



TOWARDS NET ZERO RENOS



CASE STUDY



This beautiful century farmhouse has retained its character and charm while being transformed into a high-performance home. Through thoughtful retrofitting with advanced windows, doors, and modern mechanical systems, the homeowners' vision and active involvement have delivered remarkable results.

PROJECT PRIORITIES

- Air Tightness
- Solar Generation
- Pairing both old and new in design
- Foundation Reinforcement
- Interior Treatment

RENOVATOR: Lanark Design Build Group

ENERGY ADVISOR/SERVICE ORGANIZATION:

Homesol Building Solutions

TARGET: Net Zero Home Renovation

ENERGY REDUCTION: 86.6%

YEAR BUILT: 1908

YEAR RETROFIT COMPLETED: 2026

LOCATION: Lanark, Ontario

HOUSE TYPE: Single Detached

SIZE: 3293 sq.ft.

CLIMATE: Zone 6, 4354 HDD

UPGRADES INCLUDE

Above Grade Walls

Ceiling with Attic Space

Cooling & Heat Pumps

Domestic Water Heater

Foundation Wall

On-site Generation and Storage

Principle Ventilation

Space Heating

Windows & Doors



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NET ZERO PLAN

BEFORE

ENERGY CONSUMPTION

223 GJ/year

COMFORT

It's an older home with draft/hot/cold areas.

BUILDING CONDITION

Propane heating, high energy bills. 10.3 ACH.

RENEWABLES

None

WALL INSULATION

None

CEILING INSULATION

R20 blown cellulose + (x2 layers)

FOUNDATION INSULATION

R28 batt

WINDOWS

Double glazed (U-val=2.14, SHGC=0.36)

VENTILATION

None

HEATING

95.0% AFUE furnace, ENERGY STAR® certified

COOLING

None

HEAT LOSS & GAIN

HL: 116043 Btu/h, HG: 33897 Btu/h

HOT WATER

0.67 EF propane induced draft fan

AFTER

30 GJ/year

Comfortable environment, no longer drafts.

Increased space with mudroom. Added solar to outbuilding. Still looking to add ERV and heat pump. 5.7 ACH.

15 kW Solar PV

R14 batt + 1.5" XTPS IV

R20 blown cellulose + (x2 layers)

R28 (100%)

Vetta U-0.95 SHGC 0.33

To add in final phase

Cold Climate Heat Pump (Make; Mitsubishi, Model; PUZ-HA36NKA, PVA-A36AA7)

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HL: 47680 Btu/h, HG: 21640 Btu/h

To add in final phase; heat pump hot water



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ANNUAL ENERGY USE

Before Retrofit
223 GJ/
year

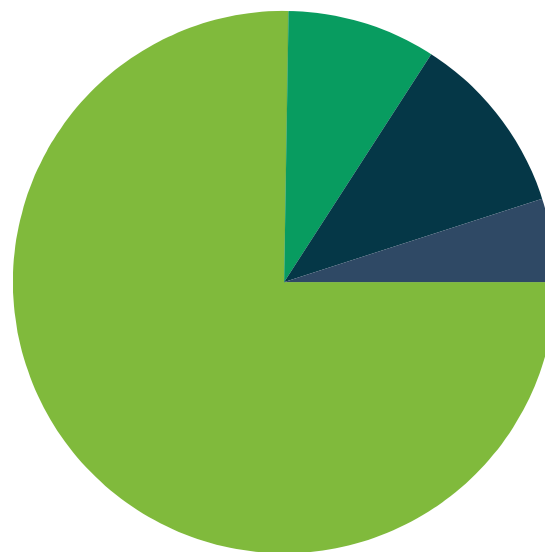
Typical New Home
98 GJ/
year
After Retrofit
81 GJ/
year

PV Production
30 GJ/
year



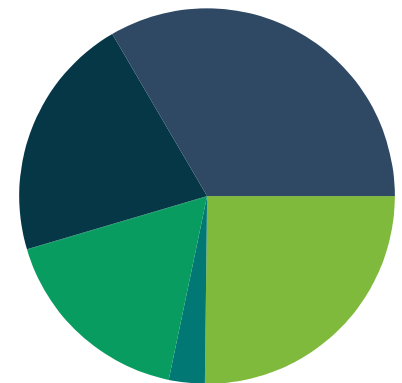
ENERGY CONSUMPTION BREAKDOWN

BEFORE RENOVATION



Space Heating
Other Electrical
Water Heating

AFTER RENOVATION



Light and appliances
Ventilation
Space Cooling

AS BUILT ENERGY PERFORMANCE

ANNUAL ENERGY SAVINGS	86.6%
GREENHOUSE GAS SAVINGS	10.70 Tonnes



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WHY ARE WE RETROFITTING OUR HOME?

From the moment they purchased their Lanark Highlands property, they envisioned an energy-efficient home that blends tradition with sustainability. The homeowners are passionate about creating a high-performance home, with solar integration as a top priority. Their goal was to preserve the farmhouse's charm while incorporating modern mechanical systems and an airtight building envelope.

WHAT LESSONS DID WE LEARN?

This renovation was done in stages, the roof as the final stage. This has been a challenge due to the stack effect. The ceiling also had limited capacity for insulation. The builders proposed a hot roof detailing approach; bringing the attic into the home's thermal envelope for usable space and energy efficiency, requiring meticulous air sealing, vapor control, and proper insulation to prevent moisture issues, ensuring the roof deck stays warm.

WHAT ELSE NEEDS TO BE DONE TO GET TO NET ZERO?

We are in the final phase of this project; Ice and water shield metal roofing with added outboard rigid insulation. Intention to also finish renovation with install of heat pump hot water heater and ERV. Solar generation is up and running on the property!



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PHOTO GALLERY - BEFORE



Insulation pre-reno



Home pre-renovation



Windows pre-reno



Third floor pre-reno



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PHOTO GALLERY - DURING



ICF detail reinforcing lower part of foundation



Adding a functional mudroom



Hot roof detail - rafter cavities cleaned and closed cell spray foam added



New passive house quality doors



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PHOTO GALLERY - AFTER



Mudroom addition



New Windows and new Air Source Heat Pump



Solar generation on barn - outbuilding



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TECHNICAL DETAIL 1



Larsen truss approach on interior walls to preserve historic exterior walls.

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TECHNICAL DETAIL 2

spray on air sealing compound



Hot roof detail - rafter cavities cleaned and closed cell spray foam added

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TECHNICAL DETAIL 3



Smart VDR material & foil faced EPS insulation to maintain inward drying and continuous insulation

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TECHNICAL DETAIL 4



Stages of Larsen truss approach on interior wall - creating air barrier

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TECHNICAL DETAIL 5



Initial insulation on interior walls

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