

Beautiful Heat sets baselines for residential radiant heat efficiency in Canada

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Beautiful Heat, Canada's not-for-profit association dedicated to educating Canadians about the option of residential radiant heat, recently engaged ICF Marbek to complete an Energy and Comfort Study, measuring energy consumption of radiant heat vs. forced-air systems. Based on the results from energy simulations of different home types in six regions of Canada, annual energy savings of up to 18% could be realized with radiant heat.

"Anecdotally we have had homeowners tell us that radiant heat has saved them as much as 30% to 40% on their annual heating bills," said **Simon Fedema**, chairman of Beautiful Heat. "As with any home, setting an ideal temperature is the domain of the owners and personal comfort levels can fluctuate greatly. With this study, we have modelled the dominant styles of homes and local climates in key regions across Canada to establish a national average that represents the baseline energy savings Canadians can realize with the installation of radiant heat."

In existing Canadian homes, built before 1980, national averages revealed energy savings of 12% and 5% in two-story and one-story homes, respectively. Within new homes, savings of 10% and 5% savings were revealed. Translated into annual dollar savings, new home savings could range from of \$40 to \$136 and existing homes from \$54 to \$232.

When multi-zone controls were enabled with a 1° C reduction in basements and living rooms overnight and in bedrooms in the day, savings increased to an average energy savings of 10.6% in new two-story homes and 12.4% in existing homes. With a more aggressive 4° C reduction, energy savings in new grew to 15.1% and existing to 17%.

In addition to energy savings, ICF Marbek looked to estimate the average temperature reduction that could be realized through the consistent temperature that is provided by radiant heating without sacrificing occupant comfort. They found that to maintain an ideal heat set-point (which provides the same level of comfort) in one-story homes, owners could set their thermostats an average of 2.2° lower in new and existing structures. In two-story homes, that number increased to 3.1° in both types of dwelling.

The results of the study have provided a baseline for the recognized efficiencies of in-home radiant heat. Beautiful Heat will leverage the study's results in its ongoing programs designed to help Canadian consumers understand the benefits of radiant heating when considering the full range of home-heating options available to them.

About the study

ICF Marbek implemented a combination of two tools — EnergyPlus Energy Simulation Software and Generic Optimization Program (GenOpt) — to quantify the energy consumption, comfort level and heating set-point reduction, and to ultimately calculate the potential energy savings resulting from the use of radiant heating systems while maintaining a consistent level of comfort.

Using the energy rates in the six selected regions of Vancouver, Edmonton, Winnipeg, Toronto, Montreal and Halifax, the researchers estimated total cost savings for both new and pre-1980 built, one-story and two-story homes. Also assessed was the impact of zone controls, which reduce heat in low-traffic areas, on savings associated with the use of residential radiant heating systems in Toronto and Edmonton.

Typical natural gas and electricity retail rates in each region were used to calculate the potential annual energy cost savings associated with each single-zone home per region. Based on the results of energy simulation of different home types in the six regions of Canada, the following conclusions were made regarding the use of residential radiant heating systems relative to conventional air-forced heating systems:

- Energy savings in the range of 12 gigajoules(GJ) to 21 GJ with the average of 16.6 GJ could be achieved annually in existing two-story homes in Canada. This corresponds to a range of 10% to 14%, with an average of 12% in annual energy savings.
- Energy savings in a range of 7 GJ to 14 GJ with the average of 10 GJ could be achieved in new two-story homes in Canada. This corresponds to a range of 9% to 12%, with an average of 10% annual energy savings.
- Energy savings in a range of 2 GJ to 5.5 GJ with the average of 4.1 GJ could be achieved in existing one-story homes in Canada. This corresponds to a range of 3% to 7% with an average of 5% annual energy savings.
- Energy savings in a range of 2 GJ to 3.5 GJ with the average of 3 GJ could be achieved in new one-story homes in Canada. This corresponds to a range of 3% to 7% with an average of 5% annual energy savings.
- The use of radiant heating systems instead of air-forced heating systems would result in a range of \$40 to \$136 energy cost savings in new homes and a range of \$54 to \$232 in existing homes, depending on type of home and location in Canada.

All houses were modeled with a single HVAC zone, assuming that the entire house will be controlled by a single, constant cooling and heating set-point schedule. For zone controls, Marbek modeled the new and existing two-story homes in Edmonton and Toronto with three HVAC zones to examine the impact of radiant heating multi-zone systems. The three HVAC

zones were basement, living area (first floor) and bedroom area (second floor). “Living” and “Basement” zones were modeled with a reduced heating set-point at night. “Bedrooms” zone was modeled with a reduced heating set-point during the day.

It is important to note that energy savings as a result of radiant system multi-zoning in residential buildings are a direct function of occupant behaviour; and therefore, the calculated savings will vary significantly for each based on the thermostat setback setting. In order to capture the possible range of energy savings, ICF Marbek modeled each house with the following two setback setting scenarios:

- **Minimum setback temperature:** 1° C reduction during the night for “Living” and “Basement” zones and during the day for “Bedrooms” zone.
- **Aggressive setback temperature:** 4° C reduction during the night for “Living” and “Basement” zones and during the day- for “Bedrooms” zone.

Energy savings for a radiant system multi-zone system in two-story homes in Toronto and Edmonton are expected to be in the range of 11 GJ to 26 GJ, depending on thermostat setting in which the occupant is continuously managing the thermostat setback temperature. This corresponds to a range of 10% to 18% of the total baseline energy consumption.

Multi-zoning setup in two-story homes in Toronto and Edmonton can increase the potential energy savings resulting from the use of radiant heating system, by a range of 1% to 6% of baseline consumption, depending on the thermostat setting in the different zones.

Founded in 2010, Beautiful Heat is presented by a select group of Canadian manufacturers of radiant home heating products. For further information, visit BeautifulHeat.com.

Source: [Beautiful Heat \(Canada\)](#)

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