PLTW Engineering

10-12/Alternative energy sources

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10-12/DE

Lesson: **5/21/2020**

Objective/Learning Target: Students will be able to explain the advantages and disadvantages of renewable and non-renewable energy sources.

Energy Sources

Renewable energy sources are naturally replenished in a short period of time; think of solar, hydro and wind power. Renewable energy sources account for about 13% of the energy generated in the world (in 2004).

By contrast, non-renewable energy sources are all the sources for energy that are not replenished naturally in a short period of time; think of coal, oil (petroleum), natural gas, propane and nuclear power (uranium).

Energy Sources

We call coal, oil and natural gas "fossil fuels" because they are created from the remains of animals and plants that died millions of years ago (hydrocarbons).

Most of the world's energy is generated through using non-renewable energy sources; in 2004, 87% of the world's energy was generated u sing non-renewable energy sources. Oil accounts for about 34%, gas accounts for 21%, and coal accounts for 25%.

Advantages of Renewable Energy Sources

Renewable energy sources offer many advantages to traditional (non-renewable) energy sources. The biggest one is that renewable energy sources do not derive power from the burning of fossil fuels.

By not burning fossil fuels, less pollution and carbon dioxide is released into the Earth's atmosphere. Another advantage is that these energy sources do not run out; they provide us with an endless supply of power. And, they also do not require the costs to drill for oil and gas, or dig for coal.

Critiques of Renewable Energy Sources

Criticisms of renewable energy include being unreliable.

While this is true to an extent (you cannot tap the sun's power if it is cloudy or dark), by designing for several renewable energy sources and storage options, you can minimize this limitation so that even if the wind is not blowing or the sun is not shining, you still have power.

Critiques of Renewable Energy Sources

Many people criticize renewable energy technologies as being unsightly (solar panels, wind turbines, dams), which may be viewed as a matter of personal preference.

Fossil fuel-burning power plants are not usually attractive either.

Uses for Renewable Energy Sources

By taking advantage of energy from renewable energy sources, homes can be built off the grid.

Being "off the grid" means that a house does not require electricity from a power plant or energy company. Instead, the house is designed to generate enough electricity on its own to meet its power needs. A true "off the grid" home does not use any water, power or sewer services from any public utilities. These homes have systems in place on site to provide clean water, electricity and waste water disposal.

Uses for Renewable Energy Sources

In some cases, the utilities are too far away to affordably access, or the home is not occupied year round (remote cabin or fire watch tower), or people do not want to be dependent on utility companies and their rising costs.

Others are concerned about the local and global environments and strive to reduce their dependence on non-renewable energy sources that can cause many adverse environmental effects. For example, the citizens of Scandinavia have come to rely heavily on wind power rather than fossil fuels.

What are the financial differences?

Some states provide financial incentives to encourage homeowners who are connected to the grid to incorporate renewable energy technologies into their homes as a way to save the costs and environmental consequences of utility expansion, which would require having larger batteries to store more power on site.

Quiz yourself

1. What is the difference between *DC* and *AC* electricity? Identify some common sources of each type of electricity.

2. Suppose you are building a cabin far away from electric power service, but you desire to have electricity available to energize light bulbs, a radio, a computer, and other useful devices. Determine at least three different ways you could generate electrical power to supply the electric power needs at this cabin.

Quiz yourself

3. Where does the energy come from that causes a battery to be a source of electricity for powering electrical devices?

4. Ultimately, what is the energy *source* of a battery?

5. Is it possible to make an electrical battery that lasts forever, and never becomes exhausted? Explain why or why not?

Helpful links

[Renewable energy lecture on youtube]

[USA Department of Energy – Clean Energy information]