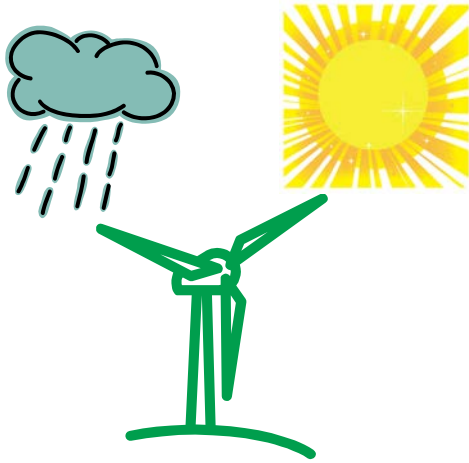


Objective sight words (consumption, terrain, integral, orbit, originated, contemporary, remote); concepts (sustainable, renewable, photovoltaics, gasification)



Vocabulary	
consumption	originated
terrain	contemporary
integral	remote
orbit	

Sustainable Energy Sources

By: Sue Peterson

What are sustainable energy sources? Sustainable energy sources are often regarded as including all renewable sources (naturally replenished) such as sunlight, wind, rain, and geothermal heat. Included in this definition is electricity and heat generated from solar, wind, ocean, hydropower, biomass (energy from plants), geothermal (energy from inside the earth), and biofuels and hydrogen derived from renewable resources. These resources usually also include technologies that improve energy efficiency. Fossil fuels are not considered sustainable energy sources because human consumption of fossil fuels creates a decrease in this type of fuel, not a constant or continual growth.

Solar Energy. The Latin word for sun is “solar” and thus solar energy is a powerful source of energy coming from the

sun. For billions of years, the sun has produced energy. It is estimated that the sunlight that shines on the Earth for one hour is capable of meeting the energy demands of the whole world for an entire year! Can you imagine that?

Solar energy can be converted into other forms of energy, most commonly heat and electricity. John Herschel, a British astronomer in the 1830s, used a solar collector box to cook his food while on an African expedition exploring differing terrain. Today, people use solar energy as an integral part of their lives and for all sorts of things ranging from heating water in homes to space heating in buildings, from drying farm products to generating electrical energy, and even heating their swimming pools!

Photovoltaics is the process of using solar energy directly to make electricity using specific devices. Electricity can also be produced indirectly from steam generators which use solar thermal collectors in heating a working fluid. How does solar energy actually work? The sun's light is harnessed by passive solar systems for heating or cooling buildings, flat plate solar collectors, and solar concentrator power systems. The sun's heat is used to create steam, which then turns a turbine to produce electricity.

The drawbacks to solar energy are the large area required for collection and the manner in which it comes to the surface of the earth.

Wind. Wind is classified as sustainable because wind will continually be produced as long as there is the sun shining on the Earth in orbit. Wind is caused by the uneven heating of the earth's surface by the sun. Today, wind energy is used to generate electricity.

The modern use of wind turbines originated in the 17th century when the Dutch used wind power to recover

hundreds of thousands of acres of land by draining the Rhine River Delta. For the next 300 years, this design was used to pump water, grind grain, and to saw wood. Now, through advances in the fields of aerodynamics and composite materials, modern electric power generating turbines was invented. These machines vary in size from as small as one meter to a hundred meters in rotor diameter, and from 100-1000 kilowatts in power output.

Wind energy cost is determined by the cost of installing the wind turbine and the amount of energy produced. The use of wind-generated electricity is growing around the world.

Biomass. Organic material which has stored sunlight in the form of chemical energy is considered biomass. This type of fuel includes wood, wood waste, straw, manure, sugar cane, and additional byproducts from a variety of agricultural processes.

By undergoing the process of photosynthesis, the chlorophyll in plants with the help of the energy of the sun converts the carbon dioxide from both the water and air from the ground into carbohydrates (complex compounds composed of carbon, hydrogen, and oxygen). When these carbohydrates are burned, they change back into carbon dioxide and water to release the sun's energy.

In addition to the typical process of burning, biomass can be changed into liquid fuels or cooked in a process called "gasification" to make combustible gases. Scientists are exploring which crops in these contemporary times are best suited for energy generation. More efficient and cleaner ways to use biomass are also being studied.

Hydropower. Hydropower is a clean, renewable energy source which converts kinetic energy from water (acting as

potential energy that is stored) into electricity by turning a turbine.

The amount of available energy in water is determined by the flow of the water and the fall of the water. This is one of the oldest sources of harnessing a source of energy by humans. In fact, water wheels were used over 2000 years ago.

Electrical power can be generated from the oceans in the forms of tidal power, wave power, ocean thermal conversion, ocean currents, ocean winds, and salinity gradients.

Most of these have a disadvantage. Specific to note are the river-based hydroelectric dams that have been known to upset the natural wildlife of the region. Tidal-based hydroelectric plants can cause widespread wildlife problems as the time span between low and high tides is disrupted, and boats are left stranded in low tides.

Geothermal Energy. Geothermal energy, heat from the earth, is used as an efficient heat source in small applications like greenhouses. This heat energy can be found almost anywhere from the dirt in our own backyards to remote wells in countries like Indonesia.

In most cases, mineral water is heated from the earth. Using geothermal energy is affordable, sustainable, and a good choice for the environment.

Practice

Language Work

A. Write the words.

consumption _____

integral _____

sustainable _____

renewable _____

photovoltaics _____

gasification _____

B. Use each word in a sentence. Underline the word used.

terrain _____

_____.

orbit _____

_____.

contemporary _____

_____.

remote _____

originated _____

C. Phonics work. What does the Latin root “terr” mean in the beginning of the word “terrain” found in the text, and in other words like terrestrial, territory and terrace?



Mercury, Venus, and Mars are **terrestrial** planets because they are closest to the Earth in density and composition.

D. Puzzle. Unscramble the different forms of sustainable energy to spell a sentence about this energy.

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1	2	3	4	5	6	7	8	9	10	11

12	13	14	15	16	17	18				

1	14	19	19	20	21	

22	23	24	25	26	27	28				

29	30	31	32	33	34

Multiple-Choice Questions (Put an X in front of the correct answer.)

1. What causes wind?

- ☐ a. The sudden change in temperature during the day.
- ☐ b. The clouds moving in circles in the atmosphere.
- ☐ c. The uneven heating of the earth's surface by the sun.
- ☐ d. All of the above.

2. According to the text, solar energy is used for all of these reasons

except _____.

- ☐ a. heat for homes
- ☐ b. space heating in buildings
- ☐ c. drying of farm products
- ☐ d. heating saunas
- ☐ e. heating swimming pools

3. According to the text, biomass includes _____.

- ☐ a. wood and wood waste
- ☐ b. straw, sugar cane and manure
- ☐ d. lake, stream and river water
- ☐ e. byproducts from agriculture

Extended Response (Answer in complete sentences.)

1. Select **one** form of sustainable energy described in the text. Write a summary of this type of energy. Include a definition and the advantages/disadvantages.

2. Why is sustainable energy so important?

3. Look up the word “sustainable” in a dictionary. What types of things are sustainable besides energy? Explain your answer.

Answer Sheet

Answers for Matching, Multiple-Choice Questions, and Extended Response

Sustainable Energy Sources

Phonics work

The Latin root “terr” means earth.

Puzzle

sunlight, wind, rain, geothermal, ocean, hydropower, biomass, biofuels,
hydrogen

Sustainable sources supply ongoing energy.

Multiple-Choice Questions

1. d

2. d

3. a,b,e

Extended Response (Accept reasonable answers.)

1. The student selects one form of sustainable energy, summarizes this type of energy (including a definition, and advantages and disadvantages).
2. Sustainable energy is important to maintain as there is always a constant source of energy available which can be tapped when needed.
3. The student researches the word “sustainable” and then writes other things besides forms of energy that are sustainable.