OFFICE OF CleanEnergy

Solar and Heat Pump Hot Water Systems

This information refers to general hot water systems currently available and not specifically to the Queensland Solar Hot Water Program.

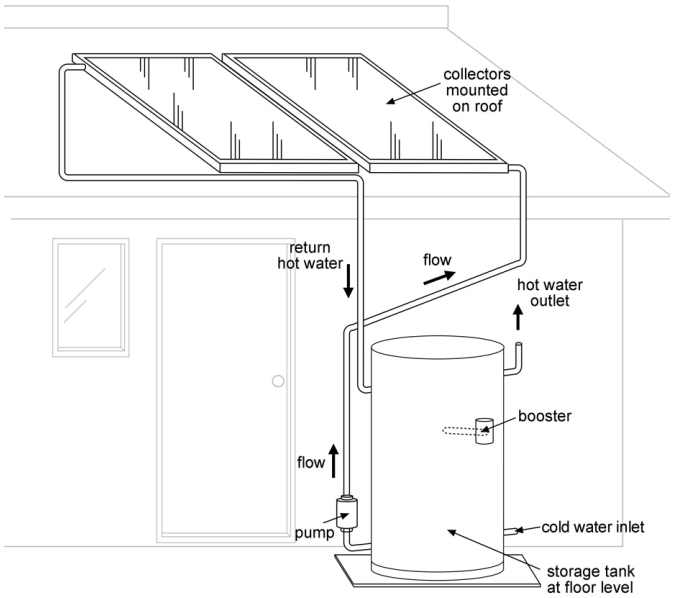
Solar Hot Water Systems

Solar hot water systems are particularly suited to Queensland's sunny climate. There are two commonly used systems that can be installed in your home, split systems and roof-mounted systems. In good weather, solar hot water systems are well equipped to supply any household's hot water needs free from the sun. For periods of low sunlight or high household hot water use, hot water is generated with an electric or gas booster, for both split system and roof-mounted systems.

Split Systems

A split system consists of solar collectors mounted on the roof, a water storage tank installed on the ground, a solar controller, small electric pump and an electric or gas booster. The electric pump circulates water from the storage tank on the ground, up to collectors on the roof where the water is heated by the sun, before returning to the water storage tank. A solar controller determines when the pump should run, thus avoiding energy wastage and overheating the water in the storage tank. A split system is often referred to as an 'active' solar system as it requires an electric pump to circulate the water through the collectors. As the water storage tank is on the ground, split systems have less visual impact, particularly when the solar collectors are mounted flush with the roof. They can be installed on any roof pitch as a pump is used to move the water through the solar collector. The length of pipes from the water storage tank to the solar collectors can be long, depending on water storage tank location, which can add to installation costs.

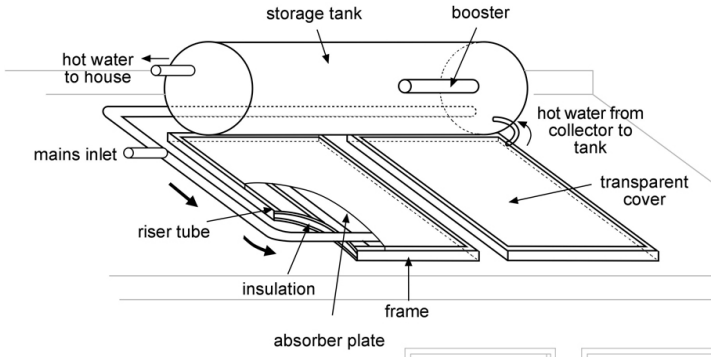
Split system



Roof-Mounted Systems

Roof-mounted systems consist of solar collectors and a water storage tank, both located on the roof. Cold water is heavier than hot water, so cold water will fall and hot water will rise. This principle is called 'thermosyphon'. The cold water in the solar collectors is heated by the sun and rises into the tank. This heated water displaces cold water in the tank which then falls into the solar collectors where the process continues. The hot water is stored in the water storage tank until it is required in the home. Unused water that cools returns back to the collectors. Roof-mounted systems are often referred to as 'passive' solar systems as they rely on the principle of thermosyphon, rather than an active system that uses an electric pump to move the water through the solar collectors. A full roof-mounted system will weigh several hundred kilograms, so potential sites need to be checked by a qualified solar hot water installer, to ensure the roof will support the extra weight. Also, in cyclone prone regions, systems require increased roof fastening to withstand strong wind conditions.

Roof-mounted system



Heat Pumps

Heat pumps are most suitable when there is insufficient solar exposure, i.e. shading over the roof or incorrect roof orientation. They are also used where it is difficult to install solar panels or in areas where frost is prevalent. Heat pumps can often be the best option for efficient hot water delivery in existing apartment complexes.

Heat pump hot water systems capture heat from the surrounding air, like a refrigerator, but running in reverse. A heat pump hot water system comprises a water storage tank and a heat pump. Heat pumps are either mounted on top of, or adjacent to, the water storage tank. The heat pump consists of a condenser, located around the outside of the water storage tank, a compressor and an evaporator. The heat pump works by absorbing heat from the air into the refrigerant gas within the evaporator as in the case of the inside of a refrigerator. The compressor then increases the pressure and temperature of the gas, and it is then sent through the condenser located in the water tank casing. It is here that the heat energy is transferred to the water. As the heat transfers to the water, the gas cools and then flows back to the evaporator in a continuous cycle.

Heat pumps do not require direct sunlight, and therefore can produce hot water 24 hours per day – rain, hail or shine. This also means that the availability of a suitable roof area is not an issue that will affect system performance. Heat pumps are capable of producing ample hot water for any household situation and generally heat water faster than a conventional residential electric hot water system. The technology used in a heat pump is proven, it has been around for a long time in air-conditioners and refrigerators.

A heat pump makes some noise when operating, unlike current solar collector technologies. This can impact on site choice. A heat pump hot water system uses approximately two thirds less electricity than a standard electric storage hot water system.