# PROJECT REPORT

**Northern Wyoming Community College District / National Science Foundation**
**Summer Energy Education Program 2011**

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## TITLE

**Wyoming Energy Capstone Project**

## SUMMARY

This lesson will review students' knowledge of Wyoming energy resources as they relate to Wyoming geography and infrastructure. This culminating activity will have students demonstrate their knowledge of the different types of energy in Wyoming and where they are located on the map of Wyoming. The students will recount their knowledge of a mining topic and design a small model to represent their aspect of the energy industry.

## ENERGY CONTEXT

Wyoming energy includes a wide range of different types of energy. Wyoming's energy industry also affects many other industries that thrive because of the energy industry such as transportation (railroads and trucking), and building infrastructure (power lines and pipelines) to transporting products within and out of the state of Wyoming.

## ANTICIPATED TIME REQUIRED

This project will require:

- Designing symbolic models of the energy source or related infrastructure – 45 minutes
- Class presentations of Energy in Wyoming – 15 minutes

## INTENDED STUDENT LEVEL

This project will present a learning activity that can be used as an assessment activity intended for students in upper elementary through high school.

## ASSUMED PRIOR KNOWLEDGE

This project will assume that students have prior knowledge of:

- Basic map reading skills
- Basic report writing
- Reading skills
- Group work etiquette

## LEARNING OBJECTIVES

- Research the different ways Wyoming energy is used
- Identify and explain the interdependence upon energy and related jobs in the world
- Create a symbol or model of the type of energy or related industry that was chosen

## MATERIALS

Each student needs:

- An energy type to model or design
- Materials available to construct a model or design
- A huge map of Wyoming

## INTRODUCTION / MOTIVATION FOR STUDENTS

There are many types of energy in Wyoming and they influence many aspects of our lives. Today you will choose a card that I have prepared from our energy study. Create a model or symbol of the word in dark print on the top of that card that will help your fellow students relate to the topic that is described on your card. After your model is complete, your job is to be able to mark the area on a Wyoming map where you could observe your topic first hand.

## PROCEDURE

- Each student chooses a prepared card with an energy related topic described on it.
- Each student will use materials to design a model or example of their topic. It should be about the size of their shoe.
- When all the students have completed their model, the students gather around the large map of Wyoming.

- The teacher starts the presentation by asking, “Who has energy?”
- The student reads their topic when it is their turn and then places their model/example on the map of Wyoming on a spot that would be an area that exhibits that energy or infrastructure.

**SAFETY ISSUES**

None

**TROUBLESHOOTING TIPS**

Make sure that students that have trouble reading are given a prepared topic card with readability at their level or that the teacher goes over the vocabulary beforehand to help prepare that student for their presentation.

**ASSESSMENT**

Activity Embedded Assessment

Question/Answer: Ask the students and discuss as a class:

- What patterns do you notice? (Answer: Some mention of the mountains, infrastructure, and related jobs.)

**SUGGESTED EXTENSIONS**

Ask the students to find energy related articles from the newspapers and place them on the correct location of the Wyoming map that the article mentions.

# Wyoming Energy Cards

**Energy**

I have energy. The state of Wyoming has become the number-one domestic exporter of energy over the last decade, supplying the rest of the U.S. with more than 10 quadrillion BTUs of energy per year. (Place your item on the map.)

**Who has coal?**

**Coal**

I have coal. Wyoming ranks number one in production of low sulfur coal in the United States. The top ten producing mines are all located in the Powder River Basin. Wyoming produces 40 percent of the nation's coal. (Place your item on the map.)

**Who has trains?**

**Trains**

I have trains. During 2009, more than 416 million tons of coal were shipped out of the Powder River Basin on single destination unit-trains, averaging 130 cars in length. On a typical day, 70-80 trains leave the Powder River Basin for energy markets throughout North America. (Place your item on the map.)

**Who has coal-fired power plants?**

**Coal-fired Power Plants**

I have coal-fired power plants. Coal-fired power plants dominate Wyoming's electricity generation. The coal is burned by boilers to produce high pressure steam at extremely high temperatures. Pipes carry that steam to the turbine to turn its blades to engage the generator to produce electricity. This electricity is sent to customers via high-voltage power lines. (Place your item on the map.)

**Who has uranium?**

**Uranium**

I have uranium. Wyoming is the largest uranium producer in the United States. The uranium in Wyoming is either strip mined like coal or by an *in-situ* recovery mining method where ground water and small amounts of oxygen and carbon dioxide are pumped into the ore zone to dissolve the uranium. The uranium bearing solution is pumped to the surface and pumped or trucked to processing plants where the uranium is recovered. (Place your item on the map.)

**Who has wind power?**

**Wind Power**

I have wind power. Wind has been harnessed for 1000's of years and it remains a clean, cost effective, inexhaustible and readily available renewable energy resource. These 404 foot high turbines generate electricity. Wyoming has huge wind potential, but not enough transmission lines to deliver wind-generated electricity to out of state customers. (Place your item on the map.)

**Who has solar power?**

**Solar Power**

I have solar power. Solar power is a clean and readily available resource in Wyoming, but we do not have enough transmission lines to deliver the electricity produced by solar panel to out of state customers. (Place your item on the map.)

**Who has hydro-electric power?**

**Hydro-electric power**

I have hydro-electric power. Wyoming has 13 hydro-electric power plants. Six of them are located on the North Platte River and another four are located on the Shoshone River in the Cody area. (Place your item on one of the site on the map.)

**Who has high voltage transmission lines?**

**High Voltage Transmission Lines**

I have high voltage transmission lines. These are used to carry electricity to other states that do not have the resources to produce their own electricity. Existing transmission lines are currently operating at capacity. (Place your item on the map.)

**Who has pipe lines?**

**Pipelines**

I have pipe lines. Pipelines, trucks, or oil tankers transport oil and natural gas from the production sites to refineries in Wyoming and out of state. (Place your item on the map.)

**Who has crude oil?**

**Crude Oil**

I have crude oil. The first oil well was drilled southeast of Lander in 1884. Wyoming ranks 8th in the nation in oil production. Oil and/or natural gas have been produced in all counties in Wyoming except Teton County. (Place your item on the map.)

**Who has oil shale?**

**Oil Shale**

I have oil shale. Oil shale is found in a fine grained sedimentary rock in the Green River Basin Formation near Rock Springs. The rock contains various amounts of waxy organic matter called "kerogen" that traps the oil. In order to release the oil from the "kerogen," the rock must be heated to about 650˚ to 700˚ Fahrenheit in and oxygen-free environment. This is called retorting. There are two methods used to extract this "kerogen"—surface retorting and in-situ retorting. (Place your item on the map.)

**Who has natural gas?**

**Natural Gas**

I have natural gas. Wyoming is ranked 2nd in natural gas production in the United States. The deepest producing gas well in Wyoming is a well drilled to 24,877 feet. Sublette County was the largest natural gas producer, with Johnson and Sweetwater Counties following. Natural gas has been used for heating and to produce electricity.