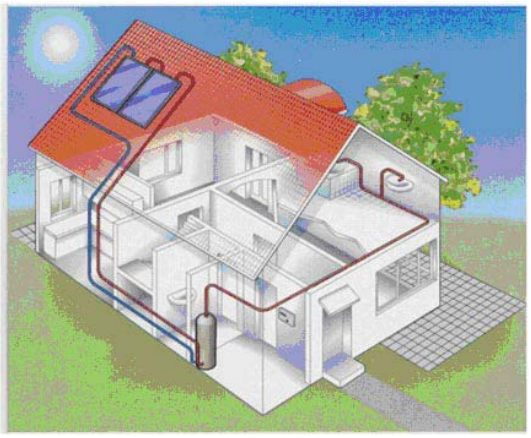
SOLAR HOT WATER HEATING

Homeowner Information



In Ireland we have an annual solar energy resource available to us which is quite similar to that found in parts of central Europe, including the largest solar market in the EU, Germany. Solar installations will perform very satisfactorily provided care is taken to design your system correctly and you also ensure that the installation is completed to a high standard. This consumer guide is aimed at providing you with some useful information and pointers which will assist you in making the correct decision. Solar hot water systems are usually made up of two main components*:

- **The solar collector array (flat plate or evacuated tube)**
- **The cylinder (usually a "dual" or "twin" coil cylinder)**

The cylinder is a very important part of the system - its job is to provide efficient storage for the free heat the solar collectors have produced. Between the solar collector array and the cylinder, insulation of pipework is important, as is the control (sensors, pumps etc.) and the security of the system (expansion vessel, safety valves etc.)

Choosing a solar hot water system: when and why, which one?

An €800 grant is now available through the SEAI Better Energy scheme to help you reduce your energy bills using solar hot water heating system.

Solar hot water systems are designed to meet a certain percentage of your overall hot water requirement over the year. In a typical dwelling, this is usually 50-60% of the annual hot water requirement, but this can vary depending on economics and hot water requirements. The higher your hot water usage, the more beneficial a solar hot water system will be, as more "free" energy will be used.

There are many different brands of solar thermal collectors on the market and many suppliers to choose from. Choosing a system might at first appear a daunting task, however, the guidance below will assist you in making the correct decision for your needs.
There are two main types of solar collector available on the market, flat plate and evacuated tube. Within these two main categories there are also sub-types, but for now, it is sufficient to outline the main differences between the two types of collector.

Flat Plate
Can be mounted both "in-roof" and on-roof
Heavy, rigid, robust box-like structure
Can be more optically appealing due to flat surface areas

Evacuated Tube
Can only be mounted on-roof
Lightweight structure, individual tubes on frame
On average 20% more yield per m^2 of aperture area than flat plates

- The above comparison does not necessarily show that one collector type is better than the other, as it is not that straightforward.
- Every situation is different and might be suited to one type of collector above the other.
- For example, where an "in-roof" installation is needed, a flat plate collector is used, and the lower yield can be compensated for by simply adding more collector area. In a situation where you have restricted roof space, then evacuated tubes would commonly be used to get the maximum yield from a smaller area.
- Along with the overall cost of the system, ensuring that the solar hot water cylinder is sized for the hot water needs of the occupants, and that the collector area is sized to provide the optimum amount of energy per year are the most important considerations (regardless of which type of collector you choose).
- The location and positioning of the solar collectors (including shading considerations) are also considered during the design stage.

**These buyers guides refer mainly to pumped solar hot water systems with dual coil hot water cylinder. Other systems are available on the market, such as drainback systems, solar heating / hot water combination systems, hybrid solar/heat pump systems etc. If you need information regarding any other systems, please contact us.*

A useful rule of thumb for sizing a solar hot water system (for information purposes only) are as follows:

- 1–1.5 m^2 of flat-plate collector area per person. Note: the aperture area is the area through which light enters in m^2 should be used.
- 0.8–1.2m^2 of evacuated tube area per person. Note: the aperture area is the area through which light enters in m^2 should be used.
- Average hot water consumption per person = 40 litres per day (this informs the cylinder size).
- However to meet the technical specification of the grant, the solar water heating installation must contribute a portion of renewable energy for domestic hot water heating as detailed in the table below (these figures are calculated in the Building Energy Rating software DEAP):

Floor Area (meter squared)	Solar Renewable Energy contribution Per Year
0-170	10kWh/metre squared
171-200	At least 1,700 kWh/year solar hot water
201-250	At least 1,850 kWh/year solar hot water
250+	At least 2,000 kWh/year solar hot water

The Solar renewable energy contribution per year must be verified by the solar water heating installation company before installation commences.

For example, a 4 person household with South facing solar collectors, no shading, mounted at a 45º angle:

- could install either a flat plate installation of 4 - 6m^2 or an evacuated tube installation of 3.2–4.8m^2
- The hot water demand of this household is approx 160 litres/day and the required cylinder volume can now be sized. Generally, for solar, the cylinder should be sized to accommodate approx 1-2 days usage, in this case 160 x 2 = approx. 320 litres.

Sizing and Design

- Is my house suitable for solar collectors? Collectors facing South will receive the optimum amount of energy. Generally, anywhere between 30- 45º is optimal for the tilt angle. Deviations from South to SE / SW will only affect output by approximately 5%, and even East/West systems are feasible. It is important to add the required amount of collector area to compensate for any expected reduction in energy due to mounting position, location, or for expected reductions due to possible sources of shading such as trees.
- Are solar installations exempt from planning? S.I. 83 of 2007 lists all the planning exemptions for renewable technologies in dwellings. They can be found at*:* http://www.seai.ie/Renewables/Microgeneration/Conditional_Planning_Exemptions/
- In short, total collector area must not exceed 12m^2 or 50% of the total roof area.
- Will the proposed installation comply with Building Regulations? If the works on your home fall under building regulations Part L 2008, then it is obligatory to produce a certain amount of energy using renewable technologies. Solar hot water systems can be used to meet or help meet this requirement. In addition to this, it is important to bear in mind that the dwelling as a whole, including the solar collectors, must meet all parts of the building regulations.

Equipment Specifications

- Is the collector registered for the Better Energy Scheme/Building Regulations Part L 2008? Go to www.seai.ie/betterenergyhomes
- Is it listed on the HARP database (Home Heating Appliance Register of Performance – for BER ratings)? Go to www.seai.ie/harp
- Does it have any quality assurance labels? For example, the Solar Keymark is a European quality label for solar collectors, further information can be found at www.estif.org/solarkeymark/regcol.php
- Is the cylinder sufficiently insulated? A pre- insulated cylinder is recommended, with a minimum of 50mm insulation thickness.
- Will the pipe loop between the solar collectors and cylinder be well insulated? Minimum recommended insulation thickness for the solar piping is at least the external diameter of the pipes. External pipe runs should be insulated suitably to protect against weather etc.
- Will the solar pipe loop be protected against overheating and excessive pressure? An expansion vessel is a device used to absorb pressure in heating systems. A correctly sized solar expansion vessel will ensure security during periods of high solar gain and Pressure Relief Valves (PRV's) will ensure that pressure will never reach unsafe levels in the system.
- How will the system be controlled? Sensors are mounted on the solar collector array and in the cylinder. When the controller detects that there is heat to be gained from the collectors, it switches on the circulating pump and allows the available heat into the cylinder. When the heat is used up, it switches the pump off again. Controllers should also display the amount of heat produced over a period of time.

Installation / Commissioning / Operation / After-sales and Service

- What qualifications and experience does the supplier/ installer have? Important considerations: Are references available for both the supplier and installer and is the installer registered with SEAI to install solar hot water systems : check www.seai.ie/betterenergyhomes
- How will it be ensured that the temperature from the cylinder will not be too high at the showers/taps? A thermostatic mixing valve must be fitted at the outlet of the cylinder. This device mixes cold water with the hot water from the cylinder to produce a lower temperature hot water "mix", which can safely be used in taps and showers. (This is important for all hot water systems, not just when solar is used)
- Has the supplier / installer set up the system to operate optimally and have they provided you with all the necessary instructions to understand the system and monitor it? User instruction manual in English and a full run through the operation of the system is useful.
- What is the warranty on parts / labour, and who do I contact for service / maintenance / troubleshooting / emergencies? Collectors should have a minimum warranty of 5 years.
- The solar water heating system must be installed to meet the technical specification of the grant, the solar water heating installation must contribute a portion of renewable energy for domestic hot water heating as detailed in the table below (these figures are calculated in the Building Energy Rating software DEAP):

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Costs / Payment / Payback

What will the system cost, fully supplied and fully installed: Solar hot water systems generally cost between €800 and €1,300 per m^2 of aperture area. The cost of a system has a significant effect on the payback time, as does the cost of the primary fuel used to heat the remainder of the water. It is therefore important to investigate a number of options, until you are happy with both service and price.