CLASP. Climate Change Local Area Support Programme

Planners' reference guide no. 9: Solar thermal

Introduction

Solar thermal systems turn solar energy into domestic hot water. They are mainly useful for houses, sports facilities, schools, hotels etc, which have a regular hot water demand in summer.

Solar thermal systems consists of the panels plumbed to a storage tank, and a pump (which may be powered by a small PV panel). This tank should be larger than conventional hot water tanks, at about 200 litres capacity for an average domestic house. The solar thermal system is typically isolated from the rest of the plumbing system, as the water in the panels will often contain antifreeze to prevent damage to the panels during the winter. The conventional hot water supply will pass through a heat exchanger in the tank, transferring heat without mixing with the water. A conventional boiler or other heat source is needed to 'top up' the water temperature during the cooler months. Some systems have been designed to work with combi-boilers, pre-heating the incoming feed, but these require the installation of a storage tank. In small new houses, space for a tank can be an issue.

Solar thermal panels work on the principle that materials with a dark colour absorb the heat from sunlight. The challenge is to transfer the heat from this material to water with high efficiency. There are two designs of solar thermal panel:

- 'Flat plate' panels are flat rectangular panels with a glass front and insulated on the sides and back. The collector material is inside the panel, with pipes running through it. The heat from the material is passed to the water running through the pipes. The insulation reduces the heat lost from the material to the surrounding air.

- 'Evacuated tubes' are long glass tubes about 10cm in diameter, with a strip of collecting material inside them. The tubes are made like a double glazed window or a vacuum flask, to retain the heat inside the collector. These tubes are set up as arrays, with several used in one installation.

Suitability

Solar thermal installation issues:

- Orientation: pitch facing between SE and SW and on a 30 - 40˚ angle is optimal
- Avoid shading (although not as critical as for PV)

- Weight on the roof
- Protection from frost

The main issue for occupants is the ability to use the hot water when it's produced. This means having hot-feed appliances (washing machine or dishwasher), and tank-fed rather than electric showers. The other factor to consider is managing the back-up heating system so that the boiler does not heat the tank every morning before any solar energy available can be used (i.e. the solar panel can be used to 'pre-heat' water during day, and the boiler is used as 'top up', which means less energy is needed to bring domestic hot water up to usable temperature).

Solar thermal systems may not be appropriate in combination with some other systems, particularly those that work best providing a baseload of heat such as combined heat and power or some biomass boilers.

Output, sizing and dimensions

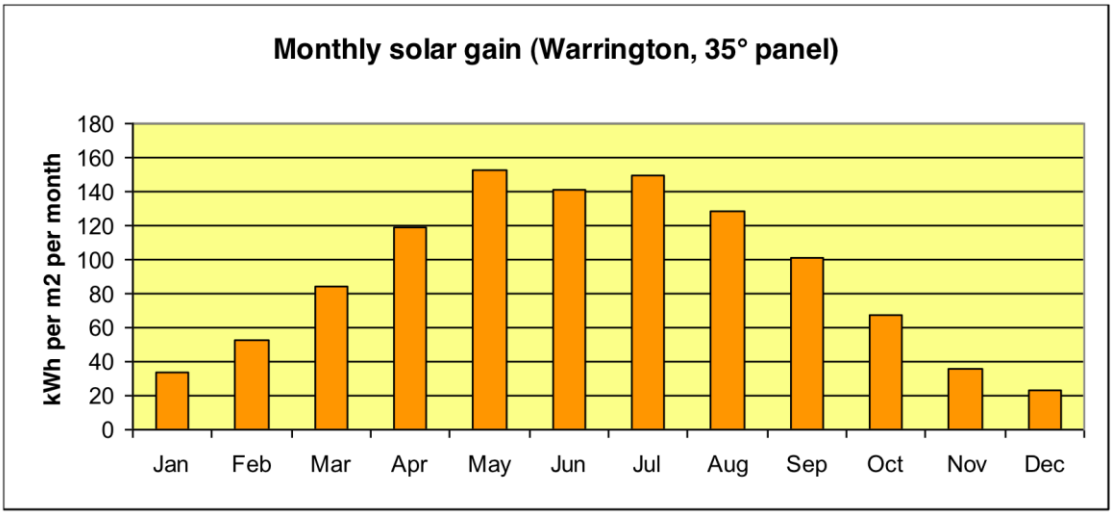
Solar panels should be sized to produce 40-60% of the hot water demand of the household or building. For commercial systems, the design should take into consideration the hot water demand profile of the building and match the peak solar hot water output to the daily summer demand.

Annual energy output: 500 – 800 kWh/m^2

Typical domestic system size: 2-4 m^2

Weight: 11-25 kg/ m^2

A typical output profile across the year is shown below



Cost and economics

Cost as at 2011: Typical capital costs for a domestic system: £3,000 - £5,000

Capital costs for commercial systems depend on the amount of plumbing needed but can range from £800 - £1200 per m^2.

Economically, solar thermal is unlikely to pay back within the lifetime of the equipment, without the Renewable Heat Incentive, if the alternative is an efficient gas boiler. They are much more viable when replacing electric heating, or with oil/LPG boilers.

Installation costs may reduce once the Renewable Heat Incentive is established.

Renewable heat incentive (RHI)

Non-domestic solar thermal systems installed by MCS-accredited installer will be eligible for the RHI payment of 8.5 p/kWh, provided the heat output is metered. The scheme is due to commence in July 2011 and payments can be made for eligible systems installed after July 2009.

Payments for domestic systems are expected to be introduced from October 2012, with an interim payment mechanism for eligible systems installed after July 2009.

Carbon savings

Carbon savings depend on the fuel replaced and the amount of *useful* energy generated, and savings calculations should take into account the hot water demand of the property as well as the theoretical output of the system and the CO_2 conversion factor of the fuel replaced. The highest carbon savings will be achieved when replacing electric heating.

Planning considerations

Domestic solar panels in the plane of a sloped roof on a house or outbuilding are permitted development as long as the system:

- Doesn't protrude > 200mm beyond the roof slope or wall surface
- Is kept below highest part of the roof (exc. chimneys)
- Is sited to minimise external impact on building and amenity of the local area
- Can be removed when no longer needed

In conservation area or world heritage site panels must be kept off walls forming the principal or side elevation of house or outbuilding and not visible from a highway.

A single ground-mounted solar system within a residential boundary is permitted development as long as it:

- Is below 4m above ground level and at least 5m from the boundary wall
- Is less than 9m2 area and less than 3m in any direction
- Is sited to minimise impact on amenity of local area
- Can be removed when no longer needed

Planning permission is needed for all listed buildings and grounds, flat roofs and commercial sites. This will take into account mainly the visual impact on the building and surrounding area.

Further information

Planning for Renewable Energy: A Companion Guide to PPS22 - http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable

Energy Saving Trust - www.energysavingtrust.org.uk/Generate-your-own-energy

Renewable Heat Incentive - www.decc.gov.uk/en/content/cms/meeting_energy/Renewable_ener/incentive/incentive.aspx

Microgeneration Certification Scheme - www.microgenerationcertification.org

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