

Renewable and Non-Renewable Energy (Focus: Geothermal)

Students will learn about the pros and cons of different renewable and non-renewable energy sources. Students will then take a closer look at Geothermal energy to learn how it works and what it is used for.

Grade Level: 6th

Phenomena:

What type of energy is most commonly used in Nevada?

Objectives:

- Students will differentiate between renewable and non renewable energy.
- Students will compare the pros and cons of different energy sources.
- Students will analyze the factors present in Nevada which allow for geothermal energy production.
- Students will create a poster with information about a specific energy source.

Materials:

- Information books and handouts on the different energy sources
- Student handouts with websites for different energy sources
- Poster paper and markers for energy presentations (1 poster per group)
- Map of energy plants in Nevada
- U.S. Geothermal map

Appendixes:

- Energy Resources Pgs. 6
- NV Energy Renewable Sources map pg. 6

Time Considerations:

Preparations: 55 minutes

Lesson Time: 60 minutes

Introduction: 5 minutes

Activity 1: 5 minutes

Activity 2: 30 minutes

Activity 3: 10 minutes

Conclusion: 5 minutes



Next Generation Science Standards

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Science and Engineering Practices (SEP):

Engaging in Argument from Evidence

Disciplinary Core Ideas:

Human Impacts on Earth Systems

Crosscutting Concepts:

Cause and Effect

Excellence in Environmental Education Guidelines

Strand 1—Questioning, Analysis and Interpretation Skills (C,G)

Learners are able to locate and collect reliable information about the environment or environmental topics using a variety of methods and sources. Learners are able to synthesize their observations and findings to coherent explanations.

Strand 2.4—Environment and Society (A)

Learners understand that human-caused changes have consequences for the immediate environment as well as for other places and future times.

Strand 3.1— Skills for Analyzing and Investigating Environmental Issues (A)

Learners are able to use primary and secondary sources of information, and apply growing research and analytical skills, to investigate environmental issues, beginning in their own community.

Background

Energy is the ability to do work. There are many different sources of energy that we use everyday. For example, humans get the energy we need to move around throughout the day from the food we eat. Plants get their energy from the sun. Cars get energy from gasoline and TVs get their energy from electricity which is often produced by burning coal.

Energy sources such as solar, wind, coal, and natural gas can be categorized either as being a renewable or a non-renewable energy source. Renewable energy does not have a limited supply, but can be used again and again without running out. Examples of renewable energy are: hydroelectric, solar, wind, and geothermal energy. Non-renewable energy comes from sources that cannot be easily

replenished within a few decades. Examples of non-renewable energy sources include: natural gas, oil, coal and nuclear power.

In Nevada, major non-renewable energy sources are jet fuel used at the airports and military bases, and natural gas power plants. A handful of coal and hydroelectric plants also exist but much of Nevada's power comes from solar and geothermal sources. Nevada ranks second in the nation for geothermal production after California with 16 existing geothermal operations and several more awaiting approval. The word geothermal means "earth heat." In geothermal plants thermal energy from the

earth is harnessed to heat water that powers steam turbines. The energy from these turbines creates electricity that is carried to homes and other buildings for our use.

Tell students that the lesson will focus on different types of energy and where it comes from.

Preparation

Collect articles, posters, books and other resources on natural gas, oil, coal, nuclear, water, wind and solar energy

Print out copies of student internet resources

Create a poster for Nuclear energy as an example.

Activity 1: Renewable and non-renewable

Explain that there are many different sources of energy that we use. The recent trend has been toward using renewable energy sources. These different sources of energy can be categorized into renewable and nonrenewable. What is renewable energy? What is non-renewable energy?

Have students open their notebooks and write down their own definitions of renewable and nonrenewable energy.

Doing the Activity

Introduction:

Ask the students to define energy. Answers will likely include examples of energy and "what we need to do stuff."

Explain to the students that their examples all have something in common. The scientific definition of energy is the ability to do work.

Discuss with students what type of work we use energy for. (powering cars, lights, factories, heating water, cooking, growing food, etc.)

Ask students where energy comes from. Yes, we get electricity from power plants, but how do the power plants get it?

Write the examples of energy sources that students provide on the board.

After students have done this individually allow time for them to discuss what they wrote down in groups and compare their definitions.

Come back together as a class and discuss the different definitions/ideas groups had. Come up with a class definition:

Renewable energy:

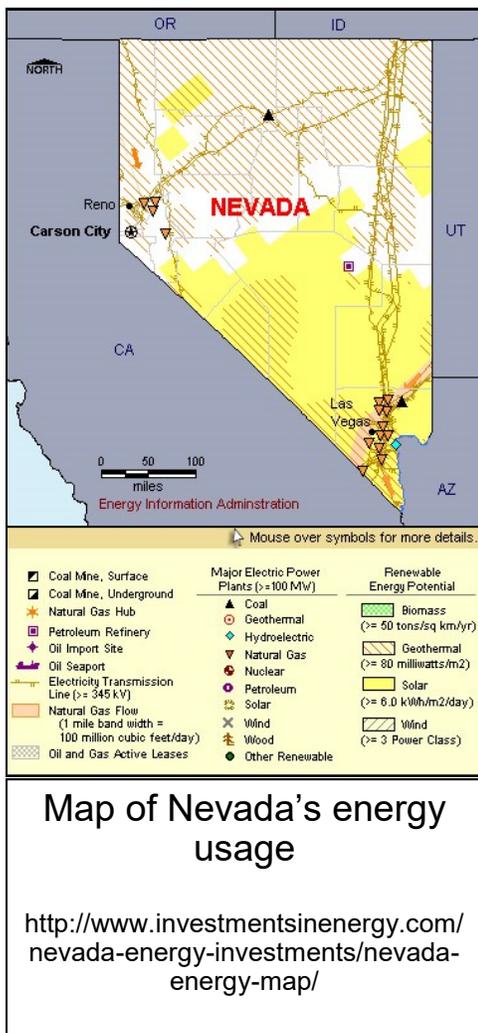
Energy from sources that do not have a limited supply.

Nonrenewable energy:

Energy from sources that cannot be replenished within a few decades.

Ask the students which of the energy sources on the board are renewable.

Have the students list the class examples of renewable and non-renewable energy sources by



the corresponding definition in their notebooks.

**Activity 2:
Taking a closer look**

Tell the students that they will be researching some different energy sources and evaluating the pros and cons of each.

Divide the class into six groups. Assign each group one of the following energy sources (Natural gas, Oil, Coal, Water, Solar, and Wind).

Give the students about 15 minutes to research their energy source and discover:

- * Where and how it is used
- * Whether it is renewable or non-renewable
- * 2 pros and 2 cons of using their energy source.

Ask the students to prepare a poster and a short presentation using their research to teach the class about their energy source.

Give an example using nuclear energy (use prepared poster)

Pass out resource materials: poster paper/ markers.

After 15 minutes, call the class back together and have groups share their findings. Clarify/add information as needed.

**Activity 3:
Geothermal Energy**

After all groups have shared their energy sources, ask students which sources they think we use most in Nevada.

Tell students that while Nevada uses natural gas, coal, and



Geothermal Power Plant in Iceland
<http://www.economicdevelopmenthq.com/blog/wp-content/uploads/2012/08/geothermal-power-plant-i01.jpg>

hydroelectric power we lead the nation in solar potential and are second in the country in terms of geothermal power.

Ask the class what geothermal energy is and where it comes from. (Thermal energy in the earth)

Ask the students: How do we harness geothermal energy? (Collect the heat and use it to power steam turbines) and Why do you think it is common in Nevada and California? (Thinner crust due to tectonic movement)

Show the thermal map of the United States and ask for observations (Students should notice that the western United States has much more geothermal heat than the eastern US).

Briefly discuss the role of tectonic activity and geographic features that create and display geothermal activity (for example,

plate boundaries, hot spots, geysers, hot springs). Explain how steam can be used to drive a turbine in order to produce electricity.

Conclusion

Ask students to decide whether they think geothermal energy is renewable or nonrenewable and generate some pros and cons for using this energy source.

Ask the students to think about the energy sources everyone researched and determine which they would use to power a city in Nevada and why. The students may write a few sentences of explanation in their notebooks and a few may be chosen to share.

Assessment

Students can be assessed using their posters and presentations as well as the responses recorded in their notebooks.

Have the students spend more time researching geothermal energy.

Extensions

Organize a field trip to a geothermal power plant or have a geothermal power plant worker come into the classroom and give a presentation.

Design and build a model of a house that uses renewable energy sources.

Vocabulary

Energy: The ability to do work

Renewable Energy: Energy source which does not have a limited supply. Renewable energy sources can be used again and again, and will never run out

Non-renewable energy: Energy that comes from sources that cannot be replenished in a short period of time.

Geothermal energy: Energy derived from the heat in the interior of the earth

Solar Energy: Energy harvested from the sun's light and heat

Hydroelectric power: Energy from the motion of water used to power turbines.

Wind energy: Energy collected by using the motion of the wind to power turbines.

Fossil Fuel: Hydrocarbons extracted from the earth's crust and burned for energy.

Sources

- "2009 Status of Energy in Nevada". <http://energy.state.nv.us/documents/2009-Status-of-Energy-in-Nevada.pdf>
- "Energy Kids." U.S. Energy Information Administration. <http://tonto.eia.doe.gov/kids/index.cfm>
- "Energy Story: Where Do Fossil Fuels Come From?" California Energy Commission. 1994. <http://www.energyquest.ca.gov/story/chapter08.html>
- "Geothermal Energy" <http://www.energy4me.org/sources/alternative/GeothermalEnergy.htm>
- "Geothermal Energy Facts." *Geothermal Education Office*. <http://www.geothermal.marlin.org/pwrheat.html#6>
- ""Nevada Quick Facts." U.S. Energy Information Administration. http://www.eia.gov/cfapps/state/state_energy_profiles.cfm?sid=NV
- "Where does Energy Come From." Pennsylvania Department of Environmental Protection. 2011. http://www.portal.state.pa.us/portal/server.pt/community/energy/13947/where_does_energy_come_from_/588853

ENERGY RESOURCES

General:

- http://www.portal.state.pa.us/portal/server.pt/community/energy/13947/where_does_energy_come_from_/588853

Natural Gas:

- http://tonto.eia.doe.gov/kids/energy.cfm?page=natural_gas_home-basics
- <http://www.energyquest.ca.gov/story/chapter08.html>

Oil:

- http://tonto.eia.doe.gov/kids/energy.cfm?page=oil_home-basics
- <http://www.energyquest.ca.gov/story/chapter08.html>

Coal:

- http://tonto.eia.doe.gov/kids/energy.cfm?page=coal_home-basics
- <http://www.energyquest.ca.gov/story/chapter08.html>

Water:

- http://tonto.eia.doe.gov/kids/energy.cfm?page=hydropower_home
- <http://www.energyquest.ca.gov/story/chapter14.html>

Solar:

- http://tonto.eia.doe.gov/kids/energy.cfm?page=solar_home-basics
- <http://www.energyquest.ca.gov/story/chapter15.html>

Wind:

- http://tonto.eia.doe.gov/kids/energy.cfm?page=wind_home-basics
- <http://www.energyquest.ca.gov/story/chapter16.html>

NV Energy's Renewable Energy Sources

