

A QUICK GUIDE TO HEAT PUMPS

Green Energy Committee

Heat pumps are the future of home heating and cooling, not just for Woodsworth but for the whole planet. They're based on a simple concept — here's how it works.

Why are heat pumps so important?

Heat pumps offer two major benefits that come from the technology itself:

- ◆ *Heat pumps are far more efficient.* They can provide the same heating as older devices while using a fraction of the energy.
- ◆ *Heat pumps can either heat a space or cool it.* You only need one unit year-round.

There are also extra benefits when converting from natural gas furnaces:

- ◆ The vast network of residential gas lines leaks constantly. Because methane is a relatively short-acting greenhouse gas, eliminating leakage can give a quicker boost to the climate than reducing CO₂ emissions.
- ◆ Big generating plants can be ten times more efficient. Switching to electric cars and appliances gives a huge savings even if we continue using fossil fuels for generating electricity. A big,

central generator can also control emissions more effectively.

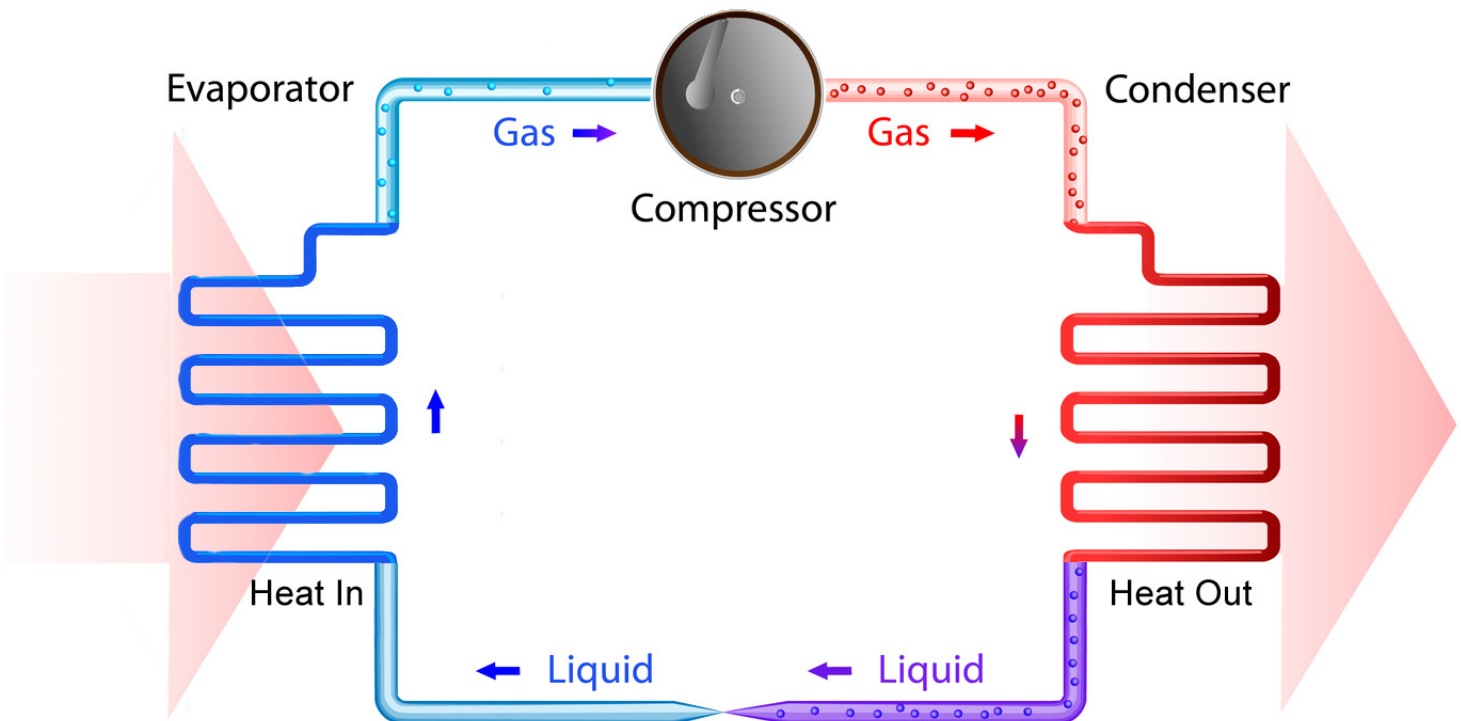
- ◆ Switching to electricity paves the way for renewable energy sources. Wind, solar, and other sources can simply feed into the electrical grid.
- ◆ Methane from gas stoves and furnaces is toxic. Recent studies show that, while it's not a huge danger, it's a significant risk factor that needs to be eliminated.

Why are heat pumps more efficient?

Today's best gas furnaces are rated as 95% efficient — they waste about 5% of the energy contained in the natural gas they burn. Older or cheaper furnaces tend to be 80% efficient or worse.

Domestic heat pumps are typically at least 200% efficient, and may hit peaks closer to 300%. That is, they can provide two to three times as much heating or cooling energy as they use the form of electrical energy.

A furnace or baseboard heater works by *converting* chemical energy or electrical energy to 'heat' energy. A heat pump instead uses electrical energy to *move* heat energy around. In winter, it scavenges energy from outdoors, making our home warmer and the rest of the world a tiny bit colder. In summer it sucks heat energy from indoors, making our home cooler, and pumps it out to make the rest of the world a bit warmer.



This allows heating even in the dead of winter. On the coldest day of the year, there is still heat energy all around us. A heat pump can continue to extract whatever is there, at most any temperature. (Heat energy is zero only at Absolute Zero — about 270 degrees below zero Celsius.)

True, when it's extremely cold outdoors, pumping becomes more difficult — efficiency is reduced. But heat pumps are so efficient to begin with, they still work better than a furnace or baseboard heater until the weather gets extremely cold.

To be on the safe side, heat pumps designed for northern climates have a simple built-in electric heater that can kick in if pumping gets too difficult. In Toronto, this would only happen a small percentage of the time — especially given the milder winters we've been having. Averaged over the whole year, a heat pump can still be twice as efficient as gas or electric heating.

How does a heat pump work?

Heat pumps take advantage of two bits of basic physics. First, that a liquid absorbs quite a lot of energy when it evaporates, and releases a similar amount when it condenses. And second, that a gas can be turned (back) into liquid by compressing it.

The diagram explains how this works. There's a closed loop of pipe, with a chemical 'refrigerant' sealed inside. There's a radiator on either side of the loop — a section of pipe with metal fins, like the radiator of a car, or a baseboard heater. (It probably has a fan, to keep air moving over the fins.) And there's a pump, called the 'compressor.'

For heating, start with the refrigerant flowing into the 'evaporator,' the radiator outside your unit. As the refrigerant evaporates, the metal fins suck up heat energy from the air. The compressor moves the refrigerant, now a gas, through the pipe and into the 'condenser.' There it's compressed until it liquifies, releasing its stored heat energy into your living room.

To switch from heating to cooling, you simply reverse the flow. This is done using valves rather than by running the compressor backward, but it comes to the same thing — the condenser and evaporator switch functions, pumping heat out of your living room and into the world outside.

A working domestic heat pump may have lots of embellishments. But the basic design is the same as in

a refrigerator or air conditioner, aside from the extra plumbing that allows reversing the flow of refrigerant.

What's the bottom line?

The case in favor of heat pumps is overwhelming. Even if energy prices weren't soaring, or the climate growing increasingly unstable, heat pump technology would still be the best way of handling our heating and cooling needs. This is a shift whose time has come, and which is being supported by various government grants, which the Green Energy Committee is now in the process of applying for.

FIRE (FROM THE A-Z HANDBOOK)

Pull the fire alarm on your floor and yell "fire."

Leave the building using the nearest exit stairway. Do not use the elevator.

Call the fire department at 9-1-1 from a safe location. Never assume this has been done. Meet the firefighters when they arrive and tell them where the fire is.

If there is no fire or smoke in your unit:

Most of the time, the best thing to do in a fire is to leave the building as soon as possible. But in some cases, you may not be able to leave and you may have to stay in your unit.

In either case, you must act quickly as seconds count. The longer you wait, the more risk there is that heavy smoke will have spread into stairways and corridors and your chances of survival are less.

No matter what your decision, you must protect yourself from the smoke. If you cannot leave your apartment due to smoke, fire or disability, call 911 to tell them your name, address and that you are staying in your unit. Keep your door closed but not locked in case you need help later. Seal the door with towels or blankets to prevent smoke from entering. Wave a bright cloth from your window or balcony.

Reminder: use the closest pull station when there is a fire or suspected fire to alert your neighbours.

In townhouses, always leave your unit. Call 9-1-1.

For more information about fires, see Fire and Emergency Procedures on the website.