

## Solar Thermal Systems

### *How do Solar thermal systems work?*

All types of solar thermal systems function similarly. Solar radiation hits an absorber surface, which converts this solar energy into heat. A heat transfer circulating fluid (e.g. water:antifreeze or air) cools the absorber and transfers the heat to a hot water cylinder or heating system.

Most Flat Plate and Evacuated Tube systems use a closed-loop indirect system. This means that the heat-transfer fluid flows through a heat exchanger in a hot water storage tank, heating the water to be used. The circulating fluid never comes into direct contact with the water.

Air Heating and Ventilation collectors can directly heat individual rooms or pre-heat the air passing into a heat recovery ventilator or through the air coil of an air-source heat pump.

### *How are the collectors set up?*

Solar panels are usually installed on the roof or integrated into the roof covering. They can also be wall mounted or free standing. They should be orientated between south-east and south-west at a tilt angle of between 25° – 45°.

### *What size should they be?*

A solar heating system used for domestic hot water heating should be sized so that no excess heat is produced in summer. A typical rule of thumb is 1m<sup>2</sup> of collector and 75-100 litres water storage per person.

Up to 40% of space heating can be supplied for a well insulated 120m<sup>2</sup> house by using 12m<sup>2</sup> of collector and 750L of hot water storage.

## Types of Collectors

There are 3 main types of solar collector, described below. These should comply with European Quality Standards EN12975 or EN12976.

### *Flat Plate collectors*

Flat-plate collectors are currently the most common collector type for domestic hot water heating. They consist of an insulated, weatherproof metal box with a glass or plastic cover and dark absorber plate with pipes to convey the heat transfer circulating fluid.



The transparent cover allows light to strike the absorber plate whilst minimising the amount of heat that can escape.

### *Evacuated Tube collectors*

Evacuated tube collectors consist of rows of parallel transparent glass tubes, each containing an absorber tube.

Evacuated tube collectors are more expensive and less robust than flat-plate collectors but they have a number of significant advantages:

- The collector efficiency remains high in cloudy conditions and low temperatures.
- The circular tube means that the sun is shining directly on the absorber for most of the day.
- Evacuated-tube collectors have the ability to heat water to higher temperatures than flat plate collectors.
- Evacuated-tubes can be added or removed as hot-water needs change.



### *Air Heating and Ventilation collectors*

Solar air heating systems use air as the heat transfer circulating fluid. They are used in conjunction with an integrated ventilation system or to heat individual rooms. They can also be installed with an air/water heat exchanger to heat domestic hot water in summer.



Air collectors produce heat earlier and later in the day than liquid systems. Some collectors have an integrated PV power supply to operate a fan blowing the heated air.

## What other components are needed?

The other main components of a solar thermal system are the hot water storage tank, pump and regulation and safety controls.

A DHW cylinder with two indirect coils is usually used. The lower coil transfers solar energy from the transfer fluid to the DHW water. The upper coil is supplied by a back-up boiler.



A control unit measures the collector and DHW cylinder temperature and starts a circulation pump when the collector temperature is higher than the cylinder temperature. A safety valve and expansion vessel balance pressure changes within the system.

## Maintenance and operation

A solar heating system requires very little maintenance. In normal conditions, rainfall ensures that the dust and leaves are removed regularly. Modern solar thermal systems have an average lifetime of 25 years or more.

## Renewable Energy & Energy Efficiency

Renewable energy combined with energy efficiency offers a viable method of minimising energy costs and counteracting the causes of climate change.

Different types of renewable energy technologies offer different benefits but they all use non-polluting and effectively limitless energy sources.

Energy efficient features can be easily incorporated into the building design and construction at minimal additional cost.

### Domestic Renewable Energy Grants

Sustainable Energy Ireland, through the Greener Homes Scheme provides grants to homeowners for renewable energy domestic heating systems.

Heating systems	Typical Lower Price	Typical Higher Price	Grant Available*
Solar Flat Plate	€800 / m <sup>2</sup>	€1,100 / m <sup>2</sup>	€250/m <sup>2</sup>
Solar Evacuated tube	€900 / m <sup>2</sup>	€1,300 / m <sup>2</sup>	€300/m <sup>2</sup>
Heat Pump - Horizontal	€13,000	€15,000	€2,500
Heat Pump - Vertical	€18,000	€21,000	€3,500
Heat Pump - Water Source	€12,000	€14,000	€2,500
Heat Pump - Air Source	€12,000	€13,000	€2,000
Biomass Stove	€2,000	€5,000	€800
Biomass Stove with Integral Boiler	€4,000	€8,000	€1,400
Biomass Boiler	€10,000	€16,000	€2,500
Wood Gasification Boiler	€10,000	€16,000	€2,000

\*from July 2008 - Phase III

Website: [www.sei.ie/greenerhomes](http://www.sei.ie/greenerhomes) : tel: 1850 734 734

## Your Local Energy Agency

The Carlow Kilkenny Energy Agency was established by Carlow and Kilkenny County Councils to provide sustainable energy information and services to the people of Carlow and Kilkenny, to local businesses and community groups and to the Local Authorities.

Impartial advice and information on energy efficiency, renewable energy and building energy rating is available by contacting the Carlow Kilkenny Energy Agency.



E-mail: [info@aiea.ie](mailto:info@aiea.ie)  
Website: [www.aiea.ie](http://www.aiea.ie)

**Carlow Kilkenny Energy Agency**  
(059) 9143871  
[www.ckea.ie](http://www.ckea.ie)

**CODEMA (City of Dublin Energy Management Agency)**  
(01) 4100659  
[www.codema.ie](http://www.codema.ie)

**Cork City Energy Agency**  
(021) 4941508  
[john\\_walsh@corkcity.ie](mailto:john_walsh@corkcity.ie)

**Cork County Energy Agency**  
(022) 43610  
[mallowre@eircom.net](mailto:mallowre@eircom.net)

**Donegal Energy Action Team**  
(074) 9172222

**Galway Energy Agency Limited**  
(091) 566 954  
[peter.keavney@galwaycity.ie](mailto:peter.keavney@galwaycity.ie)

**Kerry Energy Agency**  
(066) 7183576  
[wmoynihnan@kerrycoco.ie](mailto:wmoynihnan@kerrycoco.ie)

**Limerick Clare Energy Agency**  
(061) 234296  
[www.lcea.ie](http://www.lcea.ie)

**Mayo Energy Agency**  
(096) 76113  
[www.mayoenergy.ie](http://www.mayoenergy.ie)

**Meath Energy Management Agency**  
(01) 8358019  
[www.mema.ie](http://www.mema.ie)

**Midlands Energy Agency**  
(057) 5674351  
[mmacaulay@laoiscoco.ie](mailto:mmacaulay@laoiscoco.ie)

**Northern Ireland Energy Agency**  
(028) 90265997 - Belfast  
(028) 71273074 - Derry  
(028) 66328269 - Fermanagh  
[info@nienergyagency.org](mailto:info@nienergyagency.org)

**Tipperary Energy Agency**  
(052) 43090  
[www.tea.ie](http://www.tea.ie)

**Waterford Energy Bureau**  
(051) 395531  
[www.waterfordenergy.ie](http://www.waterfordenergy.ie)

**Wexford Energy Agency**  
(053) 9176555  
[www.wexfordenergy.com](http://www.wexfordenergy.com)



## Solar Thermal Systems

### Renewable energy heating systems



- Flat Panel Collectors
- Evacuated Tube Collectors
- Air Heating and Ventilation collectors
- Hot Water and Space Heating

Your Local Energy Agency



### Carlow Kilkenny Energy Agency

Tel No: 00 353 59 914 3871  
Fax No: 00 353 59 9143290  
E-mail: [info@ckea.ie](mailto:info@ckea.ie)  
Website: [www.ckea.ie](http://www.ckea.ie)  
Castlehill, Carlow, Co. Carlow