

Renewable Energy Sources



Renewable energy or alternative energy is defined as energy which is collected through the utilization of resources which are naturally replenished in a reasonable timeframe and can be used again and again for the purpose of collecting energy (Quaschnig, 2016).

Renewable energy is used to generate electricity for thousands of people all around the world. Some countries such as Sweden completely rely on renewable energy sources for their electricity demand (Clean Technica, 2016). Apart from electricity, renewable energy sources are also used in cooling and heating purposes.

History of Energy Sources

The demand for energy has steadily risen since the 19th century. Ever since mankind discovered the amazing implications of the steam engine and how it can be used in place of horses to do the same work with much less effort, we have only moved forward and discovered more efficient ways to feed our demands for energy (EBSCO, 2016).

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Not until recently have we really understood the negative consequences of burning fossil fuels and so have directed our attention at cleaner, renewable sources to power our planet.

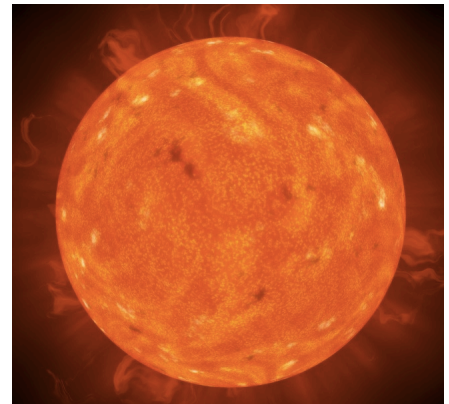
Solar Energy



The Sun:

The Sun and its power have always fascinated us. We have tried harnessing its power since the beginning of time, from using its heat to keep ourselves warm to using the light it produced to travel across the world. As the demand for electricity increased, scientists worked to discover a method through which the power of the Sun could be used to produce electricity.

In 1839, a nineteen years old French physicist named Alexandre Edmond Becquerel, observed a physical phenomenon which allowed the conversion of visible light energy to electricity using metal electrodes and electrolytes. However, the first commercial usage of solar energy did not begin until the late 1950s and currently solar energy only accounts for about 11% of the world's energy production (Sunlight, 2015).

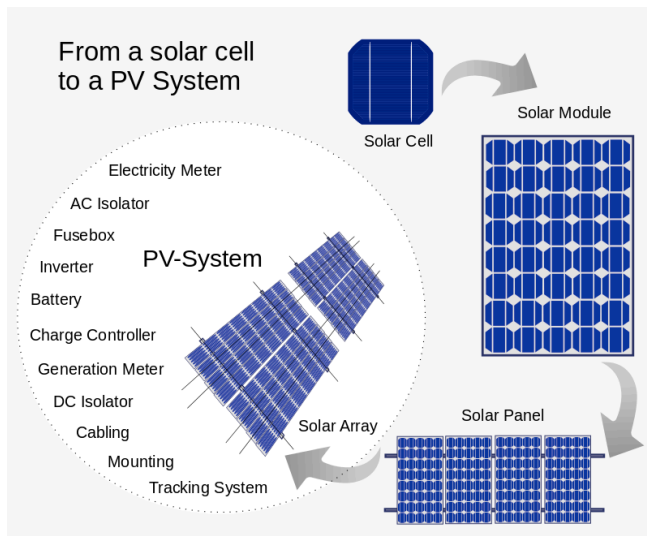


How it works:

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Flowing electricity (current) is produced by solar panels when light particles (photons) fall on the solar cells. These photons of light knock out electrons from the silicon atoms generating a flow of electrons (a flow of electrons = electricity) (Dhar, 2013).



Currently, solar panels are used all over the world in different ways such as providing electricity in remote off-the-grid areas (away from power lines) as well as allowing homes and office buildings to use less “grid” energy from the city. The use of solar energy also helps reduce the release of greenhouse gasses and therefore, helps combat the effects of climate change.

The use of solar panels in our daily lives will subsequently increase, as it is one of the most reliable and never ending sources of energy available. Furthermore, solar panels are continually improving to become more efficient, financially practical and available. Recently, a transparent form of solar panel has been invented which could be mounted over windows and other areas (Olewitz, 2015). The Sun provides more than enough energy to power our entire planet; we just need to figure out how to use it.

Reading Comprehension Questions

1. What is
2. What percentage of the world's energy demand is met using solar energy?
3. Electricity
4. Why

Extension Questions

5. Do you think the Sun is the future of energy production? Why or why not?
6. Given

For the next two questions, please go to the following site using the provided URL or the QR code.



<http://goo.gl/r0EzET>

7. Explain how solar towers generate electricity.
8. What main advantage do solar towers have over regular solar panels?

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Hydroelectric (Water) Energy



Hydroelectric Energy:

The power of water has been appreciated and used by humans for thousands of years with the first evidence of human use found in China during the Han dynasty somewhere between 202 BC and 9 AD. During this time, water wheels were used by people to hull grain, break ore and make paper (IHA, 2016).

The use of water in the production of electricity started in the later years of the 19th century with the invention of turbines. In 1849, James Francis, a British-American engineer, developed the modern turbine that is still in use today.

The first hydroelectric plant was developed in England in the year 1878. It was used to power a single lamp in a Cragside Country house in Northumberland, England.

Following its success, countries from all over the globe started using hydroelectric plants for producing energy. In 1893, the world's largest hydroelectric plant was built at Niagara Falls and was named the Edward Dean Adams Power Plant (IHA, 2016).

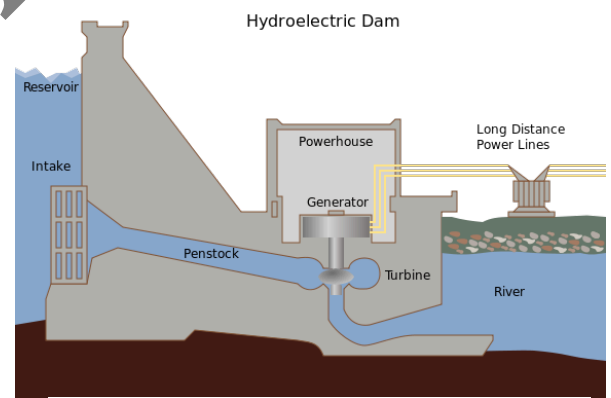


Photo by - Tomia

How it works:

Hydroelectric power harnesses the kinetic energy (energy of motion) present in moving water. This energy can be captured by placing a turbine in the way of the water flow. When the water flows from the higher to lower level, it is sent through a narrow channel called a penstock. The motion of the water down the penstock turns a turbine that rotates the shaft of the generator that

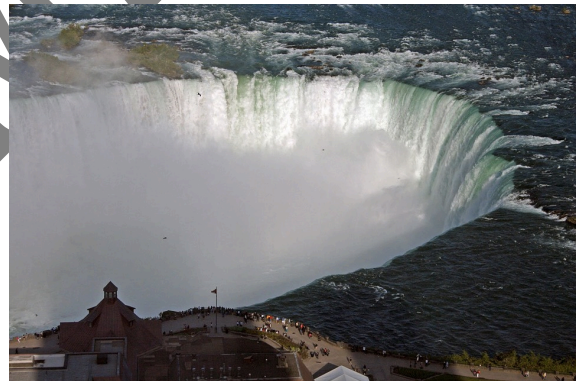
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Present Day:

Niagara Falls – Electricity was first generated from the Niagara River in 1893 when a 2,200 kilowatt power plant was built just above the Horseshoe Falls to power a nearby railway. Today, Niagara Falls generates power from both the Canadian and American side, producing more than 2.4 million kilowatts, enough to continually power 24 million 100 W light bulbs!



Niagara Falls, Canada



Hoover Dam, Nevada, U.S.A.

The Hoover Dam – Located just outside of Las Vegas Nevada, the Hoover dam produces an impressive 2,000 megawatts yearly and an average of 4.5 billion kilowatt hours, enough to serve 8 million people.

The Good and the Bad:

Although hydroelectric power is one of the most environmentally-friendly ways of generating electricity, building dams and reservoirs to store water for generating electricity diverts water

which can severely impact nearby towns, villages, wildlife habitats, etc. Furthermore, if the dam were to ever break, the nearby area would be flooded.

Despite the possible negative effects, the overall impact of hydroelectric power on the environment is positive, as it has helped reduce our reliance on fossil fuels for generating electricity. The significant upside is that the power of water is limitless as more than 70 percent of Earth's surface is covered in water which can be used to generate electricity.

Reading Comprehension Questions

1. What are two differences between renewable and non-renewable energy sources?
2. Who
3. What invention allowed us to produce electricity from the power of water, when did it occur and who invented it?
4. When
5. What is the name of the largest hydroelectric power plant built in Niagara Falls?
6. How
7. How

Extension Questions

For the next two questions, please go to the following site using the provided URL or the QR code.



<http://goo.gl/5hWiff>

8. Why are dams used?
9. What
10. Do you think hydroelectric power is the energy producing technology of the future? Why or why not?
11. Research the
12. The power of water can be harnessed in ways other than a dam. Research one other way that the motion of water is being used to generate electricity.

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Wind Energy



Wind Turbines:

In 5,000 BC, the Egyptians used the power of the winds to move their ships across the Mediterranean Sea. This was the first recorded use of wind energy. In 2,000 BC, the civilization of Babylon was the first to use windmills to grind grain, water crops and livestock and carry out other arduous tasks.

The familiar multi-blade windmills were invented in 1850 by the U.S Wind Engine Company and by the year 1889, there were more than 77 windmill factories in America. In 1890, wind turbines were first used to create electricity for homes and businesses. Wind energy business has seen considerable development over the last 80 years and today, wind energy accounts for approximately 4% of the global energy production (Dodge, 2014).



Windmill

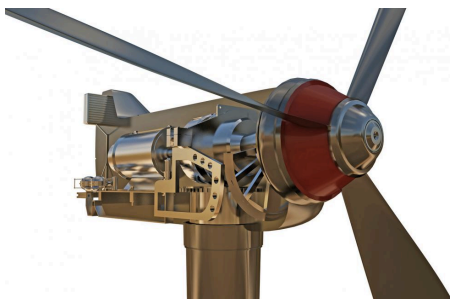
Windmill turbines are built in such a way that they are able to capture the maximum amount of wind in order to spin the blades. As the blades of the windmill rotate, the turbine inside spins, this rotates the shaft of the generator to produce electrical energy.

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How they work:



Wind turbines are engineering masterpieces with blades 50 – 60 metres (164 - 197 feet) long that can spin at 15-20 revolutions per minute and power between 1,500 and 3,000 homes each. They work by harnessing the power of wind to rotate a turbine; this turbine then rotates the shaft of an electric generator that converts the mechanical energy into

electrical energy. The applications of wind turbines are limitless as they can be built on any geographical location that has winds that are powerful enough to turn the blades. The wind energy is a renewable source of energy and produces no greenhouse gas in its operation.

Wind Farms:

A wind farm or wind park is a group of wind turbines in a certain location. They can have upwards of several hundred individual wind turbines or as few as a few dozen. Many wind farms are



located offshore so that they can take advantage of the strong winds found there.

Wind farms are located all around the world with some of the biggest in Germany, China and the U.S. Specifically, the Gansu Wind Farm in China can produce 6,000 megawatts of power and the largest offshore wind farm in California can produce 1,020 megawatts! In comparison, the largest nuclear

plant in Japan has a capacity of 8,000 megawatts and the largest fossil fuel burning plant produces 22,500 megawatts and is located in China.



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The Controversy:

A lot of controversy is associated with wind turbines, numerous people who reside near wind farms have complained that the wind turbines disrupt their local environment, kill migrating birds and cause noise pollution. Although their claims are in dispute, this fear can cause considerable hindrance in the successful implementation of wind turbines in new areas (Gray, 2010). Furthermore, wind farms take up an enormous amount of space, with hundreds of square miles needed for a large farm. However, most of that land is available for other purposes as the wind turbines themselves only take up approximately 1% of the land.

Reading Comprehension Questions

1. What
2. Other than sailing ships, what was the first use of windmills?
3. How
4. Why might farms use wind turbines to generate electricity?
5. What
6. How much more energy can the Japanese fossil fuel plant produce compared to the Gansu Wind Farm?
7. What

Extension Questions

For the next three questions, please go to the following site using the provided URL or the QR code.



<http://goo.gl/MOUXIA>

8. What

9. Why
10. How do bladeless wind turbines work?
11. What location near you do you think would be an ideal location for a wind farm and why?

Reading Comprehension Questions – Answer Key

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