Renewable Energy Guidance – Solar Water Heating Systems

Solar Water Heating Systems

Solar water heating is a system that heats water by sunlight, using a solar thermal collector. A variety of configurations is available at varying cost to provide solutions in different climates and latitudes. The main components of a solar water heating system include solar collectors, the hot water tank, and equipment such as a pump and controller. Solar water heating systems can be grouped into two main categories:

Direct and indirect systems:

Direct systems heat water under the solar collector directly. If temperatures drop below freezing, the water must be drained from the collector to avoid damaging the system. These systems are used where freezing temperatures occur at most once or twice per year, because draining the water more frequently is expensive and wastes energy. In indirect systems, the solar collector heats the liquid antifreeze, which then runs through tubes inside a water storage tank to heat water indirectly.

Passive and active systems:

Passive systems, known as thermosiphons, circulate water or antifreeze from the solar collector to the storage tank using the warm liquid's natural tendency to rise. Active systems use electric pumps to increase the efficiency of the water circulation.

Why install solar water heating systems?

Solar water heating is a safe, simple and reliable technology that can be used in ICRC premises to reduce the use of fossil fuels and energy costs. Solar water heaters reduce the need for conventional water heating by about two-thirds, and the investment payback period is below three years. The technology can be applied and run effectively in almost all ICRC locations, including less sunny areas. In addition to reducing the delegations' power bills, using solar water heating contributes to reducing the ICRC's greenhouse gas emissions.

The main reasons for considering solar water heating are:

- **Energy cost reduction**. The savings from solar water heating use will depend on a wide range of factors including, how much hot water you use, the type of solar water heating system you install, and the quality of the installation.
- **Environmental impact reduction**. Installing solar water heaters reduces the use of fossil fuels and in turn, carbon emissions.
- **Improvement of health and working conditions**. Solar water heaters replace the burning of wood or fossil fuels, which can have a negative impact on people's health.

What to consider before installing solar water heating systems

- **Site's solar resource.** The efficiency and design of a solar water-heating system depends largely on the amount of solar energy that will reach the surface of the collector. Consultants or contractors can help in analysing the solar resource before buying and installing the solar water heating system.
- **Collector orientation.** To achieve the optimal performance of a solar energy system, the collectors must be oriented in a way to maximize the exposure to seasonal, as well as daily solar power they receive. One must consider factors such as roof orientation (if you plan to mount the collector on a roof), local landscape features that shade the collector daily or seasonally, and local weather conditions (foggy mornings or cloudy afternoons).
- **Shading**. Shading from mountains, trees, buildings, and other geographical features can significantly reduce the collector's performance. They should be installed at a site that is un-shaded at least from 9 a.m. to 3 p.m.
- **Space.** The roof must be large enough to accommodate the collectors (roughly 1m^2 per person in the house).
- **Safety.** It is important to ensure proper fastening of the tank and collector with either the concrete structure or by screwing the collector array right across the roof to the underlying timber purlins. Also, the compatibility of the fastening metal being used with the system's brackets and frames must be

considered to avoid corrosion. Corrosion can be a major concern if the combination of metals is not chosen wisely.

- **Economic viability.** Solar water heating is generally more economically viable in larger set-ups that use a lot of hot water. Otherwise, the savings won't be significant.

More information on solar water heating systems can be found **HERE.**

Solar water heater system size

Solar water heating systems are sized accordingly to hot water demand. The more hot water used, the larger the storage tank and collector panel area should be. The number of people that will use the hot water is a good indication of how large the system should be.

For more advice on the sizing of the solar water heaters or questions on solar water heating systems, please contact:

- **ECC team** (Environment and Climate change), please contact Cyprian Njuki Njururi at cnjukinjururi@icrc.org
- **GVA LOG Purch Engineering services**
- **Your local WatHab engineer**