

Heat Pump Water Heater

What is it?

A Heat Pump Water Heater (HPWH) is a water heating system that transfers Renewable “free heat” from the Environment (the outside air or water) to water in a storage vessel, via a refrigeration cycle. This means that we can harness the natural energy that exists all around us to use it in our homes and industry.

Heat pumps for water heating have been available for some time, but it is only in recent years that units have become sufficiently affordable, reliable, compact and quiet to be a viable solution.

EECA is working with the HWHP and Solar Water Heating industries to develop independent and sound information to help Kiwis choose energy efficient hot water systems.

Why Choose Heat Pump Water Heating?

On average, heating water uses 30% of New Zealand households’ energy use. So choosing an energy efficient system can help reduce your energy use and greenhouse gas emissions.

HPWH’s generally use only one-third of the energy of a conventional electric hot water tank, making them a good option for energy efficient water heating. They can also work well in places that aren’t good for solar water heaters, such as the south side of hills that get less sun.

HPWH’s can be installed into both new and existing homes and buildings, and come as either a complete system, or a split system that is fitted onto an existing hot water tank.

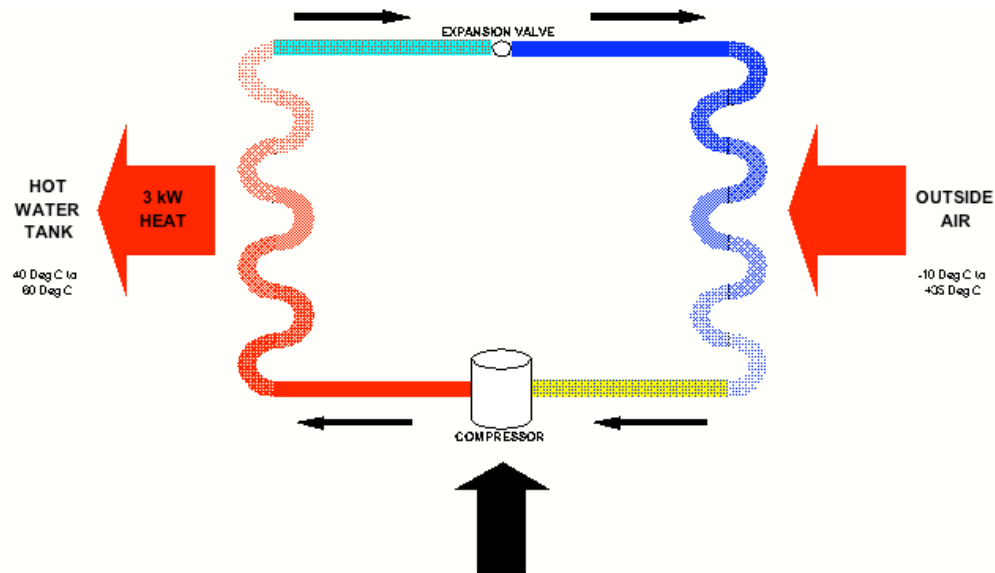
How does a Heat Pump Work?

The basic principle of a Heat Pump is a system which ‘pumps’ heat from one place to another using a “refrigeration cycle”. In a refrigerator (or freezer or Air Conditioner) it pumps heat from inside the fridge to the outside – this keeps the inside colder than outside. A Heat Pump Heater uses the same principles and technology in reverse (hence, it is often called a reverse-cycle refrigerant): It transfers heat from the outside, into the house or a hot water tank.

The outside air gets heated up by energy from the sun every day of the year – so even when the sun is not shining brightly (cloudy days, night, winter) there is still a huge amount of solar heat energy in the air, ground, and waterways all around us.

HPWH’s work by pumping a ‘refrigerant’ around the system.

1. The refrigerant changes to a liquid form when it is compressed through a ‘condenser’ coil – at this point it releases its heat energy into the hot water tank
2. The refrigerant passes through an expansion valve and expands to become a gas (like the aerosol spray can)
3. The refrigerant absorbs the heat from the air around it as it is pumped through ‘evaporator’ coils outside the house
4. The compressor then pumps the refrigerant round again and again and the cycle continues



Because we are only using electrical energy to pump the gas and 'move' the heat (we don't actually 'make' heat), the system is VERY efficient. So, for every \$1 of electricity needed to run the compressor pump, we can move the equivalent of about \$3 of heat energy. This gives us a much better efficiency compared to a traditional electric or Gas heater. This can be sometimes be between 2 and 4 times as good, depending on where you live, the outside air temperature and other conditions – Generally, the hotter the outside air, the better the Heat Pump runs).

Generally, HPWH systems work well in areas with average air temperatures above about 5 Degrees C, but most will still operate more efficiently than an electric immersion heater to as low as -10 Degrees C.

Solar Water heaters can sometimes be used together with Heat Pump Water Heaters to give an even better overall efficiency on sunny days.

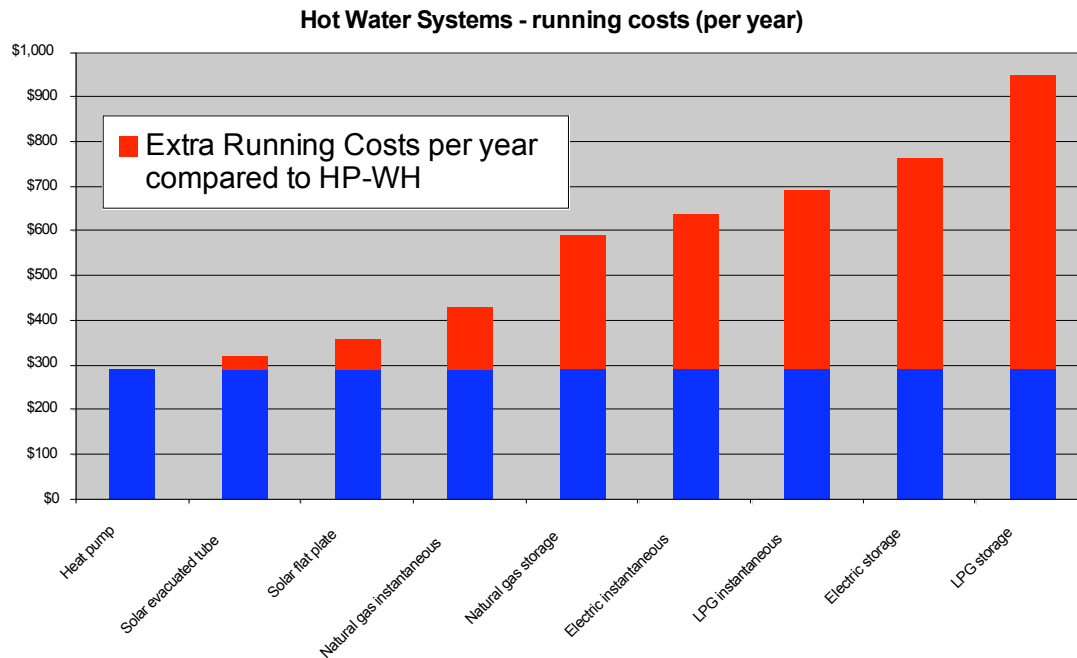
Since the 1990's, all of the CFC refrigerants which were extremely harmful to the Ozone layer have been discontinued in favour of the more environmentally friendly products used today.

There are different types of Heat pump water heaters available. In some HPWH systems the hot water cylinder is split from the heat exchanger whereas others are all in-one. Heat exchange units are generally located outdoors and may produce some background noise. Check with your Local Authority regarding the noise limit in your area.

What is EECA is doing to promote HPWH in NZ?

- The Innovation Fund is providing grants to encourage the development of the HPWH industry and to allow for information and data on the performance of the technology, in various climates around NZ. This includes encouraging development on standards and industry "Best Practice" guidelines, as well as several case studies of installations.
- EECA is funding *in situ* monitoring and a test project for a range of HPWH products currently available on the NZ market in several locations throughout NZ. Results are anticipated later in 2008.
- This will be developed into a test method to enable consumers to compare their performance.
- Minimum Energy Performance Standard** and appliance Energy Star Rating labelling may be introduced for HPWH in the future.

How Cost Effective is it?



In an average NZ home

Running a HPWH could save you approximately \$470 every year on electricity bills, compared to an equivalent traditional electric immersion heater.

If we assume that it costs about \$ 5,000 to buy and install a HPHW system compared to \$ 1,500 for an Electric Immersion heater/tank, then in less than 8 years, this saving would “Payback” the initial investment of the HPHW system.

But also, you keep on making savings every year!

Please note: the above information is a guide only and the payback period will vary in individual cases depending on each HPWH's performance, a household's hot water use and the electricity tariff.

**Based on an average household of 4 using 3,600 kWh a year for heating hot water using a standard electric 180l tank (Ref: AS/NZS 4234)*

** Assuming an electricity tariff and standing charges of 20c kWh,*

Source: Department of Building and Housing (domestic hot water and commercial heating, ventilating and air conditioning systems, 29th June 2007.

What else can we use HPWH for?

Some HPWH systems can also give you ‘Central Heating’ to your home, by pumping warm water (about 40 Deg C) from the Hot Water tank around a system of underfloor heating pipes. Again, because the Heat Pump system is cheaper and greener to run than a conventional electric or gas-fired hot water system, you can heat your whole home this way.

Some other systems can be used to heat a Hot Tub/Spa or swimming pool – again, cheaper than using an electric heater