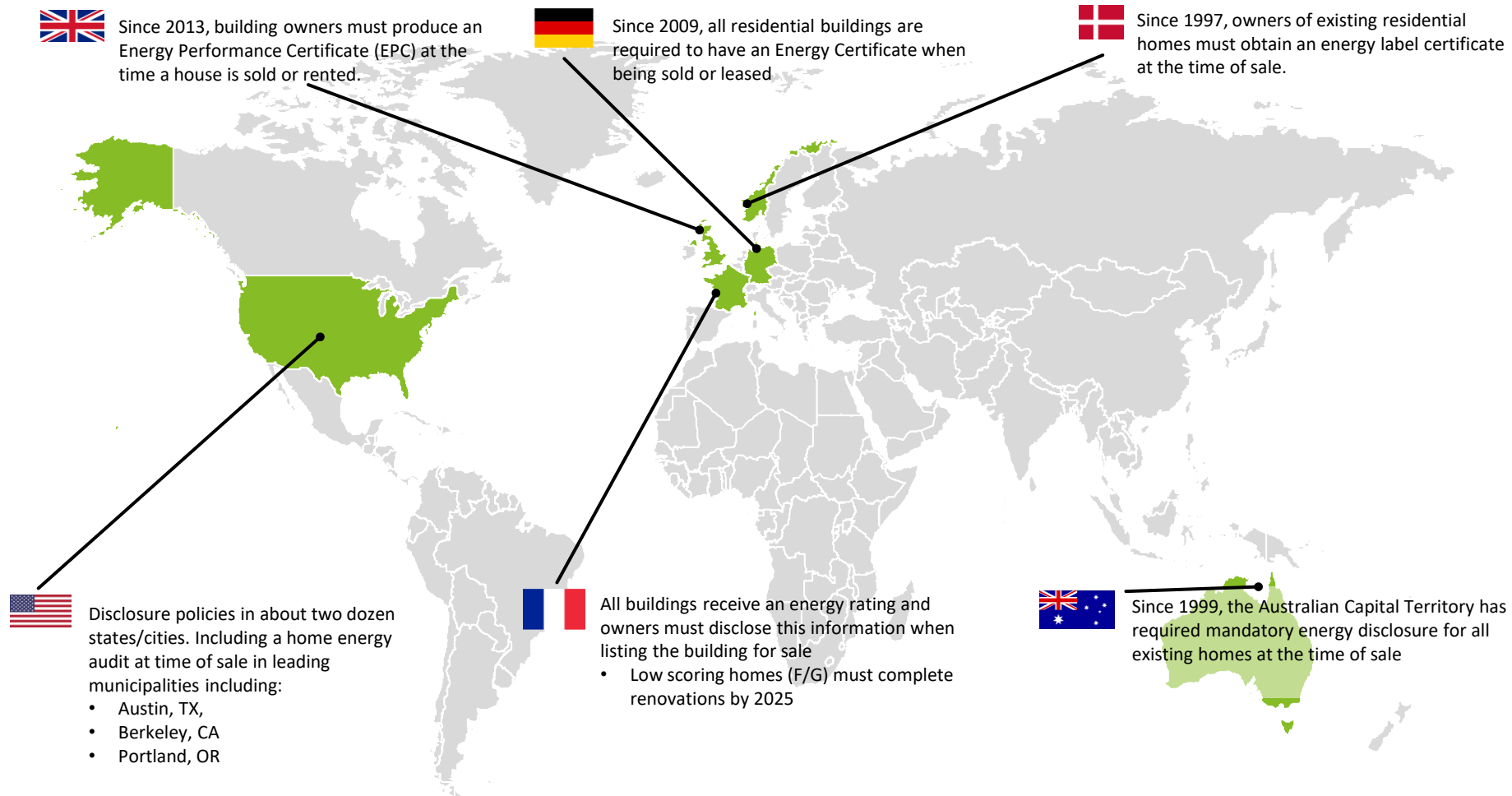
US cities, counties, and states with mandatory building energy benchmarking and transparency policies for existing buildings



- Requirements of achieving performance targets or completing additional actions
- Benchmarking policy for public, commercial, and multifamily buildings adopted
- Benchmarking policy for public and commercial buildings adopted

Home energy labeling

More than 30 countries have already implemented mandatory home energy labelling schemes to accelerate energy efficiency

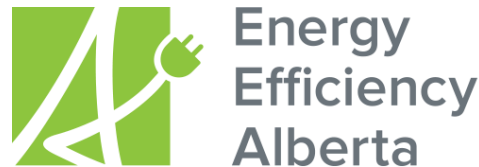


Energy efficiency incentives: Educating your clients



Energy efficiency incentives: Educating your clients

Energy Efficiency Alberta and Climate Change for Homes are the 2 programs driving energy efficiency in homes



Energy Efficiency Alberta is the Government of Alberta agency responsible for administering the Home Energy Plan program

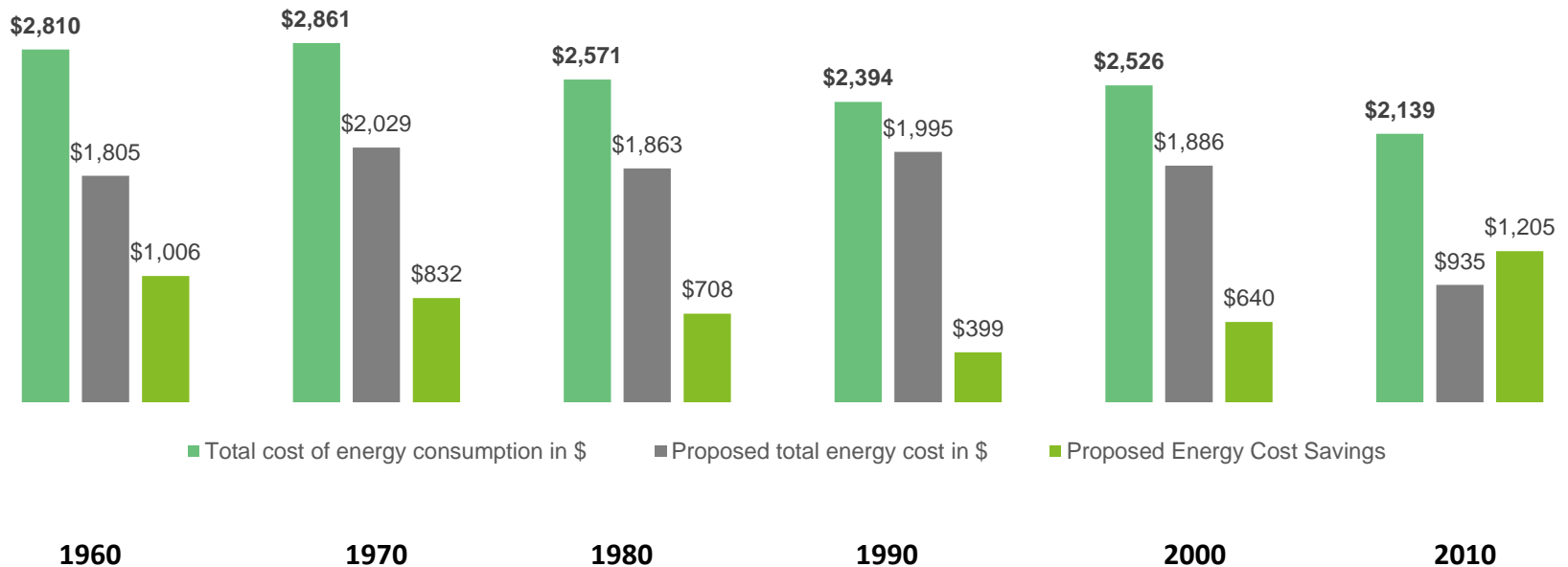


The City of Edmonton Climate Change for Homes is a complementary program that provides additional rebates for home energy efficient upgrades

Edmonton and home energy efficiency: The local market

All homes can save money on your utility bills regardless of the decade a home was built

Home energy costs by decade in Edmonton: Actual, proposed and savings potential



Edmonton and home energy efficiency: The local market

Regardless of year built, attic, draft proofing and space heating are the most common recommended upgrades

Upgrades in Alberta by year of construction since April 1, 2011

Recommended	Number of D files / Nombre d'évaluations D	Basement/ Sous-sol	Attic / Plafond	Walls / Murs	Draftproofing ¹ / Étanchéité à l'air ¹	Space Heating / Chauffage	Windows and Doors / Portes et fenêtres
Pre 1945	689	410 (60%)	487 (71%)	347 (50%)	590 (86%)	565 (82%)	508 (74%)
1945-1959	2,157	1,154 (54%)	1,463 (68%)	842 (39%)	1,525 (71%)	1,781 (83%)	1,423 (66%)
1960-1969	1,972	933 (47%)	1,312 (67%)	667 (34%)	1,248 (63%)	1,688 (86%)	1,298 (66%)
1970-1979	4,296	1,659 (39%)	3,074 (72%)	1,275 (30%)	2,883 (67%)	3,778 (88%)	2,534 (59%)
1980-1989	3,232	773 (24%)	2,004 (62%)	623 (19%)	2,222 (69%)	2,849 (88%)	1,942 (60%)
1990-1999	1,987	321 (16%)	1,238 (62%)	153 (8%)	1,259 (63%)	1,839 (93%)	1,017 (51%)
2000-2009	531	76 (14%)	292 (55%)	52 (10%)	332 (63%)	422 (79%)	178 (34%)
2010-2019	152	9 (6%)	27 (18%)	23 (15%)	67 (44%)	12 (8%)	25 (16%)
Total AB	15,016	5,335 (36%)	9,897 (66%)	3,982 (27%)	10,126 (67%)	12,934 (86%)	8,925 (59%)

Undertaken	Number of D files / Nombre d'évaluations D	Basement/ Sous-sol	Attic / Plafond	Walls / Murs	Draftproofing ¹ / Étanchéité à l'air ¹	Space Heating / Chauffage	Windows and Doors / Portes et fenêtres
AB							
Pre 1945	688	200 (29%)	317 (46%)	148 (22%)	614 (89%)	417 (61%)	213 (31%)
1945-1959	2,082	529 (25%)	821 (39%)	300 (14%)	1 878 (90%)	1 419 (68%)	538 (26%)
1960-1969	1,934	372 (19%)	753 (39%)	186 (10%)	1 678 (87%)	1 357 (70%)	470 (24%)
1970-1979	4,300	422 (10%)	1 945 (45%)	275 (6%)	3 787 (88%)	2 911 (68%)	833 (19%)
1980-1989	2,903	161 (6%)	634 (22%)	100 (3%)	2 596 (89%)	2 334 (80%)	612 (21%)
1990-1999	1,718	47 (3%)	358 (21%)	38 (2%)	1 558 (91%)	1 451 (84%)	215 (13%)
2000-2009	291	27 (9%)	60 (21%)	5 (2%)	249 (86%)	213 (73%)	13 (4%)
2010-2019	3	2 (67%)	0 (0%)	0 (0%)	2 (67%)	0 (0%)	1 (33%)
Total AB :	13,919	1 760 (13%)	4 888 (35%)	1 052 (8%)	12 362 (89%)	10 102 (73%)	2 895 (21%)

Energy efficiency incentives: Educating your clients

Energy Efficiency Alberta (EEA) is the provincial agency delivering on the federal mandate



Born out of the made-in-Alberta **Climate Leadership Plan** and funded through the **Carbon Tax**, Energy Efficiency Alberta is a **Government of Alberta agency established in January 2017** that is dedicated to helping the province save energy



HOME ENERGY PLAN

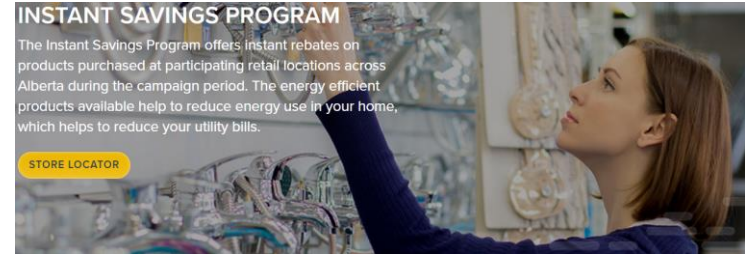
The Home Energy Plan gives you custom rebate options for your home when you complete an EnerGuide Home Energy Evaluation.

[FIND AN ENERGY ADVISOR](#)

INSTANT SAVINGS PROGRAM

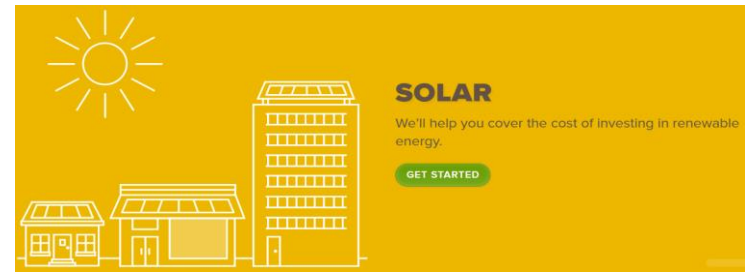
The Instant Savings Program offers instant rebates on products purchased at participating retail locations across Alberta during the campaign period. The energy efficient products available help to reduce energy use in your home, which helps to reduce your utility bills.

[STORE LOCATOR](#)



HOME IMPROVEMENT REBATES

Work with a participating Alberta contractor to increase your at-home energy efficiency with improved insulation, upgraded windows and tankless water heaters—all at a great discount.



SOLAR

We'll help you cover the cost of investing in renewable energy.

[GET STARTED](#)



ONLINE REBATES

Ready to replace your outdated refrigerator or clothes washer with an energy-efficient model? Ready to upgrade to a smart thermostat? Let us help.

Please note, effective June 1, 2018 the rebate amounts are changing to \$75 for all online rebate products.


[STORE LOCATOR](#) [Claim your Rebate](#)



ENERGY EFFICIENCY AND YOUR ORGANIZATION

Energy efficiency incentives: Educating your clients

The Home Energy Plan program provides rebates based on how much energy you save from a renovation...and more



HOME ENERGY PLAN

The Home Energy Plan gives you custom rebate options for your home when you complete an EnerGuide Home Energy Evaluation.

[FIND AN ENERGY ADVISOR](#)



Rebate = \$62.50/GJ of energy saved (+12.5/GJ)

- **\$300 (+\$100)** rebate for EnerGuide Home Energy Evaluation (required to access grants)
- **\$250** rebate for post-upgrade EnerGuide Home Energy Evaluation
- **\$1,000** bonus for completing 3+ upgrades.

- | | | |
|----------------------------|----------------------------|-----------------------------|
| • Air Sealing | • Exposed Floor Insulation | • Water Heating System |
| • Attic Insulation | • Main Wall Insulation | • Windows |
| • Basement Wall Insulation | • Heating System | • Drain Water Heat Recovery |

Rebates are available for work completed after October 16, 2018

Energy efficiency incentives: Educating your clients

The savings add up to an efficient home (and saves you money on future energy bills)

Maximum rebates



\$300 EnerGuide evaluation

\$100 EnerGuide evaluation



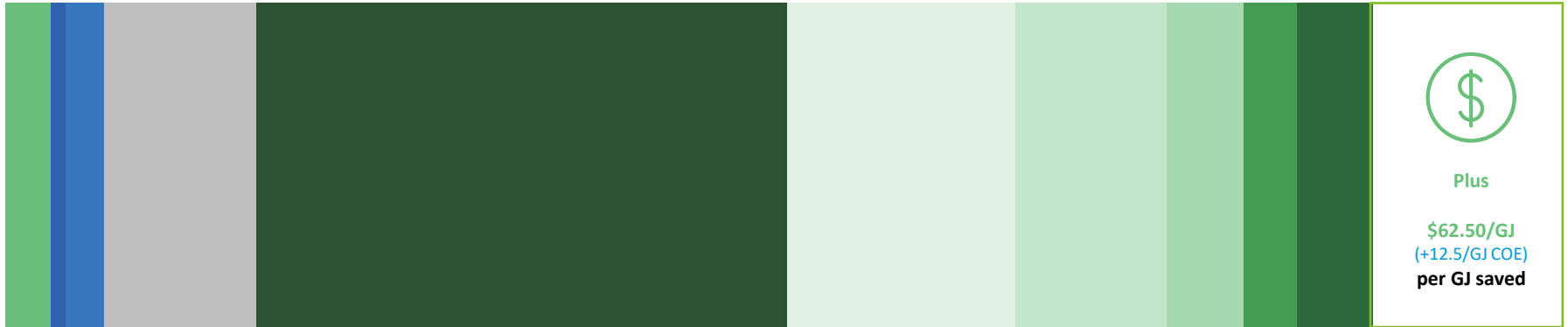
\$1,000
3 upgrade bonus



\$1,000
Tankless
Hot water



\$350
HRV



\$250 EnerGuide evaluation



\$3,500
Insulation



\$1,500
Windows



\$500
Furnace



\$500
DWHR

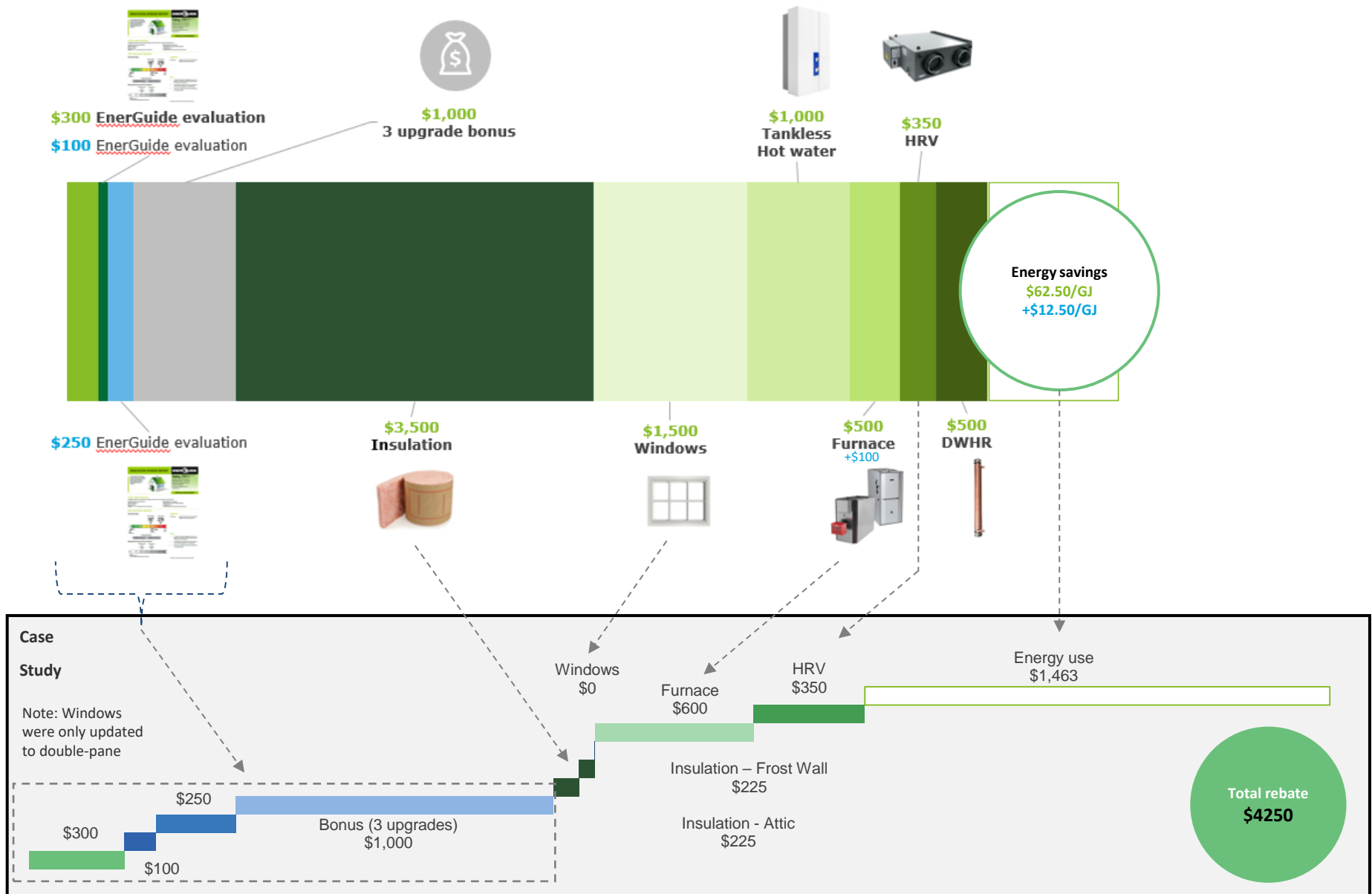


\$0 **\$1,000** **\$2,000** **\$3,000** **\$4,000** **\$5,000** **\$6,000** **\$7,000** **\$8,000** **\$9,000** **\$10,000**

Blue text = Additional rebates for homes in the City of Edmonton

Energy efficiency incentives: Educating your clients

Another look at what and where the Greens saved money



Energy efficiency incentives: Educating your clients



Rebate Guides

Rebates are calculated according to the energy savings achieved by an upgrade based on the starting and ending condition of the area upgraded. Use the tables below to provide your customer with rebate estimates and encourage them to confirm estimates on homeenergyplan.ca once their data has been submitted to NRCAN. These are estimates only and the final rebate will be dependent on the upgrade completed.

INSULATION

All values in the table below represent \$/100-sq-ft.

INSULATION	STARTING R-VALUE							
Attic Insulation	4	8	12	16	20	24	28	32
Upgraded to R-50	\$223	\$102	\$61	\$41	\$29	\$21	\$15	\$11
Upgraded to R-60	\$226	\$105	\$64	\$44	\$33	\$24	\$19	\$14
Above Grade Wall Insulation	2	4	6	8	10	12		
Upgraded to R-12	\$269	\$240	\$120	\$60	\$24	\$ –		
Upgraded to R-20	\$317	\$288	\$168	\$108	\$72	\$48		
Basement Header	2	4	6	8	10	12		
Upgraded to R-20	\$59	\$59	\$39	\$25	\$17	\$11		
Below Grade Wall Insulation	2	4	6	8	10	12		
Upgraded to R-12	\$49	\$19	\$10	\$5	\$2	\$ –		
Upgraded to R-20	\$53	\$23	\$14	\$9	\$6	\$4		
Pony Wall Insulation	2	4	6	8	10	12		
Upgraded to R-12	\$265	\$240	\$120	\$60	\$23	\$ –		
Upgraded to R-20	\$313	\$287	\$168	\$108	\$71	\$48		
Exposed Floor Insulation	2	6	10	14	18	22	26	30
Upgraded to R-28	\$131	\$60	\$31	\$18	\$10	\$5	\$1	\$–
Upgraded to R-36	\$134	\$64	\$35	\$22	\$14	\$9	\$6	\$3

WINDOWS

Only ENERGY STAR® triple-pane, Low-E, Argon windows are eligible for a rebate when processed by a Participating Contractor with no requirement for an E Evaluation. Glazing and other window types are eligible for a rebate if an E Evaluation is completed. The rebates below are based on the installation of triple pane windows.

WINDOWS		SIZE OF WINDOW		
Existing condition		24"x24"	36"x36"	72"x72"
Single	Metal	\$49	\$103	\$376
Single	Wood/Vinyl	\$21	\$57	\$279
Dual	Metal	\$32	\$56	\$149
Dual	Wood/Vinyl	\$8	\$16	\$70

TANKLESS HOT WATER HEATER

Energy saving calculations are based on the EF of the current technology and the UEF (or EF if UEF is not available) of the new device.

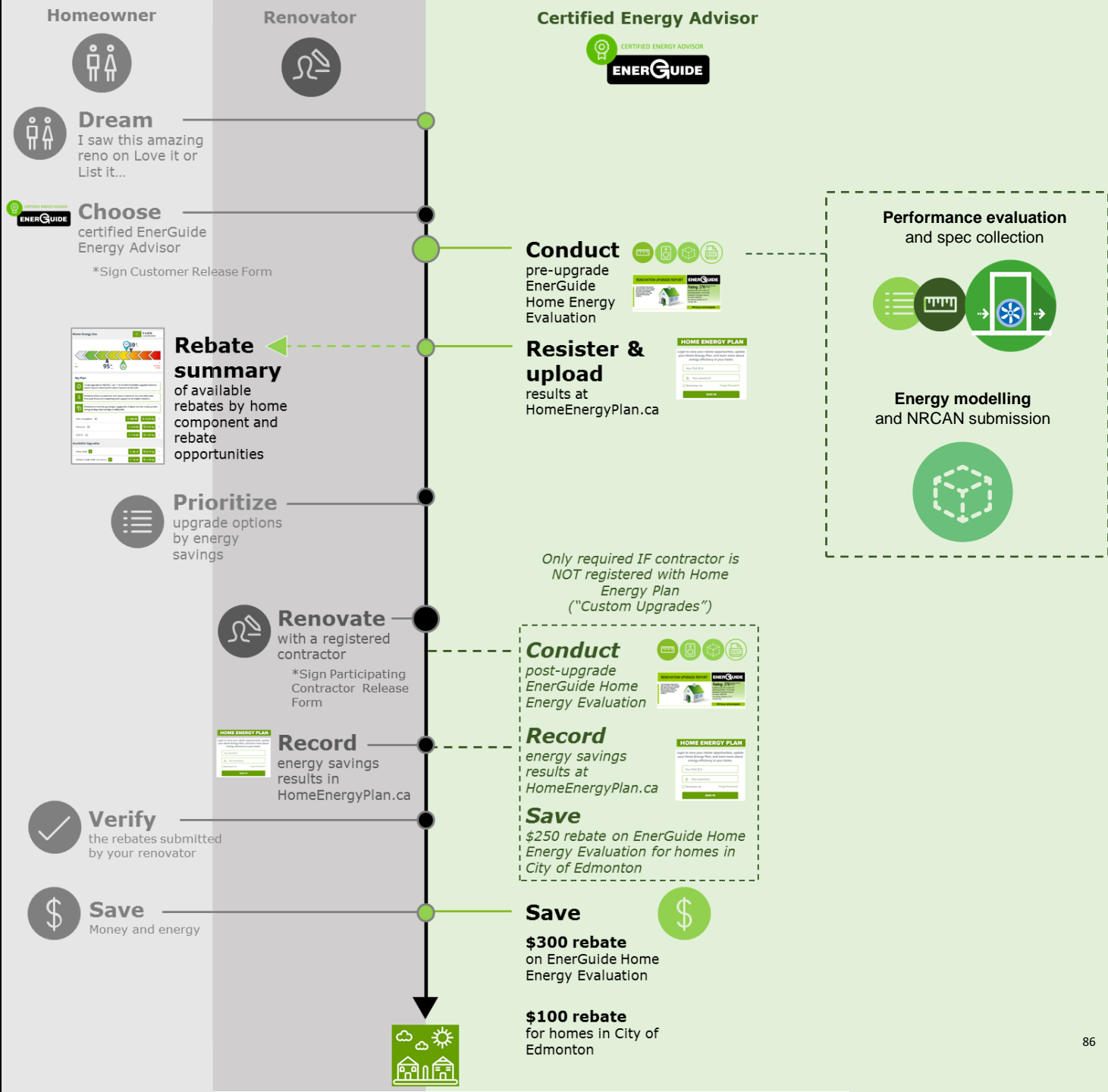
DHW	UPGRADED EF				
	0.87	0.9	0.93	0.96	0.99
Conventional	\$615	\$648	\$680	\$709	\$737
Conventional with Pilot	\$989	\$1,023	\$1,054	\$1,084	\$1,111
Induced Draft Fan	\$529	\$563	\$594	\$624	\$651
Induced Draft Fan with Pilot	\$907	\$941	\$972	\$1,001	\$1,029
Direct Vent (Sealed)	\$503	\$537	\$568	\$598	\$625
Condensing	\$12	\$45	\$77	\$106	\$134
Instantaneous with Pilot	\$88	\$122	\$153	\$183	\$210
Instantaneous	\$49	\$82	\$113	\$143	\$171

DRAIN WATER HEAT RECOVERY (DWHR)

Only DWHR devices which satisfy CSA B55.1 and B55.2 and are included in HOT2000 are eligible for rebate.

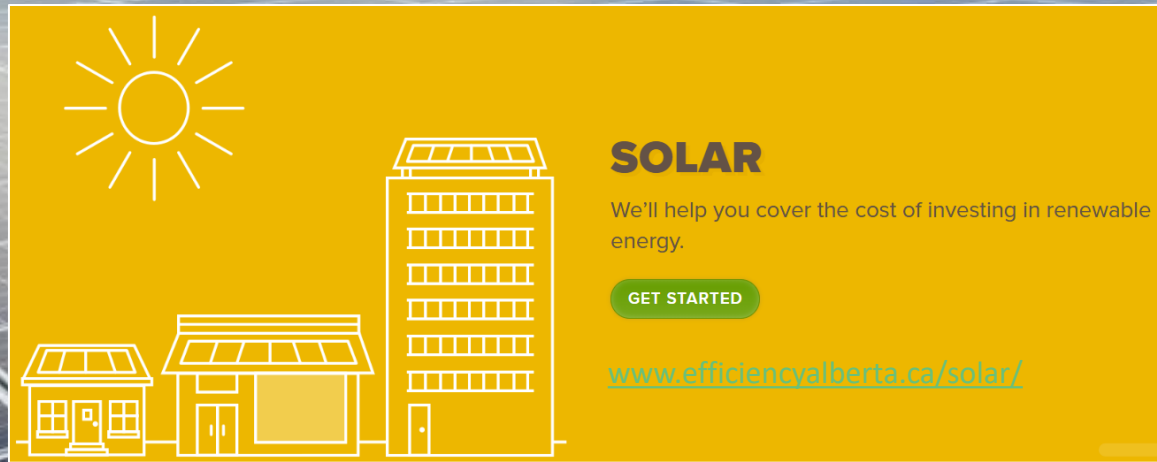
SIZE OF DWHR SYSTEM	ONE CONNECTED SHOWER	TWO CONNECTED SHOWERS
Small - Up to 42"	\$107	\$214
Medium - 42" - 62"	\$191	\$382
Large - 62" and up	\$256	\$513

The process to access Home Energy Plan rebates



Energy efficiency incentives: Educating your clients

The residential Solar Program has increased the incentives levels for installation of solar photovoltaic (PV) systems



SOLAR

We'll help you cover the cost of investing in renewable energy.

GET STARTED

www.energycalberta.ca/solar/



TBD
UCP

+



TBD
COE

=

Previous rebates added up to
~40% off the cost
of the home solar system

The average home in the US can go net zero electricity for ~\$11,000
and yield a 4\$/watt value increase in resale value of a system

Energy efficiency incentives: Educating your clients



CMHC offers a premium refund of 15 or 25% to borrowers who either buy, build or renovate for energy efficiency using CMHC-insured financing

A premium refund is available based on the level of energy efficiency achieved for the purchase of:

New or existing housing, including residential condominium units in low rise buildings	Existing housing with improvements	New or existing residential condominium units in high rise buildings
<ul style="list-style-type: none"> Homes built under a CMHC-eligible energy-efficient building standard automatically qualify for a premium refund Homes NOT built under an eligible building standard must be assessed by a NRCan qualified energy advisor and have a rating that complies with the following requirements 	<ul style="list-style-type: none"> The home must be assessed by a qualified energy advisor before and after the energy-efficiency improvements are made 	<ul style="list-style-type: none"> Buildings built under the LEED Canada New Construction standard (Certified, Silver, Gold and Platinum) automatically qualify for a premium refund

How to Apply

1. Pre-retrofit EnerGuide home evaluation before upgrades
2. Post-retrofit EnerGuide home evaluation after upgrades
3. Submit the [paper application form](#)

Homes built under the following building standards are automatically eligible for a partial mortgage loan insurance premium refund:

15% Premium Refund	25% Premium Refund
Homes built under eligible building standards Automatically eligible	
<ul style="list-style-type: none"> Built Green™ ENERGY STAR® LEED Canada for Homes 	<ul style="list-style-type: none"> R-2000
Homes NOT built under an eligible building standard Must have an EnerGuide rating less than "A Typical New House"	
<ul style="list-style-type: none"> 15% lower 	<ul style="list-style-type: none"> 40% lower
Energy-efficiency improvement rebates Must show a decrease in GJ/year	
<i>Pre-retrofit rating is > 200 GJ/year</i>	
Decrease by 45 GJ/year	Decrease by 90 GJ/year
<i>Pre-retrofit rating is <200 GJ/year</i>	
Decrease by 20 GJ/year	Decrease by 45 GJ/year

Energy efficiency incentives: Educating your clients

The Government of Alberta recently announced Bill 10: An Act to Enable Clean Energy Improvements

Property Assessed Clean Energy (PACE)

PACE is an innovative financing tool which building owners and developers can use to upgrade their building's energy performance, install renewable energy systems and reduce resource consumption with no money down and with the financing repaid through their property's tax bill.

What projects are eligible?

PACE will apply to residential, commercial and agricultural properties. Individual municipalities must pass a PACE bylaw to administer the program; Edmonton is planning to be the first participant. Bill 10 is focused on energy efficiency upgrades and renewable energy.

Examples of eligible projects include:

- Solar panel installations
- High-efficiency heating and cooling upgrades
- Upgraded insulation
- Energy efficient windows and doors

Timeline

1. City of Edmonton Bylaw to be passed this year, accompanied with program design
2. Smaller pilot program to launch in Q3-Q4 2019
3. The results will inform a larger PACE program in the future.

How PACE might work?

PACE is voluntary – if a homeowner does not want clean energy upgrades, there is no obligation and property taxes will remain the same as before.

If one chooses to take advantage of clean energy upgrades,

1. An agreement with the municipality will be completed. Municipalities will each need to pass a bylaw to enable PACE financing.
2. Municipality will pay for the solar power installation, through a list of certified contractors
3. Homeowner pays the municipality back through annual/monthly property taxes
4. Owners will save hundreds or thousands of dollars per year due to solar power and/or energy efficiency upgrades



Home Inspections: EnerGuide vs. Real Estate

Home inspections: EnerGuide vs. real estate

Examining the both the physical condition and the energy performance is wise for one of your largest life investments

	Real Estate home inspection	EnerGuide home energy evaluation
Professional designation requirements	Licenced Home Inspector	Certified Energy Advisor
Review requirements	<p>Onsite evaluation</p> <p>Report on the physical condition of the home including all of the following:</p> <ul style="list-style-type: none"> • Roofing • Flashing and chimney • Exterior including lot grading • Walkways • Driveways • Retaining walls • Patios and decks • Structure • Electrical • Heating • Heat pumps and cooling • Insulation • Plumbing • Interior 	<p>Onsite evaluation and off-site computer modelling</p> <p>Report and testing on energy performance of the home, including:</p> <ul style="list-style-type: none"> • Airtightness, using a blower door test • Insulation levels of your walls, ceilings and basement • Efficiency ratings and size of your space heating, space cooling and water heating equipment • Ventilation equipment information • Windows and exterior doors count, type and location • Other information relevant to your home's energy performance
Equipment	<ul style="list-style-type: none"> • Thermal imaging camera (if requested) • Camera • Electrical voltage tester 	<ul style="list-style-type: none"> • Thermal imaging camera (if requested) • Camera • Computer modelling software (ie. Hot2000) • Blower Door System
Reporting requirements	Custom home inspection report	EnerGuide home energy evaluation report

Home inspections: EnerGuide vs. real estate

Home inspection reports provide detailed descriptions and recommendations of the home's physical conditions

Home Inspection Report

123 Street, Edmonton, AB

Inspected for: Mr. & Mrs. J. Doe

Date of Inspection: 19/03/2019

Age of Home: 1980 (100+ Yr)

Inspector: John Doe - CMAA

License #: 123456 - Expires: 12/31/2020

Phone: 780-123-4567

Email: john.doe@inspect.com

Report Summary

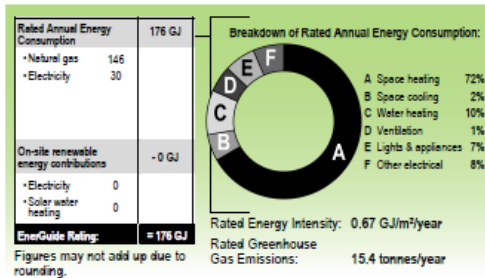
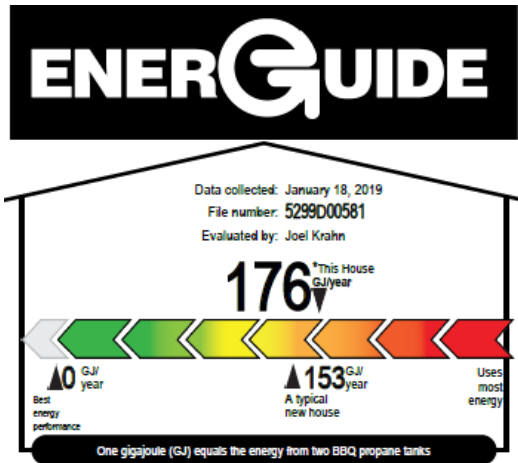
Page	Item	Condition	Notes
Page 7	Item: 3	Exterior Wall Cladding Condition	<ul style="list-style-type: none"> EIFS in North America North American builders began using EIFS in the 1980's, first in commercial buildings, then applying it as an exterior finish to residences—mostly wood frame houses—using the same techniques that had been successful in Europe. There are three layers to EIFS Inner Layer Foam insulation board that's secured to the exterior wall surface, often with adhesive. Middle Layer A polymer and cement base coat that's applied to the top of the insulation, then reinforced with glass fiber mesh. Exterior Layer A textured finish coat. EIFS layers bond to form a covering that doesn't breathe. That's fine when no moisture is present behind the covering, but if moisture seeps in it can become trapped behind the layers. With no place to go, constant exposure to moisture can lead to rot in wood and other vulnerable materials within the home. Siding appears to be "Exterior Insulation and Finish System" (EIFS), also known as "Synthetic Stucco". This type siding has been known to allow water intrusion into the wall cavities at cracks, joints, around window and door frames, and other areas where water can enter causing damage to the structure. We are unable to determine if any underlying damage or moisture problems are present in the wall cavities by a "Visual Inspection Only". Further evaluation by a licensed qualified contractor is recommended prior to close to ensure no moisture damage exists.
Page 10	Item: 4	Trim/Facia/Soffit Conditions	<ul style="list-style-type: none"> Recommend review by a qualified professional for repair or replacement as necessary.
Page 11	Item: 6	Exterior Door Conditions	<ul style="list-style-type: none"> Hardware requires attention to operate correctly.
Page 12	Item: 7	Gutter Condition	<ul style="list-style-type: none"> Downspout discharges water at foundation. Recommend installation of extension to ensure proper drainage away from foundation to prevent seepage. We do not recommend under ground drainage for down pipes as these can easily block - One of the main jobs of gutters is to direct water away from the building, which helps to prevent wet basements and foundation problems. When downspouts drain right next to the building, water gets concentrated to one location. Downspout extensions are important, keep them connected, down and in good condition.
Page 17	Item: 14	Patio Conditions	<ul style="list-style-type: none"> Patio is pitched towards the structure, ideally the grade would run away from the structure, this may result in seepage.

Roof

Page 1 of 70

Home inspections: EnerGuide vs. real estate

EnerGuide home energy evaluation reports provide you with a comparative benchmark of your home's performance



*This house has significant energy uses not included in the rating. See "House Details" on your Homeowner Information Sheet for details.

The energy consumption indicated on your utility bills may be higher or lower than your EnerGuide rating. This is because standard assumptions have been made regarding how many people live in your house and how the home is operated. Your rating is based on the condition of your house on the day it was evaluated.

Quality assured by: Envision

Visit NRCan.gc.ca/myenerguide

HOMEOWNER INFORMATION SHEET

Your EnerGuide® rating and this report are based on data collected and, where necessary, presumed from your evaluation. Rating calculations are made using standard operating conditions.



ENERGUIDE

Rating: 176 gigajoules per year (GJ/year)

Heated floor area: 261.6 m² (2815.8 ft²)

Rated energy intensity: 0.67 GJ/m²/year

Evaluated by: Joel Krahn

Quality assured by: Envision

File number: 5299D00581

Data collected: January 18, 2019

Year built: 2006

NRCan.gc.ca/myenerguide

HOW YOUR RATING IS CALCULATED:

- Rated annual energy consumption 176 GJ/year
 - Minus renewable energy contribution -0 GJ/year
- Equals your **EnerGuide rating** = 176 GJ/year

I. Your rated annual energy consumption is the total amount of energy your house would use in a year based on the EnerGuide Rating System standard operating conditions. For your house, this includes 29.34 GJ of passive solar gain.

Energy Sources	Rated Consumption (GJ/year)	Equivalent Units (per year)	Greenhouse Gas Emissions (tonnes/year)
Natural gas	146	3916m ³	7.6
Electricity	30	8454kWh	7.8
Total	176		15.4

II. On-site renewable power generation systems can offset some or even all of your home's energy consumption. Renewable energy contributions are factored differently for your rating and your greenhouse gas emissions calculations.¹

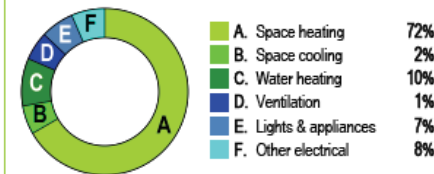
On-Site Renewable Energy	Estimated Contribution (GJ/year)	Equivalent Units (per year)	Offset Greenhouse Gas Emissions (tonnes/year)
Electricity	0	0 kWh	0.0
Solar water heating	0	0	0.0
Total	0		0.0

YOUR RATED GREENHOUSE GAS EMISSIONS CALCULATION:

Total greenhouse gas emissions 15.4 tonnes/year
Minus emissions offset by on-site renewables -0.0 tonnes/year
Equals your **rated greenhouse gas emissions** = 15.4 tonnes/year

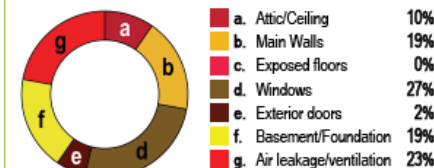
HOW YOUR RATED ENERGY IS USED:

The chart below represents the breakdown of rated annual energy consumption in your home under standard operating conditions. You can use these figures as a guide to help identify where you can lower home energy costs through proper home maintenance, efficient home operation, energy efficiency renovations or equipment replacement.



WHERE YOUR HOME LOSES HEAT:

Houses lose heat through their exterior shell, or building envelope. The chart below shows where and how your home loses heat. The quality and upkeep of your home can have a major impact on the amount of energy your heating and cooling systems use annually.



¹EnerGuide is an official mark of Natural Resources Canada. Refer to the glossary section for an explanation of relevant terms.



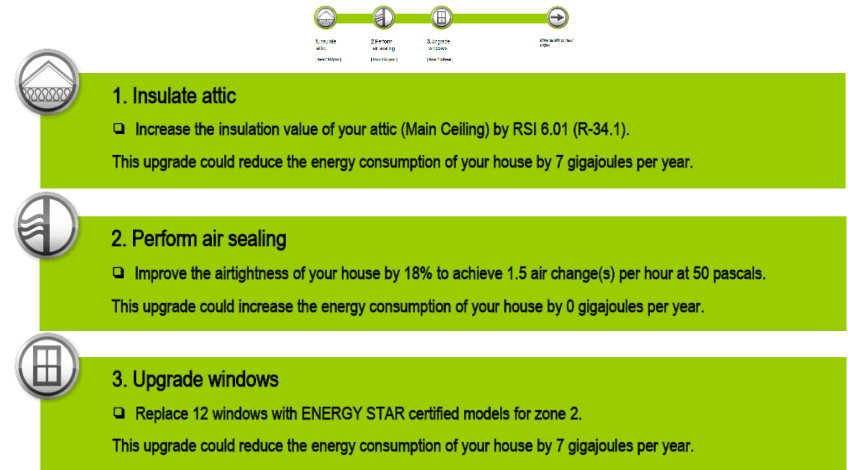
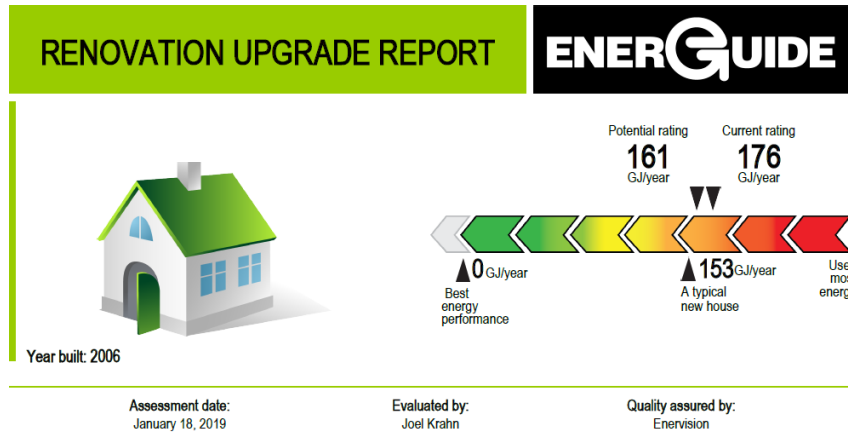
Natural Resources Canada
Ressources naturelles Canada

Canada

CHANGE FOR CLIMATE

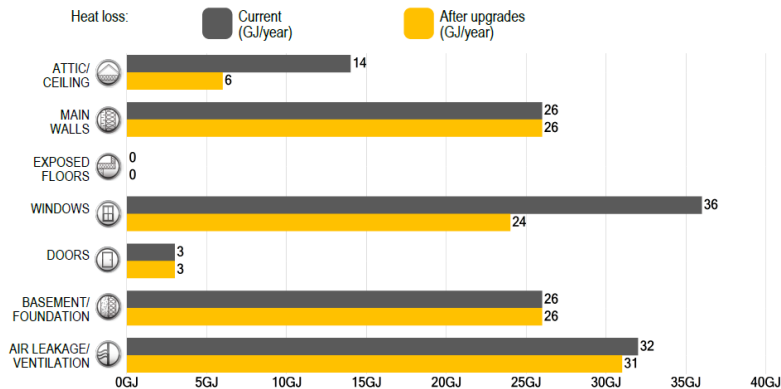
Home inspections: EnerGuide vs. real estate

EnerGuide reports develop a data-based, prioritized roadmap of upgrade considerations to improve home energy performance



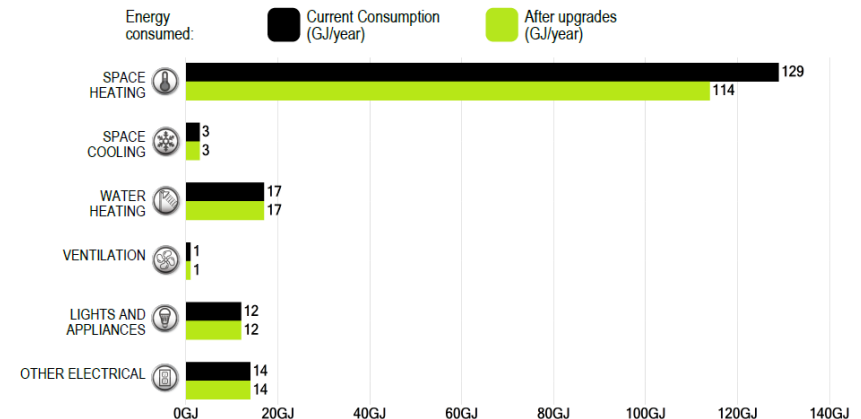
BEFORE AND AFTER: Estimated heat loss through the building envelope*

This bar chart shows where heat is lost from your house. The dark bars show the areas where you are currently losing heat. The longer the bar, the more heat you are losing. The light bars show the estimated heat loss if you were to complete all the recommended upgrades as outlined.



BEFORE AND AFTER: Estimated energy use*

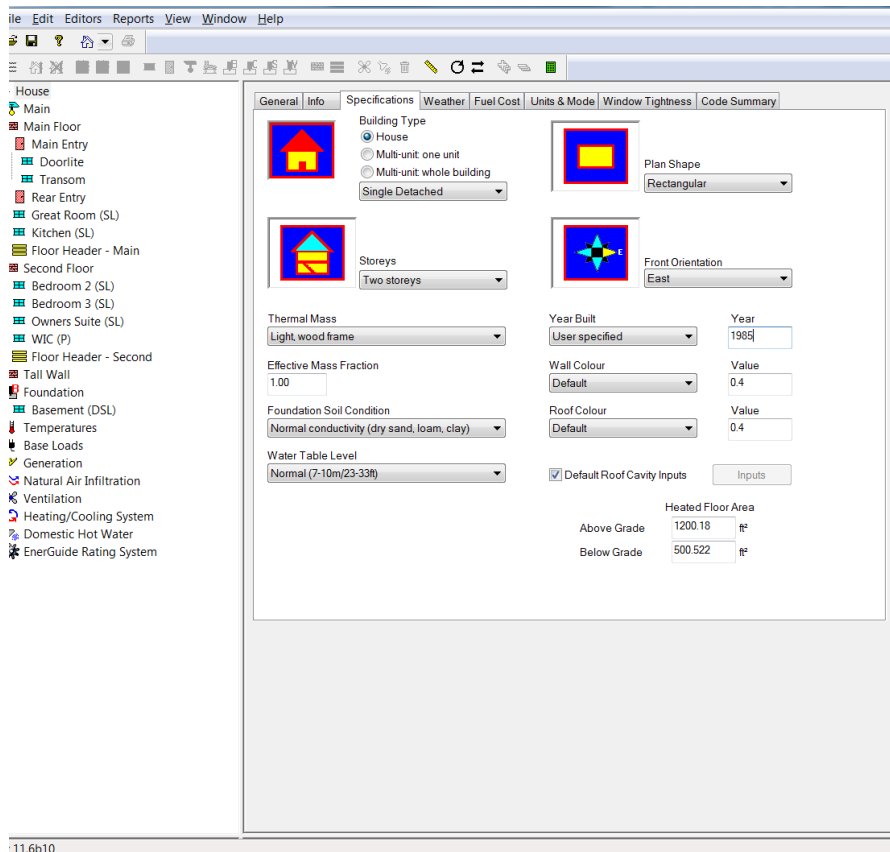
This bar chart shows the potential for improving the energy performance of your house. The dark bars show your current rated consumption. The longer the bar, the more energy you are using. The light bars show the rated energy consumption if you were to complete all the recommended upgrades as outlined.



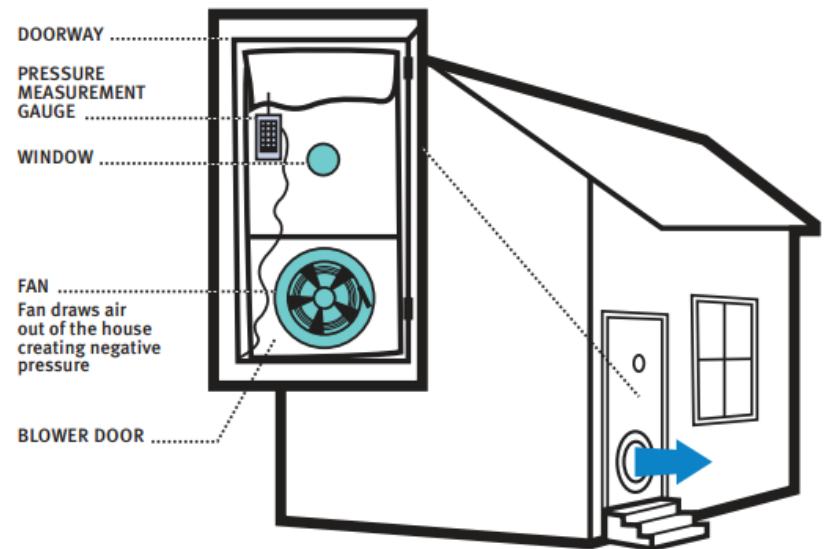
Home inspections: EnerGuide vs. real estate

EnerGuide reports are based on empirical data calculated in energy modelling software and tested with blower door systems

Energy modelling software



Blower door test



To view a demonstration of a blower door test, visit: youtu.be/icZG05XU9pM

Home inspections: EnerGuide vs. real estate

Process of becoming an Energy Advisor

Foundation Level exam



150 questions
3 hours
\$150

Energy Advisor exam



150 questions
3 hours
\$150

Affiliation with a Service Organization



Foundational competencies such as

- Numeracy
- low-rise housing construction and renovation
- building envelope
- heating
- ventilation and air conditioning
- building science principles
- house-as-a-system concept

EnerGuide Rating System Version 15.0

- Standard
- Technical Procedures
- HOT2000 User Guide
- Administrative Procedures
- Quality Assurance Procedures
- User's Guide for Electronic File Transfer

File mentorship

- under a NRCan licensed Service Organization

Note: Minimum of 30 calendar days before you can rewrite the same exam

**The future
of solar is
here**



A brief introduction to solar PV

Today, 2 active solar technologies that involve electrical or mechanical equipment are becoming more common in homes

Solar Thermal

collectors or panels are used for water, space and pool heating in buildings.

Solar Photovoltaic (PV)

technology uses solar cells to convert sunlight directly into electricity.

Solar Thermal Panels



OR

Solar PV Panels



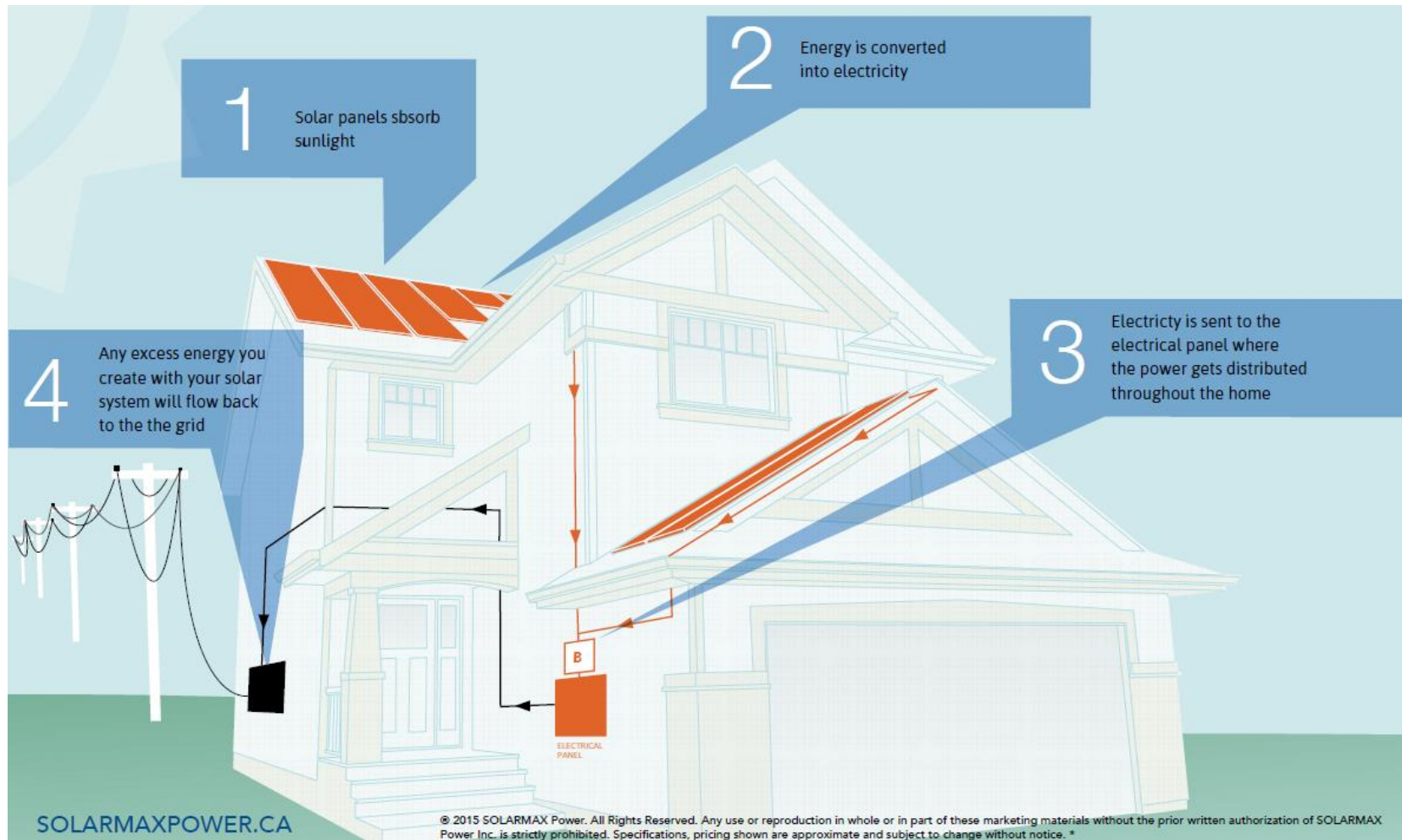
A brief introduction to solar PV

Solar energy is energy from the sun in the form of radiated light and heat

Did you know?

In 2017, China installed the equivalent of all the solar in Alberta, every 5 hours for the entire year

of



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**CHANGE
FOR CLIMATE**

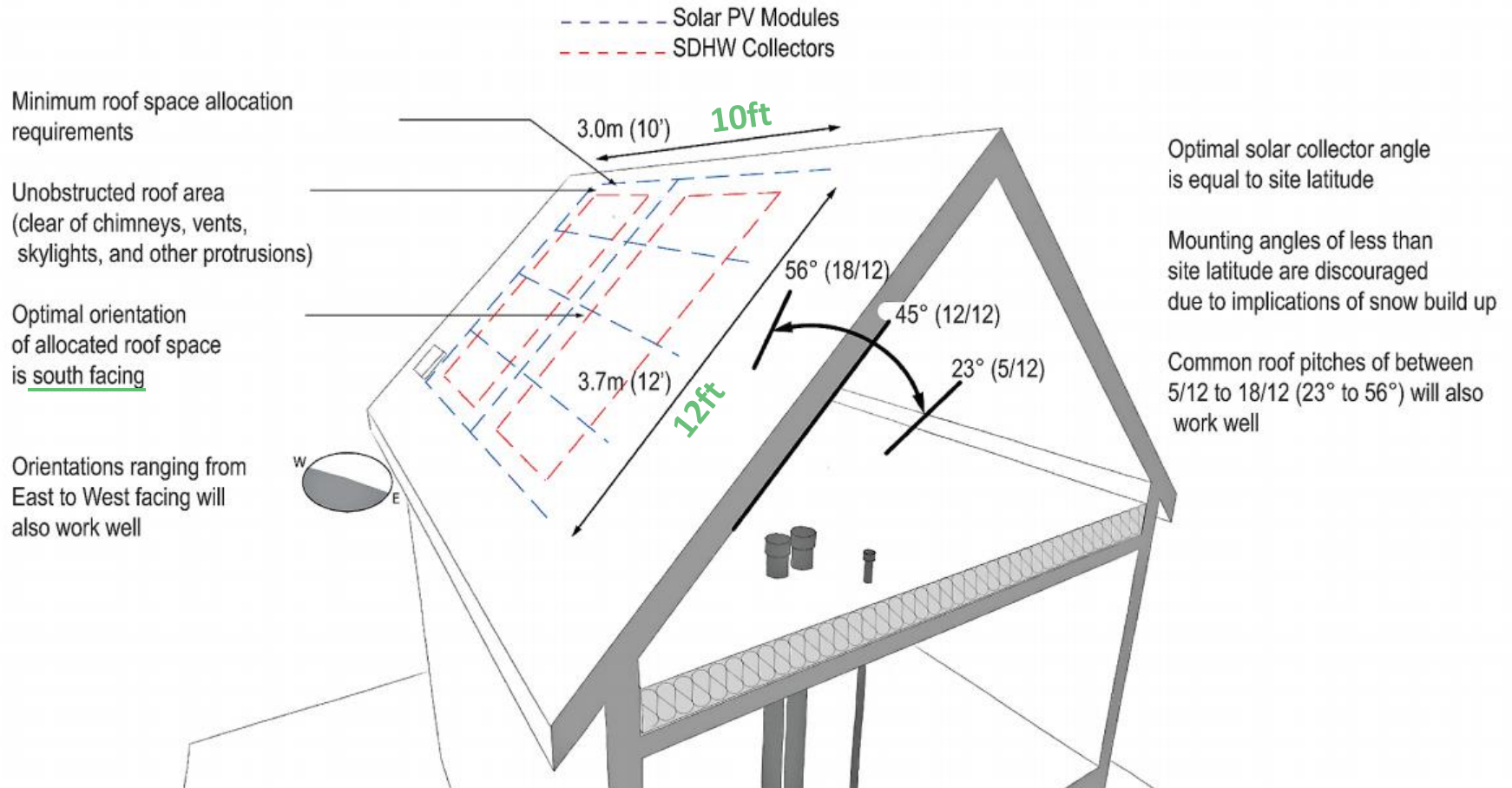
A brief introduction to solar PV

The major components of solar PV systems



A brief introduction to solar PV

Roof space, orientation and mounting angle of SDHW collectors and solar PV modules



Roof space specifications for Solar Ready:

Minimum of: **two 1.2 m (4') x 2.4 m (8')** flat-plate solar thermal collectors (allowing 30.5 cm (12") of work space around each collector)

A brief introduction to solar PV

Did you know?
If properly harnessed, there's enough sunlight that falls on the earth in just one house to meet the world energy demands for a whole year!

Alberta is one of the sunniest places in Canada and is geographically primed for solar

1 BUT WHAT ABOUT OUR WINTERS?

Panels convert sunlight, not heat. The cold can actually improve panel efficiency.



2 BUT WHAT ABOUT SNOW?

Research shows that clearing snow barely improves output. Most owners don't clear their panels during the winter.



3 BUT WHAT ABOUT UPKEEP?

There's very little upkeep required, and rain and snow will generally clean the panel for you.



YEARLY PV POTENTIAL

[kWh/kW]



A brief introduction to solar PV

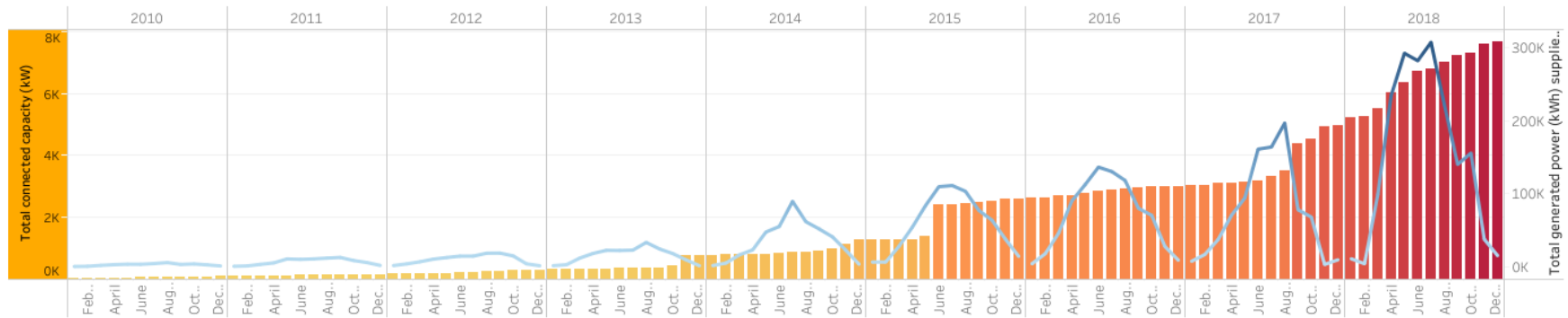
Did you know?
California mandates all new homes after 2020 have solar,
100% zero carbon electricity by 2045, Executive Order for
100% carbon neutral economy by 2045

Solar installations have been steadily increasing in Edmonton

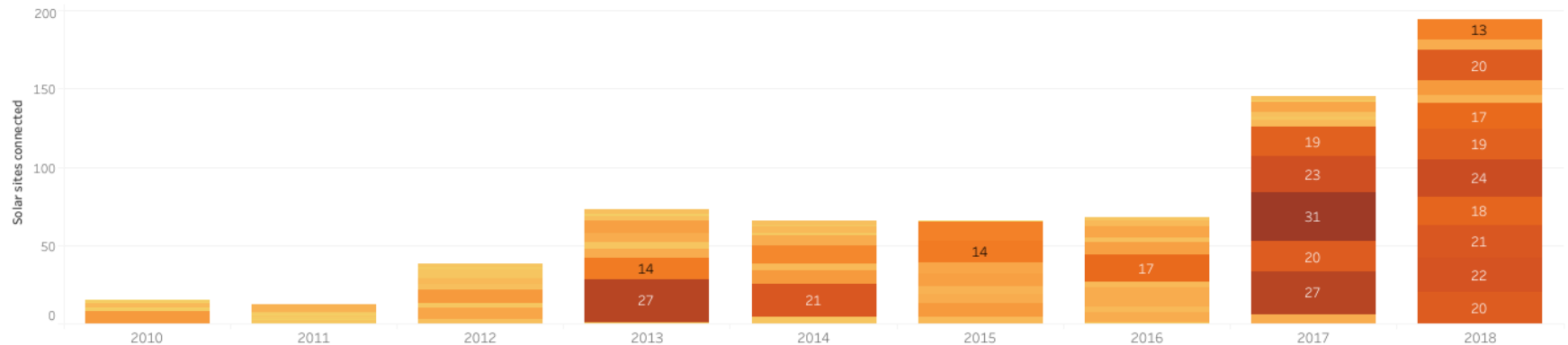
Edmonton's Solar Power Installations Over Time



Connected Capacity and Generated Power Supplied to the Grid



Solar Installations by Month and Year

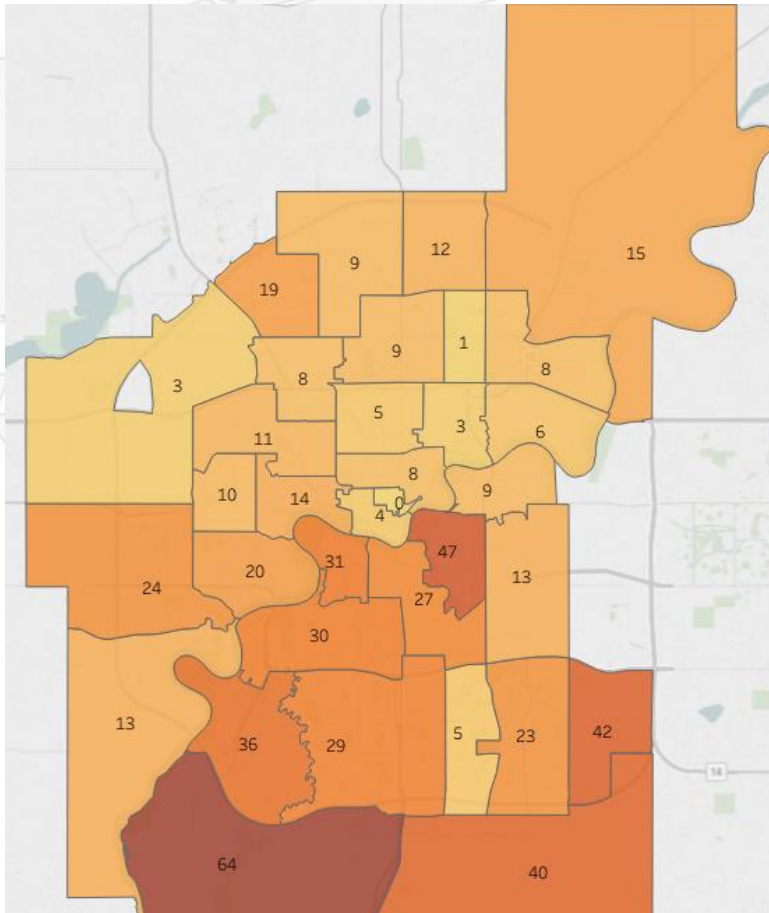


A brief introduction to solar PV

Where have solar systems been installed?

Did you know?

Alberta has more than 320 days of sunshine per year -2,300 hours of sun



484 Residential projects and
27 Commercial/Non-Profit
Projects



4.8 Megawatts of Installed
Solar PV Capacity



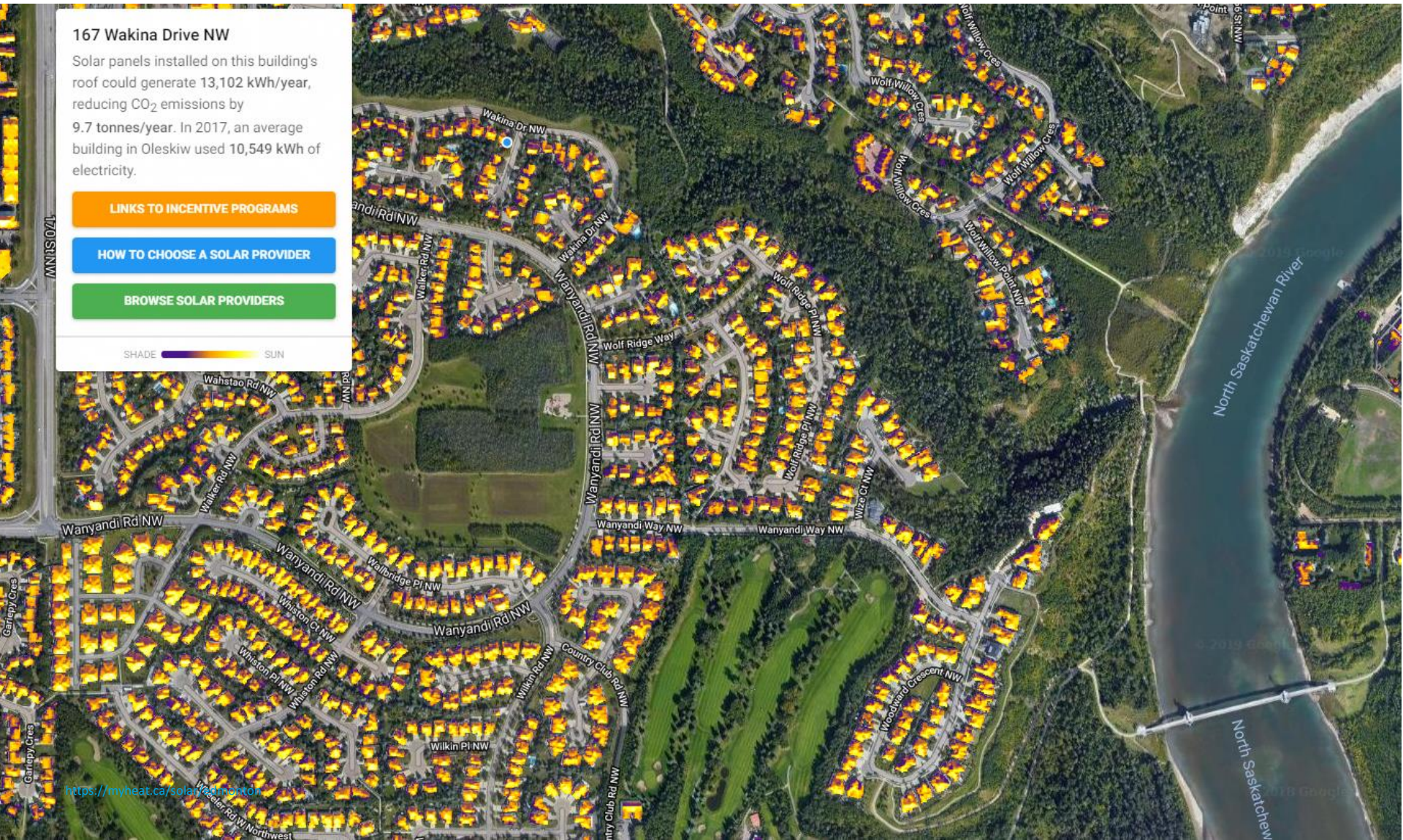
95,000 tCO₂e Reduced

“ We cut our power bills in half this last year after installing our solar panel system. We look forward to ongoing savings and feel good about doing our part to protect our environment. ”

- Kalliel, Resident of Pickardville, Alberta

A brief introduction to solar PV

Use MyHeat to understand your home's solar potential Map



A brief introduction to solar PV

The value of solar

PUT YOUR ROOF TO WORK

The more the sun shines, the bigger your payoff!

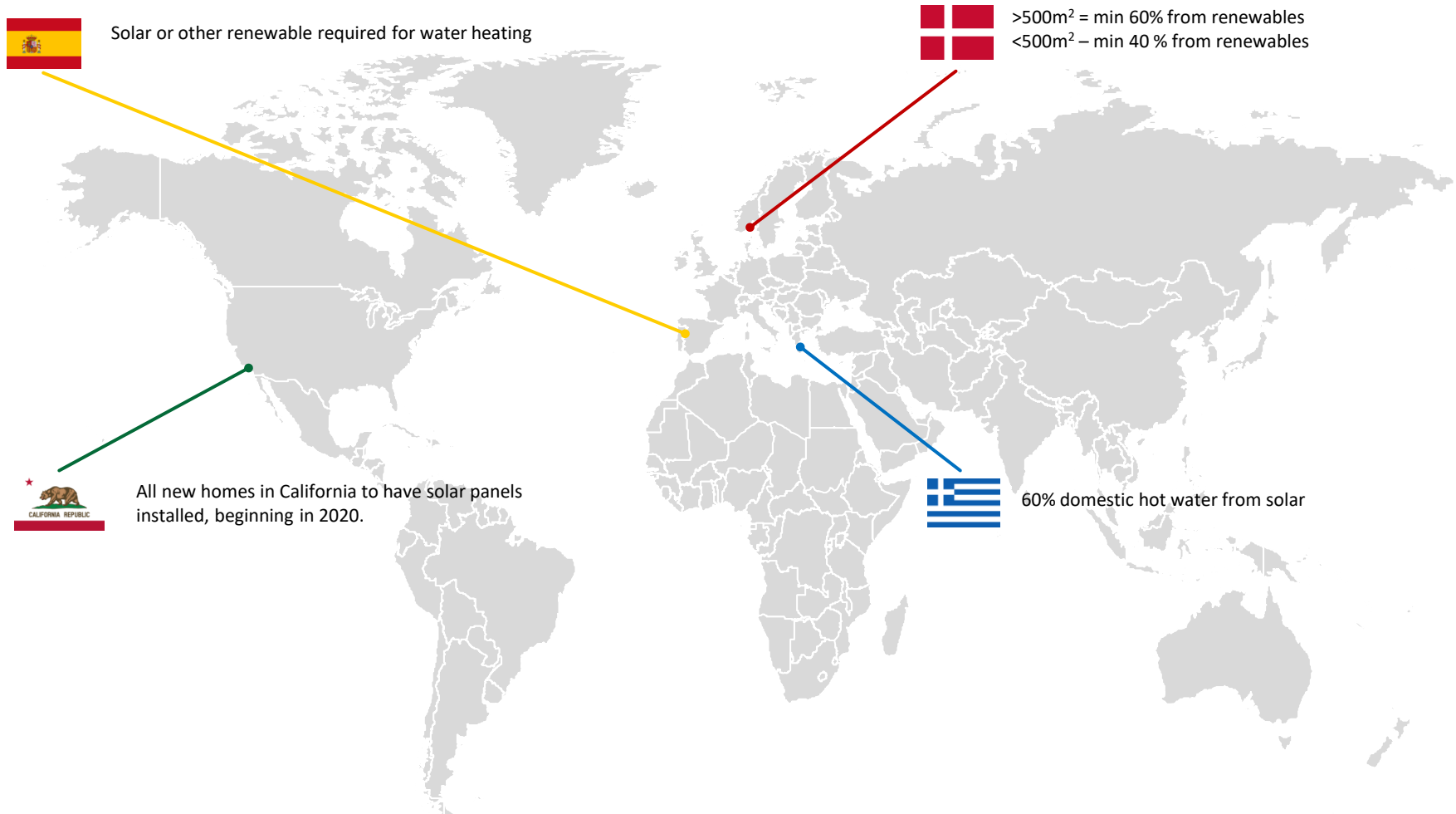


Benefits

- Lower utility bills
- Diversifying one's investment portfolio (adding to your home equity with power)
- Protection from future increases in Energy Prices (pre-purchase power at one rate)
- Securing electricity for the home
- Making a house an electricity generating power plant (pride in ownership)
- No longer being dictated to by a large faceless utility company
- The positive side of renewable energy for the home (carbon levies)
- Banking on the value of renewable power increasing value over time (MG Credits)
- Social buying trends – keeping up with your neighbours
- Capitalize on Government Incentives & industry offset programs
- Multi family living – social trend for co-op energy purchase & ownership
- Literally taking the power back- living behaviors have immediate results
- Protect against climate change and preserve natural resources
- Secure power – health monitoring systems

A brief introduction to solar PV

Leading counties have renewable energy systems requirements in their building code



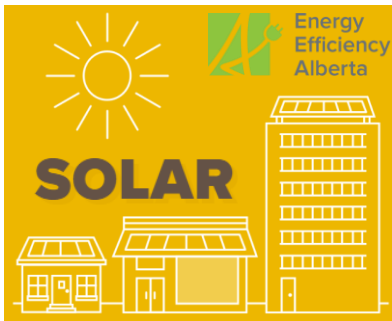
A brief introduction to solar PV

Learn more from these key resources



Solar Energy Society of Alberta

solaralberta.ca



Energy Efficiency Alberta

www.energycalberta.ca/solar

Grant Funding Questions

solar@efficiencyalberta.ca

1-587-287-1903



City of Edmonton: Change for Climate (Solar)

<http://ace.edmonton.ca/energguide/solar-rebate-program/>



City of Edmonton – Renewable series

www.edmonton.ca/city_government/environmental_stewardship/season-one.aspx

Next steps: Influencers in Change for Climate



Next Steps

Visit changeformclimate.ca/homes for City program information.

Our homes consume nearly 20% of the energy used in Edmonton and produce 20% of the greenhouse gas emissions. Check the City of Edmonton programs below to see how you can help change your home for climate while taking advantage of available rebates/incentives.

Home Energy Plan

Understand how your home works and get \$400 towards the cost of a home evaluation

[GET STARTED](#)

Solar Rebate Program

Get up to 40% off the cost of a residential solar system

[GET STARTED](#)

Energy Mapping

See the Map of Participating Homes and their Builders.

[GET STARTED](#)

Guides

Your guides to an energy efficient home and a sustainable lifestyle

[GET STARTED](#)

Questions?

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changeformclimate.ca/homes



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