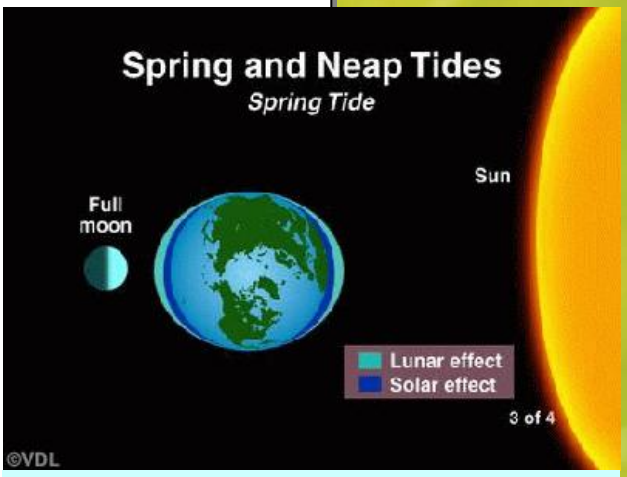
Energy from the Tides

Scientists and businesspeople want to develop renewable energy sources because renewable energy cannot be used up. Common types of renewable energy include solar, geothermal, and wind power. Another kind of renewable energy can be found in the tides.

The water level on ocean beaches changes over time. These changes are known as tides, which rise and fall twice a day. The tides are caused by the gravitational pull of the Moon, which orbits Earth. As Earth rotates, the Moon pulls the water in the oceans toward space. The oceans also pull out on the side of Earth opposite the Moon. The Moon goes around Earth once every approximately 29 days. The Earth makes a complete rotation on its axis every day. The tides are the result of the Earth spinning through the bumps in the oceans.



During a spring tide, Earth is pulled in both directions by the Moon and the Sun, resulting in large differences between high and low tides.

Renewable Energy from the Tides

The tides rise and fall twice a day, every day. The tides hold a great deal of kinetic energy. Tidal changes are particularly pronounced in narrow channels such as bays or estuaries. In the Bay of Fundy, Nova Scotia, the difference between high and low tide is as much as 16 meters.

Tides have been used to power mills and pumps for centuries. Using the tides to generate power had to wait until electricity generation was practical. In 1966, the first tidal electric power station opened at La Rance on an estuary in Brittany, France. The turbines in a tidal power station work in a similar way to those in a hydroelectric station, where water falling from a height causes turbines to spin, making electricity with generators. A tidal energy turbine can run either in one direction only or in two directions. Therefore, the turbine can operate either when the tide is coming in or when the tide is going out.

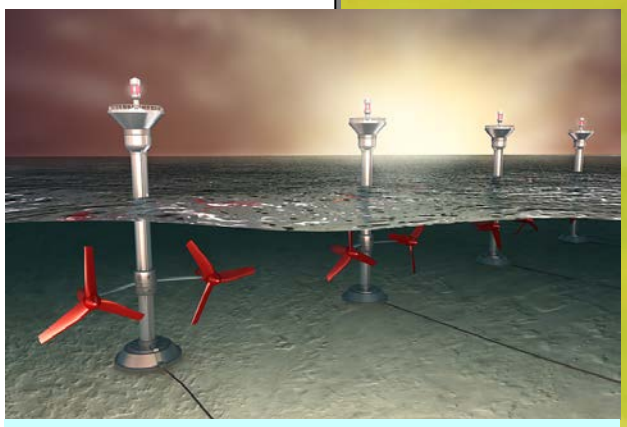

This tidal mill is located on the Morbihan Gulf in Brittany, France.

Energy from the Tides

There are four tidal power plants around the world today:

- La Rance Tidal Power Station generates 240 megawatts (MW) with an average tidal range of 8.55 meters.
- Kislaya Guba Tidal Power Station in Russia opened in 1968 and generates 0.4 MW with an average tidal range of 2.3 meters.
- The Annapolis Royal Generating Station in Canada opened in 1984 and generates 18 MW with an average tidal range of 6.4 meters.
- The Jiangxia Tidal Power Station in China opened in 1985 and generates 3.9 MW with an average tidal range of 5.08 meters.

Each of these plants uses a dam across the tidal flow and turbines that are very similar to normal hydroelectric turbines. To work effectively, a tidal power plant requires a large tidal range.



This artist's rendering shows tidal turbines spinning offshore.

The difference between high and low tides is relatively small compared with the amount of height in a tidal plant. Turbines in tidal power plants cannot work as well as they do in regular hydroelectric plants. Also, the current designs for tidal power plants require a dam, referred to as a tidal barrage, which can destroy fish habitats. For these reasons, new kinds of tidal power plants are being developed.

The Future of Tidal Power

Several kinds of new tidal power plants are under development. Most will not have a solid, fixed barrier, such as a dam. As a result, migrating marine animals will not be separated from their habitats. A disadvantage of tidal power is that the electricity has to move far away from the power plant to be used in a city, which is impractical. One idea is for the electricity generated in a tidal power plant to be used right at the plant. The power could be used to turn seawater into hydrogen fuel, which could be transported over large distances.

In May 2011, researchers conducted a 2-month trial of a tidal turbine in the Thames estuary, in London, England. A

renewable energy company wants to build an array of turbines there that could eventually supply enough energy to power 35,000 homes. For now, however, the company is focused on demonstrating that the turbines are both economically and environmentally friendly.