

Teacher's Guide

Wyoming Energy Ag-tivity Map

WYOMING STATE FACTS

Discuss local, state and possible national significance of Wyoming state facts. Identify locations using a physical map.

Wyoming State Facts	
Capital.....	Cheyenne
Nickname.....	Big Wyoming, Equality State, Cowboy State
Motto.....	"Equal Rights"
Admitted To Union.....	July 10, 1890-44th State
Size.....	97,914 square miles, 9th largest state
Highest Point.....	Gannett Peak, 13,804 feet
Lowest Point.....	3,100 feet Belle Fourche River
Average Annual Precipitation.....	14.5 inches
Population (2006 quickfacts.census.gov).....	515,004

Wyoming Content Standards :

SOCIAL STUDIES:

TIME, CONTINUITY AND CHANGE - *Students demonstrate an understanding of the people, events, problems, ideas, and cultures that were significant in the history of our community, state, nation and world.*

- **SS4.4.1** Students identify significant local, state and national persons, holidays, and symbols.

PEOPLE, PLACES, AND ENVIRONMENTS - *Students demonstrate an understanding of interrelationships among people, places, and environments.*

- **SS4.5.1** Students use physical maps, political maps, and globes to identify locations using scale, cardinal and intermediate directions, legends, keys, and symbols.
- **SS4.5.3** Students locate major landmarks, landforms, and areas/regions in the community and in Wyoming.

WYOMING ENERGY FACTS

- The Powder River Basin, most of which lies in northeastern Wyoming, is the largest coal-producing region in the Nation, accounting for approximately 40 percent of all coal mined in the United States.
- Many Midwestern and Southern States are highly or entirely dependent on Wyoming's coal supply.
- Wyoming is one of the top natural gas-producing States in the Nation.
- The Southeastern Wyoming Corridor is one of the most favorable locations for wind power development in the country.
- Western governors are pursuing a 1,300-mile high-capacity power line that will allow Wyoming and other Rocky Mountain States to transmit as much as 12 thousand megawatts of electricity to California.

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- **SS4.3.1** Students describe the importance of major resources, industries, and economic development of the local community and Wyoming.

- **SS4.3.2** Students describe different ways that people earn a living in the local community and in Wyoming.

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WYOMING ENERGY- MAP

Have students create their own “KEY” and have them plot the information on the Wyoming map.

Additional energy information can be added to this activity map.

Petroleum

Wyoming typically accounts for roughly 3 percent of annual U.S. oil production. The State has five oil refineries, which lie in the southern and eastern parts of the State. Wyoming’s total petroleum consumption is low, and refineries deliver much of their product to markets in neighboring States. The Green River Formation, a group of basins in Colorado, Wyoming, and Utah, contains the largest known oil shale deposits in the world. Wyoming’s oil shale deposits, concentrated in the Green River and Washakie Basins in the southwestern part of the State, contain an estimated 300 billion barrels of oil; equal to about one-fourth of the world’s proven oil reserves.

Natural Gas

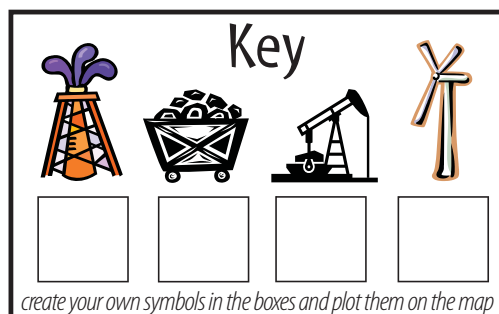
Wyoming is one of the top natural gas-producing States in the Nation and typically accounts for almost one-tenth of U.S. natural gas production. Drilling activities take place throughout the State, but most of Wyoming’s production comes from fields in the Greater Green River Basin.

Recovery of coalbed methane from coal seams in the Powder River Basin has grown rapidly since the late 1990s and now accounts for about one-fifth of State natural gas production. Wyoming is the third leading coalbed methane producer in the United States, after Colorado and New Mexico.

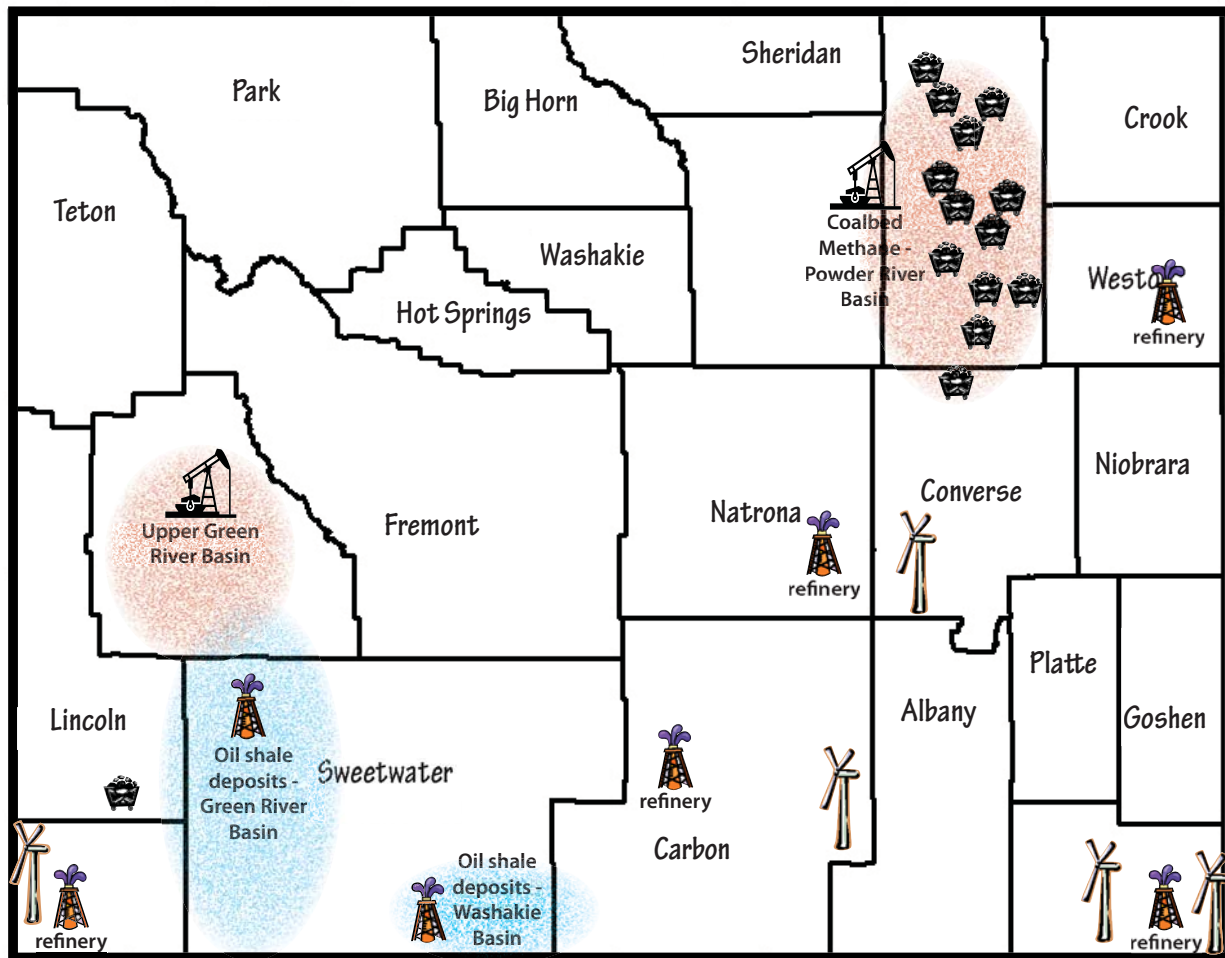
Coal, Electricity, and Renewables

The Powder River Basin in northeastern Wyoming is the largest coal-producing region in the Nation, accounting for nearly two-fifths of all coal mined in the United States. Powder River Basin coal seams are thick and facilitate surface mining, making extraction easy and efficient. As a result, the price of Powder River Basin coal at the mine mouth is less than that of coal produced elsewhere in the country. Powder River Basin coal also has lower sulfur content than other coal varieties, making it attractive for electricity generators that must comply with strict emission standards.

Coal-fired power plants dominate Wyoming electricity generation. Small hydroelectric facilities and a growing number of wind farms also contribute to the electric power grid. Although most of Wyoming’s wind power facilities are in the southeastern part of the State, its largest wind facility is situated in the southwest corner of the State. State electricity demand is low, and Wyoming exports electricity to neighboring States.



WYOMING ENERGY- MAP *continued*



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ENERGY SCAVENGER HUNT

DIRECTIONS: Go to the Energy Information Administration Kids' Page web site. Read through the different energy forms for Renewable and Nonrenewable Energy, and find the answers to the following questions.

1. **What is energy?**

The ability to do work

2. **What are the 5 main types of renewable energy? Why are these types of energy considered renewable?**

solar, wind, geothermal, biomass, hydropower

Renewable energy can be easily replenished

3. **What are the 4 main types of nonrenewable energy? Why are these types considered nonrenewable?**

oil, coal, natural gas, fossil fuels

Nonrenewable energy is energy that we are using up and it can't be recreated

4. **Name 4 fossil fuels. Why are they called "fossil"?**

oil, coal, natural gas, uranium

5. **What is the most common form of renewable energy used to generate electricity? What percentage of U.S. electricity generation comes from this source?**
Hydropower, the source for almost 6% of U.S. electricity generation in 2007, is a process in which flowing water is used to spin a turbine connected to a generator.
6. **What causes wind? How does the process reverse itself between day and night?**
During the day, the air above the land heats up more quickly than the air over water. The warm air over the land expands and rises, and the heavier, cooler air rushes in to take its place, creating wind. At night, the winds are reversed because the air cools more rapidly over land than over water.
7. **How does a windmill work?**
The wind flows over the blades creating lift, like the effect on airplane wings, which causes them to turn. The blades are connected to a drive shaft that turns an electric generator to produce electricity.
8. **How do engineers use the earth's heat to create geothermal energy?**
Geothermal energy is heat from within the Earth. It is recovered as steam or hot water and use it to heat buildings or generate electricity.
9. **Biomass involves burning organic materials to release chemical energy. What are the steps in the Carbon Cycle that describe this process?**
Biomass is organic material made from plants and animals. Biomass contains stored energy from the sun. Plants absorb the sun's energy in a process called photosynthesis. Biomass fuels are wood, crops, manure, and some garbage. When burned, the chemical energy in biomass is released as heat.
10. **How did petroleum and natural gas form?**
Millions of years ago, the remains of plants and animals (diatoms) decayed and built up in thick layers. This decayed matter from plants and animals is called organic material — it was once alive. Over time, the sand and silt changed to rock, covered the organic material, and trapped it beneath the rock. Pressure and heat changed some of this organic material into coal, some into oil (petroleum), and some into natural gas .
11. **What is "crude oil" and how is it brought to the surface of the earth?**
Crude oil is a smelly, yellow-to-black liquid and is usually found in underground areas called reservoirs. A structure called a 'derrick' is built to house tools and pipes that go into a drilled well to bring a steady flow of oil to the surface.
12. **What are 10 different petroleum products that come from "crude oil"?**
Ink, Crayons, Bubble gum, Dishwashing liquids, Deodorant, Eyeglasses, CDs and DVDs, Tires, Ammonia, Heart valves,
13. **How did coal form?**
For millions of years, a layer of dead plants at the bottom of the swamps was covered by layers of water and dirt, trapping the energy of the dead plants. The heat and pressure from the top layers helped the plant remains turn into what we today call coal.
14. **Name and describe 4 major uses for coal.**
1. Coal is used to create almost half of all electricity generated in the United States. Power plants burn coal to make steam. The steam turns turbines that generate electricity. 2. Separated ingredients of coal are used in making plastics, tar, synthetic fibers, fertilizers, and medicines. 3. Coal is also used to make steel. Coal is baked in hot furnaces to make coke, which is used to smelt iron ore into iron. 4. The concrete and paper industries also use large amounts of coal.
15. **In terms of percentages, who are the 3 biggest users of natural gas in the United States?**
Electric power sector, Industrial sector, Residential sector

Wyoming Content Standards :

SCIENCE:

CONCEPTS AND PROCESSES

Physical Systems

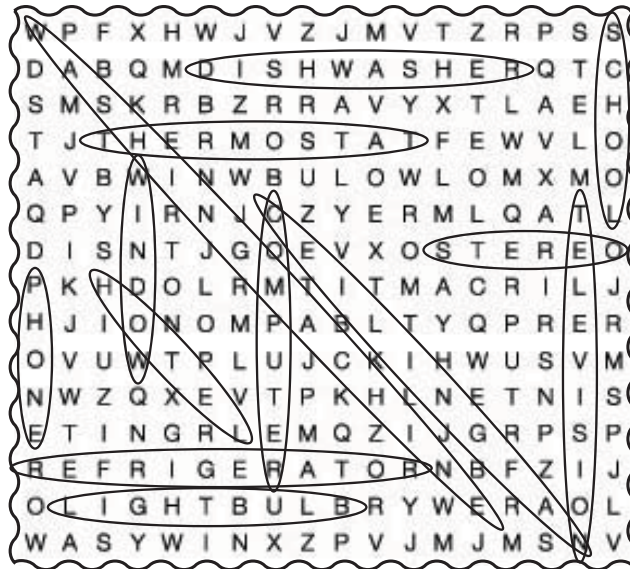
- **SC4.1.8** Changes in States of Matter: Students demonstrate that the processes of heating and cooling can change matter from one state to another.
- **SC4.1.9** Physical Phenomena: Students investigate physical phenomena commonly encountered in daily life, including light, heat, electricity, sound, and magnetism.

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ENERGY STAR & WAYS TO SAVE ENERGY



HOW MANY WAYS ARE THERE TO SAVE ENERGY?

Energy saved is energy gained for another day! Saving energy will cut down on pollution and help our fossil fuels last longer.

Here are some energy saving tips that you should know:

- Turn off the radio and television when not in use.
- Turn off the lights when you are not using them.
- Use a solar powered calculator instead of a battery powered calculator.
- Don't leave the refrigerator door open for a long time.
- Don't use an electric toothbrush.
- Use a hand operated can opener, not an electric one.
- Use a sweater to stay warm in the winter instead of turning up the thermostat.
- Recycle your pop cans, glass bottles and plastic containers.
- Use a fluorescent bulb instead of an incandescent one.
- Pass the clothes you've outgrown to a brother or sister or to someone who needs them.

- _____
- _____
- _____

answers will vary

<http://www.nrel.gov/docs/gen/fy01/30928.pdf>

Wyoming Content Standards :

SCIENCE:

HISTORY AND NATURE OF SCIENCE IN PERSONAL AND SOCIAL DECISIONS - *Students recognize the nature of science, its history, and its connections to personal, social, economic, and political decisions. Historically, scientific events have had significant impacts on our cultural heritage.*

- **SC4.3.1** Students recognize the nature and history of science.
 - ~ Discuss how scientific ideas change over time.
 - ~ Describe contributions of scientists.
- **SC4.3.2** Students recognize how scientific information is used to make decisions.
 - ~ Identify and describe local science issues, such as environmental hazards or resource management.
 - ~ Suggest feasible solutions and personal action plans to address an identified issue.
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