

ENERGUIDEThe First Step On Your Home  
Retrofit Journey!**THE HOME**

- A Hamilton home constructed in 1900
- Roughly 2,300 square feet
- Heated using natural gas

**THE PROBLEM**

- Basement/foundation accounts for 35% of estimated annual heat loss
- 25% of annual heat is lost through the leaky building envelope
- Older windows that need replacing

**POTENTIAL SOLUTIONS**

- Use the proper insulation to insulate the foundation, reducing heat loss
- Air seal around the home to increase air tightness
- Install high-efficiency windows
- Install heat-pump system to replace fossil-fuel powered space heating

**BENEFITS OF AN ENERGUIDE HOME EVALUATION****Reduce Energy Consumption**

By completing the EnerGuide evaluation, the homeowner has the practical knowledge to **reduce annual energy use by 50%**

**Reduce Impact on the Environment**

By completing the recommended retrofits, the homeowner can **reduce their greenhouse gas emissions by 65%**

**Pathway to Grant Reimbursement**

Doing an EnerGuide evaluation opens up a \$5,000 financial incentive pathway (via grant) that helps **alleviate high renovation costs**

## Retrofit Case Study: An EnerGuide Home Energy Evaluation

This is a case study of a home energy evaluation performed by a Natural Resources Canada Registered Home Energy Advisor, employed by Green Venture. An EnerGuide home evaluation as created by Natural Resources Canada (NRCAN) can help homeowners understand how their home uses energy and identify potential retrofits that improve energy efficiency. In this case study we will focus on an initial EnerGuide home energy evaluation that was completed on a Hamilton home constructed in 1900.

The homeowner, Alison, moved into this home with the intention of completing renovations as the home was already in need of some upgrades. With different retrofit projects in mind, she waited until the perfect opportunity had presented itself – the Canada Greener Homes Grant. Through word of mouth, Alison heard that Green Venture has experience in delivering home energy evaluations and has been doing so for over 20 years. As a first step, she applied and met the eligibility criteria through NRCAN for the Greener Homes Grant. She then reached out to us via phone to ask about the process and find out more information. As a service organization certified to facilitate the Greener Homes Grant, we were able to schedule an initial EnerGuide evaluation to begin the process. More on the registration process [here](#).

### **The EnerGuide Home Evaluation**

The EnerGuide home evaluation process is a basement to attic study of exactly how efficiently the building is using energy.

The energy advisor begins the assessment by taking measurements and collecting data on the exterior of the home.

Moving to the interior of the home, the advisor assesses windows, insulation levels, and all mechanical systems. Next, they set up a blower door test to see how much air leakage is happening in the home. The process takes two to three hours. Two evaluations are needed (pre retrofits and post retrofits) to successfully complete the Greener Homes Grant and Loan programs.



Figure 1. An EnerGuide home evaluation as carried out by a registered energy advisor

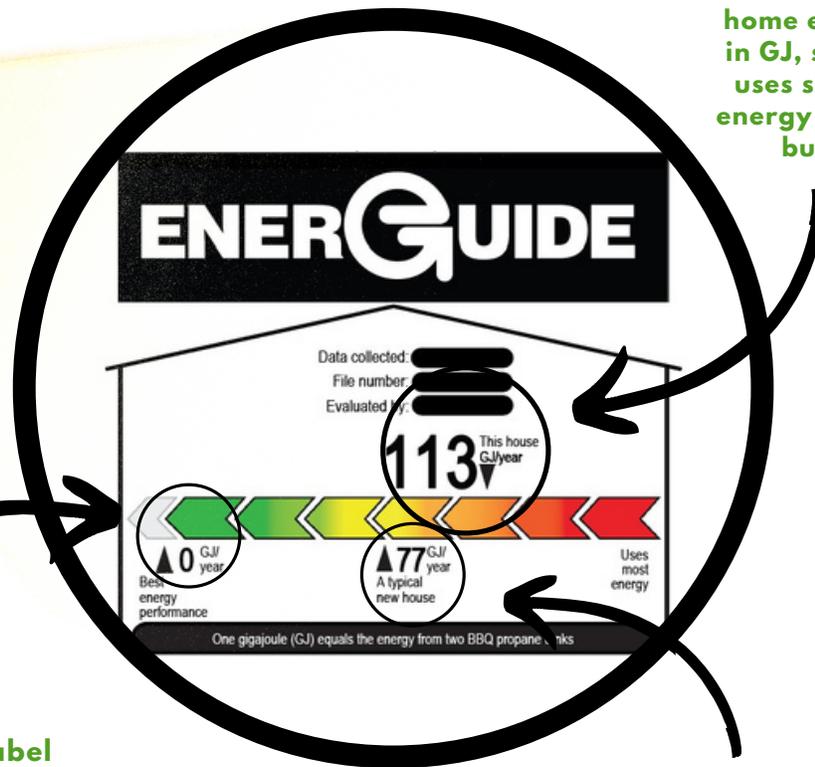
Once the evaluation is complete, the advisor can plug the data collected into the energy simulation software used to model the building under standard operating conditions. Unique to each home, an EnerGuide Rating (annual energy usage) is determined and recommendations for improvement are shared with the homeowner.

# The Label

An example of a label for a high-performing home



Alison's annual home energy usage in GJ, she currently uses slightly more energy than a newly built home



Did You Know?

Homes that have an EnerGuide Label Rating of 0 GJ consume as much energy as they produce!

I.E. A net-zero home that consumes 80 GJ of energy can offset that usage by producing 80 GJ through renewable technology such as a solar panel system.



Energy usage of a typical newly built home of similar size, structure, and location is provided as a reference

Figure 2. Alison's EnerGuide Label

In figure 2, we see Alison's EnerGuide label which was assigned to her by her energy advisor based on the initial EnerGuide evaluation. The annual energy usage is measured in gigajoules (GJ) - for reference, one GJ is equivalent to the energy in two barbecue propane tanks. Alison's home has an energy rating of **113 GJ** based on standard operating conditions at the time of the evaluation. Thanks to the EnerGuide Label, Alison has a measurable way to identify and better understand her annual energy use.

# The Breakdown

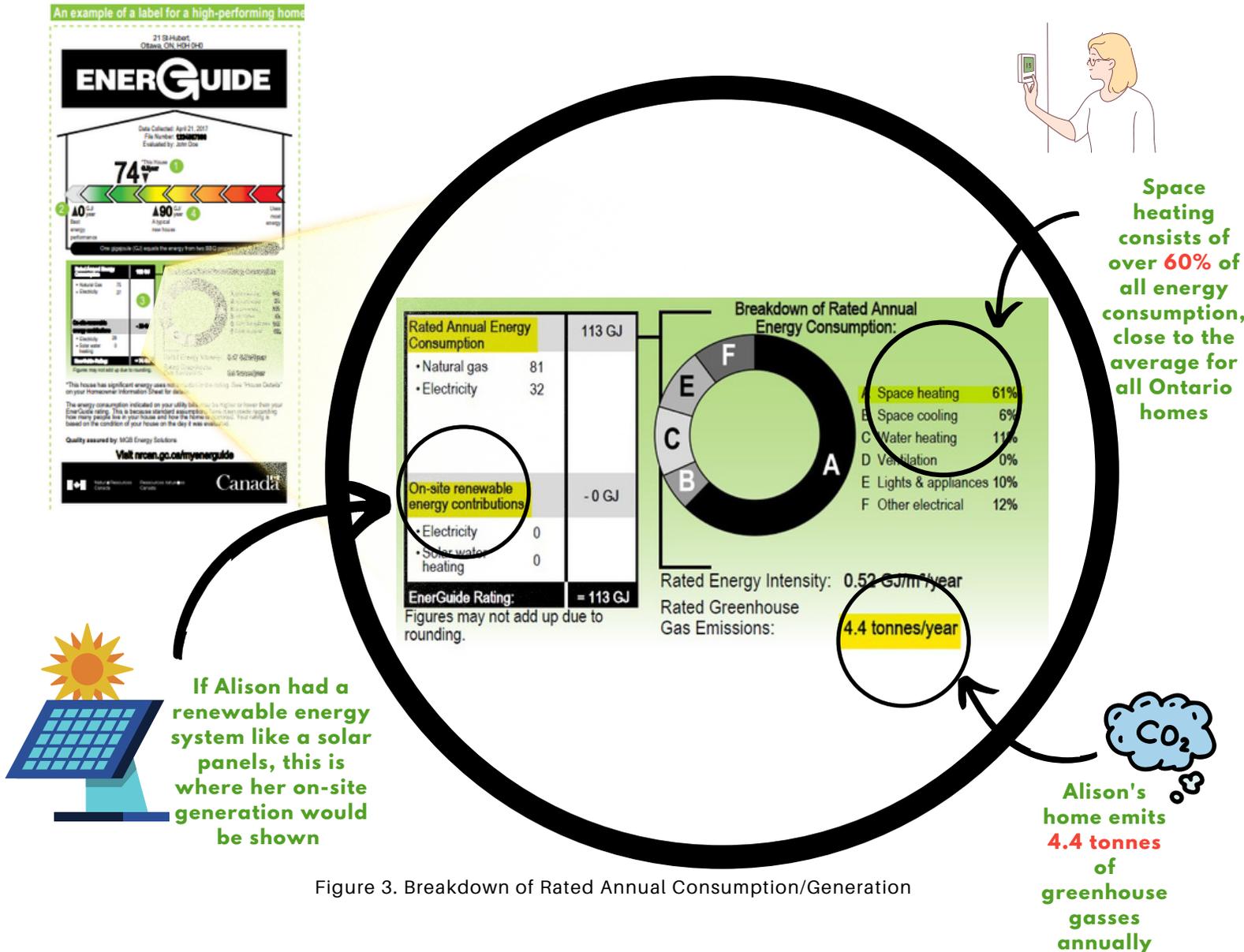


Figure 3. Breakdown of Rated Annual Consumption/Generation

Diving deeper into Alison's EnerGuide Label we see a breakdown of her 113 GJ EnerGuide Rating. On the left hand side of figure 3 we have a section labelled "rated annual energy consumption" and "on site renewable energy contributions". Alison is also able to see how much energy is generated if she had an operating renewable energy system, such as a solar panel system. Currently, she has nothing installed and does not offset her annual energy consumption of 113 GJ.

A further breakdown on the right side of figure 3 reveals an analysis of her annual energy consumption. Alison's home uses **61% of its total energy to heat the home**. This is not surprising as space heating is used the majority of the year and is generated through the burning of fossil fuels. Her home also has a rating of **4.4 tonnes of green house gas emissions annually**.

# The Renovation Upgrade Report

Alison's report provides upgrade recommendations. If all are completed, she can reach the potential energy usage rating of 62 GJ

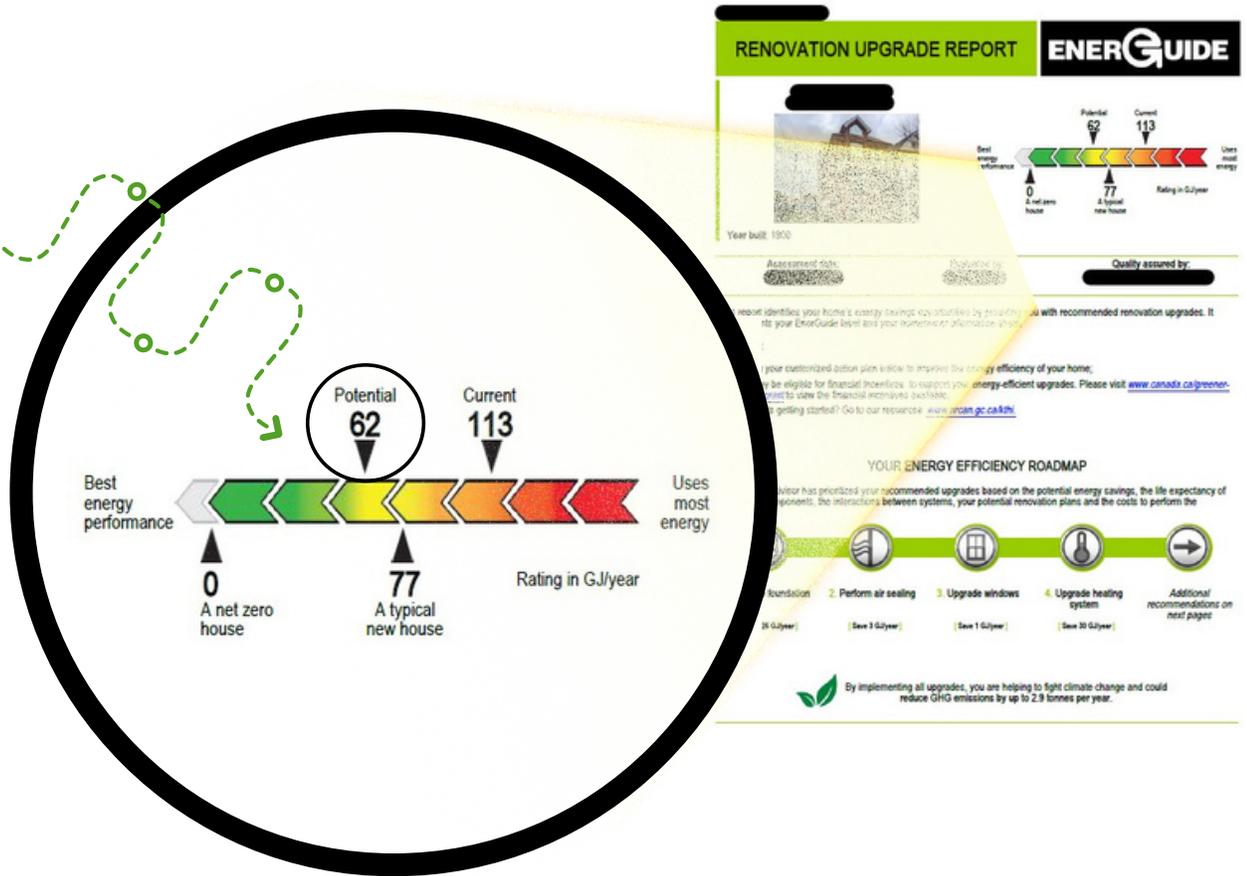


Figure 4. Alison's EnerGuide Rating as depicted on her Renovation Upgrade Report

The Renovation Upgrade Report which is provided to Alison in addition to her EnerGuide Label is a report that highlights potential upgrades that could help increase her home's energy efficiency.

In figure 4. Alison has the potential **62 GJ/year** rating if she decides to implement all upgrades that are recommended in the report - a slightly lower rating than that of a typical newly constructed home. The lower the ratings, the less energy is being consumed

# Your Energy Efficiency Roadmap



Figure 5. Alison's Energy Efficiency Roadmap

The first section of the **Renovation Upgrade Report** is Alison's Energy Efficiency Roadmap. This roadmap provides the homeowner with a prioritized breakdown of potential renovations. It can help Alison understand her homeowner journey better and visualize what the most energy efficient version of her home may look like. Her energy advisor has also provided the following retrofits as potential options.

The roadmap also contains a section with detailed notes specific to the home and the provided recommendations. At this point, the advisor is available to explain the report and answer any of the homeowner's questions or concerns.

# Insulation: Managing Your Heat flow

## Did You Know?

An R-value rating is given to insulation to rate how well a material resists heat flow; the greater the number, the better the material is at resisting heat flow.

**RECOMMENDED ENERGY EFFICIENCY UPGRADES**

A customized plan to improve the energy efficiency of your home is found below:

**1. Insulate foundation**

- ❑ Increase the insulation value of 100% of your basement walls (Foundation - 1) from the interior by RSI 4.30 (R-24.4).
- ❑ Increase the insulation value of your foundation headers (BW hdr-01) by RSI 3.93 (R-22.3).

This upgrade could reduce the energy consumption of your house by 26 gigajoules per year.

**Did you know?**  
Your foundation accounts for 35 percent of the estimated annual heat loss of your house.

The "Did you know" section provides background information on the upgrade - this section highlights the fact that 35% of all heat loss comes from Alison's uninsulated basement

**RECOMMENDED ENERGY EFFICIENCY UPGRADES**

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**1. Insulate foundation**

- ❑ Increase the insulation value of 100% of your basement walls (Foundation - 1) from the interior by RSI 4.30 (R-24.4).
- ❑ Increase the insulation value of your foundation headers (BW hdr-01) by RSI 3.93 (R-22.3).

This upgrade could reduce the energy consumption of your house by 26 gigajoules per year.

**Did you know?**  
Your foundation accounts for 35 percent of the estimated annual heat loss of your house.

**Checklist**

Assess the status of your foundation for water leaks, cracks and flooding and remediate these issues before beginning any insulation job. Foundations can be insulated from the interior, exterior or a combination of both depending on accessibility and the complexity of the building. Refer to your energy advisor's comments to determine which would be best suited for your foundation.

**Consult our resources** [www.enrg.ca/energy-efficiency/homes/make-your-home-more-energy-efficient/keeping-the-heat-in](http://www.enrg.ca/energy-efficiency/homes/make-your-home-more-energy-efficient/keeping-the-heat-in) to learn more and take action.

**Your energy advisor's comments**

The Canada Greener Homes Grant initiative offers grants of up to \$1,500 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the RSI-value of the added insulation and the percentage of wall area insulated.

The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated.

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Your basement had R-0 when I assessed it. To qualify for the Greener Homes grant the finished R-value of the basement walls has to be at least R-10 which will satisfy the requirement for the \$1500 grant, if you bring the insulation up to R-22, the grant will be \$1000.

HC42010

Through the Canada Greener Homes Grant initiative, a grant of \$240 is available for sealing and adding insulation to basement headers. In an unfinished basement, sealing and insulating headers can be a relatively simple task. The grant of \$240 is available when RSI 3.93 (R-22) or more is added to a minimum of 50% of your entire basement header area, along with air sealing.

Figure 6. Recommended upgrade #1: Insulate Foundation

Starting with the basement walls, the energy advisor recommended they prioritize this retrofit first based on their current home conditions. The simulation software estimated that nearly **35%** of all heat loss occurs through here. **24 GJ** of heat loss attributes to approximately **\$174** being wasted annually. Furthermore, by implementing this upgrade and reducing her energy usage by 26 GJ, she can save an estimated **\$187** on her gas bill annually.

This process ensures controllability of heat within the home which helps with keeping warmer or cooler air from escaping through building envelope. Reducing heat loss also means that less energy being used to keep the home comfortable which can lead to utility bill savings over time.

# Air Sealing: Eliminating Air Leaks and Minimizing Heat Loss

**2. Perform air sealing**

- Improve the airtightness of your house by 10% to achieve 5.36 air change(s) per hour at 50 pascals.
- This upgrade could reduce the energy consumption of your house by 3 gigajoules per year.

Renovation Upgrade Report

### RECOMMENDED ENERGY EFFICIENCY UPGRADES - CONTINUED

**Did you know?**  
Air leakage accounts for 25 percent of the estimated annual heat loss of your house.

**Useful tips**  
Air sealing is one of the most cost-effective energy-saving measures you can undertake. It is typically performed before and during other upgrades to ensure optimal benefit. Air sealing can help to minimize potential moisture damage and improve comfort by reducing drafts, heat loss, dust and outdoor noise in your home.

**The "Useful tips" section provides meaningful advice on any specific retrofit. In this particular section, the advisor shares the cost-effective benefits of air sealing**

**RECOMMENDED ENERGY EFFICIENCY UPGRADES**  
A customized plan to improve the energy efficiency of your home is found below.

**1. Insulate foundation**  
The Canada Greener Homes Grant includes a grant of up to \$1,000 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the RSI-R value of the added insulation and the percentage of wall area insulated. The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated. The Canada Greener Homes Grant includes a grant of up to \$1,500 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the RSI-R value of the added insulation and the percentage of wall area insulated. The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated. Your basement floor RSI-R value is assumed to be equal to the Greener Homes grant the highest RSI-R value of the basement walls has to be at least R-10 which will satisfy the requirements for the \$1,500 grant. If you bring the insulation to R-12, the grant will be \$1,000.

**HEADERS**  
Though the Canada Greener Homes Grant includes a grant of \$200 available for sealing and adding insulation to basement headers, in an unfinished basement, sealing and insulating headers can be a mutually simple task. The grant of \$200 is available when RSI-R (R-20) or more is added to a minimum of 60% of your entire basement header area, along with air sealing.

Figure 7. Recommended upgrade #2: Perform air sealing

The retrofit that Alison should prioritize second is air sealing - an extremely cost-effective, high payback retrofit that reduces air leakage in the home. As simulated, air leakage may account for up to 25% of her home's annual heat loss. Not only does air sealing reduce heat loss, but it also reduces drafts, noise pollution, and generally makes the home more comfortable. Like insulation, air sealing reduces heat loss in the house which can lead to direct utility savings over the lifetime of the home. Air sealing should be a top priority for any homeowner looking to minimize air leakage throughout the home.

# High-efficiency Windows: Reducing Heat Transfer

The image is a screenshot of a digital interface showing a recommended energy efficiency upgrade. At the top, a green banner contains a window icon and the text: "3. Upgrade windows", "Replace 4 windows with ENERGY STAR certified models.", and "This upgrade could reduce the energy consumption of your house by 1 gigajoules per year." Below this, a "Did you know?" section states that windows account for 17 percent of the estimated annual heat loss of a house. To the right, a "Did You Know?" box highlights that high-efficiency windows can increase comfort, reduce noise pollution, and increase property resale value and aesthetics. On the right side of the screenshot, there is a "RECOMMENDED ENERGY EFFICIENCY UPGRADES" section with a list of items, including "1. Insulate foundation" with a list of sub-points and a "Did you know?" note. Below this is a "Useful tip" and a "Consult our resources" section. At the bottom, there is a "Your energy advisor's comments" section with detailed text about grant amounts and R-values.

**3. Upgrade windows**

- Replace 4 windows with ENERGY STAR certified models.

This upgrade could reduce the energy consumption of your house by 1 gigajoules per year.

**Did you know?**  
Windows account for 17 percent of the estimated annual heat loss of your house.

**Did You Know?**  
In addition to reducing heat loss, high-efficiency windows can increase comfort, reduce noise pollution, and increase property resale value and aesthetics

**RECOMMENDED ENERGY EFFICIENCY UPGRADES**  
A customized plan to improve the energy efficiency of your home is found below:

**1. Insulate foundation**

- Insulate an insulation value of R10 on your basement walls (Foundation - 1) from the interior by R2.4-2.0 (R-4).
- Insulate the exterior support posts and window headers (HW hb-01) by R2.3-3.0 (R-2.3).

This upgrade could reduce the energy consumption of your house by 28 gigajoules per year.

**Did you know?**  
Your foundation accounts for 35 percent of the estimated annual heat loss of your house.

**Useful tip**  
Assess the status of your foundation for water leaks, cracks and settling and remediate these issues before beginning any insulation job. Foundations can be insulated from the interior or a combination of both depending on accessibility and the complexity of the building. Refer to your energy advisor's comments to determine which would be best suited for your foundation.

**Consult our resources** [Save energy by insulating efficiently](#) [Automate your home more energy-efficiently](#) [Keep the heat in to learn more and start doing it](#)

**Your energy advisor's comments**

The Canada Greener Homes Grant initiative offers grants of up to \$1,500 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the RSI/R-value of the added insulation and the percentage of wall area insulated.

The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated.

The Canada Greener Homes Grant initiative offers grants of up to \$1,500 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the RSI/R-value of the added insulation and the percentage of wall area insulated. The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated.

Your basement had R-0 when I assessed it. To qualify for the Greener Homes grant the finished R-value of the basement walls has to be at least R-10 which will satisfy the requirement for the \$1000 grant. If you bring the insulation up to R-22, the grant will be \$1500.

HE4-0210

I have modelled your house with R-24 this will be sufficient for the \$1500 grant.

HE4-0210

Through the Canada Greener Homes Grant initiative, a grant of \$240 is available for sealing and adding insulation to basement headers. In an unfinished basement, sealing and insulating headers can be a relatively simple task. The grant of \$240 is available when RSI 3.32 (R-20) or more is added to a minimum of 60% of your entire basement header area, along with air sealing.

Figure 8. Recommended upgrade #3: Upgrade Windows

Third on the energy efficiency roadmap is the recommendation to upgrade windows. Windows are critical in reducing heat transfer both in and out of the home. With poor quality windows, we can expect greater heat loss and discomfort. Alison's advisor recommended that they replace 4 windows with ENERGY STAR windows (highly efficient windows that are eligible under the grant). Although 1 GJ can be saved as predicted by the simulation software, windows are still a great point of focus when undergoing energy efficient renovations in the home.

# High Efficiency Mechanical Systems: Heat Pump Technology

## 4. Upgrade heating system

- Install a new ENERGY STAR certified air-source heat pump that has a heating seasonal performance factor (HSPF) of 10.

This upgrade could reduce the energy consumption of your house by 30 gigajoules per year.

**Did you know?**  
Space heating accounts for 61 percent of the estimated annual energy use of your house.

**Useful tips**  
Perform any planned building envelope upgrades before your heating contractor begins work since a more energy efficient building envelope may mean that a smaller heating system could be installed. The contractor should first conduct a heat loss calculation before deciding on the capacity and model of your heating system.

**Did You Know?**

**Air-source heat pumps act as a single mechanical system to heat and cool the home. It uses electricity to transfer heat into the home during heating months and transfers heat out of the home during summer months.**

Air-source heat pumps (ASHP) are extremely energy efficient - this upgrade alone could reduce Alison's energy consumption greatly and decarbonize her space heating system



**RECOMMENDED ENERGY EFFICIENCY UPGRADES**

A customized plan to improve the energy efficiency of your home is found below:

**1. Insulate foundation**

Insulate the foundation value of 100% of your basement walls (foundation - 1) from the interior by R-10.

Insulate the foundation value of your foundation headers (R-10-R15) by R-10 (R-20).

Seal gaps to reduce the energy consumption of your home by 20 gigajoules per year.

**Did you know?**  
Your foundation accounts for 61 percent of the estimated annual heat loss of your house.

**Useful tips:**  
Inspect the exterior of your foundation for water leaks, cracks and flooding and remediate these issues before beginning any foundation remediation. Remediation can be completed from the exterior, interior or a combination of both depending on accessibility and the category of the work. Your energy advisor's comments to determine which would be best suited for your foundation.

**General information:** [energyefficiency.homesideyourhome.com/energy-efficiency/insulating-the-basement](#)

**How energy advisor's assistance:**  
The Canada Greener Homes Grant initiative offers grants of up to \$1,000 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the current value of the added insulation and the percentage of wall area insulated. The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated.

The Canada Greener Homes Grant initiative offers grants of up to \$1,000 for adding insulation to basement walls. Insulating basement walls can reduce energy costs and improve comfort. Grants are based on the current value of the added insulation and the percentage of wall area insulated. The current amount of insulation does not affect the grant amounts. A minimum of 20% of the exterior foundation wall area must be insulated.

Your basement wall R-10 grant is restricted to 1 to qualify for the Greener Homes grant the historical R-value of the basement walls has to be at least R-10 which will verify the requirement for the \$1,000 grant. If you bring the basement wall to R-10, the grant will be \$1,000.

I have modified my house with R-10 this will be sufficient for the \$1,000 grant.

**HEADERS**  
Through the Canada Greener Homes Grant initiative, a grant of \$200 is available for sealing and adding insulation to basement headers. In an unfinished basement, sealing and insulating headers can be a mutually complex task. The grant of \$200 is available when R-10 (R-20) or more is added to a minimum of 50% of your entire basement header area, along with air sealing.

Figure 9. Recommended upgrade #4: Upgrade heating system

Last on the roadmap is upgrading the heating system of the home. The advisor provided the option of installing a heat pump which could replace her fossil fuel heating system. If Alison's goal is to decarbonize and electrify her home, she could pursue this retrofit to reduce her natural gas consumption while significantly reducing her greenhouse gas emissions.

# Energy Efficiency Forecast

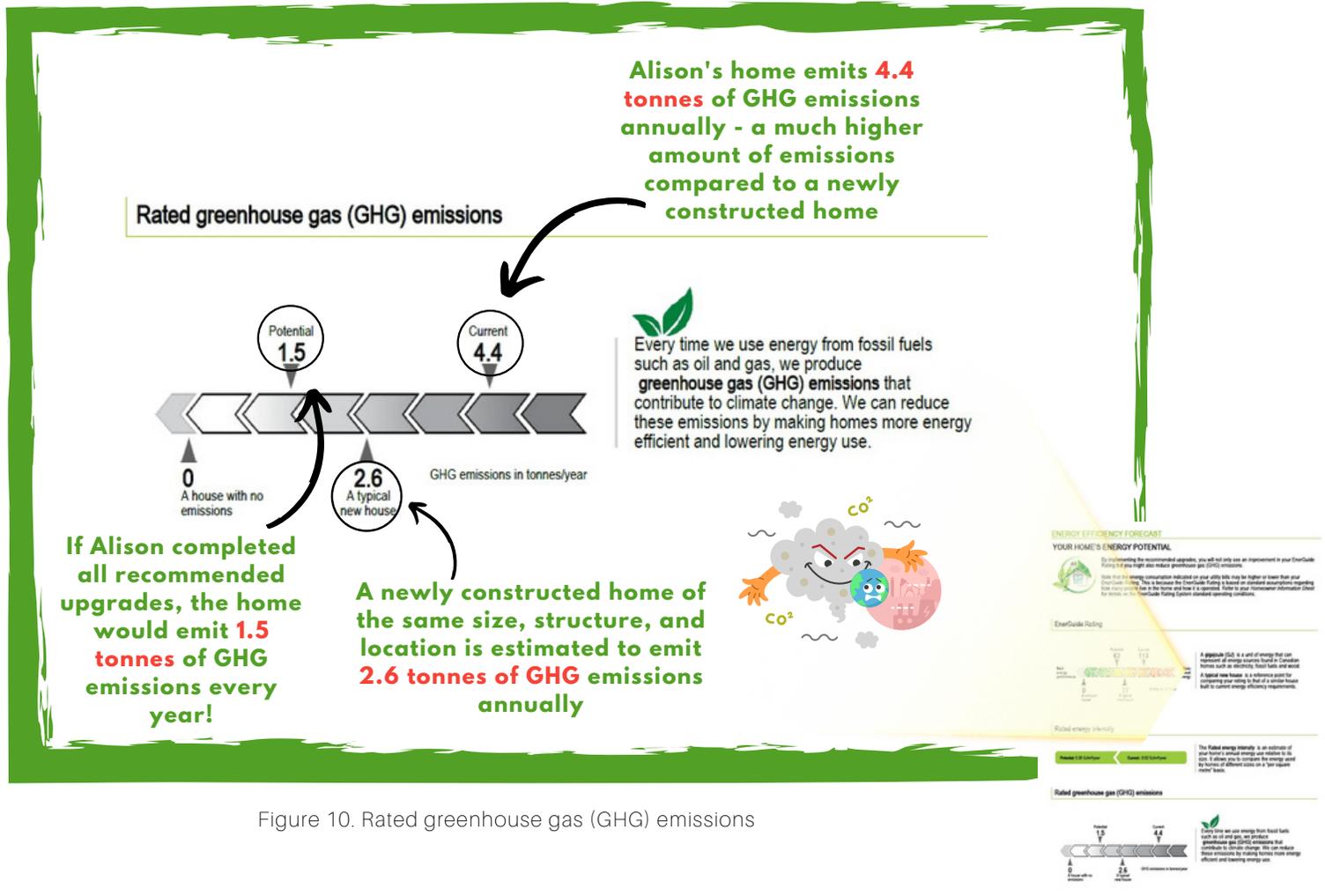


Figure 10. Rated greenhouse gas (GHG) emissions

One of the last notable sections in the report is the Energy Efficiency Forecast. This section includes a breakdown of Alison's greenhouse gas emissions and includes bar charts that break down estimated heat loss and energy usage.

As simulated, Alison's home is estimated to emit **4.4 tonnes** of GHG emissions annually. This is much greater than a newly built home of the same size, shape, and location as seen in figure 10. By completing all retrofits provided by the advisor, Alison can reduce her home GHG emissions down to **1.5 tonnes** of GHG emissions annually. We hope to see continued support for incentives to pursue deep home retrofits that aid in minimizing carbon pollution.

# Energy Efficiency Forecast cont.

Understanding **heat loss** in the home is critical to improving energy efficiency.

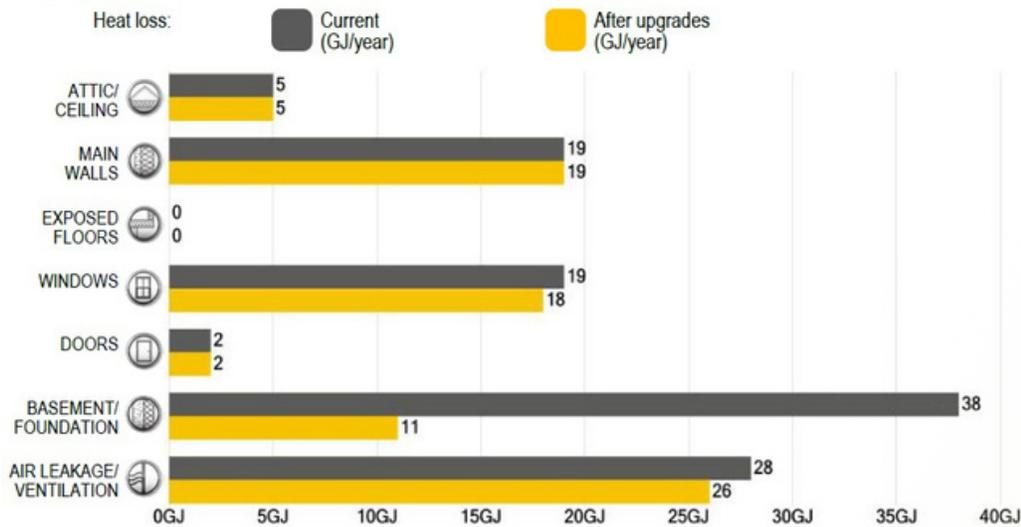
Alison's home loses the most heat through her **basement/foundation** - focusing on this area will help her save money by reducing her heating and cooling loads



## ENERGY EFFICIENCY FORECAST - CONTINUED

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

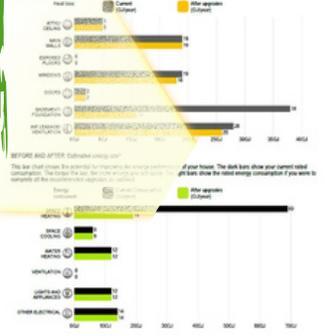
This bar chart shows where heat is lost from your house. The dark bars show the areas where you are currently losing heat. The longer the bar, the more heat you are losing. The light bars show the estimated heat loss if you were to complete all the recommended upgrades as outlined.



## ENERGY EFFICIENCY FORECAST - CONTINUED

### 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.

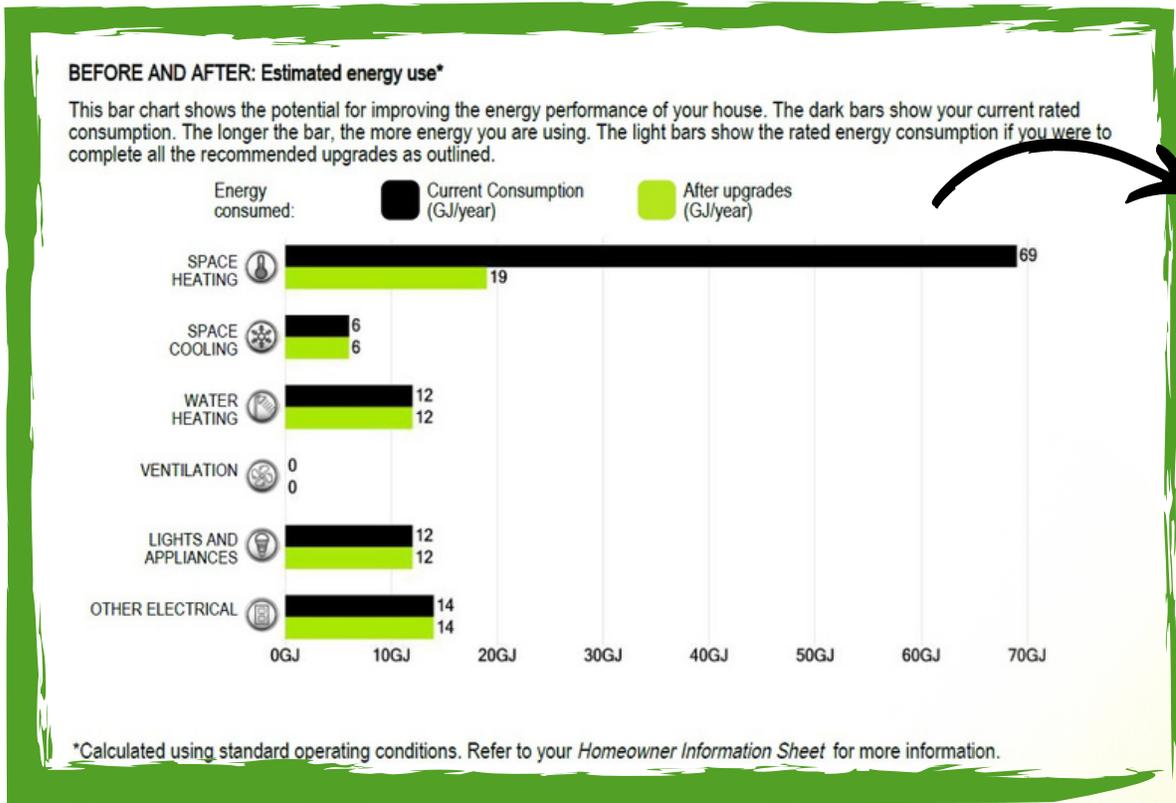


\*Calculated using standard operating conditions. Refer to your Homeowner Information Sheet for more information.

Figure 11. Estimated heat loss through the building envelope before and after upgrades

The bar chart in figure 11 compares where heat is lost in the home in its current state and compares it to how heat would be lost after all retrofit upgrades are taken. The heat loss chart shows that Alison is currently losing **38 GJ** of energy, a substantial amount. She has the potential to reduce the heat loss from her basement by nearly **27 GJ** of energy by completing all retrofit upgrades in the report, notably, insulation!

# Energy Efficiency Forecast cont.



Completing all recommended upgrades will significantly reduce Alison's energy use, particularly her space heating

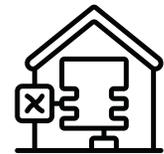
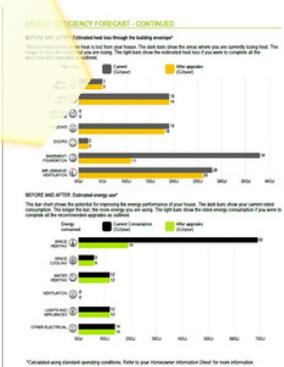


Figure 12. Estimated energy use before and after upgrades



The bar chart in figure 12 provides the estimated energy use after retrofits. This compares the current rated consumption and the consumption if all recommended upgrades were completed. Currently, Alison's home uses 69 GJ of energy to heat the space in her home annually. Although all upgrades would help her reduce her space heating energy use down 11 GJ, the most significant retrofit would likely be the heat pump installation. The heat pump could consume less energy compared to a condensing furnace and would help to reduce annual energy usage while greatly reducing greenhouse gas emissions.

## By signing up for an EnerGuide Evaluation Alison received:

- An EnerGuide **label** detailing home energy use
- A **breakdown** of current energy consumption/generation
- **Personalized** retrofit recommendations
- A "Before and After" **analysis** of heat loss and energy use
- **Professional** and **insightful** tips and advice from a Registered Energy Advisor



### From The Client:

*"I contacted GreenVenture for a pre-renovation home energy efficiency audit. The home energy audit report confirmed that we'd likely get a rebate for a window replacement and basement insulation and it also identified some other renovations that we weren't expecting. The home energy advisor highlighted some air sealing that was a pretty quick fix, something that we could do ourselves! The energy audit also named some furnace replacement options that will help us in the years ahead when it comes time to make the transition from gas to electric heating. Although we're still waiting on our window installation (delays), we expect to receive a rebate for about \$1,500 plus an additional \$600 for the costs of the pre and post audits."*

*- Alison*

### Conclusion

By investing in her century old home and getting an EnerGuide evaluation, Alison now knows how her home uses energy and has identified ways to get her home to perform as energy efficient as possible. The upgrade pathway including improving insulation, air sealing, and mechanical upgrades work together as a system to reduce heat loss, reduce greenhouse gas emissions, improve comfort, and reduce heating and cooling loads which produce annual utility savings.

Ultimately, If all renovations are completed Alison can reduce her energy use by 50% and reduce greenhouse gas emissions by 65%. We ask that homeowners prioritize their goals when it comes to home energy retrofits. Whether it is choosing to pursue deeper retrofits on our path to decarbonization, or if it's to capture the low hanging fruit to save money on utility bills - there is always a pathway to living a greener life in the building you call home.