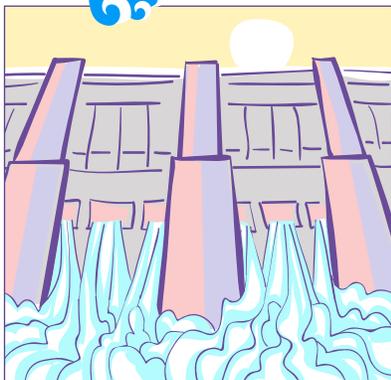


# Renewable Energy



## HYDROPOWER



"Hydro" means "water," so hydro-power is another name for water power. The power of running water can be used to produce electricity. Xcel Energy, for example, operates 27 hydroelectric power plants on or near the banks of rivers or streams.

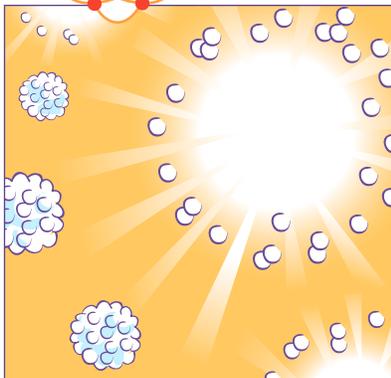
A dam traps the flowing water, creating a lake or pond. When the dam is opened, the water rushes out. The power of the rushing water turns turbine-generators, which produce electricity.

Sometimes natural waterfalls can also be used to make electricity.

Making electricity from rushing water is clean; it does not create air emissions. And we do not have to worry about running out of hydro-power. It is a renewable energy source. As long as rivers and streams continue to flow, we can use them to make electricity. But there are only so many places with water that we can use for hydropower, and most of them are already being used to make electricity.



## NUCLEAR FISSION

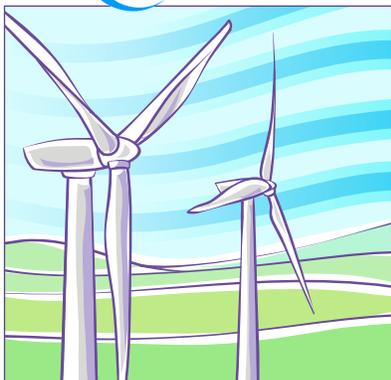


Nuclear fission is used to make electricity. "Fission" means "splitting apart." In a nuclear power plant, the atoms that form uranium - a mineral - are split apart, one after another after another. The splitting of millions of atoms creates a lot of heat. This heat is used to produce electricity.

The uranium used for nuclear fission is a common mineral around the world. And splitting atoms of uranium does not create air emissions. However, the material left over after the atoms are split is radioactive. That means that it gives off radiation that can be harmful to us. The waste material must be stored carefully since it remains radioactive for hundreds of years.



## WIND POWER

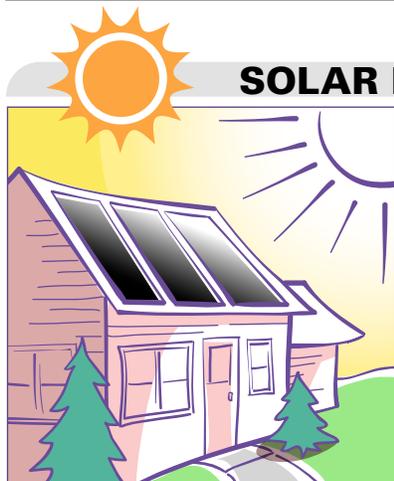


Wind has been used for energy for thousands of years. Wind powers sailboats. Wind turns windmills that pump water and grind grain. And wind can be used to produce electricity.

Strong winds can turn the blades of huge wind machines. The turning blades power turbine-generators to make electricity. Fields of wind machines are sometimes built in areas with strong winds.

Operating wind machines creates no air emissions. Since the wind just blows naturally, energy from the wind is renewable. Unfortunately, we cannot count on the wind always blowing. Constant winds at high speeds are needed, and they are not found in many places. Also, lots of land and frequent maintenance is needed for wind turbines, but the cost of wind power has come down, and is now competitive with other power sources.

# Renewable Energy

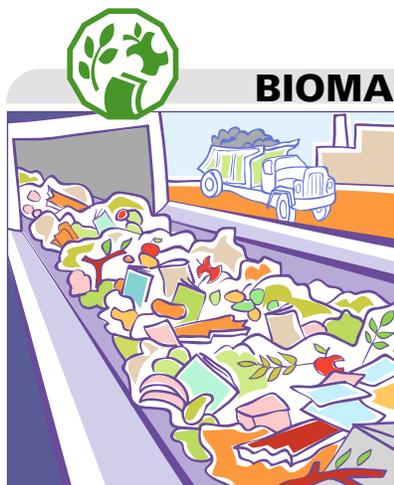
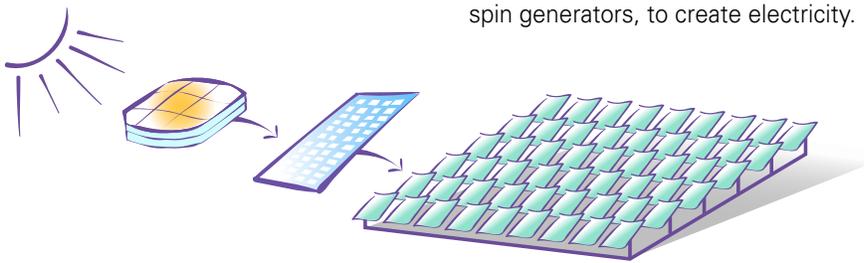


## SOLAR ENERGY

Energy from the sun is called solar energy. It can be used to heat the air and water in buildings. Black solar collectors, which are made of glass and metals, are put on roofs or next to buildings. Heat from the sun warms the water or air in the collectors, just like it heats water in a garden hose on a hot day. The hot air or water is used to provide heat or hot water for the building. At experimental solar power plants, many, many solar collectors are used to produce enough heat to create steam, which turns turbines to spin generators, to create electricity.

Solar cells can also create electricity. They are small, from less than an inch wide to just a few inches. When sunlight shines on a cell, a little bit of electricity is produced. Solar cells can be combined into solar panels, which may be put on buildings, or in large groups called arrays to create more power. They are used in devices such as cameras and calculators, on spacecraft, and in remote places where there is no other electricity.

Solar energy is clean and renewable. However, in some areas the sun does not shine brightly every day, and it doesn't shine at all at night. So we can't always depend on solar energy. The cost of solar cells is also high. This prevents solar energy from being used more often today, but that may change as costs come down, and the power of solar cells improve.



## BIOMASS CONVERSION

"Bio" means "life"; "conversion" means "to change." So bioconversion means changing matter from living things – or once living things – into energy. We've used bioconversion for years by burning wood for heat.

Today, we also burn trash and garbage for energy. At waste-to-energy power plants, paper, wood, food, and even some plastics can be burned to create heat to generate electricity.

Burning trash does produce air emissions, but not as much as burning fossil fuels. And we will probably never run out of fuel for waste-to-energy power plants; we have a lot of trash! But the trash does have to be sorted, since not everything burns.

Some waste can also be changed into liquid or gas fuels. When our garbage decays in landfills, methane gas is produced. Methane gas can be collected and used much like natural gas. Also, some plants and trees can be changed into liquid fuels. These fuels can be used to heat buildings and to run some cars. But the process of changing waste into fuel is expensive.

## NEW ENERGY

Some day we may use energy from sources that are experiments today. Hydrogen is used in fuel cells to power cars and other things. Tides in the ocean may provide energy for new power plants. Geothermal energy is created by heat from deep underground. Perhaps you will help to find new energy sources.

