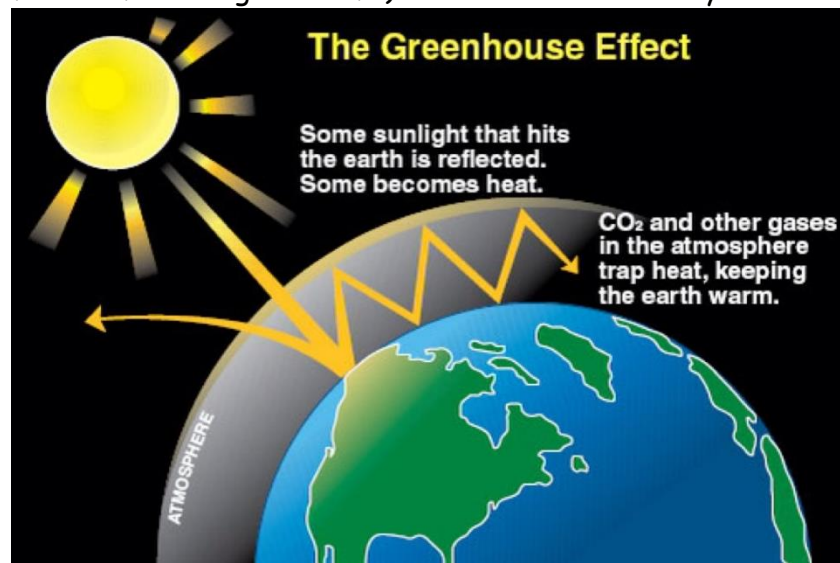
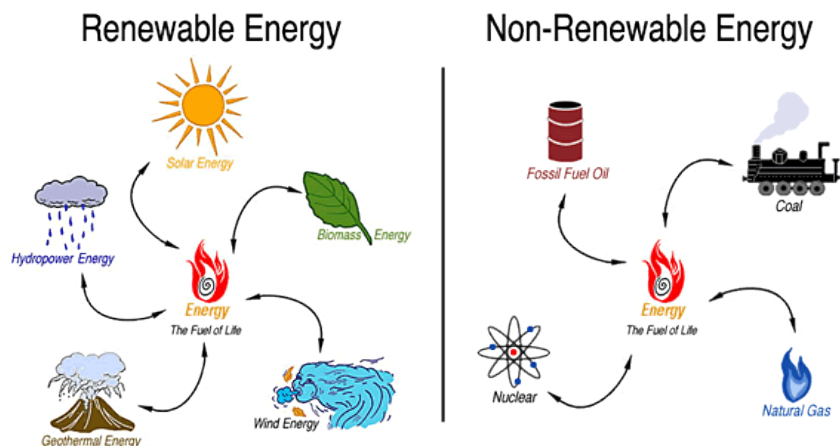


Energy Resources

Humans have been harvesting electricity and energy from natural resources for over a hundred years. This electricity is, or can be, used for almost everything we know today: from communication and lighting to cooking and transportation. However, not all electricity is produced in the same.

Energy resources are typically separated by how it is generated: *renewable* and *non-renewable*. **Renewable** energy resources generate electricity from sources that do not run out, or that can be renewed quickly. Hydropower generates electricity from moving water, which is very reliable - rivers rarely dry up, and tides and waves keep moving. **Non-Renewable** energy resources generate electricity from sources that cannot be quickly or easily renewed. Coal and petroleum take millions of years to form from dead life, and have limited amounts on Earth. Eventually these "fossil fuels" (energy sources formed from long-dead life) will run out with no way to renew them.

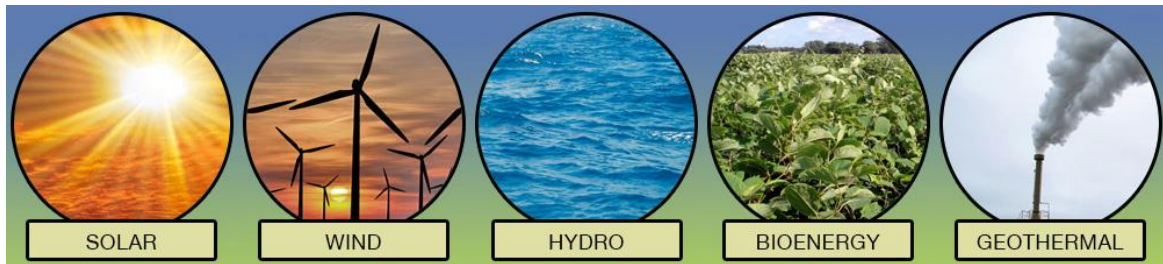


Another factor to think about with how electricity is produced is how each source affects the environment around us. Most renewable sources of energy do not emit **greenhouse gases**: chemicals in the air that capture sunlight and warm atmosphere. These are important because, with enough greenhouse gases in the atmosphere, it can become warm unnaturally, a process called **global warming**. *All fossil fuels release these chemicals when they are burnt*: coal, oil, petroleum, gasoline, and natural gas. Common greenhouse gases are carbon dioxide, methane, and water vapor. Furthermore, mining for certain resources, such as coal, can damage the environment.



Open-pit coal mine. Notice how there is no life in or near this mine.

Renewable Resources are resources that are renewed naturally within a human lifespan. The sun, wind, hydropower, bioenergy, and geothermal are all renewed so that people can use them again and again without them running out. However, some of these sources can be considered to be limited because of how they generate electricity: the wind isn't always blowing, the sun isn't always shining, and rivers can dry up. There are areas, though, that are known for their wind, sun, and water: Nevada and Texas are known for being sunny, and decrease the limits of solar power because clouds rarely block the sun in these areas.



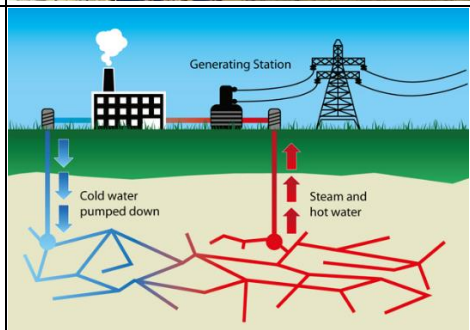
Wind energy produces electricity through the wind turning the blades on these towers. The blades spin turbines, producing electricity. This method works best in windy areas, and produces absolutely no carbon dioxide or methane.



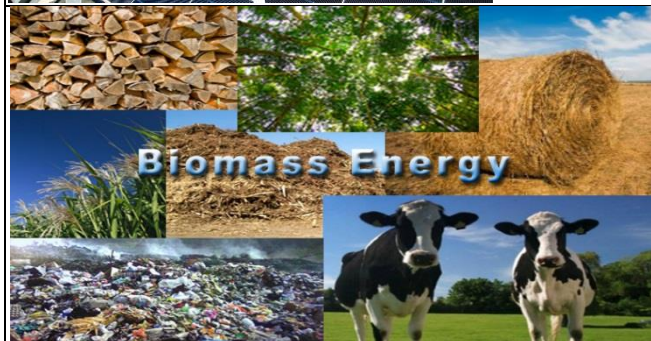
Hydroelectric energy, or hydro power, is generated by water moving through the power plant. Gravity always pulls water down, from the mountains to the sea, causing water to move. In the plant, moving water spins generators, which produce electricity.



Solar power produces electricity through solar panels converting sunlight directly to electricity. It is considered "clean" because solar panels passively produce electricity without releasing carbon dioxide or methane.

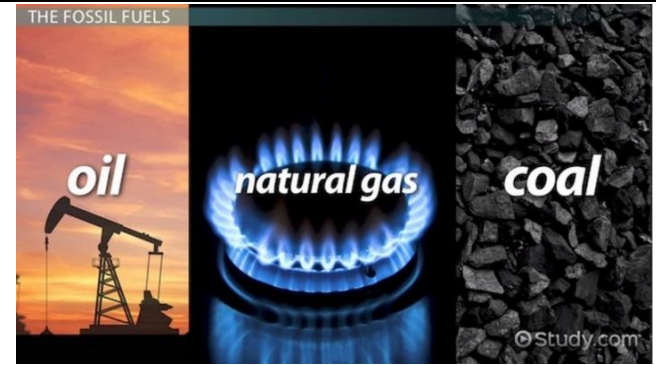


Geothermal energy can produce electricity by pumping water to hot areas in the Earth's crust. There, the water is heated to steam, runs up pipes to the surface, where it turns turbines and produces electricity.



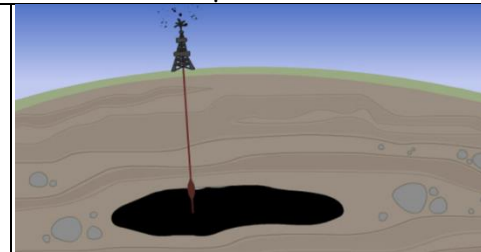
Biomass energy generates electricity through life: wood, corn, etc. This material can be burnt directly or rotted for methane, a fuel source. Cooking oils, such as vegetable oil, are normally generated from plants, and can be used as fuels in adapted engines: this means that some cars can run on the deep-frying oils used for french fries!

Non-Renewable Resources are energy resources that are not renewed as quickly as we use them, if they renew at all. Except for nuclear, these resources are produced quickly, easily, and cheaply, are relatively cost-effective, and pollute the environment: releasing greenhouse gases, causing global warming, and some release chemicals that cause acid rain. The production of these energy sources involves mining (coal and nuclear) or drilling (oil and natural gas), which can harm the areas around the production sites. "Fossil fuels" (oil, natural gas, and coal), formed from long-dead life, are limited in volume on Earth, meaning that one day these fuels will be used up. Nuclear is considered non-renewable because the radioactive materials used do not renew at all, but generates electricity in a unique way: unstable elements are mined and used to heat water, turning turbines to produce electricity. Nuclear facilities are large, expensive investments that pay out with electricity over time, so they are not as cheap, but have more fuel and potential than fossil fuels.



Coal is found underground, formed from the pressurized and heated remains of dead plants. It burns at high temperatures, which has been useful in transportation, transportation, and production of electricity. However, burning coal produces

significant amounts of carbon dioxide, a greenhouse gas, along with other pollutants, causing global warming and acid rain. Mining, as the picture shows, can remove any vegetation in the area. This means that coal is a very environmentally damaging energy source.



Oil, or **petroleum**, is produced by drilling a pipe into an oil-rich rock layer. Using various techniques, we can draw this oil up the pipe, and to the surface. Oil, like coal, produces plenty of carbon dioxide and pollutants when burnt, causing global warming and acid rain. Oil can leak from pipes and drill sites, which can cause more environmental damage and problems for life. Oil is what gasoline is made from: gasoline, when burned in cars, produces carbon dioxide.

Natural gas is a fossil fuel and a flammable gas, frequently used for lighting, cooking, and, more recently, vehicles. It is produced in a similar



manner to oil: we drill a pipe to rock that contains the natural gas, and we pipe it up. Natural gas is primarily composed of methane, and produces carbon dioxide when burnt. Natural gas is considered "clean" because, while it still causes global warming if it leaks or is burnt, it is not as polluting as other fossil fuels.

Nuclear power uses radioactive materials to heat up water. These materials are mined, but contain great amounts of radioactive energy, which is released



through fission: larger elements are split into smaller ones, converting mass into energy. While these carry some risk of the release of dangerous radioactivity, they are generally considered to be safe, and have potential for generating large amounts of energy.

Energy Questions

1. What is the difference between "renewable" and "non-renewable" energy resources?
2. Name the advantages of renewable energy resources.
3. Name the advantages of non-renewable energy resources.
4. Name the disadvantages of renewable energy resources.
5. Name the disadvantages of non-renewable energy resources.
6. Why are non-renewable energy resources considered finite?
7. What are some of the environmental concerns that can occur with non-renewable energy resources?
8. How does nuclear power generate electricity?
9. What causes global warming?
10. Name several ways to reduce greenhouse gas emissions.

Energy Sort: Place each type of energy source into the appropriate type!

Renewable	Non-Renewable

<u>Energy Sort Word Bank</u>				
Solar	Hydroelectric	Geothermal	Coal	Wind
Oil	Natural Gas	Nuclear	Petroleum	