

# Homeowners: Introduction to Solar Heating

From RVR

## Introduction to Solar Heating

Solar panels (also known as "Solar Collectors") collect radiant heat from the sun and use it for one of two purposes. One type of collector works by directly heating your domestic hot water the same way the sun heats a glass of water sitting on the ground during summer. This is known as Solar Thermal. In Ireland, the most common meaning when people say "Solar Panels" or "Solar Heating" is Solar Thermal.

Another type of collector works by converting the sun's energy into electrical energy. This is known as Solar PV or Solar Photovoltaic.

There is plenty of sun in Ireland to heat water using Solar Thermal panels as they are very efficient. PV panels are rarely used however as they are still very inefficient.



Solar Panels on a roof

## How does Solar Heating work?

Almost all energy ultimately comes from the sun. Coal, Oil, Gas and peat are fossil fuels. These are the remains of plants which captured energy from the sun. The only exception is nuclear power which comes from the release of energy from matter itself.

The energy available from the sun annually is more than 10,000 times the energy consumed by the human race each year, and vastly exceeds the planet's finite supply of coal, oil, gas and uranium.

## Is the Irish climate suitable?

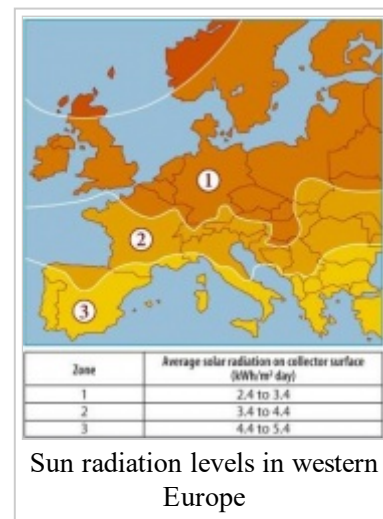
The amount of solar energy reaching the earth as measured in kWh/m<sup>2</sup>/day is known as the insolation level. Insolation levels in Ireland are about the same as in other countries such as France, Germany and Austria.

As one might expect, levels in Southern Europe are higher. In fact the insolation level reduces as the latitude increases. In other words, the amount of solar heat available reduces as one moves northwards.

Germany is one of the largest markets for solar heating in Europe with about 1 million m<sup>2</sup> being installed each year. German insolation levels are quite similar to Ireland.

Ireland typically receives about 2.6kWh/m<sup>2</sup>/day on average, year round. However, the best months such as May, June, July and August usually have average figures as high as 4.7kWh/m<sup>2</sup>/day as the sun is nearer the northern hemisphere.

In contrast, winter months are much lower as the sun is further from the northern hemisphere, with December having average insolation levels of just 0.7kWh/m<sup>2</sup>/day.



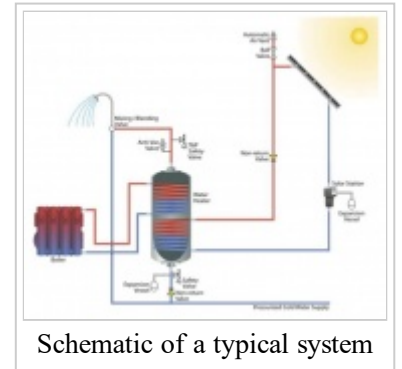
Sun radiation levels in western Europe

The American government agency NASA publish insolation information for all regions of the world. You can find this at the Nasa Surface Solar Energy Data Set (<http://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?uid=3030>) Web site if you are interested.

## How does a typical solar water heating system work?

As there are higher insolation levels during the summer months, solar must be used for a purpose which takes advantage of this. The best way for most households will be to use it for heating of the domestic hot water. This is the water that is used for washing, showering etc.

Typically a solar panel (often called a solar collector) is mounted so that it faces the sun. This can be on a roof or at ground level. The solar system contains a mixture of water and about 40% of propylene glycol (food grade antifreeze). We call this mixture the solar fluid. The reason we use this glycol mixture is that it prevents freezing in winter but also has a higher boiling point than water. This is useful as it allows the pump to circulate the fluid for a longer period than if water was used.



Schematic of a typical system

As the solar panel is warmed by the sun's rays, the solar fluid in the collector is heated up and is pumped through a coil in the bottom of a water heating tank. The solar fluid transfers its heat to the water in the tank as the solar fluid passes through the coil. It then returns to the solar panel to be re-heated. The water in the tank is heated and can be used for showering and other purposes.

Sometimes there will not be enough sunshine to heat the water to a sufficiently high temperature. Supplementary heating can be provided by a high efficiency gas or oil boiler, a pellet boiler, heat pump, solid fuel or electricity. A second coil is located in the top of the tank which will be connected to the supplementary heat source.

## How is a solar system sized?

The size of system you require depends on the number of people in the house and the demand for hot water. The average person will need to have about 60 litres of hot water stored for them to use per day. In this situation a 300 litre tank would store enough hot water for 5 people's daily usage.

If there were eight people in the house, the tank would need to be approximately  $8 \times 60 = 480$  litres, etc.

The number and size of panels varies from manufacturer to manufacturer but is linked to the size of the cylinder. A general rule of thumb is that about 1.5-2m<sup>2</sup> of collector will be used for every 100 litres. However, some manufacturers such as Calpak offer more compact panels with a higher output and these panels require less area.

## Further Reading

A typical Solar Heating System contains several different components.

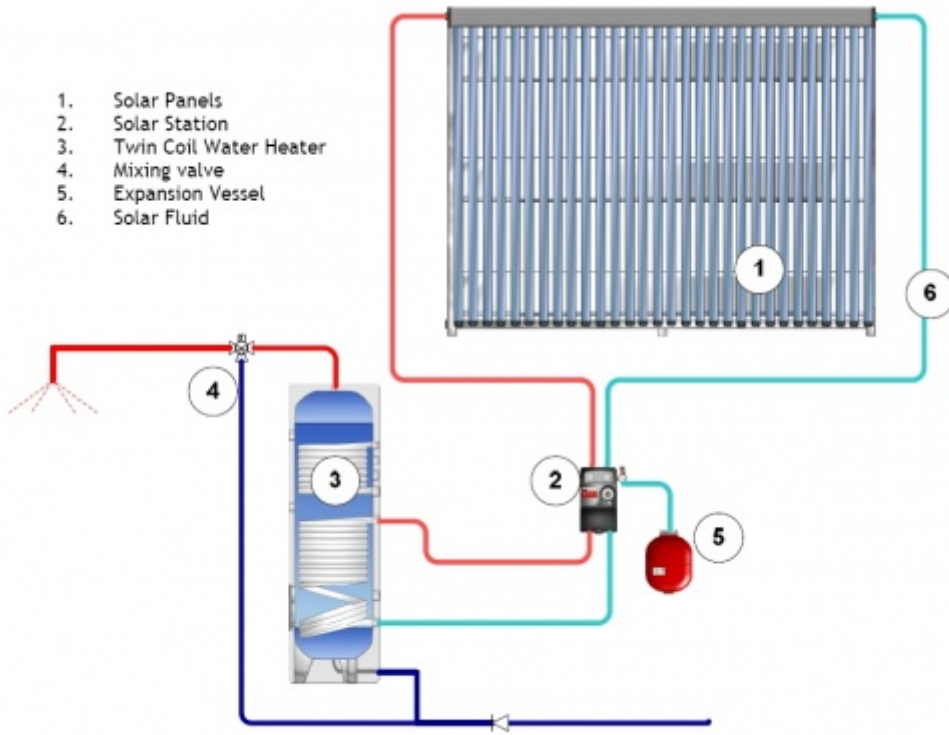


Fig. 1 - Typical solar water heating system

Continue reading about #1: The Solar panels here: [Homeowners:Solar\\_Panels](#)

Retrieved from "[http://www.rvr.ie:900/index.php?title=Homeowners:\\_Introduction\\_to\\_Solar\\_Heating](http://www.rvr.ie:900/index.php?title=Homeowners:_Introduction_to_Solar_Heating)"