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Home **Energy Assessment**

Stage: Lead

Prepared for:
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1150 Main
Decorah, IA 52101

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Dear John Doe,

Thank you for choosing Winneshiek Energy District for your comprehensive home energy audit. This report provides information to help you understand your energy usage as well as tips and recommendations to help you save more on your energy bill.

We're available to help you along your energy efficiency journey, so please reach out with any questions.

Thank you,
Paul Cutting

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Your Home Performance Concerns:

You reported the following concerns about the energy use and comfort of your home:

- ✓ House is drafty and cold
- ✓ High natural gas bills
- ✓ Appliances are nearing end of life

Understanding Household Energy Use

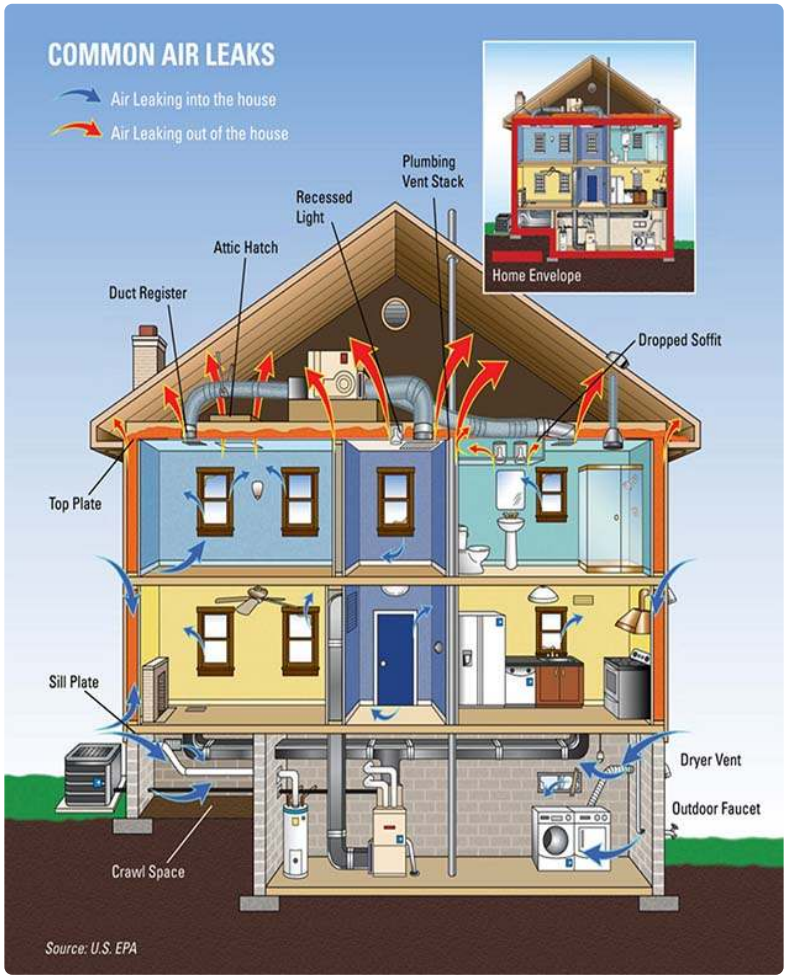
HEATING & AIR CONDITIONING
Heating and cooling account for 54% of the average household's energy usage.*

WATER HEATING
Water heating is typically the second largest use of energy in your home, representing about 16% of your annual energy use.*

LIGHTING
An average household spends about 6% of its annual energy budget on lighting.*

APPLIANCES
Replacing old appliances like refrigerators, freezers and clothes washers for newer ENERGY STAR® models can reduce your energy use for those appliances by 10-50%.*

WINDOWS & DOORS
Old, inefficient windows and doors are often among the primary reasons your home is uncomfortable and inefficient. Good seals around doors and windows create a tight building envelope that greatly enhance the performance of your home.



ATTIC & CEILING INSULATION
Installing the right type and depth of attic insulation helps reduce heating and cooling costs.

WALL INSULATION
Insulating the sidewalls of a home to the recommended R–value will accomplish three critical goals: reduce heat loss in winter and heat gain in summer resulting in lower energy use, reduce air leakage and keep walls closer to the range of optimal comfort.

AIR INFILTRATION & VENTILATION
Air infiltration contributes to drafts, uncomfortable temperature and moisture problems that affect the performance of building materials. To combat these issues, take steps to air-seal your home. Proper ventilation mitigates the presence of indoor pollutants such as molds, chemicals and gases.

FOUNDATION INSULATION
Exposed concrete or masonry wall systems lose a great deal of energy during the heating season. Insulate and properly air-seal the rim joist space.

*Source: 2012 Buildings Energy Data Book. Table 2.1.6. 2010 Residential Energy End-Use Splits by Fuel Type.

Recommended Energy Efficiency Measures

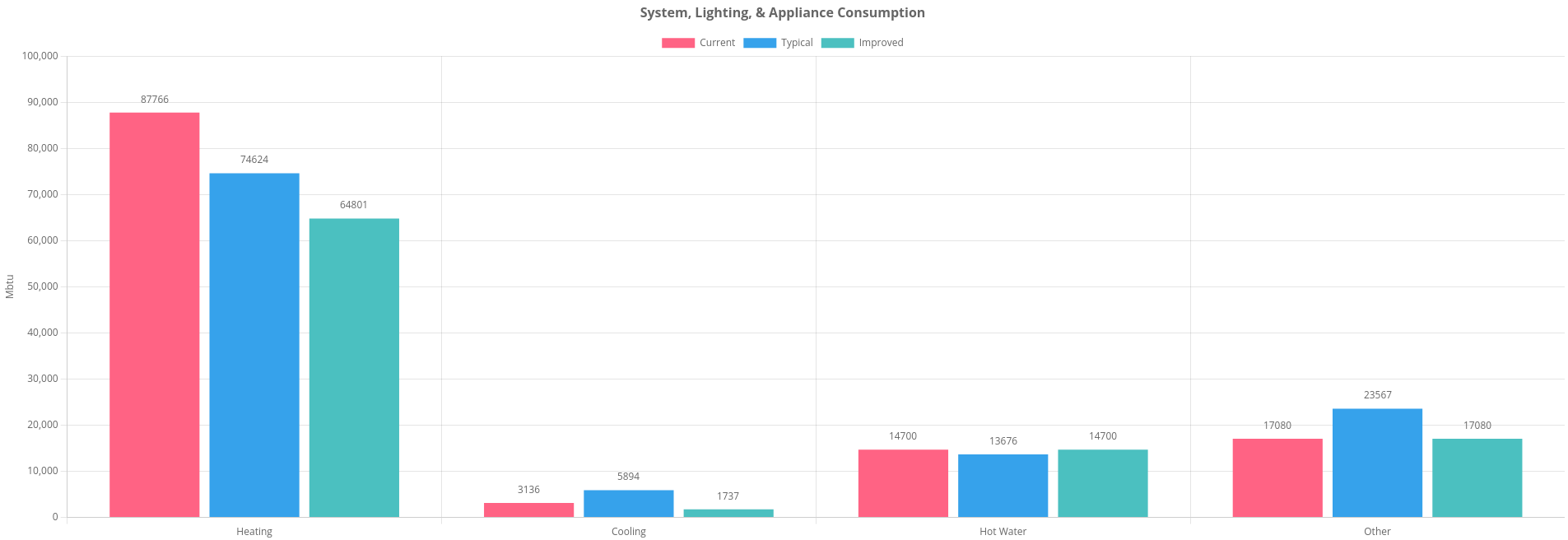
Recommendations for your Home	Annual Savings	% CO2 Saved	% Energy Saved	Cost	Total Incent	Net Cost	Pay Back Year
Increase attic insulation and coverage to save energy and increase comfort.	$53	4.1%	5.1%	$1,054	-	$1,054	14
Install a timed thermostat or increase your temperature setback to save energy.	$22	1.7%	2.0%	-	$100	-$100	1
Replace existing furnace and central AC with new high efficiency models	$159		12.8%	$8,000	$900	$7,100	>15
Total for all Energy Improvements	**$234**	**17%**	**20%**	**$9,054**	**$100**	**$8,954**	**>20**

Procedures used to make these estimates are consistent with criteria established by the U.S. Department of Energy for residential assessments. Actual installation costs and savings realized from installing measures may differ from the estimates contained in this report. The cost and incentive detailed above are estimated by your energy advisor. Final costs and incentives may differ from these estimates based on the actual scope of work installed.

Home Energy Use

This is a snapshot of how much energy your home is consuming and how the energy is being used. The chart shows the breakdown of consumption by the heating and cooling systems, water heater, and energy-consuming devices in your house.

	Current:	After recommended improvements:
Total kWh consumed per year:	5,549	5,093
Total annual electricity cost:	$737	**$676**
Total Therms Gas consumed per year:	1,037	809
Total Gas cost:	$788	**$615**

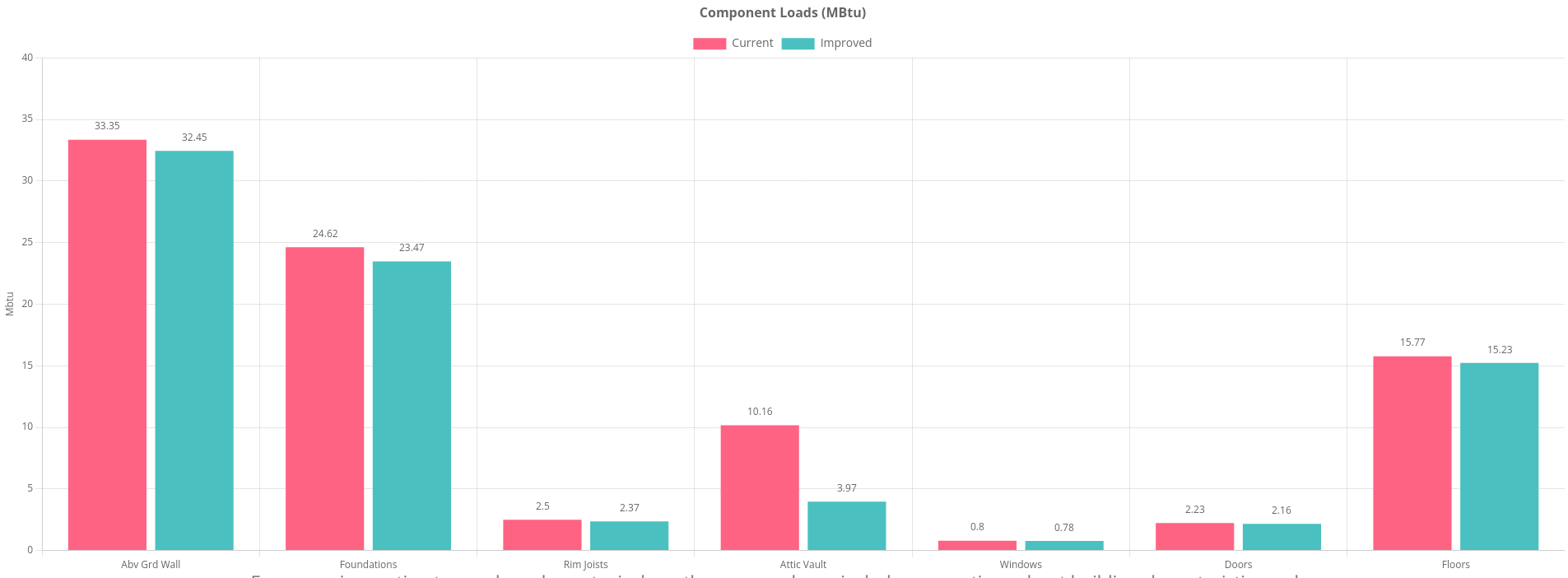


*Typical home energy estimates are from the U.S. Energy Information Agency Residential Energy Consumption Survey 2015. We present the typical consumption of homes in your area with the same number of occupants. Reasons your home may be different include different construction, equipment, and behavior. For reference, the average home in your region with 2 people is 2,508 square feet. GHG emission factors for electricity are from eGrid 2019. Other emission factors are from the Climate Registry. **Energy savings estimates are based on a typical weather year and may include assumptions about building characteristics and usage.

Heating & Cooling Loads

Here's how much you're spending on heating and cooling and where all that energy is going. The chart shows how energy flowing through the various components of your home contributes to heating and cooling loads.

	Current:	After recommended improvements:
Cooling electricity consumed per year:	919 kWh	509 kWh
Annual cooling cost:	$122	**$68**
Heating Therms Gas consumed per year:	864	636
Heating Gas cost:	$657	**$484**



Energy savings estimates are based on a typical weather year and may include assumptions about building characteristics and usage.

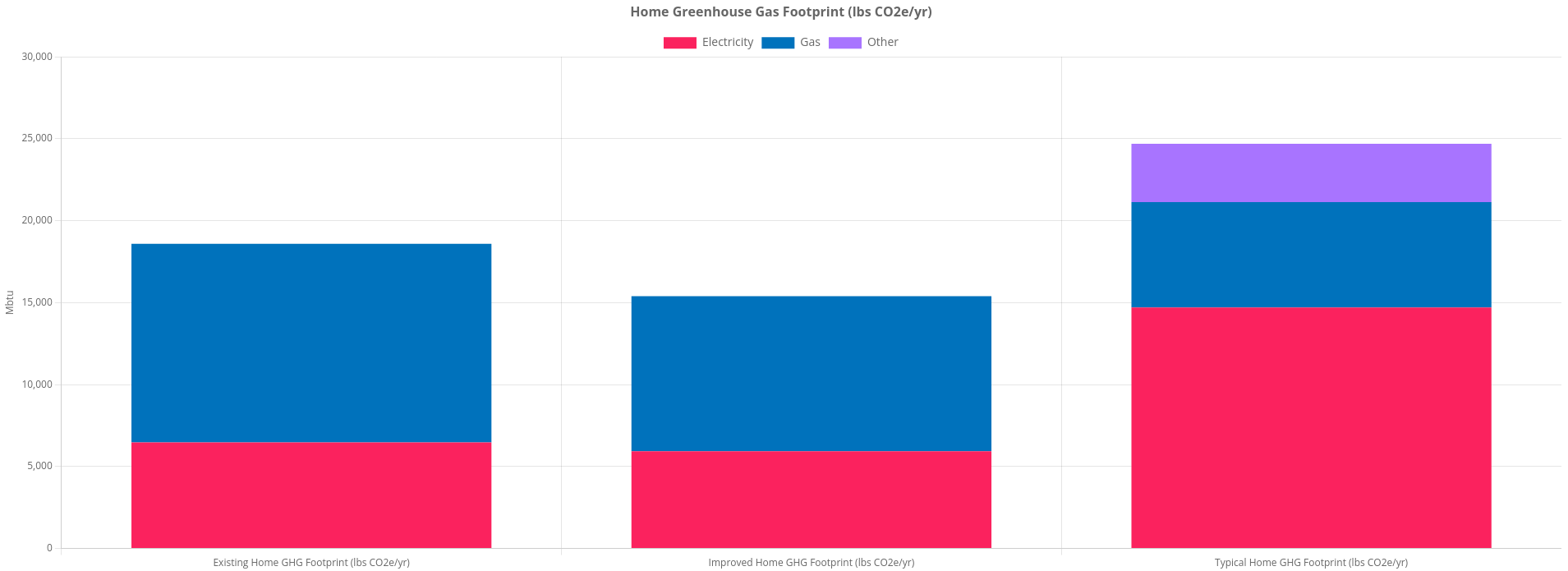
Greenhouse Gas Footprint

The chart below shows how much greenhouse gas is emitted each year because of the energy used in your home. This includes fuels burned in your home for heating, cooking, and other uses, as well as fuels burned to generate the electricity you use. The emissions are described in pounds of CO_2 equivalent, which is a way of combining the various greenhouse gasses, including carbon dioxide, that are emitted when we burn fossil fuels for energy.

Your current total greenhouse gas emissions are 18,596 lbs CO_2e per year.

After the recommended improvements, your emissions would be 15,398 lbs CO_2e per year.

The typical* home in your region with 2 people emits 24,703 lbs CO_2e per year.



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Attic

Location	Base Cavity Insulation	Base Continuous Insul	Sq. Ft.	Improved Cavity Insulation	Improved Continuous Insul
Attic Area 1	5 in.; R-17 Blown Cellulose (Loose)	N/A	1000	9 in.; R-30 Cellulose, Loose Blown	N/A

Insulation is your primary defense against heat loss/gain through your home's envelope and is almost always the first priority in terms of a practical, cost-effective improvement to a home. The effectiveness of insulation is based on its "R-Value", the standard measure of thermal resistance. A higher R-Value results in slower heat loss/gain, lower heating bills, and a more comfortable and greener home. Installing the right amount of attic insulation is a key to reducing heating and cooling costs.

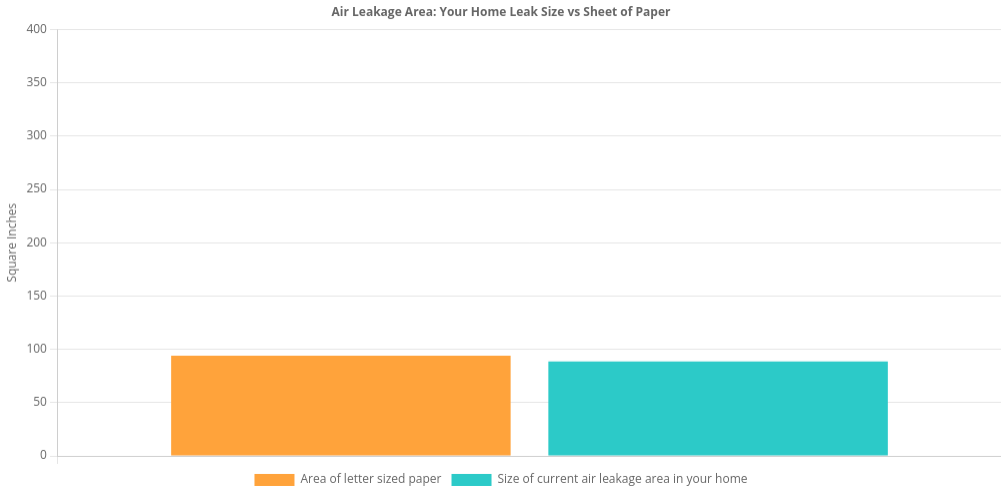
We recommend you increase attic insulation levels by adding an additional 8 inches of cellulose insulation, resulting in $51 in savings annually.

Air Leakage

Air leakage allows conditioned air to escape increasing your energy costs. However, the movement of air through your home also removes odors, pollutants, and moisture. When taking steps to air-seal your home, keep in mind that proper ventilation and air distribution work to provide a safe, comfortable and durable home.

Air Leakage Testing		ACH 50*
Current Condition	1600 CFM@50pa	10.7
Improved Condition	None	10.7

*ACH50 (Air changes per hour at 50 Pascals) compares air leakage to the volume of the house. A higher number indicates a leakier house. Standards for new construction often call for 3 to 5 ACH50.



Heating And Cooling

System	Base Type	Base Specs	Improved Type	Improved Specs
Heating System 1	Gas Furnace	Capacity: 100000 Btu/hr, Eff: 80 AFUE	Gas Furnace	Capacity: 100000 Btu/hr, Eff: 96 AFUE
Cooling System 1	Central Air Conditioner	Size: 36000 Btu/hr, Eff: 10 SEER	Central Air Conditioner	Size: 36000 Btu/hr, Eff: 17.1 SEER2

A properly sized HVAC system is designed to provide heat comfortably and efficiently to a home. Heating systems are commonly oversized, resulting in energy waste, short cycling, reduced equipment life, maintenance issues, air quality issues, and discomfort.

We recommend you replace the existing furnace with an efficiency rating of 96 AFUE and the central AC with an efficiency of 17.1 SEER2.

Estimated Impact Of Improvements On Annual Energy Costs

Current Conditions

Year	0	5	10	15	20
Electricity	$737	$940	$1,200	$1,532	$1,955
Fuel	$788	$1,006	$1,284	$1,639	$2,092
Total bill	$1,525	$1,947	$2,485	$3,171	$4,047

With Improvements

Year	0	5	10	15	20
Electricity	$676	$863	$1,102	$1,406	$1,795
Fuel	$615	$785	$1,002	$1,279	$1,632
Total bill	$1,291	$1,648	$2,104	$2,685	$3,427

Estimated Savings

Year	0	5	10	15	20
Electricity	$61	$77	$99	$126	$161
Fuel	$173	$221	$282	$360	$460
Total bill	$234	$298	$381	$486	$621

Zero-Cost And Low-Cost Improvements

Simply applying the solutions below can lower your energy use and costs while protecting the environment.

ZERO-COST SOLUTIONS

- Use a programmable thermostat to automatically adjust the temperature when you are not at home. The US Department of Energy suggests temperature settings of 68° in winter and 78° in summer.
- Wash clothes in cold water and let them air dry.
- Eliminate "Phantom Loads" by unplugging electronics when not in use.
- Clean your refrigerator's coils every six months.
- Use the light wash settings on your dishwasher and turn off heated drying.
- Turn off your lights when not in use.

INCENTIVES

- Check into Federal, State, and local incentives. Visit www.dsireusa.org and click on your state.

LOW-COST SOLUTIONS

- According to ENERGY STAR®, LEDs are 70-90% more energy efficient for the same brightness and last up to 15 times longer than standard bulbs.
- Running ceiling fans counter-clockwise in the winter pushes warm air at the ceiling downward.
- Replace HVAC filters every month.
- Plug air leaks around doors and windows with caulking and weatherstripping.
- Old electric water heaters in unconditioned spaces may benefit from adding blanket insulation. Insulating hot water pipes will also help with energy efficiency.

Procedures used to make these estimates are consistent with criteria established by the U.S. Department of Energy for residential assessments. Actual installation costs and savings realized from installing measures may differ from the estimates contained in this report. The cost and incentive detailed above are estimated by your energy advisor. Final costs and incentives may differ from these estimates based on the actual scope of work installed.

Home Facts & Summary Of Existing Components

About this home

- Year Built: 1950 Number of Bedrooms: 2 Number of Stories: 1 Average Wall Height: 8 Ft Conditioned Floor Area: 1,000 Front of House Direction: South

Air-tightness

- Infiltration Rate (ACH50): 10.7

Attic and Foundation

Attic
- Attic Type: Open Cavity Attic Insulation: R-17

Foundation
- Foundation Type: Basement Foundation Wall Insulation Value: Basement: R-0 Rim Joist Insulation Value: Basement: R-0

Wall Construction

- Wall Type: Frame 2x4 with Wood siding Wall Insulation Value: R-0

Windows and Skylights

- Window Type: Double-Pane, Clear, Wood Frame

Heating/Cooling Systems

Heating System
- System 1 Fuel: Gas Type: Furnace Efficiency: 80% AFUE

Cooling System
- System 1 Type: Central Air Conditioning Efficiency: 10.0 SEER

Other Systems

Ducts
- Heating Duct 1 Location: Basement Leakage: 15% - Somewhat leaky Insulation: None

Hot Water System
- DHW 1 Fuel: Gas EF: .61 Type: conventional water heater

Design Loads And Conditions

Design loads are instantaneous loads describing what is currently required from the mechanical systems to heat and cool the building, and what would be required if the recommended package of improvements was implemented. Design loads allow us to determine whether the current systems are appropriately sized, and what an optimal system would be given other efficiency improvements.

Base Heating Loads

Location	Heating Btu	% of Load
Walls	13,925	34.2 %
Floors	-	0 %
Foundations	7,760	19.1 %
Ceilings	3,833	9.4 %
Windows/Doors	1,541	3.8 %
Infiltration - Sensible	13,659	33.5 %
Infiltration - Latent		0 %
Internal - Sensible		0 %
Internal - Latent		0 %
Distribution	-	0 %
Total	**40,718**	**100%**

Improved Heating Loads

Location	Heating Btu	% of Load
Walls	13,925	36.3 %
Floors	-	0 %
Foundations	7,737	20.1 %
Ceilings	1,536	4 %
Windows/Doors	1,541	4 %
Infiltration - Sensible	13,659	35.6 %
Infiltration - Latent		0 %
Internal - Sensible		0 %
Internal - Latent		0 %
Distribution	-	0 %
Total	**38,397**	**100%**

Design Loads Cont.

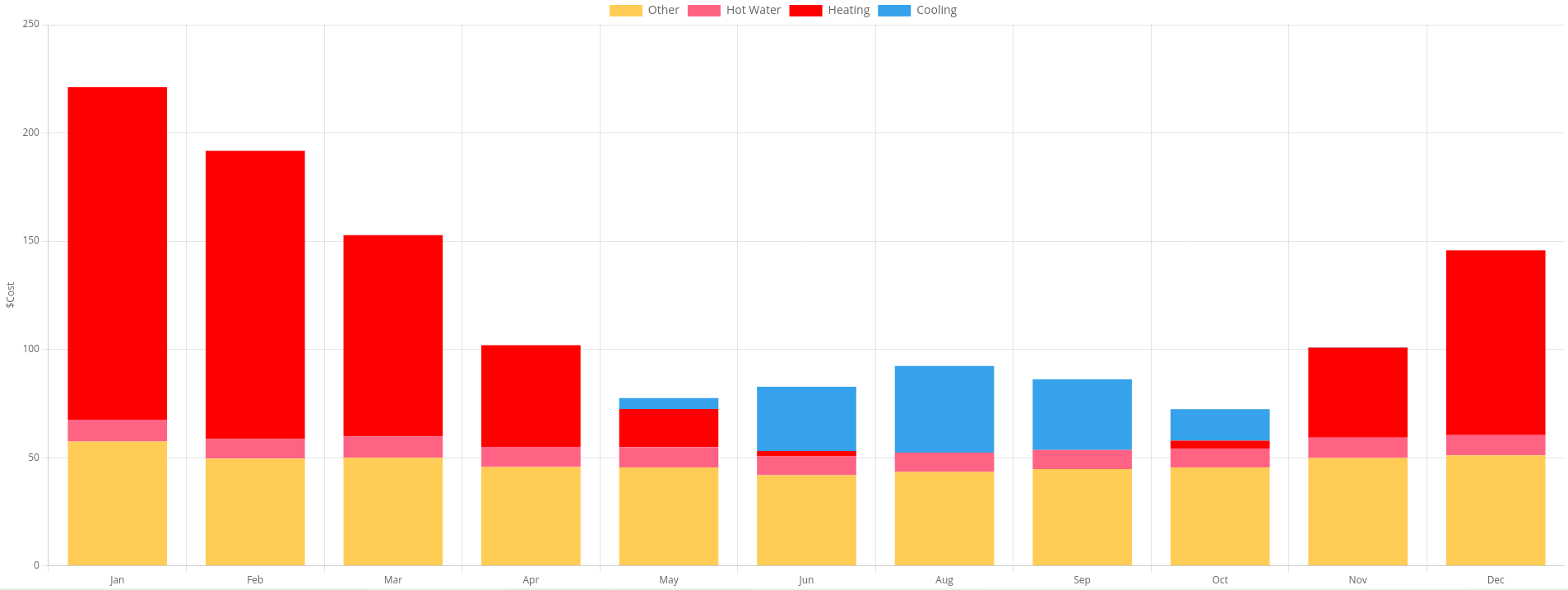
Base Cooling Loads		
Location	**Cooling Btu**	**% of Load**
Walls	5,128	34.1 %
Floors	-	0 %
Foundations	521	3.5 %
Ceilings	2,454	16.3 %
Windows/Doors	785	5.2 %
Infiltration - Sensible	1,608	10.7 %
Infiltration - Latent	1,319	8.8 %
Internal - Sensible	2,290	15.2 %
Internal - Latent	600	4 %
Distribution	324	2.2 %
Total	**15,029**	**100%**

Improved Cooling Loads		
Location	**Cooling Btu**	**% of Load**
Walls	5,128	38.5 %
Floors	-	0 %
Foundations	550	4.1 %
Ceilings	983	7.4 %
Windows/Doors	785	5.9 %
Infiltration - Sensible	1,608	12.1 %
Infiltration - Latent	1,319	9.9 %
Internal - Sensible	2,290	17.2 %
Internal - Latent	600	4.5 %
Distribution	39	0.3 %
Total	**13,303**	**100%**

Design Conditions		
Design	**Winter**	**Summer**
Dry Bulb	-6 °F	87 °F
Indoor Design Temp	68 °F	78 °F

Where Do The Energy Efficiency Estimates Come From?

Information about energy features of your building, like insulation levels, has been entered into a software program that estimates how much energy your building would use, on average, based on those features. This is an energy model of your building, which is represented by bars in the graph below. That estimation is then compared to your building's historical energy usage projected onto an average weather year, represented by the green line below. The contractor compares these two and makes adjustments to the model to match your usage – that "match-up" is displayed below. In this way, the model is "customized" to your building and usage. The customized model then estimates energy savings after installation of recommended energy improvements, like more insulation or air sealing. If historical bills aren't available to customize the model, estimated energy savings figures are based solely on the present and recommended energy features of your building in a typical weather year with typical usage. In this scenario the green line will not be present in the graph.



Definitions, Explanations And Links

- **Annual Fuel Utilization Efficiency (AFUE)**
  — The measure of seasonal or annual efficiency of a residential heating furnace or boiler. It takes into account the cyclic on/off operation and associated energy losses of the heating unit as it responds to changes in the load, which in turn is affected by changes in weather and occupant controls.
- **Annualized Return**
  — The return an investment provides over a period of time, expressed as a time-weighted annual percentage. This is the equivalent annual interest rate you would get if you put the same amount of money spent on the energy upgrade into a savings account.
- **Asbestos**
  — Asbestos is a mineral fiber that has been used commonly in a variety of building construction materials for insulation and as a fire-retardant, but is no longer used in homes. When asbestos-containing materials are damaged or disturbed by repair, remodelling or demolition activities, microscopic fibers become airborne and can be inhaled into the lungs, where they can cause significant health problems.
- **British Thermal Unit (Btu)**
  — The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit; equal to 252 calories.
- **Carbon Monoxide (CO)**
  — A colorless, odorless but poisonous combustible gas with the formula CO. Carbon monoxide is produced in the incomplete combustion of carbon and carbon compounds such as fossil fuels (i.e. coal, petroleum) and their products (e.g. liquefied petroleum gas, gasoline), and biomass.
- **Cashflow**
  — When financing energy efficiency improvements, cashflow is the difference between the average monthly energy savings and the monthly loan payment.
- **Compact Fluorescent Light bulb (CFL)**
  — A smaller version of standard fluorescent lamps which can directly replace standard incandescent lights. These highly efficient lights consist of a gas filled tube, and a magnetic or electronic ballast.
- **Cubic Feet per Minute (CFM)**
  — A measurement of airflow that indicates how many cubic feet of air pass by a stationary point in one minute.
- **Carbon Dioxide (CO2)**
  — A colorless, odorless noncombustible gas that is present in the atmosphere. It is formed by the combustion of carbon and carbon compounds (such as fossil fuels and biomass) and other methods. It acts as a greenhouse gas which plays a major role in global warming and anthropogenic climate change.
- **Energy Efficiency Ratio (EER)**
  — The measure of the instantaneous energy efficiency of room air conditioners; the cooling capacity in Btu/hr divided by the watts of power consumed at a specific outdoor temperature (usually 95 degrees Fahrenheit).
- **Energy Factor (EF)**
  — The measure of overall efficiency for a variety of appliances. For water heaters, the energy factor is based on three factors: 1) the recovery efficiency, or how efficiently the heat from the energy source is transferred to the water; 2) stand-by losses, or the percentage of heat lost per hour from the stored water compared to the content of the water: and 3) cycling losses. For dishwashers, the energy factor is defined as the number of cycles per kWh of input power. For clothes washers, the energy factor is defined as the cubic foot capacity per kWh of input power per cycle. For clothes dryers, the energy factor is defined as the number of pounds of clothes dried per kWh of power consumed.
- **Combustion Appliance Zone (CAZ)**
  — A contiguous air volume within a building that contains a combustion appliance such as furnaces, boilers, and water heaters; the zone may include, but is not limited to, a mechanical closet, mechanical room, or the main body of a house, as applicable.

Definitions, Explanations And Links To Resources 2

- **Heat Recovery Ventilator (HRV) / Energy Recovery Ventilator (ERV)**
  — A device that captures the heat or energy from the exhaust air from a building and transfers it to the supply/fresh air entering the building to preheat the air and increase overall heating efficiency while providing consistent fresh air.
- **Light Emitting Diode (LED) Lighting**
  — An extremely efficient semiconductor light source. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, and smaller size.
- **N-Factor**
  — A factor of how susceptible your house is to wind, influenced by weather patterns, location, and the number of floors in the home. Used in the calculation of NACH.
- **Natural Air Changes per Hour (NACH)**
  — The number of times in one hour the entire volume of air inside the building leaks to the outside naturally.
- **Payback Period**
  — The amount of time required before the savings resulting from your system equal the system cost.
- **Heating Seasonal Performance Factor (HSPF)**
  — The measure of seasonal or annual efficiency of a heat pump operating in the heating mode. It takes into account the variations in temperature that can occur within a season and is the average number of Btu of heat delivered for every watt-hour of electricity used by the heat pump over a heating season.
- **R-Value**
  — A measure of the capacity of a material to resist heat transfer. The R-Value is the reciprocal of the conductivity of a material (U-Value). The larger the R-Value of a material, the greater its insulating properties.
- **Radon**
  — A naturally occurring radioactive gas found in the U.S. in nearly all types of soil, rock, and water. It can migrate into most buildings. Studies have linked high concentrations of radon to lung cancer.
- **Rim Joist**
  — In the framing of a deck or building, a rim joist is the final joist that caps the end of the row of joists that support a floor or ceiling. A rim joist makes up the end of the box that comprises the floor system.
- **Seasonal Energy Efficiency Ratio (SEER)**
  — A measure of seasonal or annual efficiency of a central air conditioner or air conditioning heat pump. It takes into account the variations in temperature that can occur within a season and is the average number of Btu of cooling delivered for every watt-hour of electricity used by the heat pump over a cooling season.
- **Savings to Investment Ratio (SIR)**
  — A ratio used to determine whether a project that aims to save money in the future is worth doing. The ratio compares the investment that is put in now with the amount of savings from the project.