Renewable Energy Solutions
Solar Thermal - Domestic Hot Water systems (DHWS)
1. General Information

One of the most energy intensive (and therefore costly) processes in any hotel is the heating of domestic hot water. With energy costs always increasing, it’s no surprise that hotels are looking for new ways to reduce their energy consumption. Renewable energy technologies such as solar domestic hot water systems are a good solution that is becoming more cost effective as fuel prices rise and will help hotels stay competitive and profitable.

How well developed is solar domestic hot water technology?
Solar domestic hot water is a mature and established technology. Manufacturers have produced and sold solar domestic hot water systems for decades already and due to continuous innovation, they can supply products that work effectively. To compare product quality there are certificates that apply throughout Europe, as well as national commendations that test and confirm the efficiency and quality of solar domestic hot water systems.

What can my hotel use a solar domestic hot water system for?
Solar domestic hot water systems can heat water for guest rooms, housekeeping, laundry facilities, food services and more.

How does a solar domestic hot water system work?
There are several types of solar hot water systems, but most pump cool water through pipes in a collector usually located on the roof of your hotel which has to be exposed to the sun. Glass on the front of the collector allows sunlight to pass into the collector, but prevents it from escaping, like a greenhouse. The hot water returns then to an insulated storage tank, similar to a regular hot water tank and is ready then to be used by your hotel.

Is there enough sun in my region to install a solar hot water system?
A solar domestic hot water system can be installed anywhere in Europe; just the size of the solar system must be changed to achieve enough solar yield.

Do the solar domestic hot water systems still operate when it’s cloudy?
On a cloudy day when there is little or no direct sunlight, there is still solar radiation sufficiently enough to be usefully collected by solar collectors. While the highest amounts of monthly solar radiation are obviously experienced in the summer months, there is enough radiation coming from the sun in spring, autumn and winter to make a very useful contribution to your hotel’s energy needs.

And if the sun isn’t shining, will I only have cold water in my hotel?
No. The storage tank holds the hot water until it is required and ensures that hot water is still available even when there is not enough sunlight.
Most solar domestic hot water tanks also have a backup water heater (e.g., electricity, oil, pellets or natural gas), so there is always hot water when needed.

Where do I mount the solar collectors in my hotel?

Solar collectors are most of the times installed either on the roof of your hotel, or on a freestanding installation in your hotel yard. There are also facade collectors or installations for balconies. When choosing a location for the installation the primary consideration should be the amount of sun exposure the collectors will get. For maximum daily output the collectors should face due south, be in the direct sun (no shading at all), and be mounted at an angle to the sun that will maximize their performance. A certified installer will be able to advise you on the best way to integrate a system into the space available in your hotel.

How many collectors do I need for my hotel?

The number of solar collectors you’ll need for your hotel will depend on the number of guestrooms, the amount of water used, your local climate and the location of the collectors (whether they’re facing south or in a shaded area). For an accurate assessment of how many collectors your hotel needs consult a qualified installer for specific size and model specifications.

As a very general example, for a 20 guestrooms hotel located in the Mediterranean a solar domestic hot water system consisting of 7 glazed flat plate solar collectors with a total area of around 15 m² would cover most of the hotel’s hot water demand.

Do I need any planning permissions in order to install a solar domestic hot water system?

Most solar collectors generally not require permission. Nevertheless, it is worth checking with your local administration or authorities to find out about any local laws that may restrict solar collector placement, especially if you live in a listed building or conservation area. Also solar obligations have now been adopted in Spain for example, where the new Spanish Technical Buildings Code (CTE Código Técnico de la Edificación) was adopted in March 2006, and its solar thermal section came into force in September 2006 where an obligation to provide 30-70% of the domestic hot water demand with solar thermal energy has to be complied with. This applies to all new hotel buildings as well as those undergoing major refurbishment.

How much does it cost to install a solar domestic hot water system, and how much can my hotel save?

The cost varies based on the size of a system, and how it fits into your hotel existing plumbing. You may find cheap and efficient solar hot water systems for warm regions (thermosyphon systems), but more complex systems for colder regions (with vacuum tube collectors, pumps, heat exchangers, antifreeze mixtures, controls...) Total savings depend on the amount of hot water and the type of fuel your hotel uses to heat water. Savings are the greatest for electricity users, and less for natural gas users. Typically in Europe, solar domestic hot water systems are sized to provide approximately 50-70 percent of the heating load per year.

On sunny summer days the system may provide nearly 100 percent of the heat required, while during extended cloudy periods, the output may drop to 20-30 percent. A certified installer will be able to estimate the output of the solar domestic hot water system and to give you a general cost/saving estimate for the system.
What is the lifetime of a solar domestic hot water system?

Well maintained systems will usually last over 20 years so they should pay for themselves many times over in energy savings.

How much maintenance does a solar domestic hot water system need?

A solar system is almost maintenance-free. However, the system should be checked periodically by a qualified service technician. Every three years the solar system should be tested to make sure it is frost-proof. The circulating pump, the tank, the non-toxic antifreeze mixture and other minor components are subject to wear and tear and may need to be replaced eventually.

What is the payback time of a solar domestic hot water system?

The payback time for solar hot water systems can be relatively short. In very favorable cases (closely related to good solar radiation) 3 or 4 years paybacks are possible. Average paybacks of 5 to 6 years are also common.

Climate is important when calculating the payback of an investment in a solar system, since it also determines the type of collectors, system, needs, etc. To minimize payback period and maximize savings you need to aim for the biggest possible running capacity for the minimal possible investment in solar collectors. Installers should be able to work out the optimal size and type needed in respect to your hotel hot water needs and usage.

How can I finance a solar domestic hot water system?

You may fund your renewable energy system in several ways. Many financial incentives which can benefit your hotel are available for example. However, these have not been used to their maximum potential. Incentives can save you in some cases more than 50% of the cost of your solar hot water system. Check for national incentives and don’t forget that your local utility company or other local organization may also provide additional support. There also banks promoting the use of solar hot water systems by granting long-term, low interest loans. Visit www.iea.org/country/index.asp under ‘related country and regional information’ for more information about available incentives in your country (available for IEA member countries only).

Who can help me with the paperwork for applying to receive financial incentives?

Installation companies are more and more taking over of the application paperwork to receive an incentive. Local energy agencies may also help you.
Should my hotel receive an energy audit?

Definitely yes. Doing an energy audit before investing in a solar hot water system is in your best interest, because it will help make the existing hot water system as efficient as possible and will lower your hot water consumption and monthly energy bills. By reducing your hot water consumption you will need to pay much less for a solar hot water system that’s capable of meeting your lowered-new hot water demand.

You can improve the performance of your hot water system and reduce the hot water requirements of your hotel by for example:

- Installing low-flow showerheads and faucets
- Installing body shaped bathtubs
- Installing new more efficient water pumps
- Insulating all hot water pipes
- Installing ozone laundry systems

Who can install a solar domestic hot water system for my hotel?

A qualified installer or an Energy Service Company (ESCO). Installers will estimate the overall cost, and will also inform your hotel about rebates and incentives for which you may qualify.

What is an ESCO?

An Energy Service Company (ESCO) reduce the hotel energy costs, by taking care of the investments involved of installing a solar hot water system and sharing the resulting future cost savings with you by letting the ESCO install the solar hot water system in your hotel.

Follow the next steps to make your solar domestic hot water system

- Learn as much as you can about solar domestic hot water systems before you make a decision.
- Schedule an on-site energy audit
- Call an installer and obtain estimates
- Check zoning, permit and utility requirements, insurance, and other legalities
- Look for financing options
- Install and learn how to safely maintain your system

If you want more detailed information about the solar hot water system please click here

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How does a solar domestic hot water heating system work?

Solar water heating systems use free heat from the sun to warm domestic hot water. An auxiliary heat, additional boiler or immersion heater, is then used to make the water hotter, or to provide hot water when solar radiation is not sufficient. The solar fraction is the percentage of a building's seasonal energy requirements that can be met by a solar energy device(s) or system(s). This fraction will be optimized through the sizing of the system so as to reach 50% to 100% or even more to be used in other features like swimming pools.

What are the basic components of a solar hot water heating system?

Solar water heating systems include the solar thermal collectors and a hot water storage tank. An auxiliary heat source is used as a back-up of the solar energy. Either conventional or renewable energy sources can provide any backup needed and may already be part of the solar system.

The collector has the role of "collecting" radiant energy and converting it into heat. Two types of solar collectors are used for SME hotel applications: flat plate collectors and evacuated tube collectors (also called vacuum tubes). Typically vacuum tube collectors have better properties in the transition- and winter periods, but the investment costs are higher than for flat plate collectors.

Flat-plate collector: glazed flat-plate collectors are insulated, weatherproofed boxes that contain a dark absorber plate under a glass.

Evacuated-tube collectors: they feature parallel rows of transparent glass tubes. Each tube contains a glass outer tube and metal absorber tube attached to a fin. As solar radiation represents an intermittent energy source: the heat produced by the solar thermal collectors needs to be driven into a water storage tank to be used in any time.

There are two types of solar water heating systems: active, which have circulating pumps and controls, and passive, which don’t: Active Solar Water Heating Systems these systems use pumps to drive the heat from the collectors to the hot water storage tank, and a heat exchanger which can be immersed (small size applications) or external (bigger applications). In areas with low risk of freezing, it’s sometimes possible to have the potable water circulate directly through the collector, thus avoiding the commonly used closed primary circuit and the heat exchanger. Passive Solar Water Heating Systems: thermo syphon systems rely on the natural convection of warm water rising to circulate water through the collectors and to the tank (located above the collector). As water in the solar collector heats, it becomes lighter and rises naturally into the tank above. Meanwhile, the cooler water flows down the pipes to the bottom of the collector, enhancing the circulation. These systems are widely implemented in Mediterranean areas (very popular in Greece, Cyprus) where both the heat needs and risks of freezing are reduced.

Collective solar domestic hot water systems are being installed into multi-family houses, hotels, office buildings etc. These collective systems have a collector surface ranging from ten to several hundred square meters. Most larger systems used for collective solar thermal domestic hot water are designed as forced-circulation systems – using a pump, but multiple thermo syphon systems are also used where appropriate. Further information about collective solar thermal DHW can be found on the SOLARGE project’s website. [http://www.solarge.org/](http://www.solarge.org/)
TIPS:

- Passive solar water heating systems are typically less expensive than active systems, but they’re usually not as efficient. However, passive systems can be more reliable and may last longer.

- Solar water heating systems require a backup system for cloudy days and times of increased demand. Conventional storage water heaters usually provide backup and may already be part of the solar system.

Link with other solutions Solar Combi and Solar Combi Plus Systems

Solar domestic hot water technology is used both by the solar combi systems for space heating and the solar combi+ systems for space heating and cooling.

Swimming pools

The Solar domestic hot water technology can also be combined to the swimming-pool heating. The surplus heat produced in the warm season is sometimes used for heating the swimming pool.

BENEFITS FOR THE HOTEL

COST REDUCTION

➢ The sun doesn’t send monthly bills!!!

Solar water heating is the most cost-effective use of solar energy in many climates. A solar hot water heating system will insulate your hotel from rising fossil fuel costs and protect you from fuel-price inflation over time since your hotel will not receive any more monthly energy bills for heating water.

STAFF INVOLVEMENT

Train your staff as guides to show guests the solar hot water heating system you have applied and explain them how it works, you can both attract more tourists and further involve your staff in order to get them feeling more responsible for their working place!

GUEST INVOLVEMENT

Install a demonstration diagram or display the solar energy production to show your guests how the sun is heating the water that is consumed in your hotel. By motivating your guests, they will also feel more responsible and involved in taking care of your hotel! Guests will value the fact that your hotel is environmentally conscious.

BENEFITS FOR THE ENVIRONMENT

CARBON EMISSIONS REDUCTION

The energy produced is clean and emission-free. Solar water systems do not require fuel and produce no waste.

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