What is a Heat Pump?

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Heating and Cooling

Most homes have an air conditioner to cool in summer and a furnace to heat in winter.

A Heat Pump is an alternative highly energy-efficient system to cool or heat your home with ONE appliance, which provides year-round consistent indoor comfort.

In cooling mode (summer), it acts as an air-conditioner.
In heating mode (winter), it extracts heat from outside air to heat your home.
And it is very energy efficient.

The Heat Pump does not use fossil fuel *[natural gas or oil]* to produce heat *[like a furnace does]*. It only uses some electricity to power a compressor that moves heat energy from one place to another.

What is a Heat Pump?

A typical heat pump system consists of:

- An outdoor condenser unit and
- An indoor air handler

Heat pumps have the ability to extract heat from the cooler outdoor air (*using properties of the refrigerant*) and transfers that heat into the home.

This heat transfer technology costs much less to operate than conventional electric heat and this translates to ongoing savings over the life of the heat pump system.

In the summer the system reverses the cycle to operate as an air-conditioner.

Benefits of Heat Pumps

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Furnaces	Heat Pumps
Heats ONLY - Provides heating only.	**Heats and Cools** - Provides both heating and cooling.
Lower Efficiency - Energy Efficiency Rate only up to 99%.	**Higher Efficiency** - Energy Efficiency Rate up to 425% which translates to ongoing savings over life of the system.
Burns Fuels - Creates heat by burning fossil fuels like gas & propane.	**Transfers Heat** - In heating mode, the heat pump extracts heat from outside & moves it inside. In cooling mode, the reverse occurs.
Increases GHG (Greenhouse Gas Emissions) - Furnaces running on fossil fuels like gas and propane produce carbon emissions which harm the environment.	**Produces NO GHG (Greenhouse Gas Emissions)** - Runs on electricity instead of fossil fuels, producing zero carbon emissions.
Inconsistent Heat - Only cycles between ON & OFF.	**Consistent Temperature & Comfort** - Adjusts incrementally to match heating (or cooling) needs and ensures optimum comfort for the occupants of the unit.

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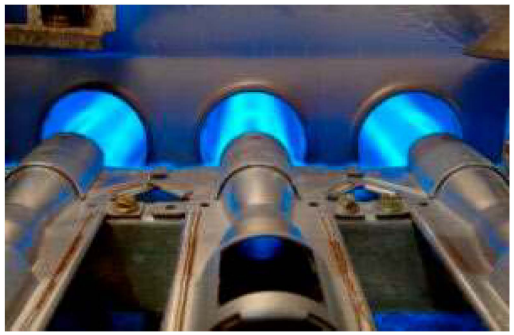
Comparing Efficiency (COP)

The Coefficient Of Performance (COP) is a performance rating that tells us how effective the heat pump or air conditioner is at transferring heat versus the amount of electrical power consumed. **Higher the COP the more efficient it is at transferring heat and greater the savings.**



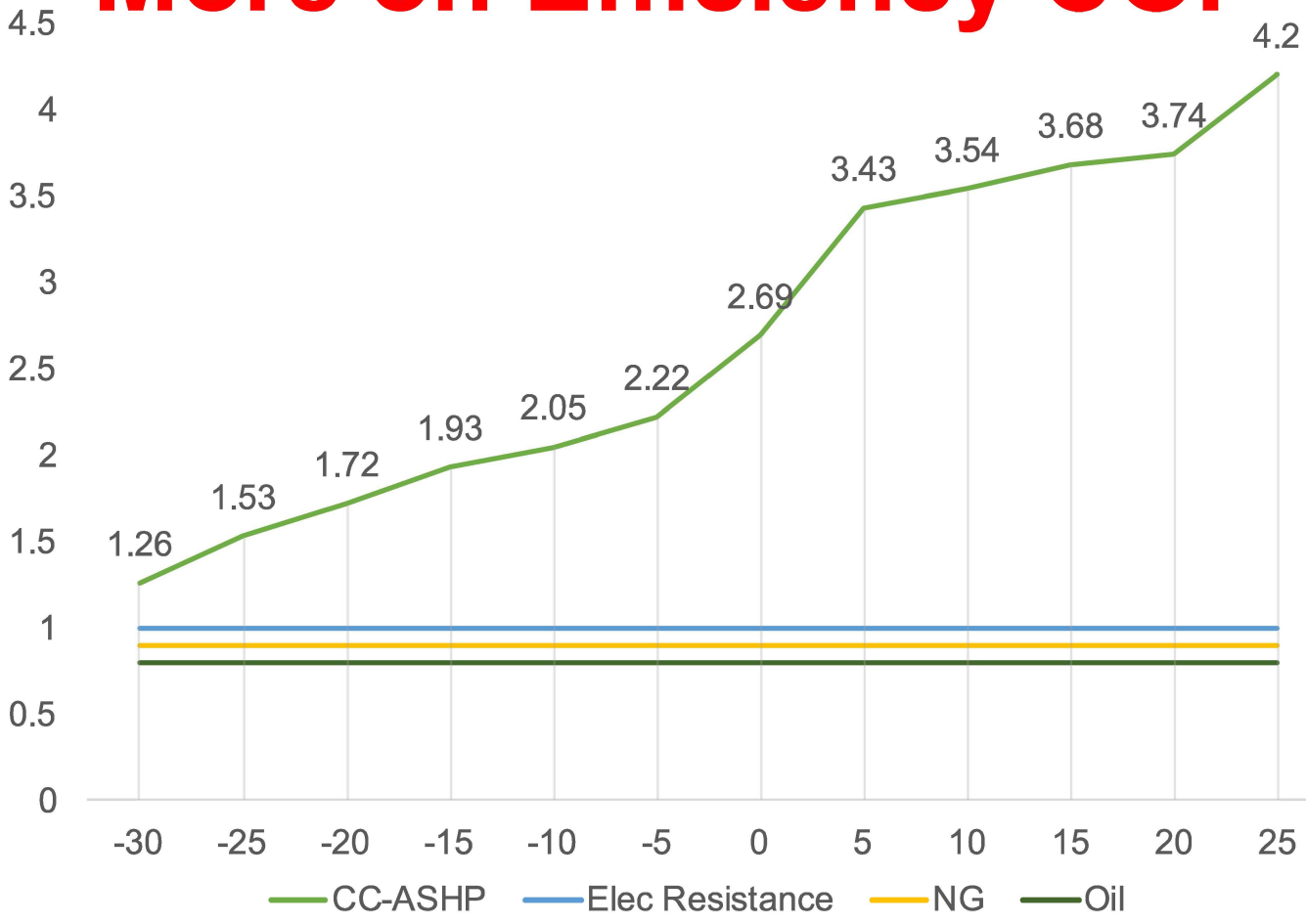
Natural Gas furnace
up to 98% Annual Fuel Utilization Efficiency (AFUE)
COP : up to 0.98

Propane furnace
up to 98% Annual Fuel Utilization Efficiency (AFUE)
COP: up to 0.98

Electric Baseboard
up to 100% efficiency
COP: up to 1

Heat Pump
200% – 425% efficiency
COP: 2.00 to 4.25

More on Efficiency COP



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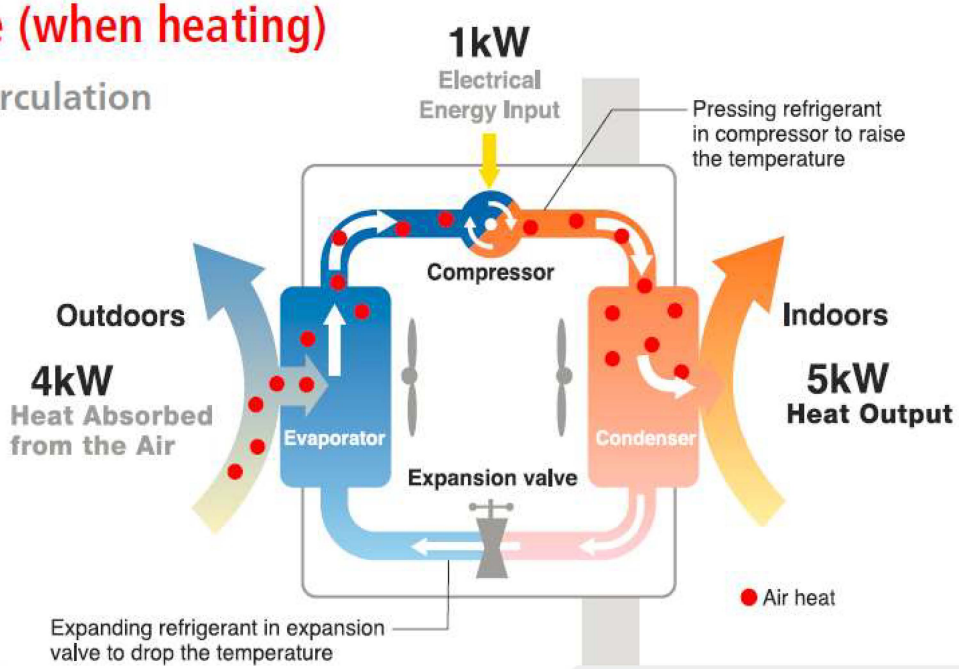
How is it so Efficient?

Heat pump principle (when heating)

Refrigerant and Heat Circulation



Output energy is a quintuple of input energy

1kW
Electrical Energy Input

+

4kW
Heat Absorbed from the Air

=

5kW
Heat Output

COP= Coefficiency of Performance

Cost-effectiveness of heat pumps

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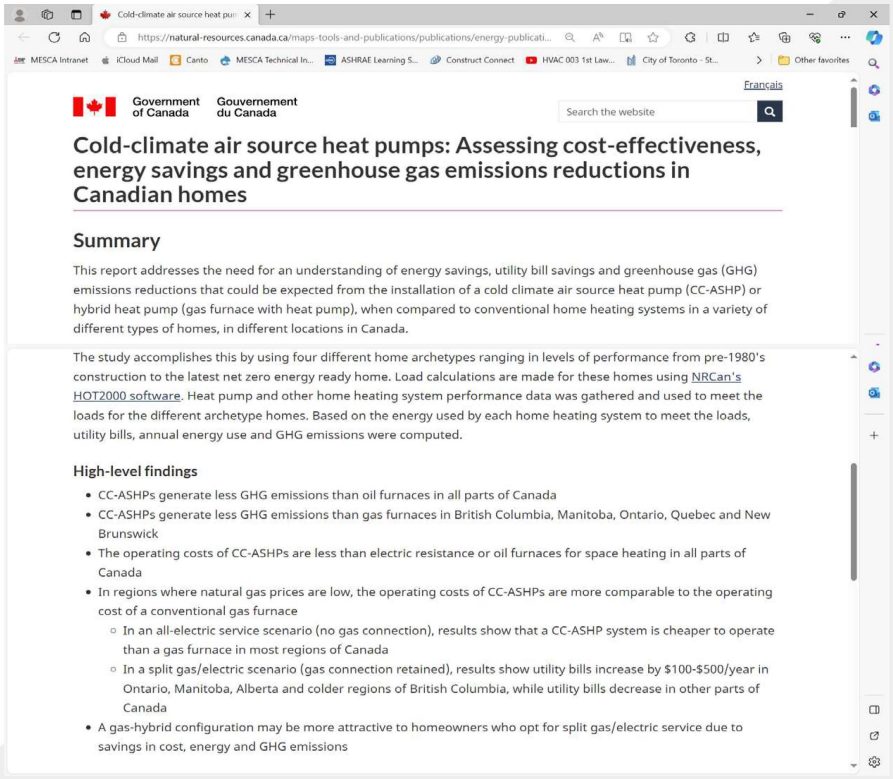
Costs of the heat pump device by itself can range anywhere from $ 3,000 to about $ 19,000, depending on model and capacity.

Typical total cost of a complete system depends on physical attributes of the home or building and related installation costs.

Most important are the ongoing savings on utility bills which in some situations can be over 50%*.



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Cold-climate air source heat pumps: Assessing cost-effectiveness, energy savings and greenhouse gas emissions reductions in Canadian homes

Summary

This report addresses the need for an understanding of energy savings, utility bill savings and greenhouse gas (GHG) emissions reductions that could be expected from the installation of a cold climate air source heat pump (CC-ASHP) or hybrid heat pump (gas furnace with heat pump), when compared to conventional home heating systems in a variety of different types of homes, in different locations in Canada.

The study accomplishes this by using four different home archetypes ranging in levels of performance from pre-1980's construction to the latest net zero energy ready home. Load calculations are made for these homes using NRCan's HOT2000 software. Heat pump and other home heating system performance data was gathered and used to meet the loads for the different archetype homes. Based on the energy used by each home heating system to meet the loads, utility bills, annual energy use and GHG emissions were computed.

High-level findings

- CC-ASHPs generate less GHG emissions than oil furnaces in all parts of Canada
- CC-ASHPs generate less GHG emissions than gas furnaces in British Columbia, Manitoba, Ontario, Quebec and New Brunswick
- The operating costs of CC-ASHPs are less than electric resistance or oil furnaces for space heating in all parts of Canada
- In regions where natural gas prices are low, the operating costs of CC-ASHPs are more comparable to the operating cost of a conventional gas furnace
  - In an all-electric service scenario (no gas connection), results show that a CC-ASHP system is cheaper to operate than a gas furnace in most regions of Canada
  - In a split gas/electric scenario (gas connection retained), results show utility bills increase by $100-$500/year in Ontario, Manitoba, Alberta and colder regions of British Columbia, while utility bills decrease in other parts of Canada
- A gas-hybrid configuration may be more attractive to homeowners who opt for split gas/electric service due to savings in cost, energy and GHG emissions

*Cold-climate air source heat pumps: Assessing cost-effectiveness, energy savings and greenhouse gas emissions reductions in Canadian homes (canada.ca)