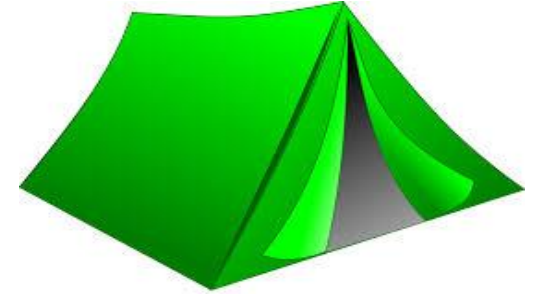


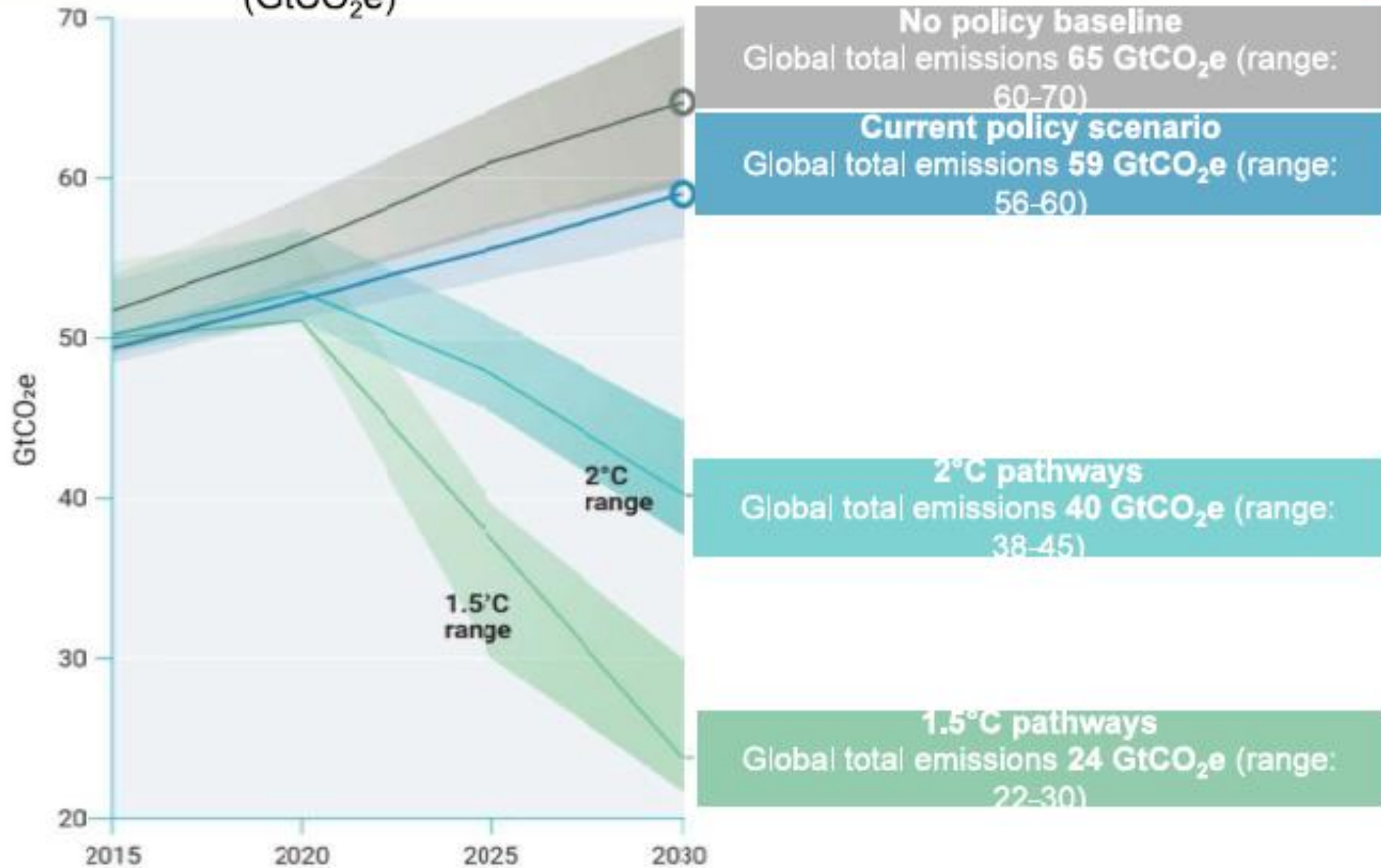
Shelter

Introduction



- The WNM Climate Group is focusing on different areas of our lives which contribute to greenhouse gas emissions.
- Today we focus on Shelter
- We hope to achieve the following:
 - Show the relative impact of shelter on greenhouse gas emissions
 - Provide basic information regarding the fuel choices and available technologies
 - Show the impact of the different technologies on both greenhouse gas emissions and installation/operational costs.

Annual global total greenhouse gas emissions (GtCO₂e)

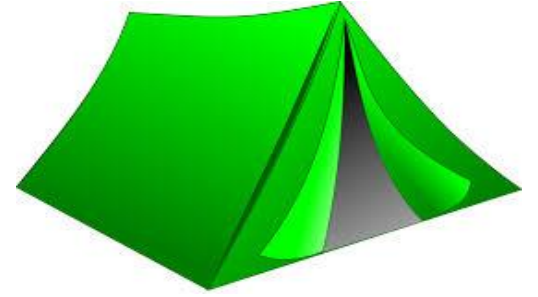


Types of Housing

- Apartment Buildings
- Single-Detached Houses
- Semi-Detached & Townhouses



The Challenge



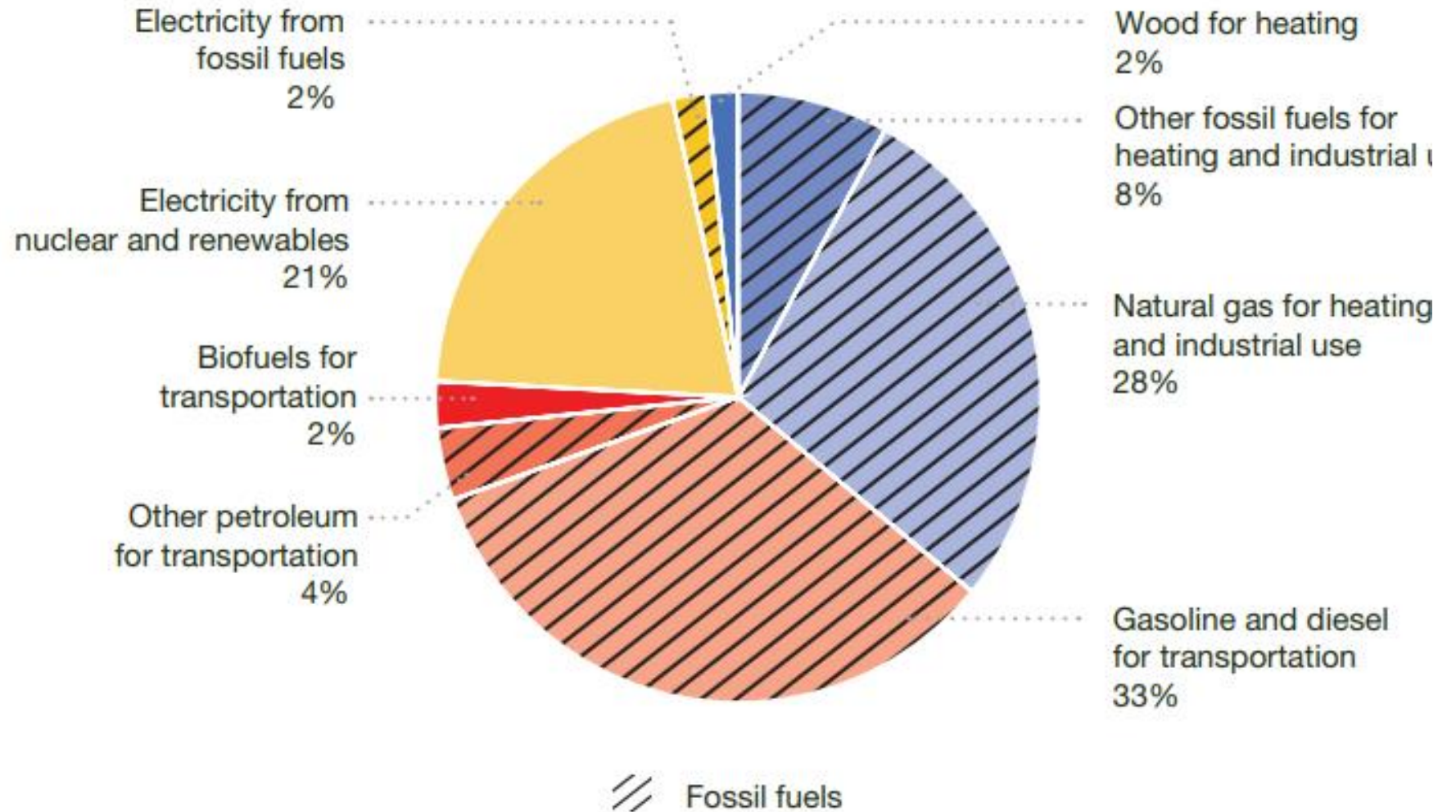
Reduce greenhouse gas emissions from:

- Heating and Cooling
- Hot Water and Appliances
- Lighting and Electronics

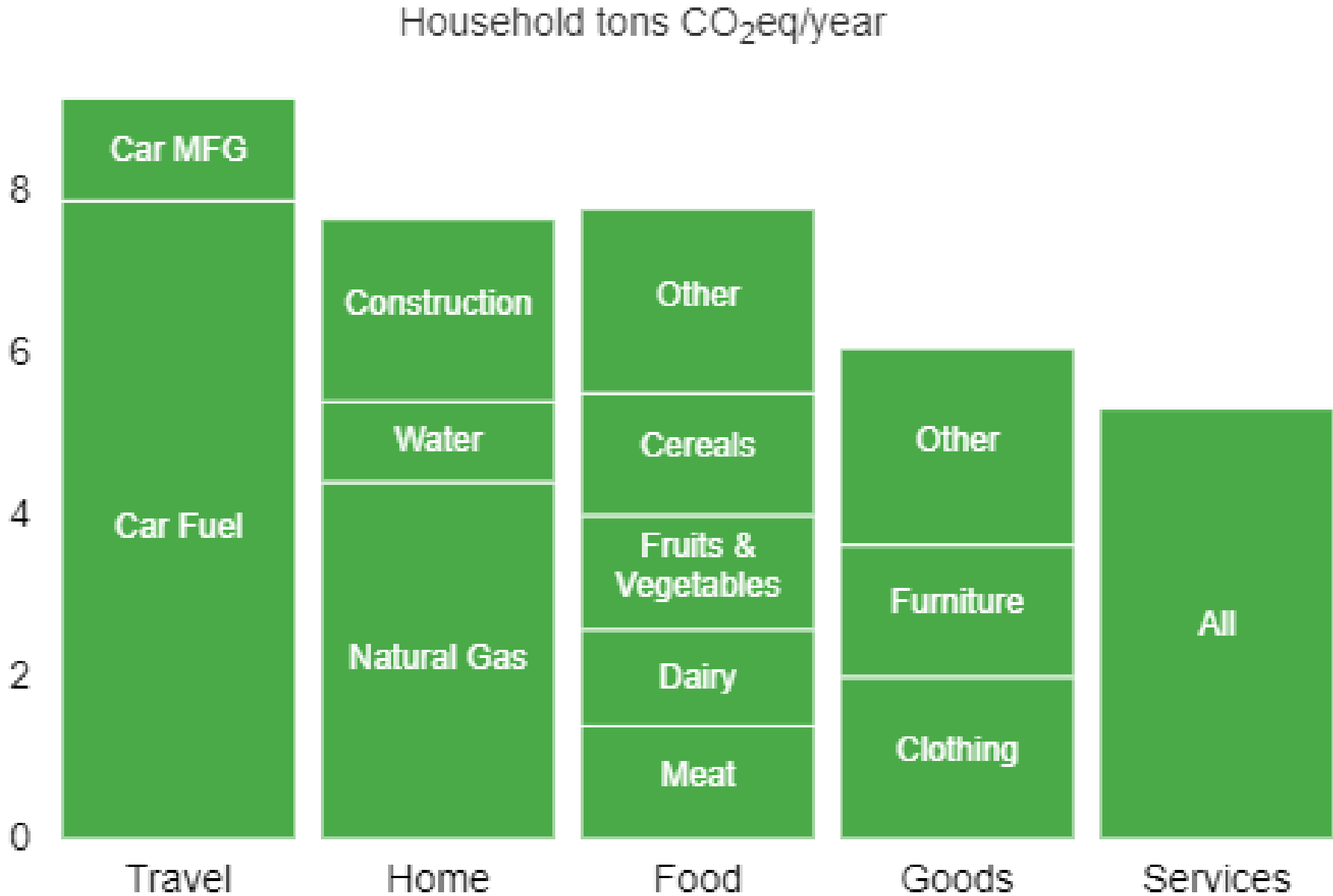
Be mindful of Building Materials

- Any material has embedded energy and CO₂

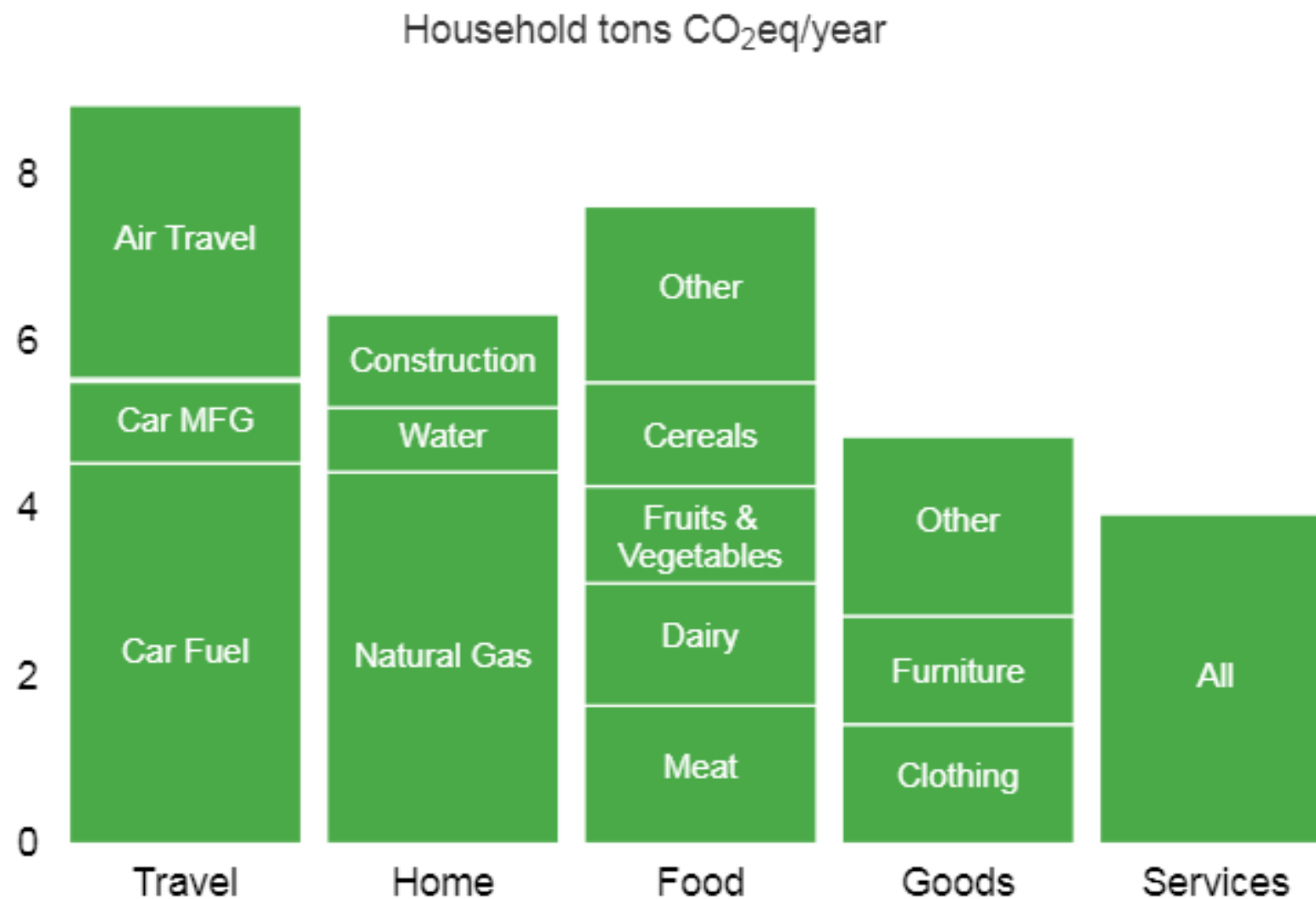
Healthy, Happy,
Prosperous
Ontario:
Why we need
more energy
conservation



Andrew's Household Carbon Footprint



Dave's Household Carbon Footprint



Heating, Cooling and Hot Water

- These are the big energy users
 - **Heating is the largest energy use**
 - Hot water is typically the second largest energy requirement
 - Air conditioning also uses substantial energy



Reducing Impacts From Heating

- Generally, there are three things we can do to reduce GHG emissions associated with heating:
 - Occupy less space per person – downsizing, co-housing?
 - Reduce the heating requirements of a home
 - Improve heating appliances or switch fuel sources

Size of Home

What is the right size of home?

- Depends on number of people
- Canada has average of 72 m²/person (775 sq.ft)
- European countries have 30 to 50 m²/person
- United Nations cites threshold of 20 m²/person for adequate housing

Larger homes mean:

- More resources to build, maintain and furnish
- Additional energy to heat and cool



Reducing the Heating Requirements

Things you could do today

- Purchase a programmable thermostat and optimize the temperature profile
- Reduce heat being provided to unoccupied rooms and bedrooms
- Seal any known air leaks – doors, attic hatches, etc.
- Voice concerns to building managers



Reducing the Heating Requirements

- Longer Term Planning
 - Consider having a Home Energy Evaluation conducted by REEP
 - Audits will help identify opportunities for further air sealing, improved insulation, and heating equipment upgrades.
 - Incentives are available!



Figure 3.5. Thermal imaging of a home shows where heat is being lost. The red colour indicates a higher temperature which means those areas of the house are losing more heat to the outdoors. The yellow and green areas of the house are better insulated and lose less heat.

Heating Appliances and Fuels

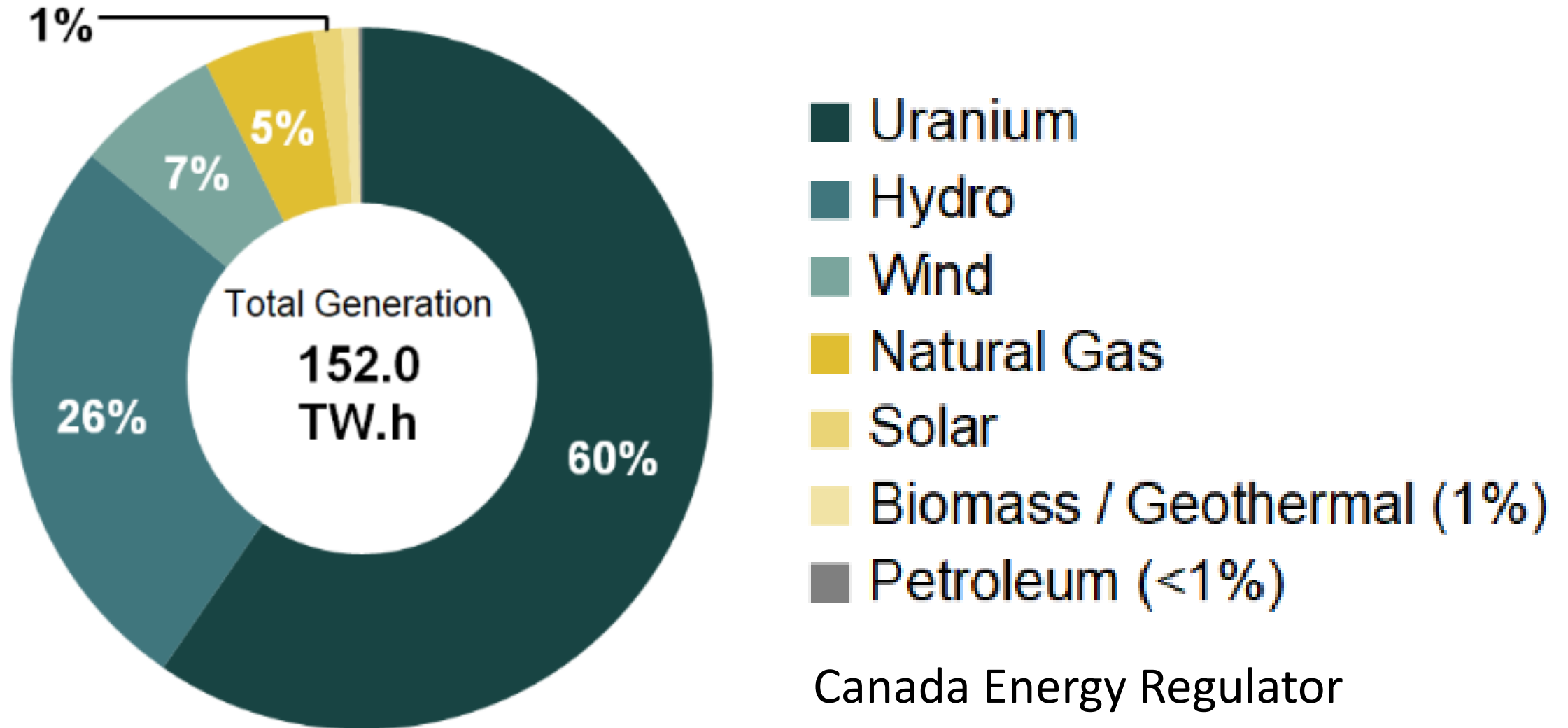
- Natural gas is the most popular method of heating in Ontario
- Efficiency of furnaces and boilers have greatly improved over the years.
- Standard efficiency furnaces, gas fireplaces and boilers are approximately 70%-80% efficient.
- Hi-efficiency gas furnaces and boilers can be up to 96% efficient.
- If your heating system is nearing the end of its life, consider upgrading or switching fuels.
- Electric energy in Ontario is less carbon intensive, but more expensive

The Issue with Natural Gas

- As a fossil fuel, burning natural gas emits carbon dioxide (CO₂)
- Natural gas is itself a greenhouse gas that is 25 times as potent as CO₂
- Gas is functioning as a bridge fuel as we shift to carbon neutrality
 - Replacing coal to produce electricity
 - Practical way to meet peak demand not covered by renewables

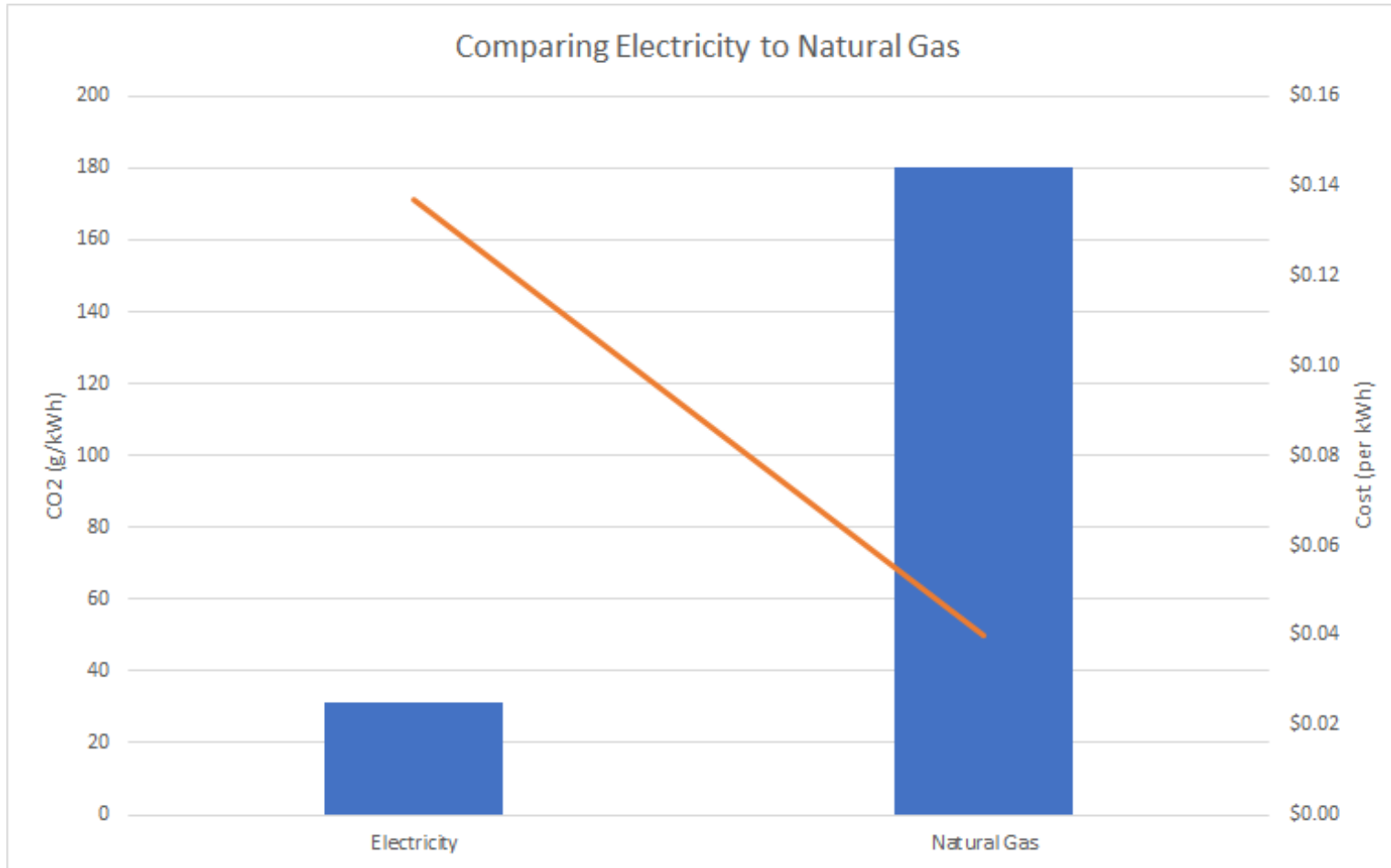


Ontario's Electricity Supply



Canada Energy Regulator
2017 Data

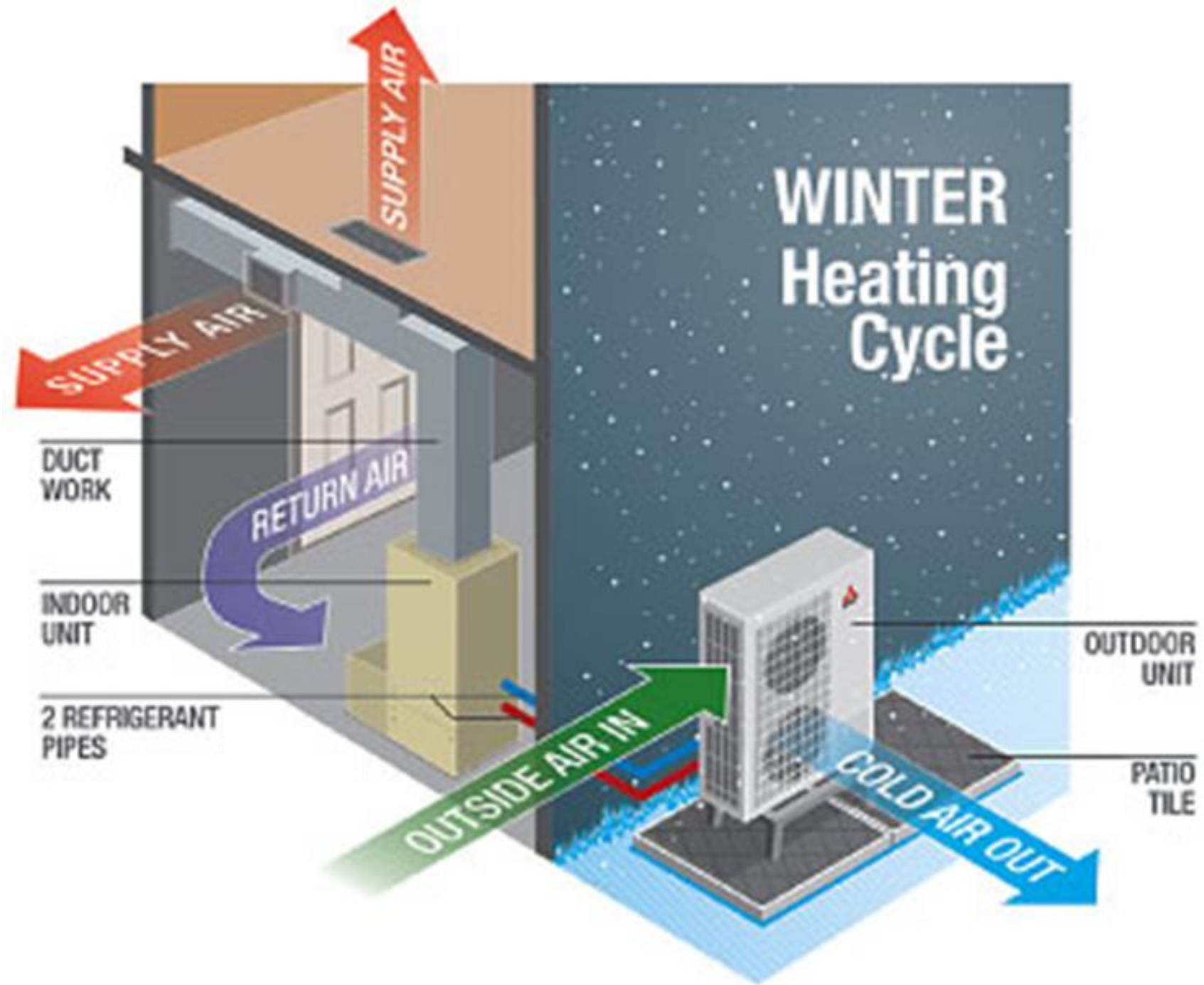
Comparing Electricity to Natural Gas - Ontario



- Natural Gas - approximately 5-6 times more carbon intense than electricity in Ontario
- Electricity is approximately 4 times more expensive than natural gas

Air Source Heat Pumps

- Air-source heat pumps (ASHPs) look like air conditioners
- They function the same way too, except in reverse for heating
- 250% to 300% Seasonal Efficiency



Ground-Source Heat Pumps

- Ground-source heat pumps extract heat from the ground
- Ground has stable temperature
- 400% to 450% Seasonal Efficiency

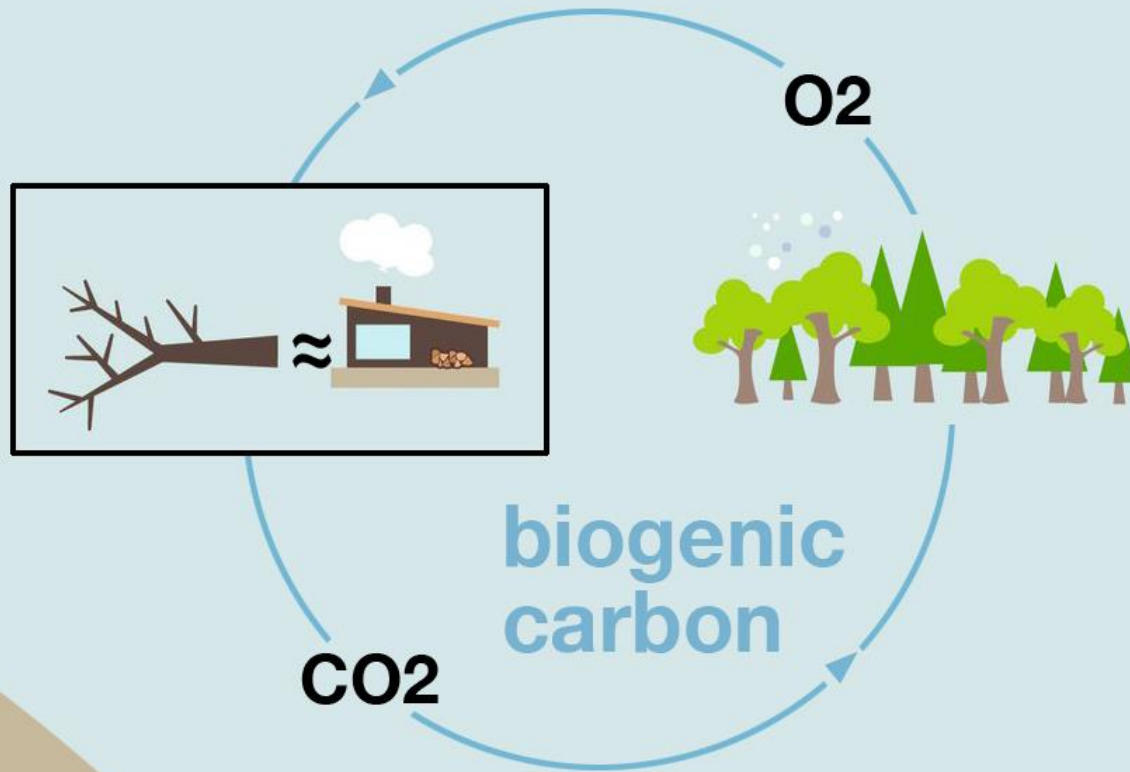


Wood Pellet Furnaces and Stoves

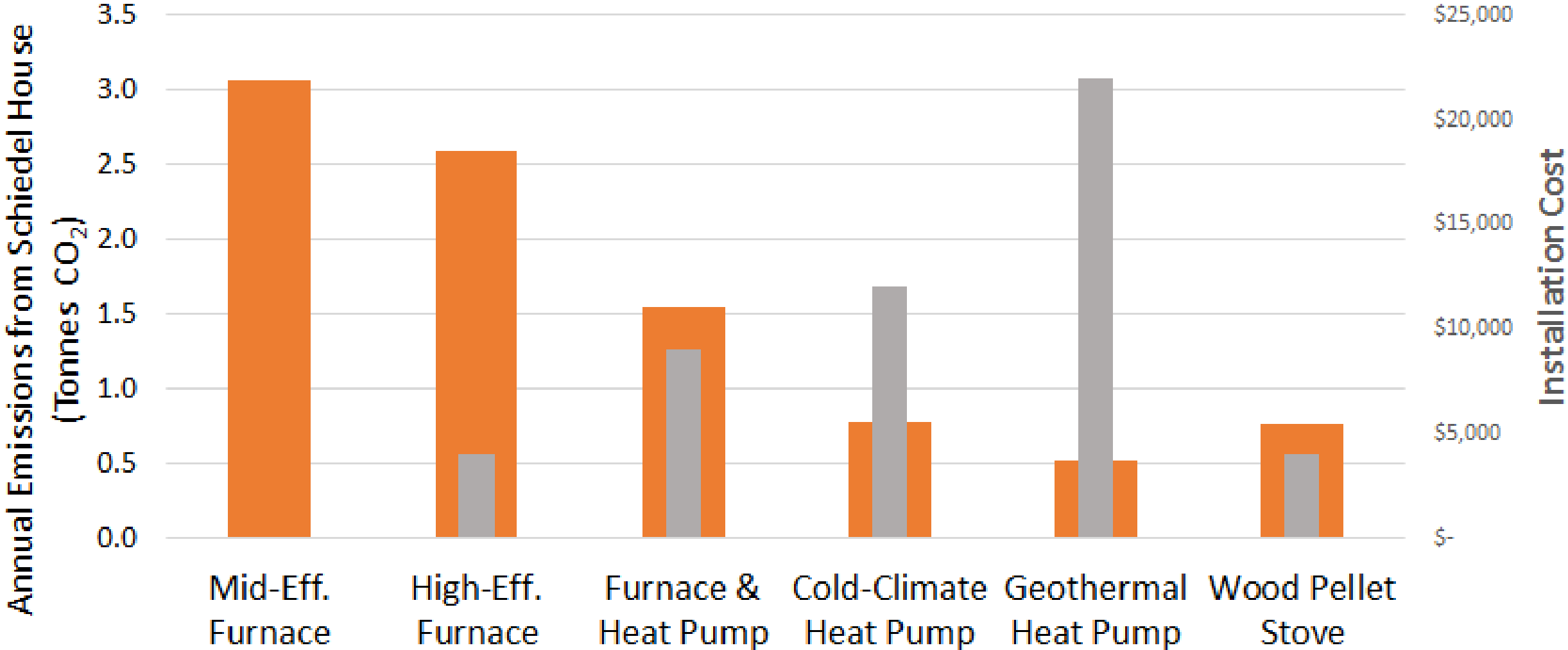
- Pellets manufactured from wood waste
- Pellets also made from switchgrass.
- Considered a very low carbon alternative



**geologic
carbon**



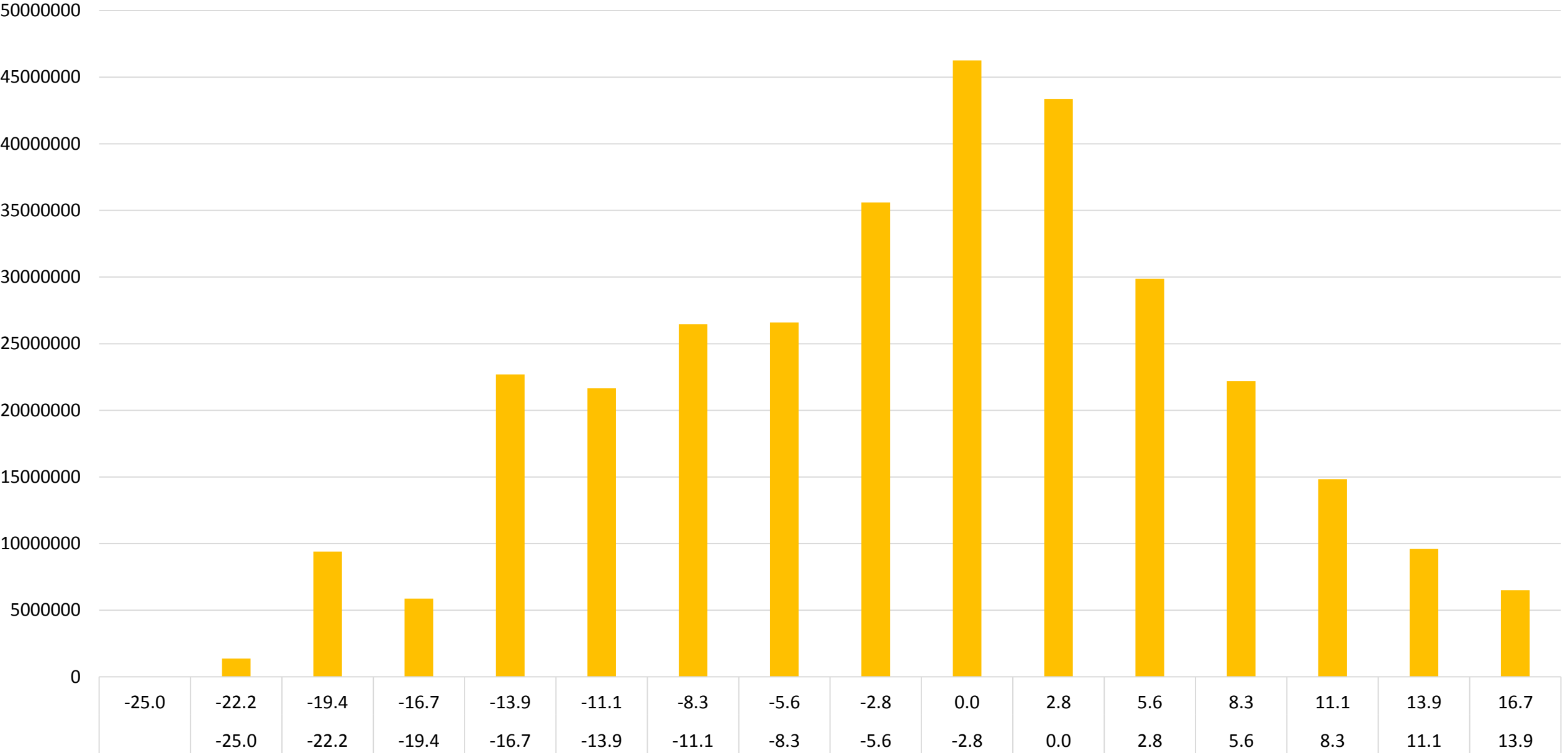
CO₂ Emissions from Various Heating Systems in Ontario



Operating Cost of Heat Pumps

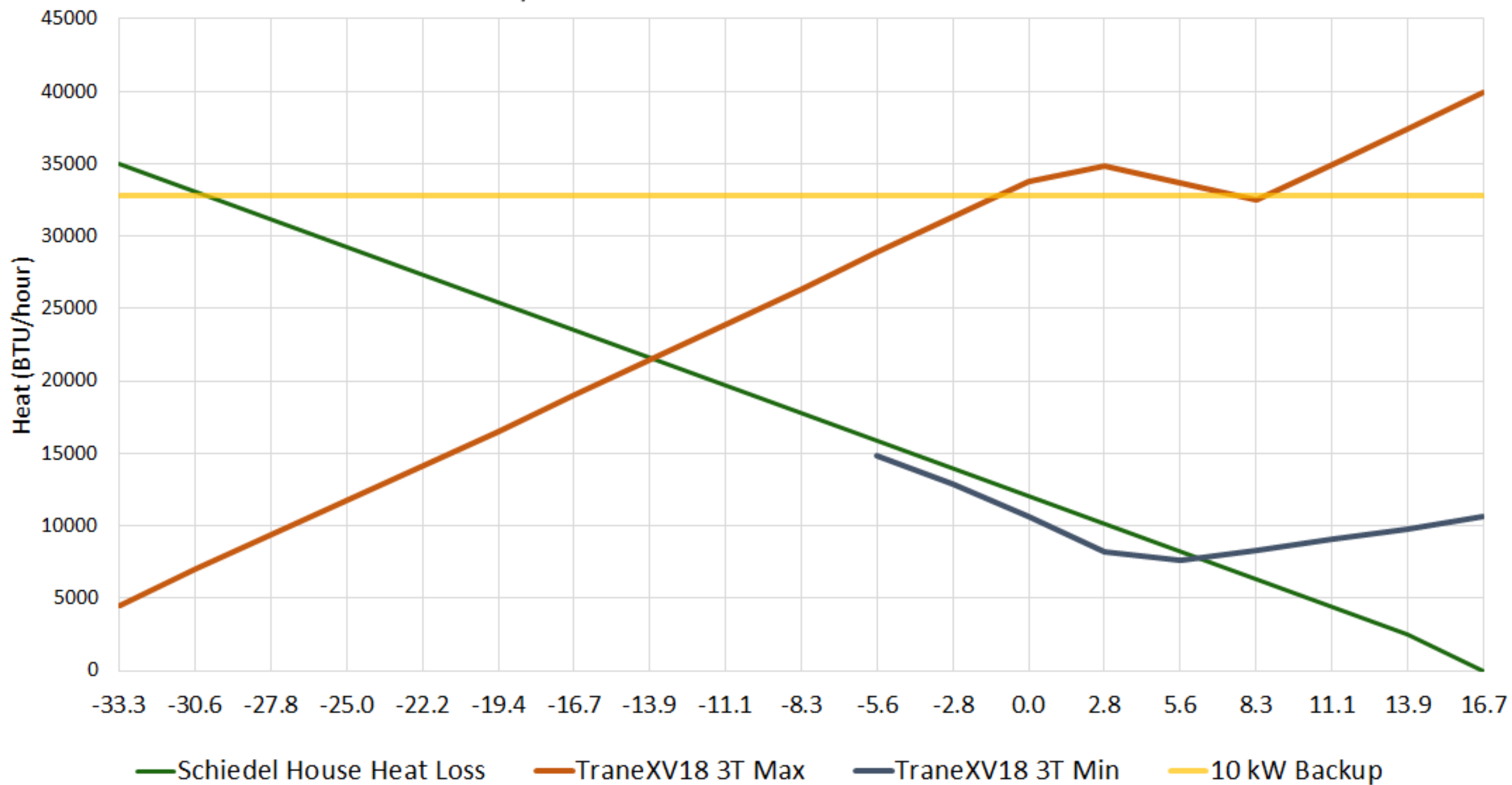
- Mid-efficiency gas furnace with \$50/tonne carbon tax = \$900/year
- Hi-efficiency gas furnace including \$50/tonne carbon tax = \$800/year
- Cold-climate Heat Pump = \$1,000/year
- Ground-source heat pump = \$700/year
- Pellet Stove = \$1200/year

Annual Heating Load (BTU) Within Temperature Ranges



■ Heating Load (BTU)

Heat Pump Performance and House Heat Loss



Water Heater Options

- Hot water heating is the second largest natural gas load.
- As with space heating, first make sure to reduce usage.
- Typical natural gas hot water heaters are approximately 60% - 75% efficient.
- High efficiency models available.
- Electric tank heaters can easily help to reduce GHG emissions. Timers can be added to only allow the heater to operate during off-peak periods.
- Heat pump options are available as well.

Key Points

- Many options for reducing our shelter-related GHG.
- Living in Ontario, we have a unique opportunity for GHG reduction due to our low carbon electricity grid.
 - Given the choice between electric and natural gas – remember that per unit of energy, electricity is about 5 times less carbon intensive.
- Installation and operating costs should be considered, as it is hard to compete with the low price of Natural Gas.
- There are small things that we can do today that will make a difference.