

Solar Heat

Re-Energy Backgrounder



The Sun: Permanent Power

The Sun is the ultimate renewable energy source. Every day for billions of years the sun has been pouring out unimaginable amounts of energy. The Earth orbiting at a distance of 150 million kilometres from the sun, intercepts a tiny fraction of this solar output.

Light from the sun provides heat that drives atmospheric winds and ocean currents on Earth surface.



Photo courtesy of NASA

At the Earth's surface, incoming energy from the sun is absorbed by the land, water, and atmosphere, and converted into measurable heat. This heat acts like a giant engine, creating winds and currents in our atmosphere, oceans, and rivers. The sun's energy also keeps the Earth hospitable warm, a balmy plus 15 degrees Celsius.

Most of the sun's energy is emitted as visible light. The trick to using it as an energy source is being able to convert it from visible light into heat, electricity, or some other useful form. Most systems that capture solar energy convert it to heat or electricity, the two forms of energy we use the most.

As an energy source, the sun has a few limitations. Obviously, sunlight is available only during the day-time, and when it is available, sunlight may be hindered by clouds, dust, or pollution in the atmosphere, or by trees, buildings or other physical obstructions. Nonetheless, sunlight is a highly practical and clean source of energy in many places around the world.

Getting Heat from Sunlight

If you want to capture heat from sunlight, you will need three things: bright light, a surface or fluid that can absorb the light and change it into heat, and a way to store and use the heat once it has been produced. Most solar heating systems depend on at least two of these factors working together.

A good example is a greenhouse. Greenhouses are designed to allow sunlight in, and then trap heat so that young plants can get a head start in the growing season. The glass of the greenhouse lets in lots of sunlight, which is absorbed by plants, floor, soil, and other dark surfaces inside. As these surfaces absorb sunlight, they warm up, causing the air above them to get hotter. Because the greenhouse is an enclosed space, the heat accumulates inside the building.

Most greenhouses can get so hot in the summer that, without ventilation, the heat would eventually kill all the plants.

Concentrating Sunlight

To get the high temperatures needed to heat water or cook food, it is sometimes necessary to concentrate large amounts of sunlight on a small light-absorbing area. The most common approach is to use some kind of curved reflective panel. A reflector with a parabolic curve can easily concentrate enough sunlight on a very small spot to start a fire.

A parabolic reflector can produce extremely high temperatures when aimed at the sun.



Photo courtesy of Solar Futures International

Practical Uses for Solar Heat

Solar heat is one of the cheapest and most practical forms of renewable energy. Here are a few of the most common applications:

- **Solar heat water heaters:** The sun's light is an excellent source of hot water for home or commercial use, such as swimming pools, car washes and laundromats.
- **Cooking:** Simple solar ovens and cookers are used around the world in both commercial kitchen's and in people's homes. Solar cookers can be made with everyday materials such as cardboard and tinfoil.

- **Home heating:** Many homes are designed to take advantage of the sun to provide at least part of the heat required over the course of a year.



The black panels near the pool side are metallic heat exchangers that absorb solar energy efficiently, and this cost-saving energy to heat the pool.

Photo courtesy of Sun Ray Solar

Solar Hot Water Heating

Each of our homes uses quite a lot of hot water, usually supplied by a gas or electric hot water heater. These appliance can be expensive to run and they cause environmental impacts. A great way to make lots of free hot water for the home is with a solar-powered hot water heater. A solar hot water heater consists of a large, flat metal box mounted on the roof of a building. It contains a network of water pipes connected to the home's plumbing system. The metal lining and the pipes generate heat when sunshine falls on the box. The heat is carried away by water that flows through the pipes and then is stored in an insulated tank for alter use. The hot water can be used for laundry or showers, or it can be sent through pipes under the floor to heat a room or building. This system can supply some or all of the hot water needed by the home, which can make a big difference in monthly energy costs!



A solar cooker uses an insulated box and reflective panels to generate the temperatures needed to cook food. Photo courtesy of The Solar Cooking Archive

Solar Cookers

If you have ever stepped into a car that was parked outside a hot sunny day, you already know something about solar cookers! A solar oven works much like a mini-greenhouse, but with a few differences. The light-absorbing surface is enclosed in a tightly sealed, well-insulated box. Sunlight comes in through a pane of glass and is then absorbed and changed into heat by the black surfaces inside the box. Insulation around the box keeps the heat in. Reflective panels increase the amount of sunlight entering the box. When pointed at the sun, the temperature in a solar cooker can easily rise high enough to bake bread!

Home Heating

Many homes are designed so that they can meet at least some of their heating requirements from the sun's energy. Such homes have large south-facing windows (or north-facing if located in the southern hemisphere) that allow sunlight to heat up a room.

The houses insulation helps keep the heat in. This is called **passive solar heating**, because no pumps, fans, or other types of equipment are used. For example, the Toronto Healthy House derives 75% of its space heating needs from the sun.



Photo courtesy of the Canadian Mortgage and Housing Corporation.

Questions

1. What are some of the advantages of using sunlight as a source of energy compared to other sources, such as coal or nuclear energy?
2. What two forms of energy are most commonly produced using sunlight?
3. How does a solar "home" work?
4. List all the ways you and your family use solar energy. Include any solar powered appliances you may have in your home.