Heat up your savings: A guide to hot water systems

Introduction

My Energy Guide was founded to assist you with your transition to Home Electrification. We aim to provide you with independent, impartial advice based on real world experiences.

The aim of this guide is to educate you on the different options available to you for your hot water. It analyses the cost, emissions and the advantages and disadvantages of each.

Types of hot water system

There are four main types of hot water system in use in Australia today:

1. **Continuous Flow Gas**

As the name suggests these systems heat water as you need it. The system works by having cold water flow through copper piping, and heat is then applied directly to the pipes. A continuous flow of gas and sufficient ventilation is required for this system.

2. **Gas Storage**

Storage water units are just that – they store hot water for use when your home needs it. Gas Storage hot water units use a gas burner to continuously heat and maintain water at approximately 60 °C. Sufficient ventilation is also required for these systems.

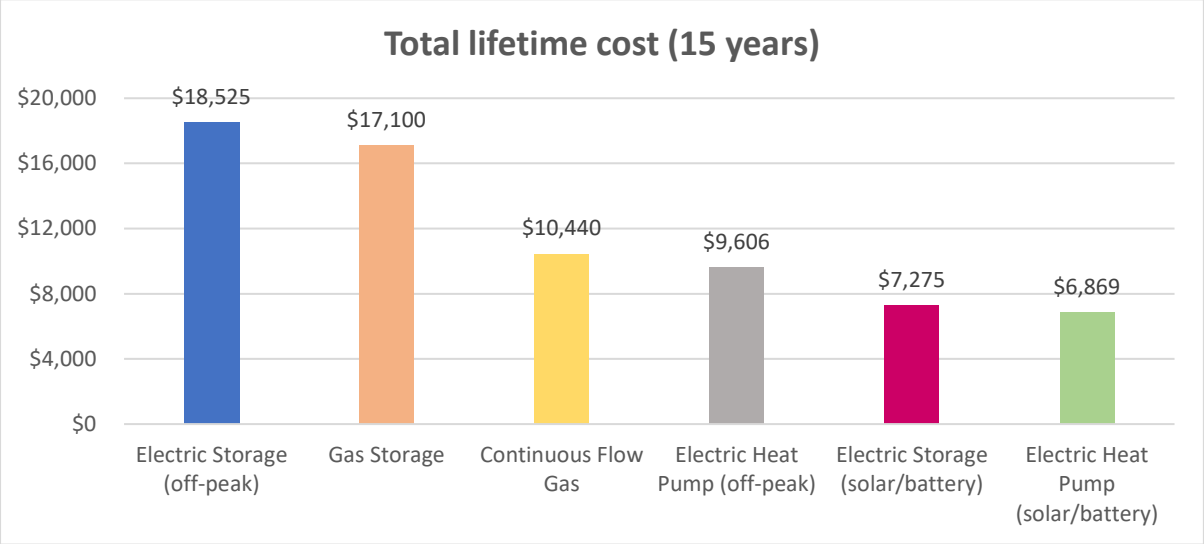
3. **Electric Storage**

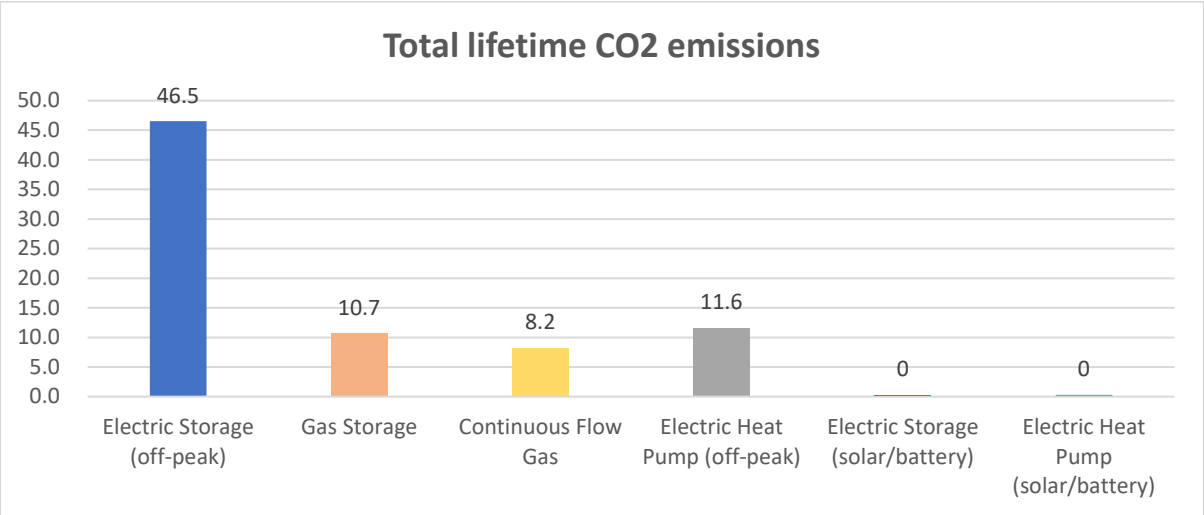
Storage Electric hot water systems are one of the most commonly used systems in Australia, including in the majority of apartment and unit blocks. They work similar to a Gas Storage system except they use electricity and an element to heat the water.

4. **Electric Heat Pump**

A Heat Pump system has some similarities to an Electric Storage system, they both have a tank and use electricity as the source for the heat. However, instead of an element to heat the water, a heat pump extracts heat from the ambient air to heat to the water. They can operate in temperatures as low as minus 10 degrees Celsius. The main advantage of this system compared to the Electric Storage system is that it uses significantly less electricity. These systems can generally only be installed outdoors or in a well-ventilated garage.

Comparison of cost and emissions





Pinpointing the exact cost savings and emissions impact of a new hot water system can be tricky. Factors like tank size, household size, and hot water usage all play a role. The basis of the above analysis is actual real-world data from a five-person household that recently switched from Continuous Flow Gas to an Electric Heat Pump system (with some assumptions for Electric Storage and Gas Storage).

The good news? This switch to a heat pump resulted in significant cost savings, regardless of whether the system is powered by solar panels or off-peak grid electricity.

While solar-powered Heat Pumps are unbeatable for emissions, it's important to consider the current state of the electricity grid. In NSW, VIC and QLD, where fossil fuels still dominate power generation, a Continuous Flow Gas system might currently have a lower carbon footprint than a Heat Pump running off the grid. However, as these grids transition towards renewable sources, heat pumps will become the clear winner in terms of emissions reduction.

For those in Tasmania and South Australia, where renewable energy makes up a larger portion of the grid, Heat Pumps may already boast a lower carbon footprint compared to Continuous Flow Gas

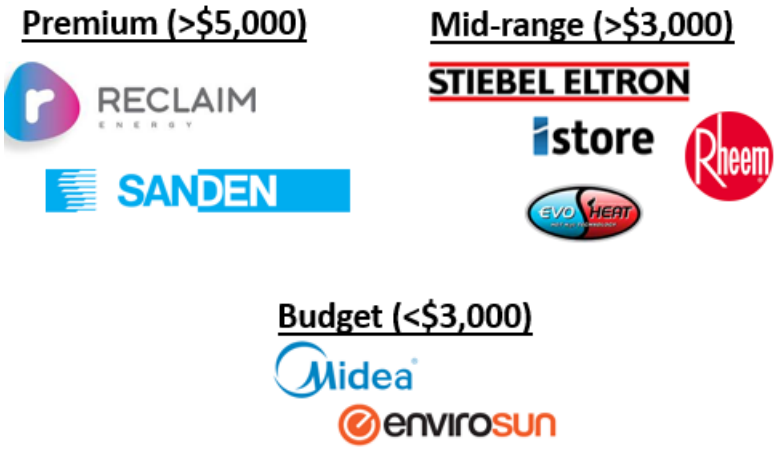
systems. Or for those people in other states who operate their heat pumps during the middle of the day when the grid has a higher portion of renewable energy.

Electric Heat Pump – Key considerations

1. **Free heat pumps are expensive!! Choose a quality brand and product**
   Standard Gas and Electric Storage systems, and even Continuous Flow Gas, are relatively simplistic pieces of equipment with minimal parts meaning maintenance should be relatively easy.

   Electric heat pumps do have a multi-component structure, including the condenser, evaporator, compressor, expansion valves, and filters. This means there are more potential points of failure compared to simpler heating systems. Therefore, if you choose to switch to an electric heat pump, consider investing in a well-established, reputable brand known for reliability and durability to minimize the risk of breakdowns.

   Many consumers are tempted by heavily discounted or "free" electric heat pump systems. These offers should be avoided. Often, such systems are either prone to early failure or are unable to meet the household's hot water requirements.



2. **Refrigerants are extremely harmful to the environment**
   Hydrofluorocarbons (HFCs) are widely used as the refrigerant in Electric Heat Pump Systems. HFCs have a huge global warming impact. For example:
   - R410a has Global Warming Potential (GWP) of 2,088, meaning it has 2,088 times the global warming impact of CO2.
   - R134a has a GWP 0f 1,340.
   - R32 has a GWP of 675.

   The average system contains around 2-3 kgs of refrigerant. If 3 kgs of R410a were to escape into the atmosphere it would have the same impact as releasing 6.3 tons of CO2!

   However, some systems are far more environmentally friendly using CO2 or propane as the refrigerant (GWP of 1 and 0.02 respectively). Unfortunately, such systems generally come with a premium price tag.

Before investing in an Electric Heat Pump do your research to understand the refrigerant used and its Global Warming Potential. Try and choose a model that uses a refrigerant like CO2 or propane. If this isn't possible, then invest in a premium brand and properly maintain it to minimise the risk of any leaks into the environment.

3. **What size tank do I need?**
   Follow the below as a general rule of thumb:
   - 5-7 people, >300 litres.
   - 3-5 people, >220 litres.
   - 1-3 people, >150 litres.

   Other considerations should include the flow rate, which dictates the number of hot water taps you can run at once, and the Coefficient of Performance (COP) which dictates how efficient the system is and therefore how quickly it can heat the water in the tank.

Conclusion

If you have solar panels and/or a home battery, investing in an Electric Heat Pump should be a no-brainer, both financially and environmentally, no matter what hot water system you currently have. This is, of course, provided you invest in a reputable, high-quality brand that is reliable and ideally avoids the use of harmful HFC refrigerants.

If you don't have solar or a home battery then the decision is not quite as clear cut and it depends on what your current system is:

- If you currently have an Electric Storage Heater or Gas Storage heater then there is a clear financial and environmental case to move to a Heat Pump.
- However, if you currently have a Continuous Flow Gas system, and no solar power, then the financial and environmental benefits are more limited.

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Appendix – system comparison and assumptions

Comparison of hot water systems	Annual cost ($)	Annual CO2 emissions (t)	Upfront cost ($)	Lost opportunity cost ($)	Total cost over 15 year life ($)	Total emissions over 15 year life (t)
1. Electric Heat Pump (solar/battery)	$0	0	$5,500	$1,369	$6,869	0
2. Electric Heat Pump (off-peak)	$274	0.8	$5,500	0	$9,606	11.6
3. Electric Storage (solar/battery)	$0	0	$1,800	$5,475	$7,275	0
4. Continuous Flow Gas	$596	0.5	$1,500	0	$10,440	8.2
5. Gas Storage	$775	0.7	$2,100	0	$13,722	10.7
6. Electric Storage (off-peak)	$1,095	3.1	$2,100	0	$18,525	46.5

1. Electric Heat Pump upfront costs based on the actual installed cost, net of the STC rebate, for a 315 litre Reclaimed Energy stainless steel system.
2. Electric Storage assumed to use an average of 10 kWh per day compared to 2.5 kWh for the Heat Pump.
3. An average off peak rate of 30 cents per kWh has been used. This is slightly higher than most current retail plans (20-30 cents) to allow for some usage in shoulder times.
4. Total costs for the Electric Heat Pump and Electric Storage using solar/battery include the lost opportunity cost from exporting excess solar. The export rate has been assumed at $0.1 per kWh. Actual export rates may be higher if you use a plan such as Amber Electric, or lower if you are on a standard retail plan.
5. Continuous Flow Gas cost based on actual usage data for a household of five people. Emissions based on actual MJ usage multiplied by 0.056 kg of CO2 per MJ.
6. The annual cost and emissions of Gas Storage have been estimated based on a 30% difference to Continuous Flow Gas.
7. No maintenance costs have been assumed for any system. Some systems may require some maintenance expenditure.

David is a pioneer in embracing solar & battery storage, electric vehicles and home electrification; a path he navigated through its early complexities and challenges. This experience led him to establish My Energy Guide, a resource dedicated to empowering others to embark on their own sustainable journey with greater ease. Visit myenergyguide.com.au to learn more.