

Digest

Renewable energy sources

How they work and what they deliver

Part 4: Solar thermal hot water systems

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Solar thermal systems are an established source of renewable energy for heating water. Working in conjunction with more traditional water heating systems, such as gas boilers, they can provide a significant proportion of a building's hot water needs. This Digest focuses on solar thermal systems in domestic buildings (ie dwellings), but the information provided may also be applied to equivalent non-domestic applications.

This Digest describes the different types of solar thermal system and how they operate. Installation requirements, including integration with the building's hot water system and the steps that should be taken to ensure their safe and efficient operation, are also discussed and methods for estimating their annual energy performance are identified. Reference is made to European Standards and certification schemes relevant to solar thermal systems to indicate the assurances that system owners and operators should expect. Financial incentives are also outlined.

This is one in a series of four related BRE Digests focusing on renewable energy technologies commonly used in domestic buildings. The other technologies covered include photovoltaics, wood fuels and electrically driven heat pumps. These publications complement an earlier series of BRE Information Papers^[1, 2, 3, 4] that cover the installation of renewable energy technologies.

Introduction

Solar thermal systems are designed to convert sunlight (solar radiation) into useable heat energy, usually in the form of domestic hot water. Solar collectors (also commonly referred to as 'solar thermal panels') are positioned where they will be exposed to the sun's rays. Generally speaking a heat transfer fluid and pump move the collected heat to a hot water storage tank, where it can be distributed throughout a building as it is required, although some systems are designed to circulate the fluid by convection and so do not incorporate a pump. Because the fuel source (in this case the sun) is not depleted by this process, solar thermal systems are considered a source of renewable energy.



Figure 1: A solar thermal installation

Traditional water heating systems commonly use fossil fuels as an energy source. Even boilers powered by electricity draw the required energy from sources currently dominated by fossil fuel power stations. Fossil fuels are carbon based; heat is generated through combustion, which also produces carbon dioxide (CO₂). The CO₂ is generally released into the atmosphere and is considered to be a 'greenhouse gas', which contributes to climate change.

In contrast, solar thermal systems produce no CO₂ during the conversion of sunlight to heat energy. Systems that use pumps to move the heat transfer fluid may use some fossil fuel-derived energy to create the kinetic energy required, although solar-powered pumps are sometimes used. Carbon-based fuels are also likely to have been utilised in the manufacture of system components.

Types of solar thermal collector and how they work

Solar thermal collectors will typically be one of two types: either flat plate collectors or evacuated tube collectors, each containing