

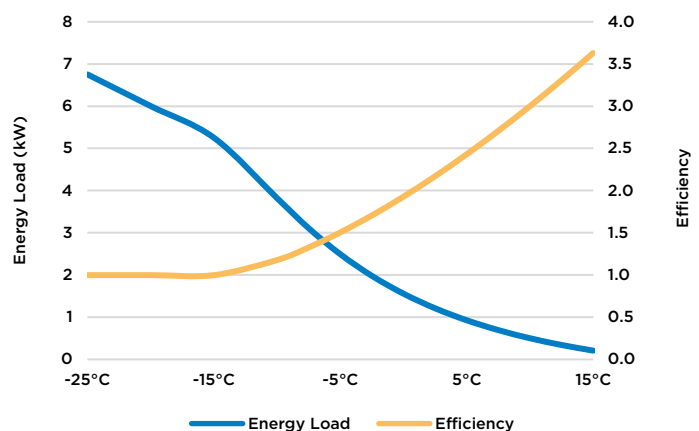
# CGA By the Numbers: What is Hybrid Heating?

## SUMMARY

1. Despite significant government incentives, electric heat pumps make up just 5% of all heating systems in Canada due to their high upfront costs, and reduced efficiency in low temperatures.
2. For Canadians looking to leverage both natural gas and electricity for heating, a more effective solution would be a hybrid heating system that uses an electric heat pump combined with a natural gas furnace.
3. Hybrid heating systems can provide households with significant cost savings compared to fully electrical heating systems. The savings are more apparent in colder climates, up to approximately \$2,100 per year in these markets.

As of 2019, nearly 80% of all households in Canada use either natural gas furnaces (52% of all households) or electric baseboards for space heating (26% of all households). Heat pumps have emerged as an energy efficient technology. There are several types available including gas absorption heat pumps and all-electric varieties; however, they currently only make up 5% of all heating systems in Canada.<sup>1</sup> Some major drawbacks of heat pumps are the high purchase and installation costs, reduced efficiency and poor operability at low temperatures. The graph on the right shows the energy load and efficiency of a typical heat pump at various outdoor temperatures. We can see that as the temperature approaches sub-zero levels, the level of efficiency drops. As a cold climate nation, this reinforces the low adoption rates across Canada. The question becomes, how can we take advantage of the value proposition of natural gas in combination with an electric heat pump? The answer: hybrid heating systems.

## HEAT PUMP PERFORMANCE VS TEMPERATURE



CGA, NRCan

<sup>1</sup>Statistics Canada, Table 38-10-0286-01 Primary heating systems and type of energy.

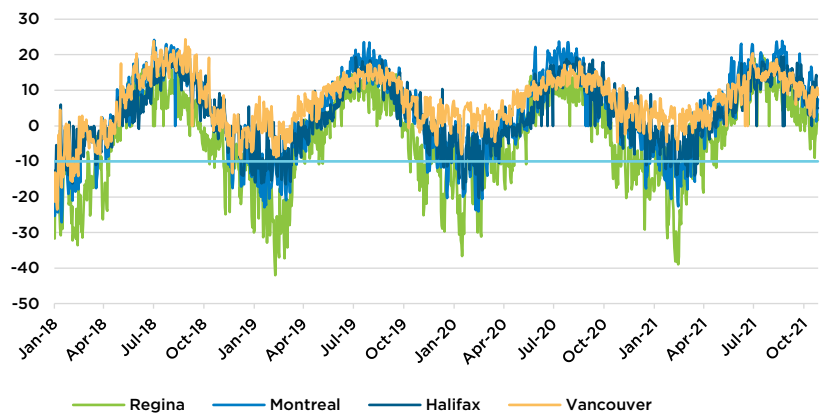
A hybrid or dual heating system is one that combines natural gas and electric heating systems together. During mild temperatures, the heat pump would operate as the primary home heating device. When the outside temperature drops below a certain temperature, known as the switch-over point, the heat pump shuts off and heating is provided by a gas furnace. These systems can overcome some of the shortfalls of heat pumps by taking advantage of the affordability and higher reliability of natural gas. They help to balance the electrical grid by offloading demand during peak periods. Furthermore, hybrid systems are cost-effective when compared to solely electric heating systems.

Consider a heat pump, set to a  $-10^{\circ}\text{C}$  switch-over point, installed in a typical home in four cities: Vancouver, Regina, Montreal, and Halifax. The chart tracks the daily minimum temperatures in each city between 2018–2021. It becomes evident that the operability of the heat pump will vary across the country. In Regina, where daily temperatures fall below  $-10^{\circ}\text{C}$  nearly 34% of the time, there would be significant concern around the ability of the heat pump to provide heating through the entire winter season. Meanwhile, there would be much less concern of this in Vancouver, where daily temperatures only fall below  $-10^{\circ}\text{C}$  less than 3% of the time.

The next chart compares four types of heating systems: gas furnace, electric resistance, heat pump, and hybrid heating in the same four cities, plus a Canada average. We can see that in all jurisdictions, the hybrid heating system is the most cost effective when compared with other all-electric systems, but is still more costly than operating with a natural gas furnace. As expected, the savings are more significant in colder climates. In Regina, the annual savings of a hybrid system is \$2,100 compared to a heat pump. Conversely, the annual savings in a mild climate like Vancouver is modest at about \$100 per year. Even in Montreal, where the cost of electricity is one of the lowest in the country, a hybrid system provides annual savings of \$170 compared with heat pumps.

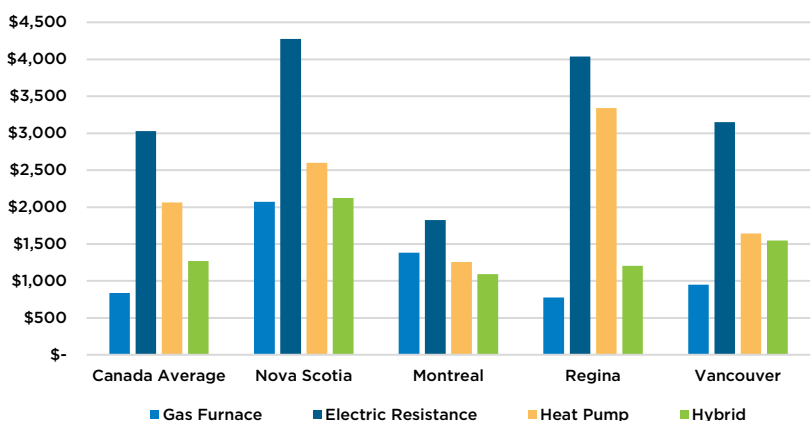
As we've seen in this issue of By the Numbers, while heat pumps are highly efficient, operation can vary greatly depending on local climates and conditions. Using a hybrid system ensures reliable heating even in the coldest of temperatures while remaining the most cost-effective solution compared to all-electric heating systems.

### DAILY MIN TEMPERATURES IN SELECT CANADIAN CITIES ( $^{\circ}\text{C}$ )



Environment and Climate Change Canada

### ANNUAL SPACE HEATING COST



CGA, Statistics Canada, Hydro-Quebec