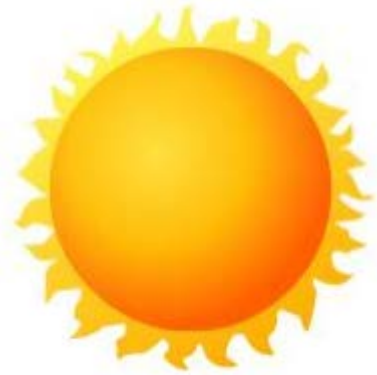


Renewable Energy

What Is Renewable Energy?

"Renewable Energy is energy that is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun, or from heat generated deep within the earth." – International Energy Agency (IEA) Renewables Information 2003.

Common forms of renewable energy include:



Solar

Capturing radiant energy from the sun to produce heat or electrical energy.

Wind

Converting the force of wind into mechanical or electrical energy.



Tidal, Wave & Marine Current

Converting the movement of water into mechanical or electrical energy.

Biomass

Burning organic matter such as wood, agricultural waste and other organic materials to produce heat energy. Methane gas can be produced from organic wastes.



Geothermal

Extracting natural heat within the earth for direct heating and/or to produce electrical energy.

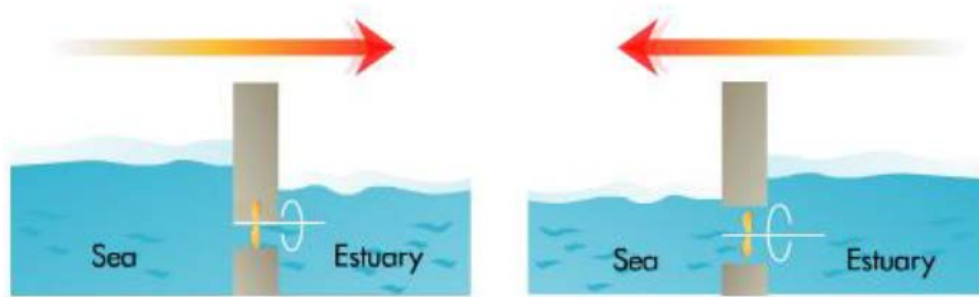
Hydropower

Generating electricity with falling water.



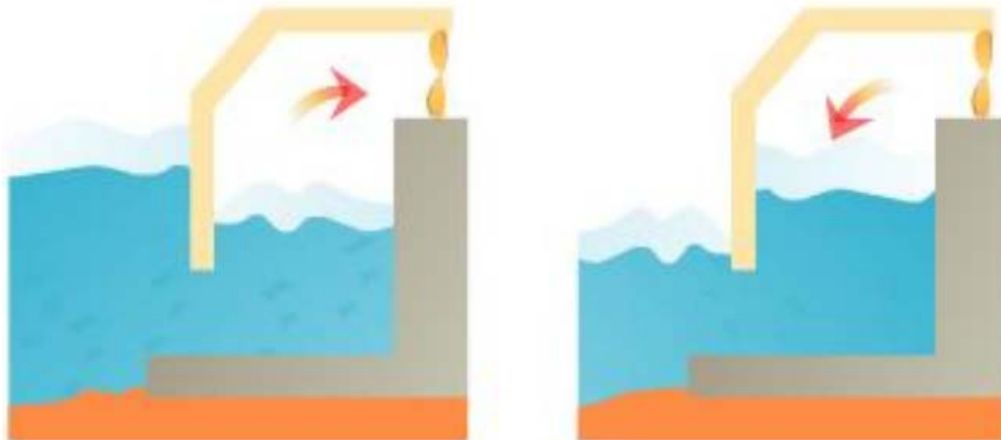
Types of Renewable Energy

Tidal Energy



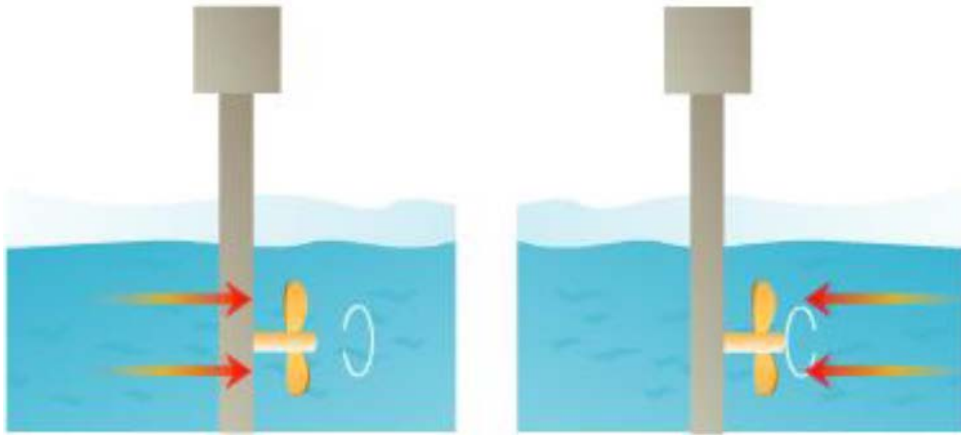
Gravitational attraction and the relative motions of the sun, moon and earth cause the surface of the oceans to rise and fall periodically. We can utilize high and low tides to generate electricity. During high tide, water flows into the estuary, turning the turbine and activating the generator. During low tide, water flows out the estuary, causing the same effect.

Wave Energy



Waves are driven primarily by wind. The interaction between wind and the surface of the sea will result in waves. Waves drive water in an air chamber to rise and fall, and the resulting airflow can turn a turbine to generate electricity.

Marine Current Energy



Marine current energy resources are mostly driven by tides. These can be harnessed to generate electricity. Marine current energy resources can generate electricity by forcing them to pass through underwater turbines comprising rotor blades and a generator.

Geothermal Energy



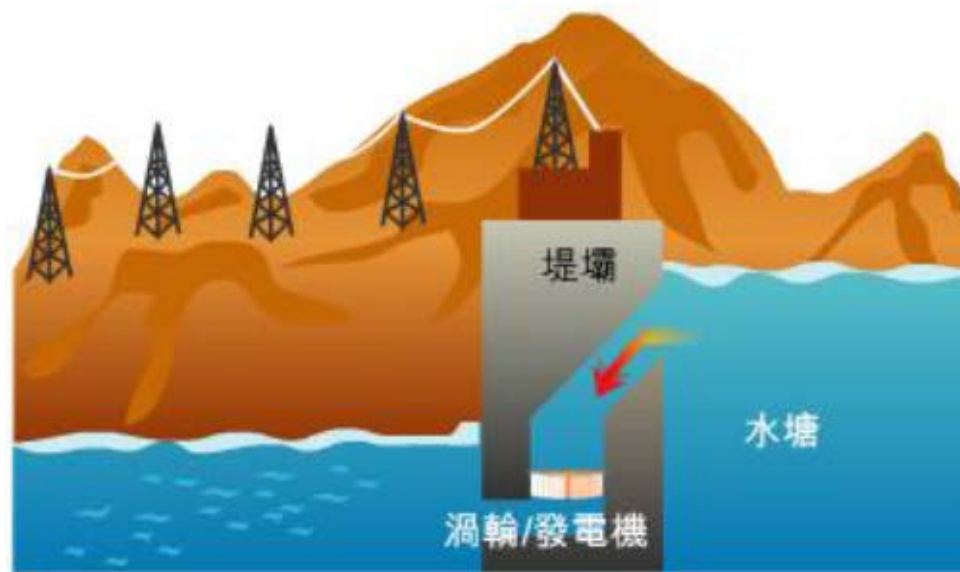
By tapping into the extreme heat of the earth's core and extracting hot water or steam, we get geothermal energy. Calculations indicate that the geothermal energy stored in the earth's crust is tens of thousands times that of the world's current oil and gas reserves.

Biomass Energy



Biomass energy is found in organic matter such as wood, plants and waste and can be used as fuel to generate heat and electricity. A simple example of biomass energy is burning wood for heat. Also, methane gas produced from organic waste in landfills can be used to generate electricity.

Hydropower



Hydropower is the harnessing of potential energy stored in water upstream from a dam. Water flowing downstream drives the turbine and generates electricity. As the construction of large-scale hydropower systems often impact on local populations, natural resources and wildlife, many experts regard only small hydropower systems as renewable.

Note: Detailed information about solar and wind energy can be found in other pages.

History of Renewable Energy

Ancient Times

Ancient Times

The use of renewable energy dates back several thousand years.



People learned to make fire from wood for light and heat.



Clothes/crop drying by solar radiation.



Farmers harnessed wind energy to power machinery for grinding and watering crops.

Industrial Revolution

Industrial Revolution

During the 19th century, some countries started using renewable energy to generate electricity.



First practical solar water heater was patented in the USA in 1891



A watermill near Kirkby, UK.
Credit: Jack Edmonson



Windmills for small electrical needs became common in the USA.
Courtesy: DOE/NREL

Modern Times

Nowadays, renewable energy is becoming more and more popular. Large-scale wind farms, hydropower stations and solar projects operate in many parts of the world.



Ponnequin Wind Farm,
Colorado, USA.

Courtesy: DOE/NREL Credit:
Gretz, Warren

Cascade house, 1 MW project
in Amersfoort, Netherlands.

Courtesy: IEA PVPS website:
<http://www.iea-pvps.org>
Copyright: Novem

Rental car powered by
100% biodiesel¹ (recycled
vegetable oil), Maui and
Oahu, Honolulu, Hawaii.

Applications of Renewable Energy in Hong Kong

Solar water heating

There are a number of installations for low-rise buildings in the New Territories. The largest system installed so far in Hong Kong is at the Sheung Shui Slaughterhouse.



Thin Film Photovoltaic (TFPV) System



HK Electric commissioned a commercial-scale solar power system with generating capacity of 550kW in July 2010. Because of its outstanding performance, HK Electric decided in 2011 to expand the system capacity to 1MW. The expansion was completed in March 2013.

Wind power

In early 2006, HK Electric began a new chapter in Hong Kong's electricity supply history with the launch of the city's first commercial-scale wind turbine. The wind turbine has a rated capacity of 800 kW.



Benefits of Renewable Energy

It is environmentally friendly

It is clean and mostly emission-free.

It is inexhaustible

Unlike fossil fuels, renewable energy can be replenished quickly. It can help slow down depletion of natural resources on Earth.

It does not require fuel

It comes from natural resources which can be used directly to generate energy or electricity.



Challenges of renewable energy

It can be unpredictable and unreliable

The availability of wind energy depends on sufficiently high and steady wind speeds, and the availability of solar energy depends on the presence of clear and sunny weather conditions.



Some applications require lots of land

For example, a wind farm that can generate 400 million units of electricity (about 1% of HK's annual electricity consumption) may require a land space of up to 4,000 hectares.

More expensive than traditional fuels

Renewable energy is not as investment-effective as conventional power generation because its construction cost is generally much higher while the utilization rate is lower.