

Facts about Solar Energy: Solar Heating

Introduction

Harnessing energy from the sun holds great promise for meeting future energy needs because the sun is a renewable and clean energy resource. Fossil fuels will eventually run out and the future of nuclear power is uncertain. For these reasons, other energy sources need to be developed. Solar energy is one of these sources.

Solar energy is produced by the sun, which is a gigantic nuclear fusion reactor running on hydrogen fuel. The sun converts five million tons of matter into energy every second. Solar energy comes to Earth in the form of visible light and infrared radiation. Scientists expect that the sun will continue to provide light and heat energy for the next five billion years.



Solar Energy Potential

The amount of solar energy that strikes Earth's surface per year is about 29,000 times greater than all the energy used in the United States. The solar energy falling on Wisconsin each year is roughly equal to 844 quadrillion Btu of energy, which is about 550 times the amount of energy used in Wisconsin. Although the amount of solar energy reaching Earth's surface is immense, it is spread out over a large area. There are also limits to how efficiently it can be collected and used for heating.

Solar Heating

Solar energy used for heating is measured in Btu (British thermal units). There are two ways to use solar energy for heating. The first uses a solar collector to heat a fluid (e.g., water or air) and then pumps or blows the fluid through tubes or ducts to deliver heat where it is needed. The heat can also be stored in an insulated tank that holds a heated liquid or in heated materials like brick or stone. These systems are called active solar heating systems.

Residential active solar heating systems use rooftop collectors to capture sunlight. The collected heat is most often used for water heating, space heating, and for heating swimming pools. Some industries use active solar heating systems for manufacturing.

The second way to use solar energy for heating is to design buildings that capture solar energy and use it to heat the interior. Rooms called sunspaces or solariums, as well as greenhouses, can be built onto the south side of a home or building to collect solar energy. The building is often designed so that the warmed air from these spaces can naturally circulate to other rooms. Some buildings use brick or stone walls and floors to store solar energy for nighttime heating. These systems are called passive solar heating systems; they differ from active solar heating systems in that they do not use mechanical systems to collect or transfer heat.

Solar Heating Production

Active solar heating systems are used throughout the United States. Most of these systems were located in Florida, California, Arizona, Hawaii, and Puerto Rico, places that receive larger amounts of solar energy than most parts of the nation. In Wisconsin, solar heating systems produce less than one percent of the total energy used. However, using the sun for water heating is becoming more popular in Wisconsin.

Effects

Solar heating offers several benefits. Solar heating systems have minimal, if any, fuel costs. Passive solar heating systems have very low operating and maintenance costs, although costs for active systems are somewhat higher. Solar heating systems produce virtually no air emissions or waste. They can be built quickly and in many sizes. They are also easily adapted to the needs of rural and developing communities and are well-suited for communities with limited access to other energy resources.

One limitation of solar heating is that the sun is not available at night and is less available on cloudy days. Solar heating systems either need to store the heat they collect or use backup heating systems (e.g., a woodstove, an electric heating system, or a small oil furnace).

References:

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Outlook

The sun is expected to remain much as it is today for another five billion years. Because we can anticipate harvesting the sun's energy for the foreseeable future, the outlook for solar energy is optimistic.

The environmental benefits of solar heating and its ability to meet the heating needs of most homes and buildings make it an attractive alternative to using nonrenewable fossil fuels. The high cost of solar heating systems is the main obstacle. Reducing costs by mass-producing equipment, designing buildings that include passive solar energy features, and improving energy efficiency may help make solar heating systems more acceptable to consumers. Price increases in fossil fuels may also make solar heating systems more attractive.

In the near future, it is more likely that increased use of solar heating systems will occur in the southern and western parts of the United States where solar energy is plentiful. On the other hand, a number of homeowners and businesses in Wisconsin have already demonstrated that active and passive solar heating systems can adequately meet their needs. These systems may become more common in Wisconsin as fossil fuel supplies decline and the environmental advantages of solar heating become increasingly important.