

Digest

Renewable energy sources

How they work and what they deliver

Part 3: Electrically driven heat pumps

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This Digest describes the different types of heat pump system and how they operate. Installation requirements, including integration with the building's heating 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 heat pump 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 solar thermal hot water systems. These publications complement an earlier series of BRE Information Papers^[1, 2, 3, 4] that cover the installation of renewable energy technologies.

Introduction

Electrically driven heat pumps are devices that may be used to generate heat for domestic hot water (DHW) and space heating. They achieve this by extracting heat from environmental sources such as the air or the ground. The heat is transferred to a refrigerant circuit where compression raises the fluid's temperature and useful heat is extracted, providing an alternative to conventional (eg gas- or oil-fired) heating systems.

Since heat pumps consume a lower amount of electrical energy than the heat energy they generate, and exploit heat from the environment, they are generally regarded as a low-carbon renewable energy technology, and the higher the ratio of heat output to electrical power consumed (known as the 'coefficient of performance' or 'COP'), the greater the efficiency.

Heat pump installations use a variety of heat sources and adopt a range of configurations to suit the user. Heat can be extracted from the outside air, from water sources such as lakes or rivers, from the ground (using a buried collector) or from adapted



Figure 1: Installing a heat exchanger for a ground source heat pump

sources such as exhaust air. The generated heat output is then distributed from the heat pump as warm air or as warm water for storage or for circulation in a heating system. Heat pumps generally operate most efficiently when delivering heat at lower temperatures than traditional sources such as gas- or oil-fired boilers, and may require the use of special low-temperature heating delivery systems such as underfloor heating or low-temperature radiators that have larger heat exchange areas.