

For most households, hot water is second only to transport as the largest cause of greenhouse gas emissions. Water heating accounts for about 30 percent of an average Australian household's total greenhouse gas emissions and about the same proportion of total household energy use.

By installing the most appropriate and efficient water heater for your household size and water use patterns you will save money and reduce greenhouse gas emissions without compromising your lifestyle.



Around 30 percent of household energy is used to heat water.

More than half of hot water use is in the bathroom, a third in the laundry and the remainder in the kitchen. Typically, between 25 and 50 percent of the average Australian household's total electricity and gas energy bills are due to hot water heating.

TYPES OF HOT WATER SYSTEM

There are two basic types of water heater - storage systems and instantaneous (or continuous flow) systems. Each system can use a variety of energy sources to heat water.

STORAGE WATER HEATERS

Water is heated and stored in an insulated tank for use when it is required. These systems can operate on mains pressure or from a gravity feed (constant pressure) tank.

Mains Pressure: Hot water is delivered at a similar pressure and flow rate to cold water so more than one outlet can usually be turned on without greatly affecting pressure. The storage tank is usually located at ground level inside or outside the house.

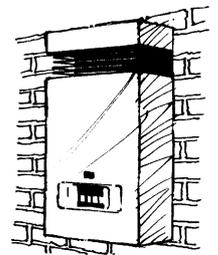


Constant Pressure or gravity feed: Hot water is delivered at lower than mains pressure from a tank located in the roof of the house. Pressure depends on the height difference between the tank and the point of use. Gravity feed systems are most common for properties not connected to mains water. They are often cheaper to purchase and last longer than mains pressure systems.

Storage tanks may be made of copper, glass (enamel) lined steel or stainless steel. Copper and glass-lined tanks typically have a sacrificial anode to reduce tank corrosion, which needs to be replaced every 5 years or so, depending on water quality. Warranties offered for tanks range from 5 to 15 years and details vary considerably.

INSTANTANEOUS WATER HEATERS

Instantaneous systems heat only the water required and do not use a storage tank. They can operate on natural gas, LPG or electricity. Gas models are available with either electronic ignition or a pilot flame, and, can operate on natural gas, LPG or electricity.



Instantaneous systems cannot run out of hot water and can be mounted internally or externally.

Standard units can only deliver adequate hot water to one or two points at the same time but high performance gas units can supply several points at once. They also have sophisticated temperature controls.

ENERGY SOURCES FOR HEATING WATER

SOLAR ENERGY



Solar hot water systems are storage systems and, depending on your climate can provide up to 90 percent of your hot water for free using the sun's energy. Solar systems may be less appropriate in smaller households, in cooler parts of the country, or where access to sunlight is restricted. [See: Solar Hot Water]

To provide hot water on cloudy days or when demand exceeds supply, most solar water heaters come with a gas or electric booster. A gas booster produces less greenhouse gas emissions.

Booster systems can be inefficient – cutting in and “pre-empting” the sun. Override switches and timers can correct this problem if well managed.

The solar collector and storage tank is generally located on the roof of your home, facing north. The storage tank can also be located inside the roof or at ground level.

Solar systems will recoup the extra investment more quickly in larger households.

Rebates may be available to assist with the purchase cost of solar water heaters. Rebates are currently available in Queensland, Victoria and some parts of NSW and SA.

NATURAL GAS

Natural gas water heaters generate far fewer greenhouse gas emissions than standard electric storage systems. This is because natural gas burns cleaner than the coal that is burnt to generate most electricity in Australia. Using gas directly in the home also avoids the energy losses associated with the generation and distribution of electricity.



Courtesy Rinnai Pty Ltd

Natural gas water heaters generate far fewer greenhouse gas emissions than standard electric storage systems.

Gas storage systems have quicker heat recovery times and generally use a smaller tank than a comparable electric storage system. This improves efficiency and makes indoor installation easier. Systems installed inside the house need a flue that leads outside to vent exhaust gas.

Instantaneous systems usually use natural gas as it is cheaper for this application than LPG and electricity.

To compare energy use of gas storage and instantaneous gas water heaters, check the star rating label. [\[See: Energy Use Introduction\]](#)

ELECTRICITY

Electricity can be used for standard storage heaters, for heat pump systems or for boosting solar systems. Expensive three-phase electricity supply is needed for instantaneous systems.

Electric Heat Pumps:

Electric heat pumps are an efficient type of electric storage water heater that extracts heat from the environment to heat water. They pay back the extra initial investment more quickly in larger households.

Heat pumps that draw heat from the air use only about one third of the energy of a standard electric system and can be made even more efficient by using a solar booster. Electricity is not used to directly heat the water but to move heat from one place to another. The heat is carried by a refrigerant. [\[See: Solar Hot Water\]](#)

Ground source (or geothermal) heat pumps use a water body, shallow trench or deep bore instead of the air as a heat source. They usually provide both space heating and water heating. Electricity is used to pump water around a loop buried in the ground or immersed in a water body. The enclosed water absorbs heat from the surroundings. Geothermal heat pumps can produce more than 4 units of heat energy for every unit of electrical energy used.

Heat pumps can be located and designed to utilise waste heat from air conditioners and refrigerators.

Government rebates may be available to assist with the purchase cost of heat pumps. Rebates are currently available in Queensland, Victoria and some parts of NSW and SA.



Quantum Energy Systems Pty Ltd

Electric Storage Water Heaters:

Standard electric storage water heaters use a heating element inside the tank to heat the water, just like an electric kettle, but because they are responsible for the most greenhouse gases of any water heater they are not recommended.

Electric storage water heaters of less than about 150 litres usually use peak electricity and are the most expensive of all to run.

Larger electric storage water heaters generally use cheaper off-peak electricity tariffs, where available, heating water at restricted times (usually overnight).

To reduce the chance of running out of hot water, tanks are often oversized and overheated, increasing energy consumption and greenhouse gas emissions. An electric storage water heater can indirectly produce as much carbon dioxide each year as the average family car.

SOLID FUELS AND OIL

Solid fuel and oil heaters or stoves can be used to heat water via a heat exchanger, commonly known as a “wet back”. Cold water is run through a coiled copper pipe or similar heat exchanger connected to the heater where it absorbs heat from the fire.

Wet back systems can be used as boosters for gravity fed solar water heaters or as stand alone water heaters. As there is potential for steam to form in the water pipes, wet back systems must be “open vented” to allow steam to escape and eliminate the potential for explosion. Pipework in a wet back system must avoid changes in direction that can allow steam to accumulate.

Only certain types of storage tanks are suitable for a wet back system. A header top up tank with a float valve is generally used to allow replacement of coolant lost through evaporation.

CHOOSING A HOT WATER SYSTEM

Of the many different types of water heaters on the market, the best hot water system for your home will depend on your situation. Consider the following.

Household size. The number of people living in your home and your water consumption patterns (ie. whether you all shower at the same time of day; run the dishwasher, washing machine and bath at the same time) will determine the size of the system you need and help to identify the best system and energy source for your needs.

Cost. The purchase cost and operating costs of your hot water system both need to be considered. The energy used by your water heater will impact on your energy bill for years to come so consider carefully before buying. Any extra purchase cost of an efficient water heater is usually recovered within the life of the unit. Government rebates are also available on some energy efficient systems.

Space Available. In existing homes it may not be possible to install some systems due to lack of space or a difficult layout.

Existing Water Heater. Some existing hot water systems can be easily converted to more sustainable types. For example, the best replacement for the old style ceiling mounted gravity service is often a roof-mounted solar system, as plumbing usually requires minimal alteration.

Available Energy Sources. Your choice may also be limited by the available energy sources. Natural gas is not available in some areas and solar energy may not be ideal in cooler climates or shaded areas.

THE BEST SYSTEM FOR YOU

The following suggests the best systems for various situations in terms of cost-effectiveness and environmental protection.

For a small, water-efficient household choose an instantaneous gas hot water system or a small, high-efficiency gas storage system.

For a medium-sized household select a high-efficiency gas or electric heat pump system. If you get enough sunshine, a solar water heater may also be a good option.

If you get plenty of sunshine and have a large household, the best option might be a solar hot water system. However, a high-efficiency gas storage system or a solar-boosted electric heat pump may also be suitable.

For a multi-residential development a large, cost-effective solar water heater can be effectively combined with instantaneous gas boosters in each unit.

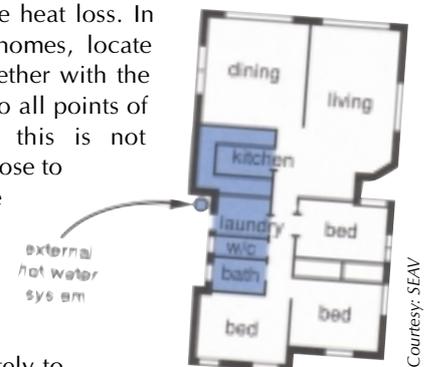
Geothermal heat pumps are very efficient electric water heaters and may be a cost effective option for blocks of 5 or more units.

A gas booster solar water heater will generate the lowest greenhouse gas emissions. Where gas is not available an electric-boosted solar system or an electric heat pump will minimise emissions.

DESIGN AND INSTALLATION

As much as 60 percent of your hot water bill is due to heat loss from the tank and associated pipework. This can be reduced through careful design and installation.

Keep hot water pipes as short as possible to minimise heat loss. In new or renovated homes, locate wet areas close together with the water heater close to all points of hot water use. If this is not possible, locate it close to the kitchen where small, frequent amounts of hot water are used.



Estimate your hot water needs accurately to ensure your system is not oversized or undersized for your household. If storage system tanks are too small for the number of people in the house hot water can run out. If the tank is too large, operating costs will be excessive.

Storage systems lose heat through the tank walls. Reduce heat loss by wrapping the tank with extra insulation. Ensure that the air supply to gas systems is not affected.

In cool and cold climates, try and locate the tank inside as part of a drying or heating cupboard. This will save heat leakage to cold air and re-use leaked heat for drying.

Insulate hot water pipes, particularly externally exposed pipe leading from the water heater to the house and the pipe leading to the relief valve (on storage systems). Note: Standard lagged hot water pipes are inadequate external protection in cold and cool temperate climates. Apply additional insulation or “lagging”.

For storage systems consider installing a timer to ensure water is not heated when it's not needed, and a switch so the system can be turned off when you go on holiday.

Design new homes with a roof pitch and orientation suitable for a solar water heater. You may not want to install one now but it leaves the option open for the future. A north-facing roof with a pitch of between 22° and 40° is usually adequate. [See: [Solar Hot Water](#)]

HOT WATER TIPS

Reducing your use of hot water is a great way to save on your energy bills, regardless of what type of water heater you have. For tips on reducing your water use, see: [Reducing Water Demand](#).

Showering uses the most hot water in a household. Installing a water efficient (AAA rated) showerhead can reduce this use by about half. The AAA rating scheme ensures you get a good shower. If you have an instantaneous water heater, make sure that your water efficient showerhead is compatible and does not reduce flow excessively. Check with the manufacturer of your heater.

Buy washing machines and dishwashers that have a cold or warm water cycle option and use this cycle as much as possible.

Immediately repair dripping hot water taps and leaking appliances, including the relief valve from your water heater.



Ensure that the temperature gauge on storage hot water systems is set at 60°C. A higher temperature than this means that energy is used unnecessarily and a lower temperature than this may allow harmful bacteria to thrive. Instantaneous hot water systems should be set to no more than 50°C.

Turn off your water heater when you go on holidays.

Maintain your system and have it serviced according to manufacturer's instructions.

KEY FURTHER REFERENCES

Australian Consumers Association
(Hot Water from Sun and Air), Ph: (02) 9577 3333
<http://www.choice.com.au/articles/a100954p1.htm>

Global Warming: Cool it! – A home guide to reducing energy costs and greenhouse gases, Environment Australia, 1999.
<http://www.greenhouse.gov.au/pubs/gwci/>.

Sustainable Energy Authority Victoria
Ph: 1300 363 744
http://www.seav.vic.gov.au/energy_smart/hot_water/index.html

Sustainable Energy Development Authority, NSW
Ph: 1300 138 638
<http://www.energysmart.com.au>