

# Introducing Wyoming's Energy Resources

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Albany County School District #1

*OVERVIEW: This lesson is intended for 3<sup>rd</sup> – 6<sup>th</sup> grade students. This lesson is an introduction to the overall study of energy resources. In the lesson students will do an open sort of various images then will define each category, those categories being the energy resources of Wyoming.*

*CONNECTION TO THE CURRICULUM: Social Studies (Economy, Geography)*

*CONNECTION TO THE NATIONAL STANDARDS:*

*Standard 1: How to Use Maps and Other Geographic Representations, Tools, and Technologies to Acquire, Process, and Report Information From a Spatial Perspective*

*Standard 11: The Patterns and Networks of Economic Interdependence on Earth's Surface*

*CONNECTION TO THE STATE STANDARDS:*

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

*SS4.5.1 Students use physical maps, political maps, and globes to identify locations using scale, cardinal and intermediate direction, legends, keys, and symbols.*

*SS4.5.4 Students describe relationships among people and places, and*

the environmental context in which they take place.

**TIME:** This lesson will take approximately one 60 min. class period.

**MATERIALS REQUIRED:** Photos depicting various aspects of each of the state's major energy resources (oil, natural gas, coal, wind, water) and other energy resources that will be discussed during the unit (uranium, solar). **\*\*SEE ATTACHED IMAGES.\*\*** These should be mixed together, not sorted by resource as below. 12 foot by 12 foot Wyoming floor map

**OBJECTIVES:** Through this lesson students will:

1. Identify the energy resources that will be explored throughout the unit
2. Identify major attributes of each resource
3. Begin to associate these resources with different regions of the state.

### **GEOGRAPHIC SKILLS:**

- Organizing Geographic Information
- Asking Geographic Questions

### **SUGGESTED PROCEDURE**

**OPENING:** To introduce the activity, each student will be given a picture (students may be given more than one picture if you do not have enough students in the class for each picture to be represented). Students will be asked to place their pictures on the table in designated columns at the front of the classroom. These columns should be unlabeled, requiring students to consider connections to other pictures that other students have placed.

#### DEVELOPMENT/PROCEDURE:

1. Once all of the pictures have been placed, the students should be asked to identify what the pictures in each column have in common—this will be the label of each category. The teacher already knows that the columns will be labeled based on the energy resources of the state, so this discussion may require some guiding questioning by the teacher to ensure that each category is accurately defined. For example, “what do you notice about the people in the pictures? Are they dressed similarly? What tools or resources are in the pictures? What are those tools used for? Is there any text? What places in Wyoming are mentioned?”

2. The students will then be asked to examine the pictures in each category more carefully, using the photos to make inferences about each industry. These inferences should include how long the industry has been around, how it is transported, complexity of refinement, whether it takes a small or large amount of land to harvest, and the place where it has the strongest foothold in the state. This can be accomplished through an interactive writing process, or by having small groups of students work on just one industry carefully studying the pictures of that industry. (Interactive writing guide can be found in the resources section).

3. The inferences made about each category of photos should be recorded on the map icons sheets so that they can serve as an anchor for future discussions.

4. After labeling each of the energy resources represented, students are asked to focus on the locations where resources are found within the state. Using the attached industry icons, students indicate each primary location on the state map. The location will be refined and broadened to include more areas where the resource is found as

students delve more deeply into the resources and their development in the state. The “clues” provided for each industry refer to a specific town in Wyoming.

This is the information that students should use to initially place their descriptions of each resource on the map. This will avoid students arbitrarily placing the icons on the map, but will allow for future discussions about the actual geographic locations of the mines, turbines, etc, how the communities they initially mapped are impacted, and how the resources impact the development of new or rejuvenation of old communities.

**CLOSING or CONCLUDING THE LESSON:** To conclude the lesson students will gather together to discuss their observations about where the resources are found, and whether there were resources that aren't on the map. Students should be told that this is the beginning of their study of energy resources in Wyoming and that they will continue to learn about places where energy resources can be found in Wyoming and how they impact our state.

**ASSESSMENT OF STUDENT LEARNING:** Once students have finished mapping the state's energy resources they will be asked to summarize their discussions from the day, providing a description of each industry based on their photo analysis and inferences. Students will also be asked to indicate the primary location of the development of this resource and questions that they now have about each industry.

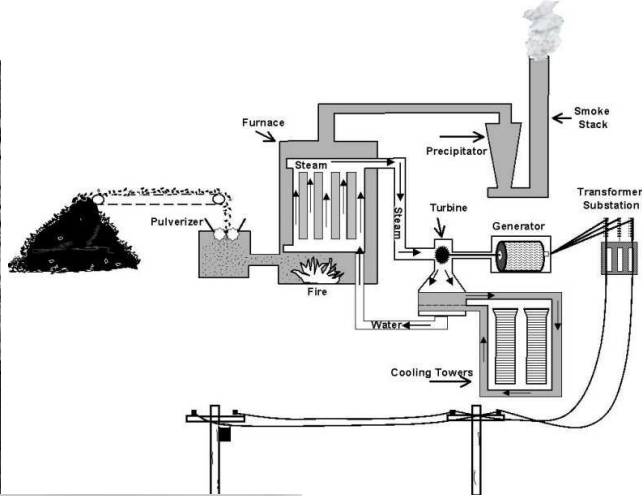
**\*\*SEE ATTACHED WORKSHEET\*\***

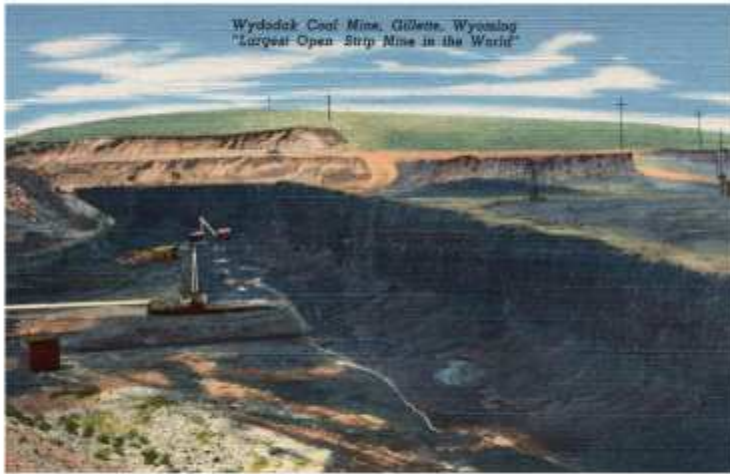
**EXTENDING THE LESSON:** To extend the lesson students may be asked to create additional images to include in each resource category or to create images to represent resources not included in the original

sort (i.e. trona).

RESOURCES: <http://www.stanswartz.com/IAW%2Oexcerpt.pdf>

# Coal Images





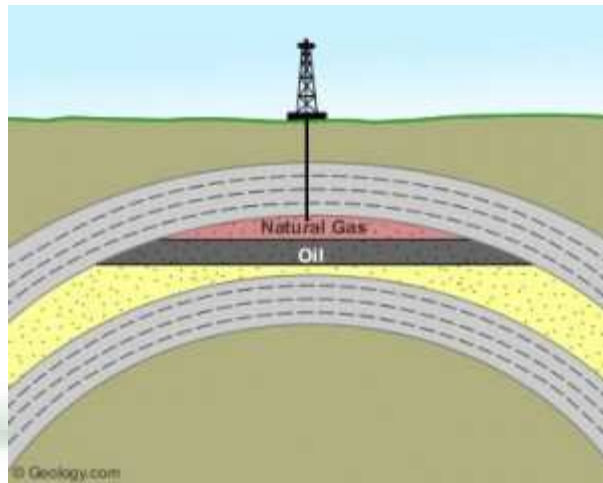
**ALPHA COAL WEST INC**  
BELLE AYR MINE  
2273 BISHOP RD GILLETTE 687-3400  
Or Call 687-3200  
EAGLE BUTTE COAL MINE  
10023 N US HWY 14-16 Gillette 687-3300

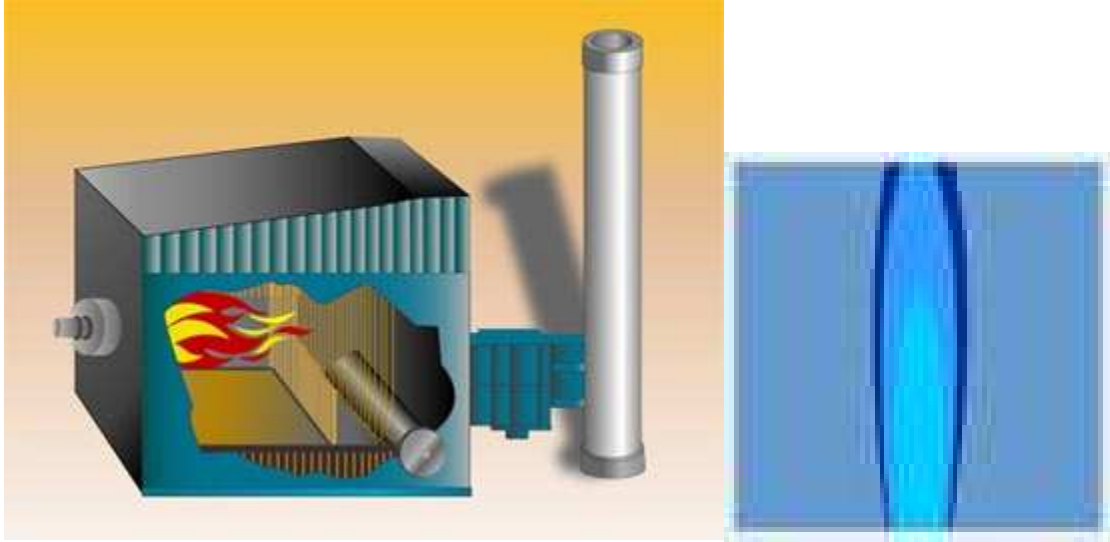


1633709 [www.fotosearch.com](http://www.fotosearch.com)



# Natural Gas Images









100 East 10th Street  
Laramie, WY 82001  
307.733.7922 ext. 200  
WYO@wyomingoutdoorcouncil.org

Ms. Kellie Roudsifer  
BLM Field Office  
NPL Natural Gas Development Project  
P.O. Box 768  
Fossil, WY 82401

April 1, 2011

**Re: Request Comments for the Normally Pressured Lower Natural Gas Development Project**

Dear Ms. Roudsifer:

Please accept these request comments from the Wyoming Outdoor Council, Greater Yellowstone Coalition, and The Wilderness Society regarding the above-referenced project (hereinafter the "NPL Project").

**I. Air Quality**

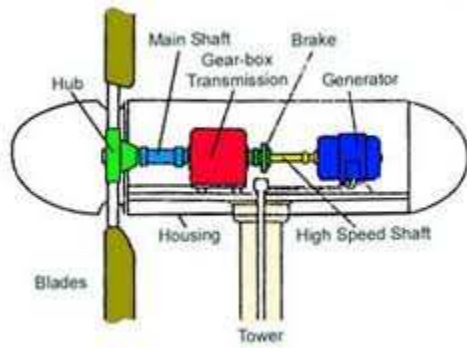
Air quality issues in the Upper Green River Valley are a dominant concern relative to this project. There are at least two major concerns: ozone pollution and impacts to visibility in nearby Class I areas. In fact, if this project cannot be permitted if it will contribute to continued violation of the ozone Below National Ambient Air Quality Standard (NAAQS), or if it will lead to impairment of visibility in Class I areas.

We will not include these comments with a detailed review of the ozone problems in the Upper Green River Valley. BLM is well aware of the extremely high ozone levels being monitored in this area, levels well in excess of the 8-hour ozone NAAQS, which is 75 parts per billion ozone (ppb). This area is poised to be designated in nonattainment with the 8-hour ozone NAAQS. The State of Wyoming has recommended nonattainment designation to the Environmental Protection Agency (EPA). Moreover, this summer the EPA will very likely establish a new 8-hour primary ozone NAAQS as well as a single secondary ozone NAAQS. The new primary standard will likely be set in the range of 60-70 ppb and the secondary standard will be a season-long average level of 1.01 part per million-hours, with the purpose of protecting vegetation, especially in Class I areas. Thus, the nonattainment status of this area will likely become an even more dominant concern. We will react as a few implications of the extreme ozone problems that plague this area.

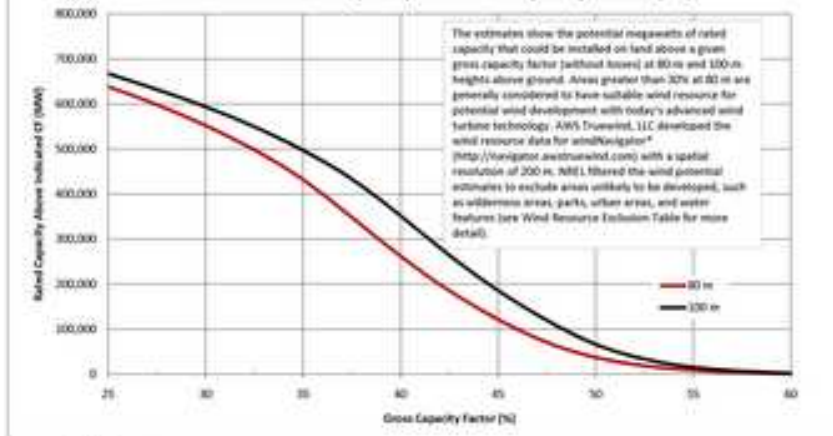
BLM is not permitted to authorize a project that will lead to the violation of Clean Air Act standards. The Clean Air Act provides "[e]ach department, agency, and instrumentality of the executive, legislative, and judicial branches of the Federal

## Wind Images





Cumulative Rated Capacity vs. Gross Capacity Factor (CF)





# Renewables

Wind Speed (mph)



## Opponents of Glenrock wind farms to sue Wyoming Industrial Siting Council

Story Discussion

Font Size:

By JEREMY FUGLEBERG Star-Tribune energy reporter | Posted: Wednesday, June 15, 2011 3:30 am (27) Comments

2 Recommend Be the first of your friends to recommend this.

A landowner group opposed to two wind farms planned for south of Glenrock will take the state board that approved the wind energy project permit to court.

The Industrial Siting Council, a state board that must sign off on large wind energy projects, approved the farms known together as the Pioneer Wind Project by a 4-3 vote Monday.

Wasatch Wind of Park City, Utah, is the developer of the 62-turbine, 100-megawatt project planned for two sites along Mormon Canyon Road.

The Northern Laramie Range Alliance, or NRLA, a vocal group of nearby landowners and others opposed to the project, announced its plans for the lawsuit Tuesday.

"We are disappointed with the decision of the Industrial Siting Council, as we believe Wasatch Wind did not meet the statutory requirements, and we look forward to judicial review of the decision," the alliance said in a media release.

The council approved a permit for the wind energy project that is good for two years. But it added a number of conditions to the permit including an \$18.8 million bond from Wasatch Wind, insisting on special radar-controlled lights and requiring the company work with nearby landowners to reduce the audio and visual impacts of the tall, white wind turbines.

The council members expressed concern about the financial aspects of the project, particularly the deteriorating credit rating of California-based Edison Mission Energy, which has an agreement with Wasatch to build and operate the wind project.

To counter those concerns, the council required that Wasatch must show it and its partners are financially capable of building, operating and taking down the wind farms prior to beginning construction.

The Wyoming Department of Environmental Quality's Industrial Siting Division, of which the Industrial Siting Council is a part, wouldn't comment on the Northern Laramie Range Alliance's announcement since it involves pending litigation.

But Wasatch Wind, which now has both county and state approval to move forward with its \$180 million to \$200 million project, struck an upbeat note after the council decision and again after the alliance announcement on Tuesday.

"The NRLA's continued opposition to the projects is not a surprise," said Michelle Stevens, spokeswoman for Wasatch Wind. "But Wyoming's Industrial Siting Division as well as a majority of the Industrial Siting Council agree that we have met the requirements of the law. Therefore we are confident that the projects will continue to move forward."

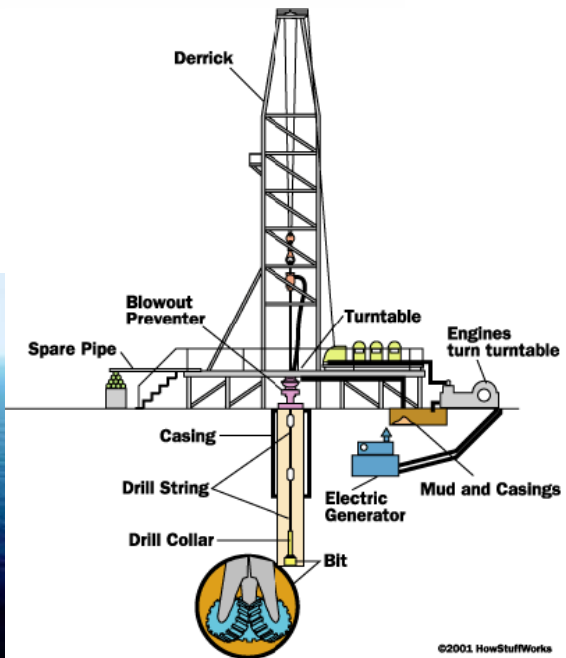
The Northern Laramie Range Alliance is also in the midst of a battle with the Converse County Commission in district court over the commissioner's 4-1 decision on May 10 to grant a permit for the wind energy project.

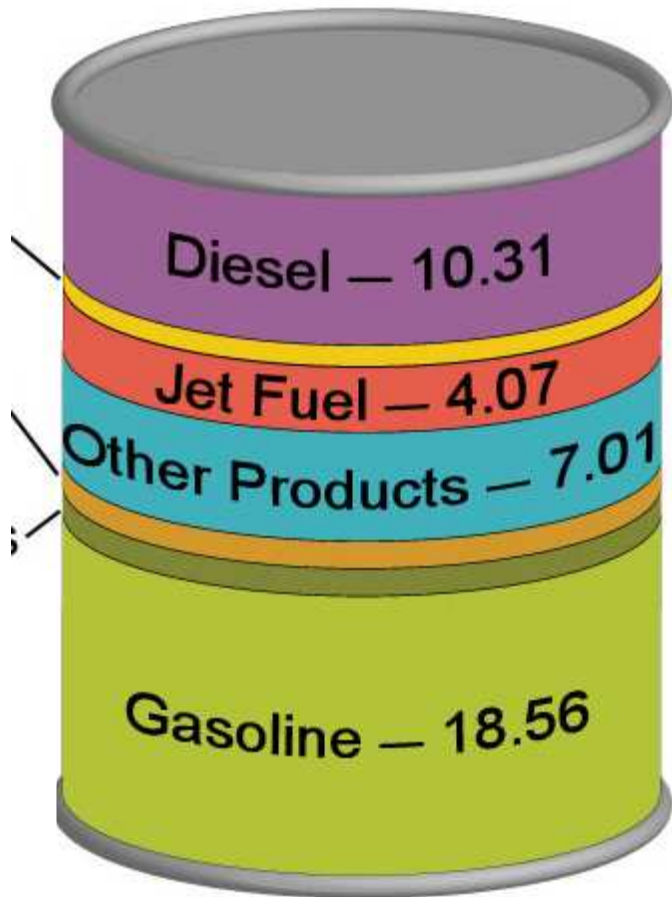
It's likely the alliance will wait to file a lawsuit against the Industrial Siting Council until the council releases the text of its decision. That written decision is due on July 28, or 45 days after the council's vote on Monday.

Reach Jeremy Fugleberg at 307-266-8833 or [jeremy.fugleberg@trib.com](mailto:jeremy.fugleberg@trib.com). Read his blog at <http://trib.com/news/opinion/blogs/boom/> and follow him on Twitter: @jereneqy.



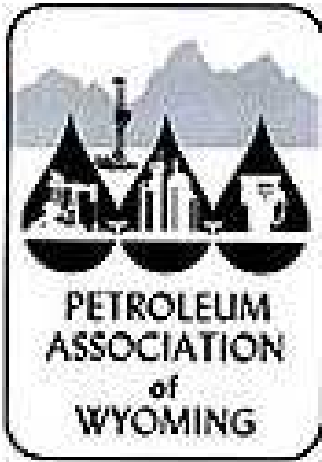
Oil Images



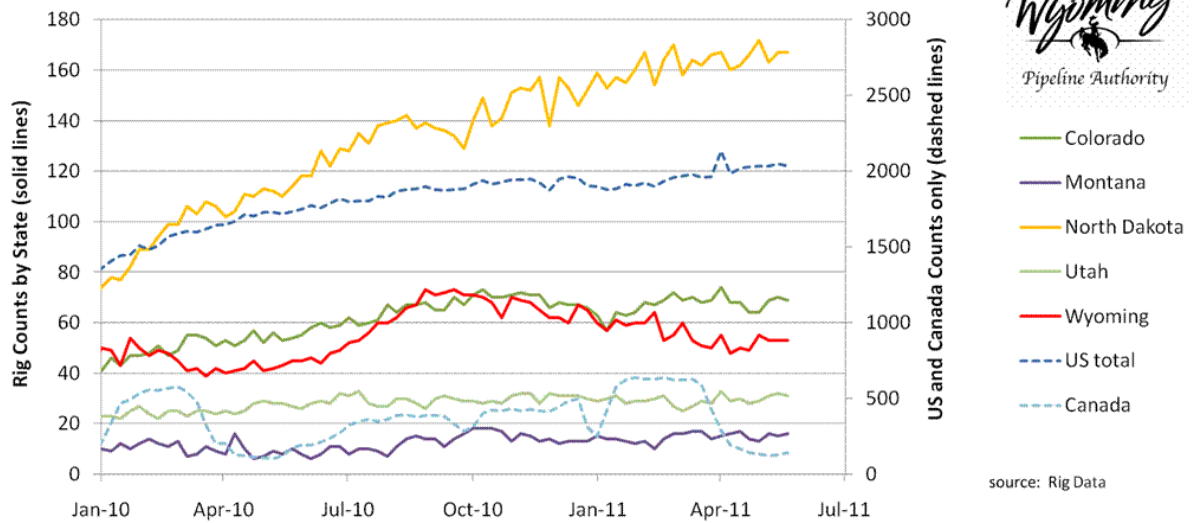






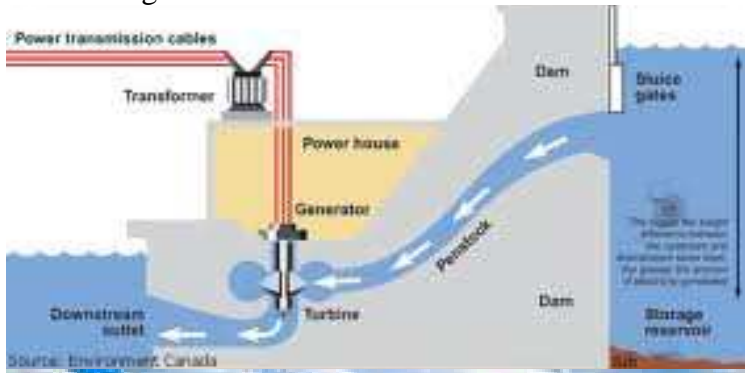


Rig Counts as of May 20, 2011



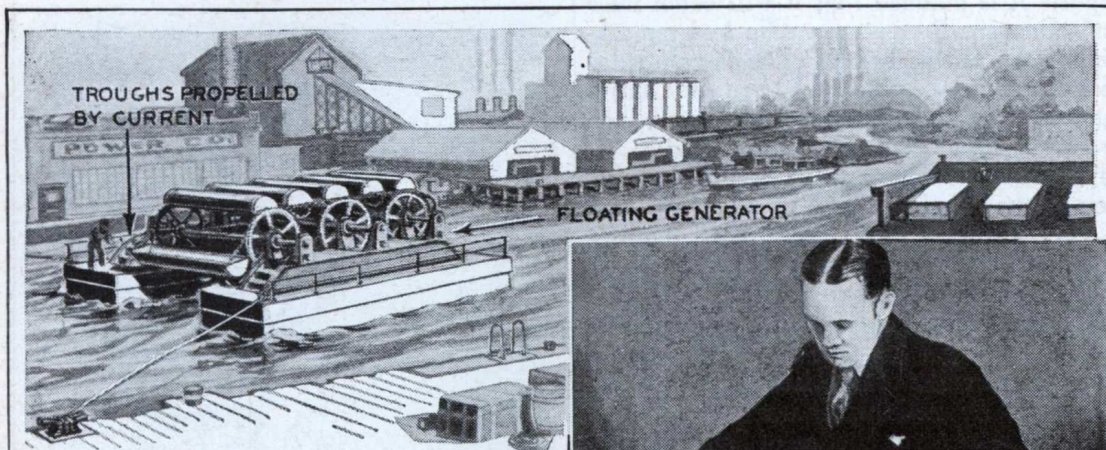
- Colorado
- Montana
- North Dakota
- Utah
- Wyoming
- - - US total
- - - Canada

# Water Images



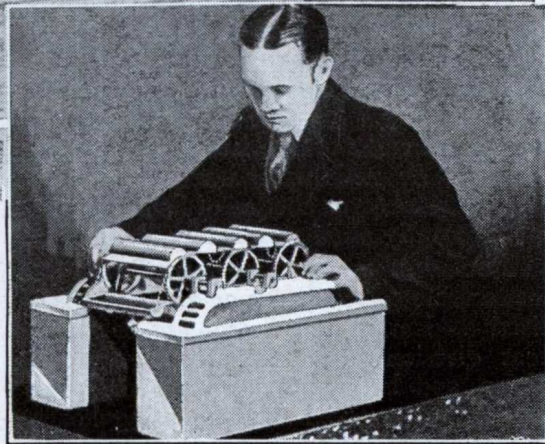


## New Water Power Generator Floats on Stream Surface



Bucket troughs are turned by water to generate electricity in this newly invented power plant.

**F**RANK L. GAEDE is credited by engineers with an invention that may revolutionize the water power industry. Power is generated by flowing rather than falling water. The mechanism is an endless chain of troughs or buckets propelled by the current of the stream and operating generators in sections of the floating power house.



Frank L. Gaede with a model of his generator.

# New Issue of Dam Engineering

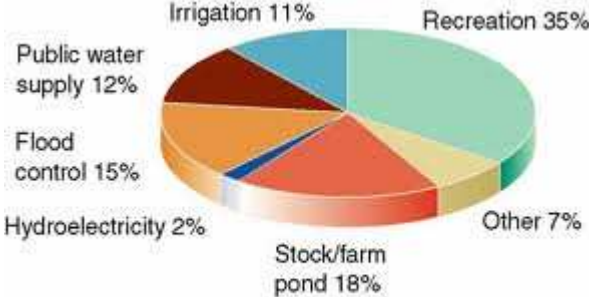
The latest issue of Dam Engineering is on its way to subscribers. This issue contains the following papers:

**A new type of dam design: stability to structural risk ratio. Multiple Reservoirs in 1 or 2 Bays. A 3-D Analysis.** These are large scale projects located in the United States and are designed to provide water for irrigation, hydroelectric power and flood control. The design of these dams is based on the use of a new type of dam design and analysis. The design of these dams is based on the use of a new type of dam design and analysis. The design of these dams is based on the use of a new type of dam design and analysis.

**Structural analysis of concrete dams. Application to an arch dam. The application of the finite element method to the analysis of concrete dams. The application of the finite element method to the analysis of concrete dams. The application of the finite element method to the analysis of concrete dams.**

**A review of dam design for seismic protection. A review of dam design for seismic protection. A review of dam design for seismic protection. A review of dam design for seismic protection.**

**Dam Engineering** is an academic journal published quarterly by International Dam Association (IDA) and International Association of Dam Engineers (IAD). It is published in English and is available in print and online. For more information on this journal, please visit our website at [www.dam-engineering.com](http://www.dam-engineering.com).



Source: U.S. Army Corps of Engineers, National Inventory of Dams

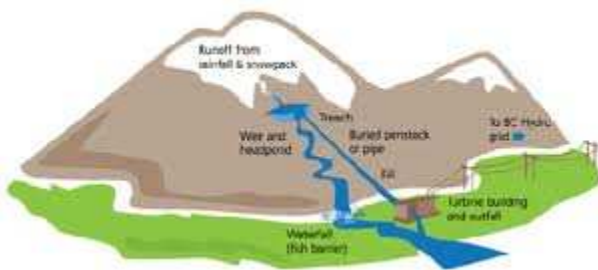




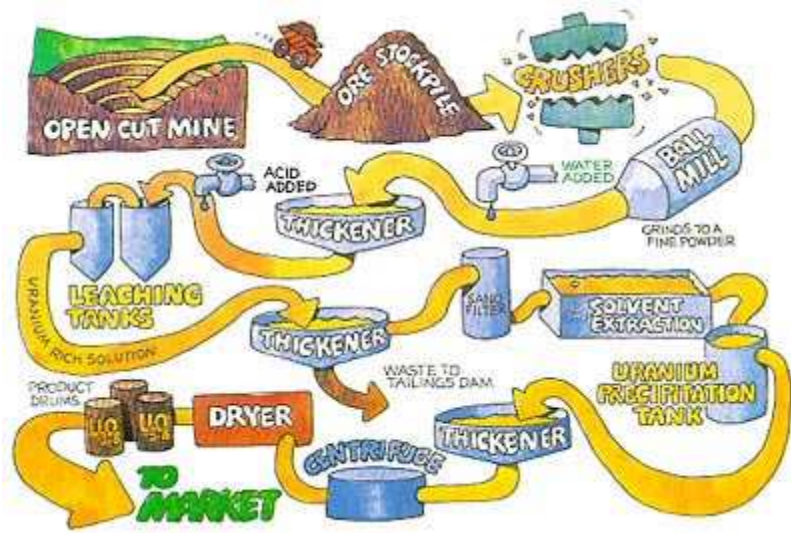


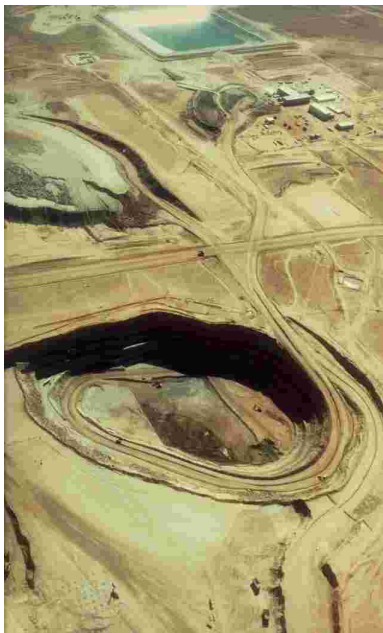
Source: ClimateConnect Research

\* Feasible generation potential of projects compared to the total annual mean power



# Uranium Images



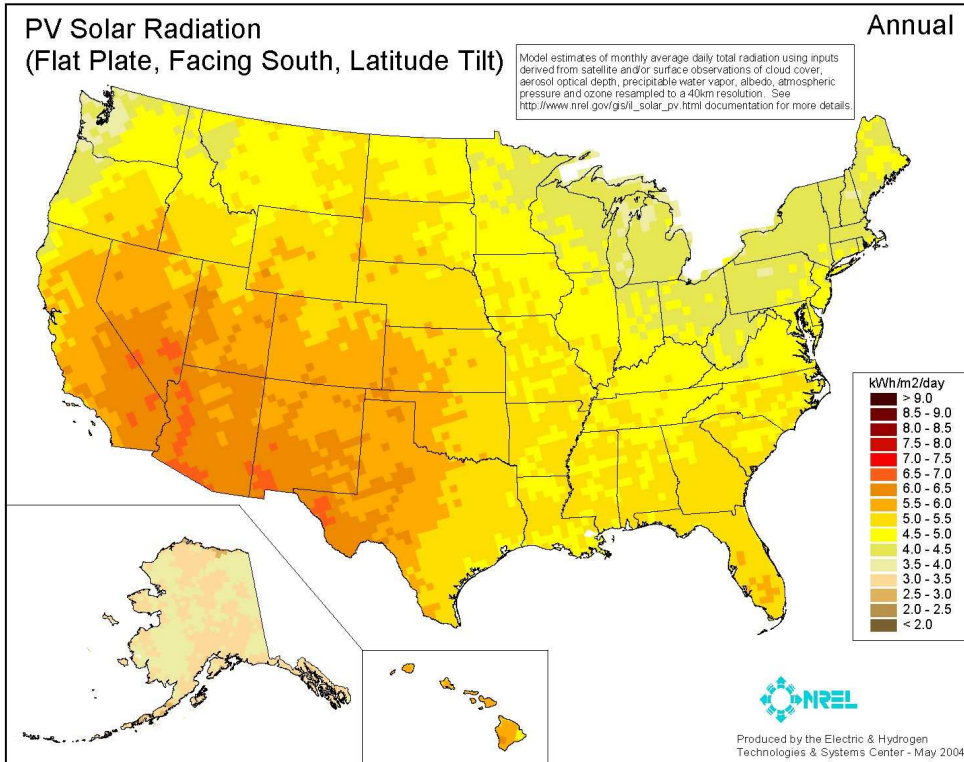
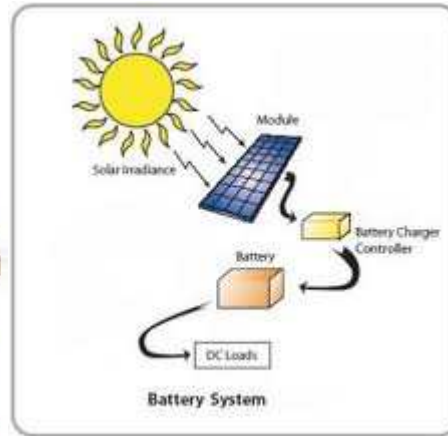
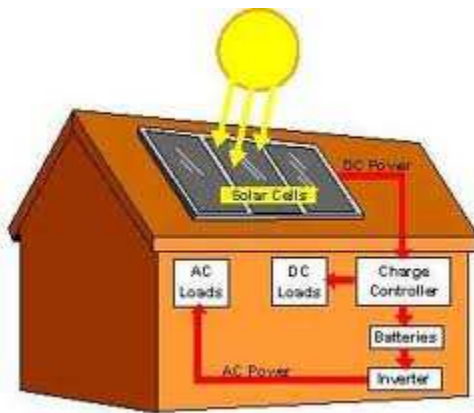


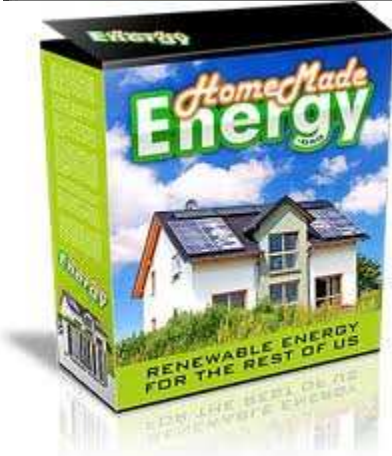
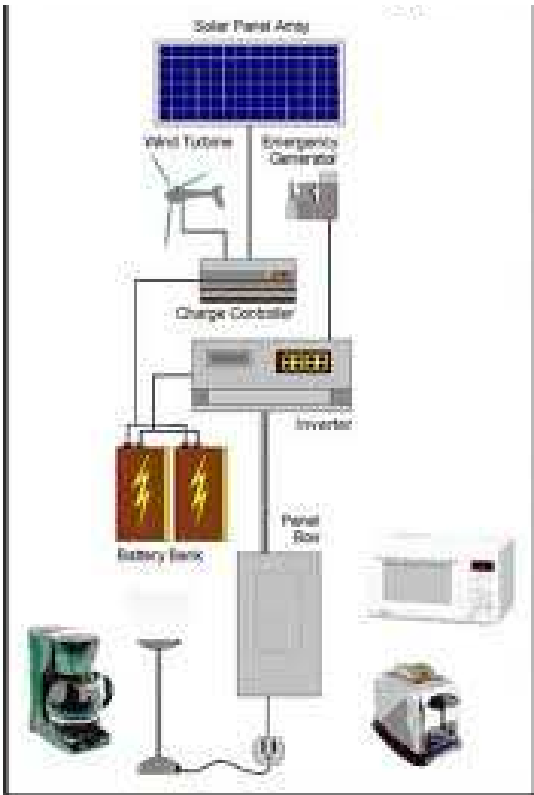
## MAJOR SOURCES OF URANIUM

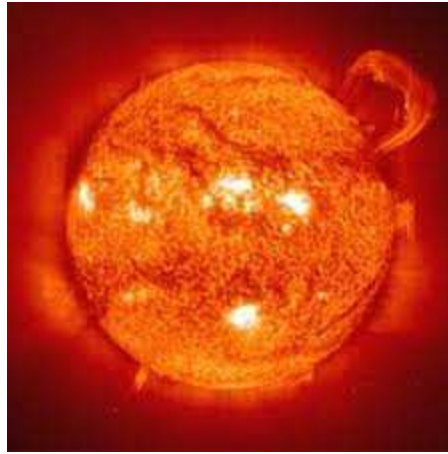
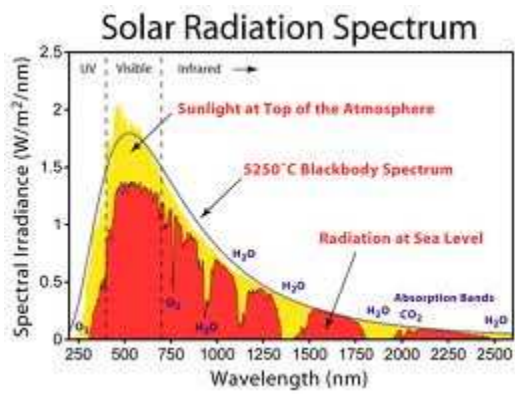
Class 1 - Sandstone Deposits			
	Share	U <sub>308</sub> Concentration (Percent)	Total U <sub>308</sub>
New Mexico	40	0.25	7,000
Wyoming	56	0.30	115,000
Utah	03	0.91	2,81000
Colorado	03	0.28	
Texas	06	0.28	
Other	03	0.28	
Class 2 - Vein Deposits			7,100
Class 3 - Lignite Deposits			1,200
Class 4 - Phosphate Rock			0.015
Class 5 - Phosphate Rock Leached Zone (PLZ)			0.010
Class 6 - Chattanooga Shale			0.006
Class 7 - Copper Leach Solution Operations			0.0012
Class 8 - Conway Granite			0.0012-Uranium 0.0010-Thorium
Class 9 - Sea Water			0.13x10 <sup>-4</sup>
			1x10 <sup>6</sup>
			4x10 <sup>6</sup>
			4x10 <sup>6</sup>



# Solar Power







Icons for the class map.



## Description of Coal

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The primary location of this resource is:

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Description of Oil

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The primary location of this resource is:

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## Description of Natural Gas

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The primary location of this resource is:

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**U** Uranium  
Atomic Number: 92  
Atomic Mass: 238.03

## Description of Uranium

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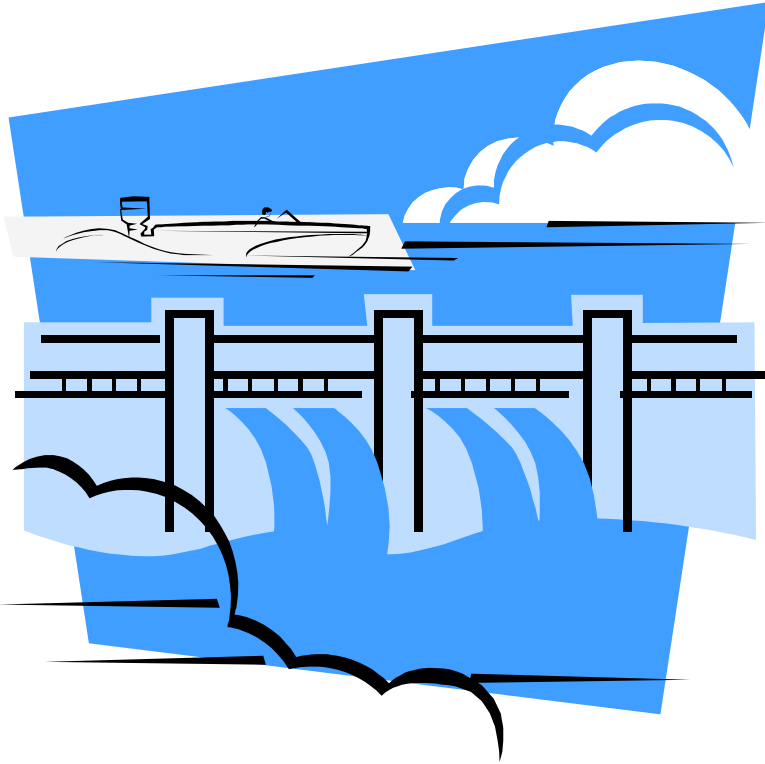
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The primary location of this resource is:

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## Description of Hydroelectricity:

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The primary location of this resource is:

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Description of Solar Electricity:

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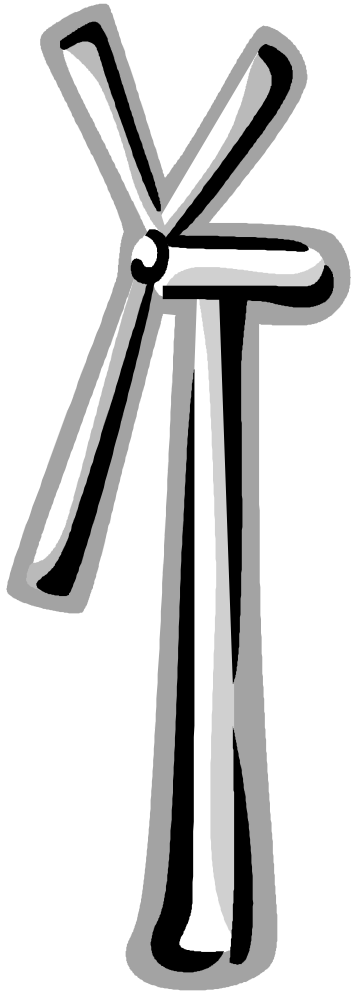
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The primary location of this resource is:

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Description of Wind Power:

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The primary location of this resource is:

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Name, Date, & Time \_\_\_\_\_

Fill in the table with the information you have learned through our class' picture sort. Fill in the primary location that the resource is found. We will continue to add to this box throughout the unit!

	Description	Questions	Location
Oil			
Coal			
Natural Gas			
Wind			
Hydro			
Solar			
Nuclear			