

STEM *Sims*™

Energy Land



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**Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.**

Start learning right now about renewable and non renewable energy. Take the following brief quiz to see how much you already know about energy sources. See the bottom of page 4 to check your answers.

1. How long are the blades on the largest wind turbine in the world?
 - a. 100 inches (the diagonal of a home theatre TV)
 - b. 100 feet (the length of two basketball courts)
 - c. 100 yards (the length of a football field)
 - d. 100 fathoms (the length of a ship's cable)
2. The amount of sunlight that the Earth's surface receives every hour could power the entire world for:
 - a. one hour
 - b. one day
 - c. one month
 - d. one year
3. Which geographical region is responsible for the most geothermal energy?
 - a. The Pacific Ring of Fire
 - b. The Bermuda Triangle
 - c. The Formosa Triangle
 - d. The Arabian Tectonic Plate
4. Which renewable energy process can convert garbage (food scraps, cardboard, leaves, plastics, etc.) to energy?
 - a. hydroelectric
 - b. biomass
 - c. geothermal
 - d. solar
5. How much potential energy is stored by the ocean waves off of the coasts of the U.S.?
 - a. 252 kilowatt hours per year
 - b. 252,000 kilowatt hours per year
 - c. 252 million kilowatt hours per year
 - d. 252 billion kilowatt hours per year



Waste to Energy

Can common waste like food scraps be used to create energy? Decay can be okay if it is put to good use. Conduct the experiment below to determine the best homemade recipe for natural gas to be used to create energy.

Supplies Needed:

- a packet of dried beans
- bowl (for soaking beans)
- three clear plastic bags
- water

Instructions:

1. Soak sixty beans in water for ten hours (or overnight).
2. Place twenty beans into each bag.
3. Squeeze out any air and then seal each bag.
4. Put one sealed bag directly in the sun, another sealed bag in a warm shaded area, and the last sealed bag in a totally dark place for a week.
5. After seven days, record your observations.



Questions:

1. Which of the bags (if any) inflated?
2. How could gas produced by decay be used as a source of energy?
3. What types of gases do you think are produced by decomposing beans?
4. Why might biomass gas be better for the environment than typical hydrocarbon fuels?

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Why Renewable Energy?

There are pros and cons to every single type of energy source. Some of the benefits and drawbacks are environmental, some are financial, and some are political. Energy sources are either nonrenewable (petroleum, natural gas, coal, nuclear) or renewable (biomass, geothermal, hydropower, solar, wind). Scientists estimate that we will run out of oil in 2052, natural gas in 2065, and coal by 2155 at our current rate of usage. Furthermore, burning hydrocarbon fuels like petroleum and coal releases an overwhelming amount of carbon dioxide (a greenhouse gas) into the atmosphere. However, because the technology required to utilize nonrenewable energy sources has been around longer than the technology for renewable energy sources, such as solar power, the cost is significantly less.



Unfortunately, cost is not the only downside to renewable energy technology. Burning biomass, for example, produces air pollution. While geothermal power plants emit very little carbon dioxide or sulfur, the circumstances required to harness geothermal energy limits the supply, as does government protection of sites like geysers in national parks. Hydropower sources (like the buoy pictured to the left) produce clean electricity but can impact the ecology like fish migration, natural temperatures, and more. Even though solar energy is clean, the supplies needed to create photovoltaic cells are toxic. Wind power produces clean electricity but the wind turbines have been associated with the deaths of a number of flying animals including birds and bats.

Unfortunately, the negative effects of nonrenewable energy sources are irreversible. The greenhouse effects due to the overabundance of carbon dioxide cannot be undone; all we can do is work hard to lessen our continuous output and preserve as much of our atmosphere as possible. Green engineers are

attempting to achieve this goal by looking to alternative forms of energy that have less environmental impact as well as making sure that the energy we are already using is being used efficiently.

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Answers: Page 2 Answers: 1) c. 2) d. 3) a. 4) b. 5) d. Page 3 Answers: 1) the bag in the sunlight 2) gas can be burned to create energy 3) decomposing beans release methane and carbon dioxide 4) Burning natural gas like methane is better for the environment because less carbon dioxide is produced than with typical hydrocarbon fuels because methane's heat of combustion is lower.

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