

LOWER both home heating costs & green house gas emissions

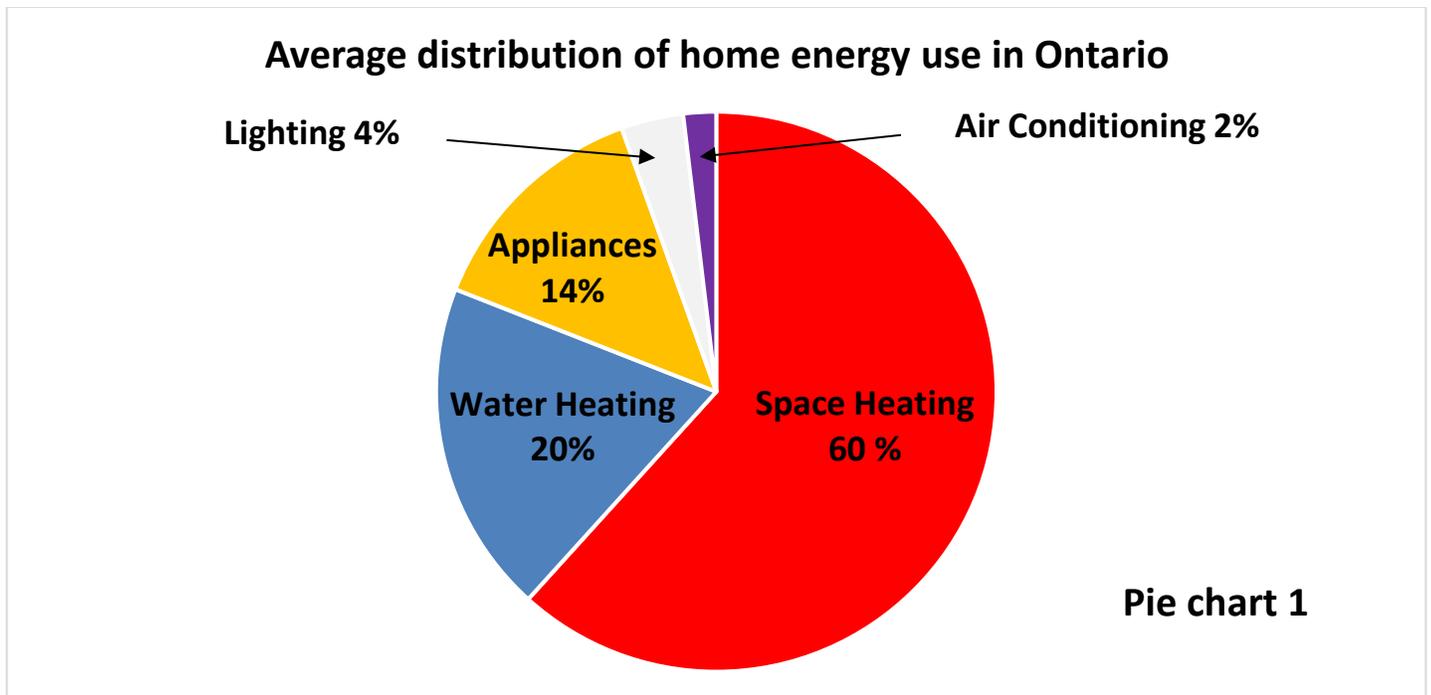
The average Ontario home is a significant source of green house gas (GHG) emissions. GHG emissions contribute directly to climate change and can be divided into *Embodied Emissions* and *Operational Emissions*. With respect to homes, *Embodied Emissions* are the GHG emissions related to planning and constructing a home and includes all the components of the supply chain. Operational GHG emissions are the day-to-day emissions generated from operating a home and includes all the components of the supply chain. *Embodied GHGs + operational GHGs* over the entire lifecycle of a home = the total GHG emissions of a home.

Knowledge about *Embodied emissions* is evolving. *Operational emissions* are better understood by scientists and therefore are easier to quantify accurately.

Operational Emissions of existing homes in Ontario:

Homes in Ontario, on average, generate significant amounts of operational GHG emissions because 1) they have less than ideal levels of insulation and 2) fossil fuel is the dominant source of energy used in existing Ontario homes. Typically, older homes have lower levels of insulation and therefore require more energy to heat during winter which means older homes typically generate more operational GHG emissions compared to newer or better insulated homes. Many Ontario homeowners could reduce their annual heating costs and their operational GHG emissions significantly by making improvements to the insulation level of their homes. Owners of well insulated homes that use natural gas heating systems should consider installing a heat pump. Heat pumps installed in a natural gas heated homes can significantly reduce GHG emissions while simultaneously achieving some annual cost reductions.

Mini splits can reduce and costs and significantly reduce GHG emissions in natural gas heated homes that don't have forced air systems. If you own a natural gas heated home, try the free app at www.m-set.org which approximates a home's relative level of insulation and makes suggestions about how to proceed based on the numerical score the app generates.



Source: Natural Resources Canada.

HOME HEATING consumes the most energy in the average Ontario home. The amount of energy required to heat any home is mainly dependent on insulation levels, the size of a home and the climate zone in which a home is located. A homeowner in the Southern Georgian area can determine the relative insulation level of their own home using the app found at www.m-set.org Homes with extremely



poor insulation levels are likely to use more than 60% of their annual energy to space heat. Homes with high levels of insulation use much less than 60% of their annual energy to space heat. Other smaller factors that influence how much purchased energy is required for home heating include: the efficiency of the heating equipment, thermostat settings and the number of full times residents. How well insulated is your southern Georgian bay area home? Try the free app at www.m-set.org to get an approximation along with suggestions about how to lower heating costs and GHG emissions.

HOT WATER PRODUCTION consumes a much smaller amount of energy in the average Ontario home compared to space heating. As a result of this, there is much less potential to reduce a home's overall energy needs by making changes in how hot water is produced compared to what can be achieved with space heating in the average Ontario home. Significant improvements in the insulation level of the average home yields much larger energy savings compared to what can be achieved with alterations in how hot water is produced. Natural gas fired hot water production varies in efficiency from 65% (most common type- gas power vented) to 95% for on-demand gas hot water. Electric hot water tanks are generally rated around 87%. Even a whopping 30% increase in efficiency of hot water production only drops the average Ontario home's overall energy consumption by 6% assuming nothing else changes. It very possible for the average Ontario homeowner to reduce their annual heating demand by 30% or more due to insulation improvements. A 30% drop in space heating demand due to insulation improvements translates to a 18% drop in overall annual energy use, in the average Ontario home assuming all else stays the same. This means space heating can offer three times the overall annual energy savings compared to what's possible with hot water production if both are reduced 30% in the average Ontario home.



CONCLUSIONS: Homeowners in the southern Georgian bay area that want to reduce their annual energy costs and GHG emissions can self assess the relative insulation level of their own home by using the free app at www.m-set.org

Poorly insulated homes have the greatest potential for cost savings and GHG reductions. Very well insulated homes have lower potential for cost savings but if those homes use fossil fuel for space heating or hot water production, they still have potential to significantly reduce their GHG emissions by electrifying more of their space heating and by electrifying hot water production.

In the average Ontario home, the potential to save money is much lower for hot water production compared to space heating, regardless of the method used to produce hot water. Electric resistance hot water production does cost more than natural gas heated water at 2021 energy prices, but the overall annual dollar difference between using electricity and natural gas isn't very large for the average Ontario home. Properly sized electric hot water tanks can be operated to only heat during off peak hours and the installation cost of an electric tank is much lower compared to natural gas hot water systems. Electrically heated hot water in Ontario produces very few GHG emissions compared to natural gas heated hot water.

APPLIANCES, LIGHTING AND AIR-CONDITIONING offer the least potential for overall all annual savings in the average Ontario home. There can also be unexpected consequences of installing more efficient lighting and appliances. Using less electricity for lighting and appliances in gas heated homes means during winter the home's gas heating system will replace the waste heat that used to come from less efficient lighting and appliances. During summer, an A/C will work a bit less if more efficient lighting and appliances are installed, but heating requirements far outweigh cooling requirements in Ontario. As a result, in natural gas heated homes switching out incandescent bulbs with LED's and buying more efficient appliances means a little less



electrical energy is used but that comes at the cost of some extra natural gas being burned in the winter. This is a scenario in which small annual savings do occur, but these savings come at the cost of higher GHG emissions. Ontario electricity is far less carbon intense compared to natural gas, which means whenever anyone in Ontario replaces electrical energy with natural gas or any other fossil fuel, their carbon footprint increases.

'Electric only' homes with the very high levels of insulation can have similar or lower annual energy costs compared to brand new homes that have both natural gas and electrical service assuming the number of full-time occupants and the sizes of the homes being compared are similar. This is because both electricity and natural gas service providers include a fixed monthly charge on each bill. When home energy requirements are low enough having a single monthly fixed charge allows for an *'electric only'* home to have comparable or even lower annual energy costs compared to a new well insulated home with both gas and electrical service. Well insulated homes with only electrical service have tiny operational GHG emissions compared to similar sized efficient brand-new homes with both natural gas and electrical service. All homes need electrical service to function, no homes needs natural gas to function. Economic arguments in favour of using natural gas melt away as insulation levels of a home improve.

Use the free app www.m-set.org as a starting point to approximate your own home's relative insulation levels. The app will also help you consider options to reduce your energy costs, and your GHG emissions. You can also use the app to compare your homes insulation levels to seventeen randomly selected Collingwood homes shown on graph 1. The units on graph 1 are the same units used in the app. Home #8 is the poorest insulated home on graph 1 and it has 35 times more GHG emissions per sq foot related to space heating compared to home 17 which is the electric only home.



Home 17 which has the highest level of insulation on the graph. The enormous variation in annual GHG emissions per square foot related to space heating between the two homes is due to the difference in insulation levels of the two homes and energy choices made by the homeowners.

Homes with very high levels of insulation and only electrical service are homes that have similar or lower annual energy costs compared to the same sized homes with natural gas service. The biggest difference between highly insulated electric only Ontario homes and their counter parts with gas service is the electric only homes have tiny carbon footprints by comparison.

Graph 1

Compare your home's insulation levels using www.m-set.org against 16 randomly selected natural gas heated homes located in Collingwood.

Home 17 is an extremely well insulated

3,100 sq. foot all-electric home built by CCAT member Laurel Hood

