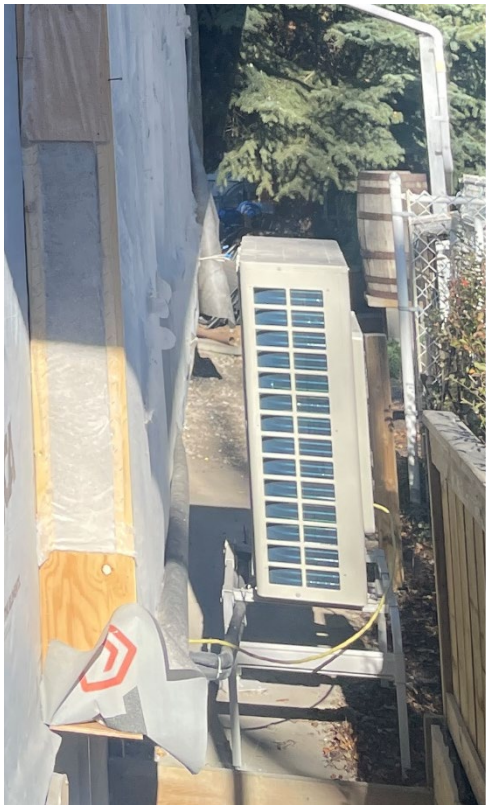
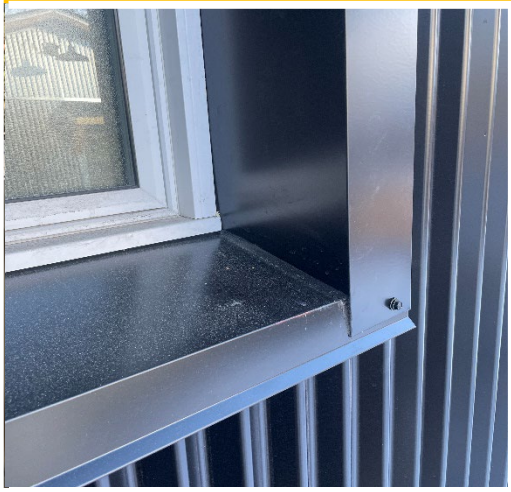
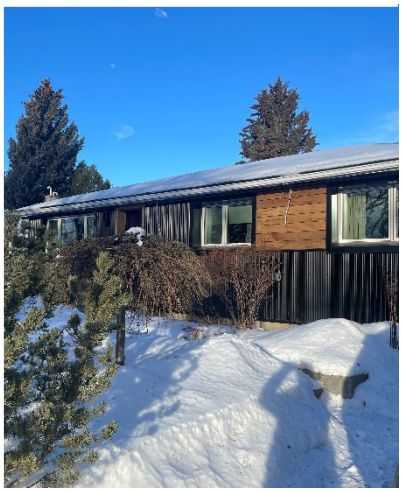


CASE STUDY

DEEP ENERGY RETROFIT





- YEAR BUILT: 1955
- STYLE: BUNGALOW
- AREA: 218.8 m2
- CONSTRUCTION: WOOD FRAME

PRE

Calgary Intercity NW,
Calgary, ALBERTA, T2K 0G4

ENERGUIDE

Data collected: June 14, 2022
File number: **9401D00066**
Evaluated by:

152 GJ/year This house

0 GJ/year Best energy performance
86 GJ/year A typical new house
Uses most energy

One gigajoule (GJ) equals the energy from two BBQ propane tanks

Rated Annual Energy Consumption		152 GJ
• Natural gas	125	
• Electricity	27	
On-site renewable energy contributions		- 0 GJ
• Electricity	0	
• Solar water heating	0	
EnerGuide Rating:		= 152 GJ

Figures may not add up due to rounding.

Breakdown of Rated Annual Energy Consumption:

A	Space heating	66%
B	Space cooling	0%
C	Water heating	17%
D	Ventilation	0%
E	Lights & appliances	8%
F	Other electrical	9%

Rated Energy Intensity: **0.69 GJ/m²/year**
Rated Greenhouse Gas Emissions: **12.6 tonnes/year**

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: 4 Elements Integrated Design Ltd

Visit NRCan.gc.ca/myenerguide

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POST

Calgary Intercity NW,
Calgary, ALBERTA, T2K 0G4

ENERGUIDE

Data collected: April 18, 2023
File number: **9402E10006**
Evaluated by:

0 GJ/year * This house produces more energy than it uses on an annual basis

0 GJ/year Best energy performance
85 GJ/year A typical new house
Uses most energy

One gigajoule (GJ) equals the energy from two BBQ propane tanks

Rated Annual Energy Consumption		51 GJ
• Electricity	51	
On-site renewable energy contributions		- 51 GJ
• Electricity	61	
• Solar water heating	0	
EnerGuide Rating:		= 0 GJ

Figures may not add up due to rounding.

Breakdown of Rated Annual Energy Consumption:

A	Space heating	43%
B	Space cooling	4%
C	Water heating	7%
D	Ventilation	1%
E	Lights & appliances	18%
F	Other electrical	27%

Rated Energy Intensity: **0.23 GJ/m²/year**
Rated Greenhouse Gas Emissions: **0.0 tonnes/year**

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: 4 Elements Integrated Design Ltd

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Project Profile / Case Study Submission

Description:

A showcase project and personal home for a Deep Energy Retrofitter, SNAP Building, this project pushed to net zero energy performance with innovative low carbon wall systems, electrification and large solar array. Quiet and comfortable this "new" home leverage recently completed interior renovations and basement suite work for a minimally invasive full Deep Energy Retrofit.

A

Building Profile			
Address	Cambrian Heights, Calgary AB		
Year Built	1955	**Type of building**	Single Family Detached
Floor Area (M^2)	218.8	**Structure Type and Foundation**	Wood frame
Climate Zone	7a		Concrete

B

Project Goals	Comments
Reduce Energy Consumption	Reduce to Net Zero
Increase Thermal Comfort	Wall insulation, windows, air sealing and roof insulation to be improved or replaced, as well as seal chimney to reduce air leakage. Reduce chill in 400sf addition with crawlspace, add cooling in the summer.
Improve Indoor Air Quality	Improve ventilation exhaust and fresh air supply to reduce stuffiness. Improve crawl space air tightness to improve moisture control. Control radon without dedicated fan, replace gas range & fireplace for reduced CO2
Reduce GHG reliance (Net-Zero Readiness)	Electrify house while adding renewable energy
Improve Home Value	Electrify house, improve thermal comfort and air quality, long term durability with increased curb appeal, and energy target resilience.
Other Typical Renovation Goals	Make garage art studio more comfortable/efficient

C

Stakeholder Profile			
DER Manager	Steve Norris - SNAP Building	**Builder**	SNAP Building
Building Sciences Advisor	Cory MacDermott - Beacon High Performance Homes	**Builder Website**	snapbuilding.ca
Energy Advisor	Cooper Le - 4 Elements	**Energy Advisor Website**	www.4elements.eco
Architect	N/A	**Utilities Provider**	Enmax

Retrofit Checklist			
	Retrofit Type	**Initial Assessment**	**Retrofit Improvement**
	Envelope		
1	**Airtightness - Penetration Sealing**	Appliance venting, ceiling penetrations	Chimney, fans, vents removed, ceiling penetrations sealed
	Wall Insulation	Original - Effective R15 - 2x4 with R6 & 1" XPS exterior Addition - Effective R16 - 2x6 with R20	Effective R36 - 8" dense pack cellulose
	Ceiling Insulation	Effective R11 - 2" wood chips & 1.75" loose fill fibreglass	Effective R42 (low heel) - 24" blown cellulose
	Foundation Insulation	Effective R10 - 2x4 with R12 furring wall	No change due to driveway and walkout basement restrictions
	Window Replacement	11 original - double glazed	Replaced triple glazed PVC Windows Rear bay eliminated, 1 BSMT window removed
	Door Replacement	3 Exterior Doors	2 Exterior Doors (main floor) replaced
	Other	*Crawlspace not sealed*	Crawlspace 90% sealed, R8 added under heat run, 4"XPS added to exposed foundation. Perimeter skirt re-insulated with 4"XPS
	Mechanical and Electrical Systems		
2	**Heating**	80% AFUE natural gas furnace	Air Source Heat Pump
	Cooling	N/A	Air Source Heat Pump
	Hot Water	natural gas tank with pilot	Integrated domestic hot water heat pump
	Electrical Service Amperage	100amp	200amp
	Other	Furnace/bath fan ventilation only	Panasonic 100CFM ERV

	Energy Performance			
		Initial	**Final**	**% Improvement**
3	Annual Electricity Consumption (kWh/a)	27.7 GJ / 7701 kWh	50.8 GJ / 14108 kWh	83.4% increase (switch to all electric)
	Annual Natural Gas Consumption (GJ/a)	125 GJ / 34 722 kWh	0 GJ / 0 kWh	100% decrease
	Energy Use Intensity (kWh/m2/a)	0.69 GJ/m2 or 193.88 kWh/m²	0.23 GJ/m² or 64.5 kWh/m²	70.5% decrease
	Annual Heating Demand (kWh/m2/a)	91 kWh/m2/a	27.7 kWh/m2/a	78% decrease
	Annual Cooling Demand (kWh/m2/a)	N/A	1471.11 kWh	
	Heat loss / Heat Gain	HL 16.6 kW / HG 2.9 kW	HL 6.5 kW / HG 1.6 kW	60.8% decrease / 44.8% decrease
	Air Leakage Rate (ACH50)	5.74	2.04	64.5% improvement
	Renewable Energy Generation	No renewables	Net Zero	60.7GJ Solar Generation

3

Carbon Emissions

	Initial	Final	% Improvement
Annual Operational Carbon Emissions from Electricity Consumption (Kg/a)	4329 Kg/a	8026 Kg/a (Before Solar) 0 Kg/a (After Solar)	89.8% increase (Before Solar)
Annual Operational Carbon Emissions from Natural Gas Consumption (Kg/a)	6446 kg/a	0 Kg/a	100% decrease

4

Lessons Learned

Not worth keeping existing windows. While some windows were only a few years old, quickly after insulating the home and noticing the difference between the new windows and the levels of comfort and condensation resistance, the remaining windows were replaced.

Original ductwork was reused but was found loud after installation. Further investigation and minor rework allowed for sound dampening and less turbulence in the ductwork. Careful testing and review of ductwork is recommended when reusing existing.

Air sealing the ceiling from the attic was time consuming and challenging work and some areas could not be accessed to seal. In hindsight, providing better access and use of a spray foam layer could have been more effective.

Substantial changes to the comfort and quietness of the home was noticeable right after construction.