GET ENERGIZED!

BLM

Educator's Guide

About the BLM

Get Energized! was developed by the Bureau of Land Management's (BLM) Campbell Creek Science Center for a national audience. The BLM is America's largest public land manager. Our federal public lands are critical to meeting our nation's energy needs. In the year 2000, approximately one-third of all the oil, natural gas, and coal produced in the United States came from federal public lands. Half of all hydroelectric dams are on federal public lands. Half of our geothermal power and 12 percent of our wind energy are generated from public lands. And public lands are important for getting power to consumers. Just how important? Consider this: Pipelines and electric transmission lines that stretch across public lands would wrap around the earth almost two and half times if they were tied end to end!

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

The BLM must weigh energy production with competing land uses as it seeks to achieve a balance that serves the American public and sustains the health of the land. The BLM recognizes that an energy literate citizenry is crucial to helping it achieve that balance.

About BLM Colorado

The Bureau of Land Management (BLM) manages 8.4 million acres of public lands in Colorado. These lands are managed for a multitude of uses including, but not limited to, recreation, mining, wildlife habitat and livestock grazing. Along with these 8.4 million acres, BLM oversees 27.3 million subsurface acres for mineral development.

Our Mission Statement
Serving the people through progressive stewardship of the public lands.

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Introduction

Welcome to *Get Energized!*

Americans make up less than 5% of the world's population but use 25% of the world's energy.

This interactive computer program is designed to increase viewers' knowledge and understanding of energy and to empower them to take personal actions that will help address our nation's energy challenges.

Why energy? It plays a key role in every facet of our lives, from transportation and communication to medical services, food production, and home heating and cooling. The ways we extract and use energy may be linked to changes in the natural environment. It affects both our domestic and foreign policy. And it plays a major role in our economy. But despite energy's importance, Americans know surprisingly little about it. (*American's Low "Energy IQ,"* NEETF/Roper Report, 2002) This lack of knowledge impedes constructive debate about how to meet our future energy needs. It also impacts the management of our public lands, which are critical to both the production and delivery of our energy.

Get Energized! is an answer to the need for energy education. Through engaging and entertaining interactive formats, the program enables users to discover more about energy in a self-directed way.

This guide is designed to provide teachers of students in grades 5-8 with opportunities to use the interactive CD-ROM program as a jumping-off point for exploring and learning more about energy topics. The content of the guide is organized to match up with the different sections of the CD-ROM program. Each activity includes related national science and social studies standards, an overview, objectives, and subjects, all of which are highlighted in the margin. The activities also include any needed background information and worksheets as well as sources for additional information. Each activity also includes suggested activities from the National Energy Education Development (NEED) Project that tie in well with the content of the program segment. (For more about NEED, go to page 32 or www.need.org.)

The *Get Energized!* CD-ROM is divided into three main sections:

An Energy Snapshot—a short video introduction to energy that's a great way to "energize" your students.

Watt Do You Know?!—a quick quiz that lets viewers test their knowledge of energy. The quiz is different every time someone takes it. Students are sure to love the quiz show host!

Powering Our Planet—a portal to six other segments to explore:

- **Energy and Public Lands—**a video that highlights the role of the Bureau of Land Management in providing energy for the nation. What challenges and opportunities does the BLM face as protector and developer of public lands?

- **The CEO Challenge—**a game in which players become the "Chief Electricity Officer" for a city. Students try to meet the city's electricity needs by choosing a mix of sources from a variety of energy options. What trade-offs are associated with each of our different energy sources?

- **New Technology—**a video-based segment that illustrates the ongoing role of technology in addressing our energy challenges. This segment also highlights personal actions that can help meet our energy needs. What role can technology play and where does personal action fit in?

- **Conservation and You—**a cartoon house that visitors explore to uncover ways to make it more energy efficient. Can your students find and correct all the energy inefficiencies?

- **Colorado's Energy Story—**a series of video segments that showcase Colorado's production and use of energy resources. What role does Colorado play in meeting the nation's energy needs?

- **Global Energy Connections—**profiles of six countries that include statistics and short video segments. This section reminds viewers that energy issues confront everyone on the planet. What solutions are people implementing around the world and what trade-offs are associated with them?

Getting Energized!

National Standards:

Science
E: SCIENCE AND TECHNOLOGY
2. Understandings about Science and Technology

F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments

Overview:
Students will investigate the connections of energy to their lives and write articles, compose stories, or create visual representations about what they discover.

Objective:
Students should be able to explain at least three ways in which energy is important in day-to-day life.

Subjects:
Science, Language Arts, Social Studies

CD-ROM Segment: Energy Snapshot

This section of the CD-ROM program introduces your students to the importance of energy in our lives and is meant to pique their curiosity to learn more about energy—where it comes from, how we use it, the effects of producing and using energy, how we can conserve energy, and what energy challenges we face.

Activity

1. Begin by asking the students to brainstorm some of the ways they use energy each day. *(Answers may include entertainment and communication—radio, television, computer, cell phone; comfort and cleaning—heat, air conditioning, hot water; cooking food—stove, microwave; and transportation—car, bus.)* Record their answers on the board. Then ask them to keep track of all the ways they use energy until the next class period.

2. Have the students share their lists of the ways they used energy. Add any additional energy uses to the list you recorded earlier. Do the students know where the energy for all of these activities comes from—and how it gets to us? *(Students may answer "electricity" or "gasoline." Push them further in their thinking by asking what energy sources local power plants use—and where those sources come from. Where does the gas to run cars come from? How does the gas get from the ground to its useable form? Students may not know the answers to these questions, but it will get them thinking as they try to trace back the energy they use to its sources. It will also help them begin to realize what it takes to produce the electricity, heat, and transportation energy they use every day.)*

3. Have the students view "An Energy Snapshot" in the *Get Energized!* program. This segment is less than two minutes in length.

4. Discuss "An Energy Snapshot." Were there things the students were surprised to discover? What questions about energy do the students have? *(Answers will vary.)*

5. Have the students complete one or more of the following projects.

    - ♦ Have the students write fictional stories about life without energy in order to depict the ways in which we depend on energy. (See potential titles below.)

        The Day the Lights Went Out
        De-Energized!
        The Day After
        The Long Walk

    - ♦ Have the students collect articles and pictures about energy and use them to create a "Get Energized!" bulletin board.
    - ♦ Have the students create collages that depict all the ways in which we use energy.

Information Resources on the Web:

- Energy Information Administration—www.eia.doe.gov
- U.S. Department of Energy—www.energy.gov
- Department of Energy Kid's Page—www.eia.doe.gov/kids

Related Activities from NEED (see page 32):

- Current Energy Affair

Quiz Mania

National Standards:

Science
E: SCIENCE AND TECHNOLOGY
2. Understandings about Science and Technology

F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments
4. Risks and Benefits

Overview:
Students will take a quiz to assess their energy knowledge. They can also create their own energy-related games.

Objective:
Students should be able to explain at least three facts related to energy production and use in the United States.

Subjects:
Science, Language Arts, Social Studies

CD-ROM Segment: Watt Do You Know?!

This section of the CD-ROM program is an interactive quiz that lets students test their knowledge of energy. It can be used before, during, or at the end of an energy unit. There are five randomly selected questions in each quiz and the quiz can be played up to three times in a row with different questions each time.

Activity

"Watt Do You Know?!" can be played at the beginning of an energy unit to pique student curiosity, at the end to assess what they've learned, or along the way to inject some fun and measure student progress. It can also be played at more than one point in a unit.

1. Have the students play "Watt Do You Know?!" in the *Get Energized!* program. Because the game can be played up to three times in succession without repeating any questions, play time may last up to 20 minutes, depending on how many times students play.

2. Discuss "Watt Do You Know?!" with your students. How did they do on the quiz? Did they find questions that they could not answer? Did they discover anything new? Was there anything in the quiz that they disagreed with? Did they discover any topics they'd like to investigate further? *(Answers will vary, especially depending on whether they take the quiz at the beginning or end of an energy unit.)*

3. At the end of your energy unit, have your students create more questions for the "Watt Do You Know?!" quiz. Or they may design their own energy-related games that incorporate what they've learned about energy. They might create a board game, an energy Jeopardy!® game, or a game with some other format.

Information Resources on the Web:
- Energy Information Administration—www.eia.doe.gov
- U.S. Department of Energy—www.energy.gov
- Department of Energy Kid's Page—www.eia.doe.gov/kids

Related Activities from NEED (see page 32):
- Energy Jeopardy
- Energy Source Expo
- Energy Enigma

Making a Federal Case

National Standards:

Science
F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments
3. Natural Hazards
4. Risks and Benefits

Social Studies
F: A STUDENT SHOULD BE ABLE TO USE GEOGRAPHY TO UNDERSTAND THE WORLD BY INTERPRETING THE PAST, KNOWING THE PRESENT, AND PREPARING FOR THE FUTURE.
3. Analyze resource management practices to assess their impact on future environmental quality.

Overview:
Students will discuss public lands, their importance for energy production and transport, and how they're managed.

Objectives:
Students should be able to describe the role of public lands in meeting our energy needs and to explain the role of BLM in managing those lands.

Subjects:
Science, Social Studies

CD-ROM Segment: Energy & Public Lands

This section of the CD-ROM program is a short video about the important role public lands play in meeting our nation's energy needs. It also addresses the challenges the Bureau of Land Management faces as protector and developer of public lands.

Background:

The Bureau of Land Management is an agency within the Department of the Interior. The other agencies in the Department of Interior are the U.S. Fish and Wildlife Service, National Park Service, Minerals Management Service, Bureau of Reclamation, U.S. Geological Survey, Bureau of Indian Affairs, and Office of Surface Mining.

The BLM is responsible for managing more than 262 million acres of land—about one eighth of all the land in the United States—and another 300 million acres of subsurface mineral resources. Most of these lands are in the western United States, including Alaska. The BLM manages for a wide variety of uses, including recreation, forestry, mining, oil and gas development, grazing, wilderness, fish and wildlife protection, and cultural resource protection.

Activity

1. Tell the students that they are going to watch a short video titled "Energy and Public Lands." Ask them if they know what "public lands" are. (*Answers will vary. "Public lands" are lands that belong to the American people and are managed by the government. State and local governments manage some public lands, such as town or county parks, state parks, and state forests. Other public lands are managed by the federal government through agencies such as the BLM, National Park Service, and U.S. Fish and Wildlife Service. These lands include national parks, national historical sites, national wildlife refuges, and national forests.)*

2. Have the students watch "Energy and Public Lands." The segment opens with the following question. *What's more important to the country: A.) Fulfilling our nation's vast and varied energy needs, or B.) Protecting natural ecosystems and ensuring recreational opportunities*. You might want to answer this question as a group or have the students do so independently.

3. Discuss this segment using the following questions as a guide.

- The video described the BLM's multiple-use mission. What are some of the activities that take place on BLM-managed land?

  (Answers mentioned in the video were landscape, wildlife, and ecosystem protection; recreational opportunities, such as mountain biking and hiking; cattle grazing; mining; energy development; wildfire management; and cultural resource protection.)

- In what ways are federal public lands important for U.S. energy supplies? *(Students should identify that these lands are important for energy* production *and* use. *Examples given in the video are that one-third of the oil, natural gas, and coal produced in the U.S. come from public lands; half of U.S. hydroelectric dams are on public lands; and half of our geothermal and 12% of our solar energy are generated on public lands.)*

- What challenges do you think government officials face as they manage for multiple uses? *(Answers will vary. Students should recognize that trying to balance competing demands can be challenging.)*

- Multiple-use management enables many different activities to occur simultaneously on the same piece of public land. For example, it may be possible in a given area to develop oil and gas while minimizing impacts to recreation opportunities and wildlife resources. But multiple-use does not mean all activities can occur all the time. Sometimes BLM managers must make tough decisions about which activities can take place in particular areas. If two or more uses are incompatible in an area, when do your students think one use should take precedence over another? For example, when should energy production take precedence over preserving pristine environments? When should cultural resource protection take precedence over mining activities? When should recreation activities take precedence over commercial activities such as cattle grazing? *(There are no right or wrong answers to these questions. Students should realize that the uses given in the examples above are not necessarily incompatible—but that there could be instances in which allowing both to occur on a piece of public land might not be possible. For example, it might not be possible to have mining going on in an area with an ancient archaeological site and also preserve that site intact; restricting where mining occurs in order to protect cultural resources may mean that fewer minerals are able to be extracted. Give students the chance to discuss the trade-offs involved in management decisions like these.)*

4. Have your students learn more about public lands through one or more of the following projects:

- Have students investigate the public lands in and near your community. What sorts of public lands are nearby (parks, refuges or preserves, historical sites, and so on)? Who is in charge of managing each of these lands? How and why were these lands selected to be public? What issues, if any, have pushed them into the news in recent times? Invite someone who manages those lands to come and talk to your group about the land management challenges they face.

- Have the students compare land management patterns in your state with those in another state. You'll need maps that show federal, state, municipal, and private land ownership designations. (These may be available from a state or federal agency in your area or at a local map store. You can also do a search online using key words: "[state name] land ownership." Also check out the online resources listed below.) You might want to compare your state to Alaska, where 67% of the land is managed by the federal government; to Nevada, where more than 86% of the land is managed by the federal government and more than 68% is managed by the BLM; or to Rhode Island, where less than 2% is managed by the state and federal government combined.

- Have your students research the different agencies that are part of the Department of the Interior and have them create a "Who's Who" guide to all the agencies. Different teams of students can research different agencies to find out what they do, what their mission is, what places they manage, and so on, and then assemble the information into a guide. The guide could also include listings or other information about lands in your area managed by each agency.

Information Resources on the Web:

Facts about the BLM—www.blm.gov/nhp/facts/index.htm
Land use map—www.nwi.org/Maps/GovLands.html
Land use chart—www.nwi.org/Maps/LandChart.html
Links to all Interior Agencies—www.doi.gov/
NEED U.S. Energy Geography (maps showing the availability of energy sources across the country)—www.need.org/needpdf/Geography.pdf

Related Activities from NEED (see page 32):

- U.S. Energy Geography
- The Great Energy Debate Game

Power Up!

National Standards:

Science
F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments
3. Natural Hazards
4. Risks and Benefits

Social Studies
E: A STUDENT SHOULD UNDERSTAND AND BE ABLE TO EVALUATE HOW HUMANS AND PHYSICAL ENVIRONMENTS INTERACT.
1. Understand how resources have been developed and used
2. Recognize and assess local, regional, and global patterns of resource use.

Overview:
Students learn about the trade-offs associated with different energy sources by playing a game.

Objectives:
Students should be able to explain that all energy sources have trade-offs associated with them. Students should also be able to describe several advantages and disadvantages of at least three different energy sources.

Subjects:
Science, Social Studies, Math

CD-ROM Segment: The CEO Challenge

In this section of the CD-ROM program, students learn about the trade-offs associated with different types of power plants through a game. The object of the game is to fully power a city without incurring unacceptably high costs or environmental impacts.

Background:

Large power plants generate most of the electricity used in the United States. These plants may use coal, natural gas, uranium, wind, sunlight, biomass, flowing water (hydro), or the heat in the ground (geothermal) to generate electricity. Coal is the most widely used fuel, generating a little over half of the nation's electricity. Nuclear plants (about 20 percent), natural gas plants (about 18 percent), and hydroelectric plants (nearly 7 percent) generate almost all of the other half of the nation's electricity. All other sources, including wind, solar, geothermal, and biomass, account for less than 5 percent.

Each energy source used for electricity generation has its own set of advantages and disadvantages. These advantages and disadvantages relate to the fuel itself (how it's obtained and transported to the power plant), how it's used to generate electricity (including the type of technology used), and the types of waste materials left over. They also include environmental impacts, such as impacts on the air, land, and water, as well as monetary costs and the efficiency with which the particular type of power plant generates electricity.

"The CEO Challenge" gives students the opportunity to learn about some of the trade-offs associated with different types of power plants. It can serve as a jumping off point for further investigations of different energy sources and their impacts, costs, and benefits. It can also be a springboard to deepen student understanding of electricity generation and transmission in the United States.

Activity

1. Begin by asking your students where the power comes from to power the lights and run electrical appliances. *(Answers will vary. Students should know that most electricity in the United States is generated by power plants and that there are different kinds of power plants. They should also be able to list a few different types of power plants and may know what kind of power plants generate electricity in your area.)*

2. Have the students play the "The CEO Challenge" in the *Get Energized!* program. Make sure they review the information from each of the different energy plants available to them in the game and encourage them to play the game more than once, trying different combinations of power plants in different games.

3. Discuss "The CEO Challenge" using these questions as a guide. *(Answers will vary.)*

    - Were the students able to power the city? What were some of the combinations they used?
    - What challenges did they run into during the game?
    - What affected their choice of energy sources?
    - What did they think were the biggest advantages and disadvantages of each of the energy sources?
    - Were there things the students were surprised to discover about any of the different energy sources?
    - What questions about the sources of electricity do the students have? What questions do they have about electricity generation in the United States?

4. Depending on student interests, have them complete one or more of the following projects:

    - Have students research each of the energy sources to find out more about them. Students can create displays about their energy source, including where the fuels come from, how they're used, and the trade-offs associated with them. Invite students from another class to tour their energy sources exhibit!
    - Have students explore electricity further by making batteries, building electromagnets, building circuits, and using photovoltaics. See the NEED activities "Electro Works" and "Photovoltaics" for step by step explorations into these topics. (See page 32 for more information.)
    - Have the students find out more about electricity in your area, including the sources of energy used to generate the electricity, the types of plants that generate the power, and how electricity gets from those plants to homes and businesses.
    - Tour a local power plant to find out firsthand how it works.

Information Resources on the Web:

- Energy Information Administration—www.eia.doe.gov
- U.S. Department of Energy—www.energy.gov
- NEED Energy Infobooks—www.need.org/infobooks.htm
- NEED U.S. Energy Geography (maps showing the availability of energy sources across the country)—www.need.org/needpdf/Geography.pdf

Related Activities from NEED (see page 32):

- Current Energy Affair
- Mission Possible

Going High Tech

National Standards:

Science
E: SCIENCE AND TECHNOLOGY
2. Understandings about Science and Technology

F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments
3. Natural Hazards
4. Risks and Benefits

Overview:
Students will invent new technologies that address energy challenges we face and then find out more about actual technologies being developed.

Objectives:
Students should be able to describe at least three energy challenges we face and several solutions being worked on for each one. They should also be able to describe one action individuals can take to help address our energy challenges.

Subjects:
Science, Social Studies

CD-ROM Segment: New Technology

This section of the CD-ROM introduces students to some of the energy challenges we face and to the role technology is playing in solving them. It also highlights the importance of personal action.

Activity

Before you get started, make copies of page 15 and cut it into four cards. Make enough copies so you have one card for every three to four students.

1. Begin by discussing what "technology" means. Have the students share their ideas, then explain that technology is the practical application of knowledge, especially in a particular area, such as energy-saving technology, communications technology, and space-exploration technology. Have them give examples of technologies that they benefit from everyday. *(Answers may include bicycles, cars, computers, televisions, communications satellites, and medical procedures such as x-rays.)*

2. Ask the students to list energy-related technologies. *(Answers may include power plants, solar collectors, wind turbines, fuel cells, oil exploration equipment, and gas and oil pipelines.)* Then ask them if they're aware of any energy-related challenges we face that technology might be able to help address. *(Answers will vary. Students may be aware of issues associated with the development and use of various energy sources, such as pollution problems and impacts on wildlife. They may also be aware of discussions about moving away from a fossil fuels-based economy, strains on our energy infrastructure, and other challenges. Don't worry if they don't know much about these challenges yet.)*

3. Divide your class into teams of three or four and give each team one of the cards you made earlier. Explain that they should read their card and then brainstorm ways to address their challenge. They might come up with new technologies or ways to improve existing technologies. Finally, they should pick one of their inventions and draw a representation of it. (Note: Students may need help getting started. Several of the challenges give students a choice of things to invent. Be sure they understand that they need to draw only one invention.)

4. Have the students take turns presenting their challenges and inventions to the rest of the class, having all the teams that worked on the same challenge follow each other. After all the solutions to each challenge have been presented, ask the entire group what similarities and differences they noticed in the solutions different teams came up with. *(Answers will vary.)*

5. Once everyone has had a chance to present their inventions, ask the students if they think there's anything that individuals could do right now to help address each of the challenges. *(Answers will vary. Don't worry if students can't think of anything at this point.)*

6. Have the students view "New Technology" in the *Get Energized!* program. Be sure they explore all four of the energy challenges and each of the solutions, including the "You're the Solution," highlighted with each one.

7. Discuss "New Technology" using these questions as a guide:

    - Were any of the new technologies discussed in the segment similar to what the students came up with earlier? *(Answers will vary.)*

    - Were there technologies or approaches they were surprised to discover? Do they have questions about any of the technologies? *(Answers will vary.)*

    - Do they think we can rely on technology to solve our energy challenges? Why or why not? *(Answers will vary. Point out that new technologies have enabled us to do things more efficiently, accomplish new tasks, improve our lives, or make other advances. Also point out that sometimes new technologies can create new problems and that technological solutions may address only the effects of a problem and not the root causes.)*

    - Are there ways to address our energy challenges that don't rely on new technologies? Did the students think any of the personal actions mentioned under "You're the Solution" are things that they could do? Do they think these actions would make a difference? *(Answers will vary. Options for getting around without using a car vary from community to community. Students may bring up the higher initial cost of some energy saving technologies, such as energy efficient appliances, light bulbs, and hybrid cars, as barriers. Students should realize that small actions multiplied by a lot of people can make a big difference. They should also realize that it will take more than just personal actions to deal with many of our energy challenges.)*

Activity adapted from "Challenge Technology!" in *Ranger Rick's NatureScope—Pollution: Problems & Solutions.*

Information Resources on the Web:

- Energy Information Administration—www.eia.doe.gov
- National Energy Technology Laboratory—www.netl.doe.gov
- Office of Energy Efficiency & Renewable Energy—www.eere.energy.gov
- Office of Fossil Energy—www.fossil.energy.gov/
- Energy Star Program—www.energystar.gov
- *Technology Review*—www.techreview.com

Related Activity from NEED (see page 32):

- Alternative Fuels: The Future Is Today

Protect the Environment

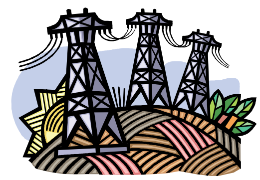
We use fossil fuels to power our cars, trucks, and buses; to generate electricity; to heat our homes and businesses; and to power the factories that make the products we buy. Many of the products we use every day are also made from fossil fuels. But use of fossil fuels has been linked to acid rain, smog, and even global climate change. Finding, extracting, and transporting fossil fuels can also lead to environmental damage if they're not managed properly.

Your Techno Challenge: Invent something that makes fossil fuel exploration, production, *or* use more environmentally friendly.

Energy on the Move

To get energy from the places it's produced to the places it's used requires pipelines and transmission lines. For example, electricity travels to your house from a nearby power plant through electrical transmission lines. Much of this energy *infrastructure* is aging. As our energy demands continue to rise, our infrastructure is becoming increasingly strained.

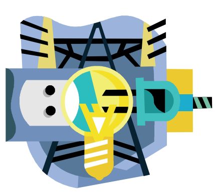
Your Techno Challenge: Invent a way to get electricity, natural gas, *or* oil from one place to another more efficiently.



Save Energy

Today we use less energy than we otherwise might because improvements in technology have made appliances, computers, and other devices more energy efficient. To keep up with our increasing energy demands in the future, we'll need to become even more energy efficient.

Your Techno Challenge: Pick an appliance or machine that people use today and invent something that accomplishes the same job but uses less energy.



New Fuels

Today our economy runs mostly on fossil fuels. We use coal, oil, and natural gas for most of our transportation, industry, heating, and electricity generation needs. No one knows how much of these fuels remains on the planet. But people do know that these fuels are *non-renewable* resources. That means that once they're gone, they're gone.

Your Techno Challenge: Invent a way to generate electricity *or* a way to move people from place to place that doesn't use fossil fuels.

Energy Stars

National Standards:

Science
E: SCIENCE AND TECHNOLOGY
2. Understandings about Science and Technology

F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
1. Personal Health
2. Populations, Resources, and Environments
4. Risks and Benefits

Social Studies
E: A STUDENT SHOULD UNDERSTAND AND BE ABLE TO EVALUATE HOW HUMANS AND PHYSICAL ENVIRONMENTS INTERACT.
4. Determine the influence of human perceptions on resource utilization and the environment

Overview:
Students explore a cartoon house to discover ways to save energy.

Objectives:
Students should be able to list several ways to save energy at home.

Subjects:
Science, Social Studies

CD-ROM Segment: Conservation & You

This section of the CD-ROM program looks at the importance of energy conservation and the ways individual actions can make a difference. Students explore a cartoon house to uncover ways to make it more energy efficient.

Activity

1. Divide your class into teams of four and have each team brainstorm the ways they use energy in their homes. (*Answers may include lights, heat, hot water, appliances, television, stereo, and computer.)* Have each team record their ideas on large chart paper.

2. Review the lists as a class. Then ask the students if they ever try to conserve energy. If so, how? Record their answers on a chalkboard or large sheet of chart paper. *(Answers will vary. Don't worry if students don't have too many ideas at this point.)*

3. Have the students view "Conservation and You" in the *Get Energized!* program. Have students keep track of what they learn in the house with the sheet on page 18. *(See answers on page 19.)*

4. Discuss "Conservation and You" as a group.
   - Were they surprised by the potential energy savings highlighted in the house? Did any of the actions seem like things they themselves could do? Which ones? *(Answers will vary.)*
   - Is saving energy a good thing? Why or why not? *(Answers may vary. Students should realize that saving energy saves money. They should also understand that saving energy reduces the need to produce more energy.)*
   - Do you think energy conservation actions could reduce our energy demands significantly?

5. Now that the students have become more energy aware, have them conduct an energy audit of the school or their own homes. You can use NEED's "Energy Conservation Contract" to guide them or use one of the online resources listed below.

Energy Audit Resources on the Web:

- Alliance to Save Energy—www.ase.org/educators/lessons/audit.htm
- Co-NECT—www.co-nect.org/Schools/Energy/
- ComEd—www.studentpower2000.com/where_you_should_be/energy_auditing.asp

Related Activities from NEED (see page 32):

- Energy House
- Saving Energy at School: Learning & Conserving

Conservation & You

Kitchen

1. The kitchen is loaded with energy saving tips. List five of them here:

a. ______

b. ______

c. ______

d. ______

e. ______

Living Room

2. What is the Energy Star® program

______

______

3. How can you save energy with your thermostat?

______

______

Garage/Yard

4. Name three ways to save energy that are mentioned in the garage/yard?

a. ______

b. ______

c. ______

Bedroom

5. How can you be sure your computer or DVD player is really off (i.e., not using electricity)?

______

______

Bathroom

6. Three of the energy saving suggestions in the bathroom could be used in other parts of the house as well. What are they?

a. ______

b. ______

c. ______

Conservation & You

Kitchen

1. **The kitchen is loaded with energy saving tips. List five of them here:**
 Possible answers: 1) wash small loads of dishes by hand; 2) run the dish washer without the drying cycle; 3) cover pots on the stove; 4) keep the oven door closed while baking; 5) keep the refrigerator door closed; 6) set the refrigerator to 40°F and the freezer to 5° F; 7) use a microwave for quick reheating.

Living Room

2. **What is the Energy Star® program?** A program that rates qualified appliances on the basis of their energy efficiency. For more about the program go to www.energystar.gov/

3. **How can you save energy with your thermostat?** Turn it back a few degrees in the winter and up a few degrees in the summer.

Garage/Yard

4. **What are three ways to save energy mentioned in the garage/yard?**
 Possible answers: 1) plant trees for shade; 2) get rid of gas lamps; properly seal the garage door; 3) drive less/ride bikes more; 4) do laundry in warm rather than hot water; 5) insulate water heater; 6) keep your car tuned and the tires properly inflated.

Bedroom

5. **How can you be sure your computer or DVD player is really off (i.e.,not using electricity)?**
 Unplug them. Many devices including televisions, cordless phones, DVD players, and VCRs draw electricity even when they're not turned on.

Bathroom

6. **Three of the energy saving suggestions in the bathroom could be used in other parts of the house as well. What are they?**
 a. Seal leaky windows.
 b. Replace incandescent bulbs with compact fluorescents ones.
 c. Turn down the setting on your hot water heater.

Colorado's Energy Story

National Standards:

Science
D: EARTH AND SPACE SCIENCE
1. Structure of the Earth System

F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments

Overview:
Students explore energy production and use in Colorado.

Objectives:
Students should be able to describe the history of energy use in Colorado, discuss several renewable and nonrenewable energy resources produced in Colorado, explain the role of the BLM in permitting and monitoring oil and gas exploration on federal lands, describe some of the ways Coloradans use energy, and give examples of how Colorado's geography affects the types and ways people in Colorado use energy.

Subjects:
Science, Language Arts, Social Studies

CD-ROM Segment: Colorado's Energy Story

This section of the CD-ROM program contains a series of video segments that profile energy production and use in Colorado and highlight the importance of Colorado's energy resources to the state's economy and the nation.

Activity

1. Begin by having the students brainstorm a list of all the ways they use energy. *(Answers may include moving from place to place, generating electricity, playing video games, cooking, taking hot showers.)*

2. Ask the students where the energy to allow us to do all of these things comes from. *(Answers will vary. Some students may know that we import over half of the oil we use. Others may know that Texas, Alaska, California, and Louisiana, in that order, are the top oil producing states in this country. Some will point out that Colorado has a great amount of natural gas to use, that coal is used to generate electricity, and that solar, wind and hydroelectric power generate electricity in the state as well.)*

3. Explain that Colorado is the nation's eighth largest state in area and ranks 22nd in population. Colorado supplies over 1 trillion cubic feet of natural gas, 40 million tons of coal a year (the 3rd top producer in the Western United States), and over 1100 megawatts of electricity from hydroelectric power. What impact does energy development have on Colorado's economy and environment? What geographic locations in Colorado are perfect for oil and natural gas formations and for coal? What parts of Colorado are good for solar and wind production? (Don't try to answer these questions now— use the questions to pique student curiosity.) Explain that they'll get to answer these questions in this activity.

4. Divide your class into pairs or small groups and give each group a copy of the scavenger hunt sheet on page 23. Explain that they should view "Colorado's Energy Story" and fill out as much of

the sheet as they can.

5. Review answers to the scavenger hunt as a class using page 24. Also use these questions in your discussion:

    - How was energy used in the history of Colorado? *(Native Americans building houses and shelters into rock and cliffs facing south to allow sunlight to warm homes, burning coal and wood for heating and cooking, using natural gas to light streets.)*

    - What are some of the energy rich areas of Colorado? (*The San Juan and Raton Basins are rich in coal bed natural gas and coal; Western Colorado is rich in oil and gas reserves in the Piceance and Paradox Basins, as well as Northeastern Colorado in the Denver Julesburg Basin; Colorado has great potential along the front range of the Rocky Mountains to harness wind power.)* Are there times when energy production should take precedence over wildlife protection or subsistence activities or vice versa? Is it possible to produce energy and still protect wildlife? If the land in question is federally owned—that is, it belongs to *all* Americans—who should have a voice in deciding what happens to the land? Should people in Colorado have more say than people in New York, Kansas, Arizona, or other parts of the country? *(Answers to all these questions will vary but they should get your students thinking about impacts and benefits associated with oil and gas development and about public land and their own voice in what happens on Federal public lands. For more about public lands, see the "Energy and Public Lands" section of* Get Energized! *and "Making a Federal Case" on pages 6-8 of this guide.)*

6. Depending on your students' interests, you might have them tackle one or more of the following projects:

    - Have your students investigate energy resource production in your state. Do people drill for oil in your state—on land or offshore? Is coal mined there? Are there nuclear power plants, wind farms, hydroelectric dams, solar arrays, or geothermal plants in your state? Here are some questions the students can try to answer:

        - What energy resources are produced in your state?

        - How important is energy production to your state's economy?

        - What environmental concerns are there in your state related to energy production and how are they being addressed?

    - Have your students find out more about the Naval Oil Shale Reserve in Colorado (Roan Plateau in Northwest Colorado). What species live there? Has any oil been produced from the Green River formation beneath the Reserve? What new activities are underway to tap into the oil reserves there? What environmental concerns are associated with development? What environmental protections are in place?

Information Resources on the Web:

- Energy Information Administration—www.eia.doe.gov/kids/energyfacts/sources/non-renewable/oil.html
- Colorado Energy Statistics—www.eere.energy.gov/states/state_specific_statistics.cfm/state=CO
- BLM Colorado—www.co.blm.gov/
- Colorado Geological Survey — http://geosurvey.state.co.us
- National Renewable Energy Laboratory — http://www.nrel.gov
- U.S. Dept. of Energy (for Students and Kids) — http://www.energy.gov/forstudentsandkids.htm
- Classroom Energy! — http://www.classroom-energy.org

Related NEED Activities to Try (see page 32):

- Transparent Energy
- Energy in the Balance

Colorado's Energy Story

View segments of "Colorado's Energy Story" to find the following information. How many answers can you find?

1. How many acres of land does BLM manage in Colorado? ________
   How many acres of subsurface mineral estate? ________

2. How many gallons of gasoline do Coloradans use each day for transportation?
   ____

3. The richest deposits of oil shale in the United States are found in the
   ______________ ______________ Formation in Colorado.

4. Name the two Colorado basins mentioned in the video that are rich in coal bed methane resources. ______________ __________________

5. How do scientists figure out where to drill for oil and natural gas?
   ____

6. What are two renewable energy sources in use in Colorado?
   __________________ __________________

7. How is most of Colorado's coal used? _________________________________

8. How many barrels of oil does Colorado produce each day? ____________

9. Almost 75% of homes in Colorado are heated by ____________________ .

10. What are the benefits of Unitization in oil and gas development?
    ____

11. Colorado is "electricity independent". True? or False? ________________

12. Most of the Carbon dioxide resources found beneath Canyons of the Ancients National Monument are exported to ______________ and ______________. How is the Carbon dioxide used? ____

13. What things does the BLM need to balance in order to manage the public lands for Colorado's citizens?
    ____
    ____
    ____

14. How does the Bureau of Land Management work to achieve this balance?
    ____
    ____
    ____

Colorado's Energy Story

View segments of "Colorado's Energy Story" to find the following information. How many answers can you find?!

1. How many acres of land does BLM manage in Colorado? 8.4 million acres
   How many acres of subsurface mineral estate? 27 million acres

2. How many gallons of gasoline do Coloradans use each day for transportation? 4.7 million gallons

3. The richest deposits of oil shale in the United States are found in the Green River Formation in Colorado.

4. Name the two Colorado basins mentioned in the video that are rich in coal bed methane resources. San Juan Basin Raton Basin

5. How do scientists figure out where to drill for oil and gas? They look at surface rock formations, core samples, and where resources have been found in the past; they use 3-D underground seismic technology to create 3-D underground maps; and drill test wells once they've identified likely places.

6. What are two renewable energy sources in use in Colorado? Hydroelectric, wind, solar, burning biomass

7. How is most of Colorado's coal used? To generate electricity

8. How many barrels of oil does Colorado produce each day? 55,000 barrels

9. Almost 75% of homes in Colorado are heated by natural gas.

10. What are the benefits of Unitization in oil and gas production? Companies must share resources like roads and water resulting in less damage to the environment; competitive drilling is eliminated; companies share development, infrastructure, production and profits.

11. Colorado is "electricity independent". True? or False? True

12. Most of the carbon dioxide resources found beneath Canyons of the Ancients National Monument are exported to Texas and Oklahoma. How is the carbon dioxide used? Carbon dioxide is pumped under pressure into existing wells to allow much more oil to be extracted.

13. What things does the BLM need to balance in order to manage the public lands for Colorado's citizens? BLM has to balance preserving open spaces for recreation and wildlife; developing energy resources; providing rangeland, protecting cultural resources, protecting wildlife habitat; protecting hunting and fishing stock....

14. How does the Bureau of Land Management work to achieve this balance? BLM works with industry and citizens in formulating multiple-use land management plans for public lands above and below the ground; BLM participates in Resource Advisory Councils where all interested parties can voice their opinions.

Global Connections

National Standards:

Science
E: SCIENCE AND TECHNOLOGY
2. Understandings about Science and Technology

F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES
2. Populations, Resources, and Environments
4. Risks and Benefits

Social Studies
D: A STUDENT SHOULD UNDERSTAND AND BE ABLE TO INTERPRET SPATIAL (GEOGRAPHIC) CHARACTERISTICS OF HUMAN SYSTEMS, INCLUDING MIGRATION, MOVEMENT, INTERACTIONS OF CULTURES, ECONOMIC ACTIVITIES, SETTLEMENT PATTERNS, AND POLITICAL UNITS IN THE STATE, NATION, AND WORLD.
2. Explain how and why human networks, including networks for communications and for transportation of people and goods, are linked globally;
3. Interpret population characteristics and distributions;
Continued next page...

CD-ROM Segment: Global Energy Connections

This section of the CD-ROM program includes information about six different countries: the United States, France, China, El Salvador, Sri Lanka, and Nigeria. There are pop-up boxes with energy statistics and graphs for each country that students can compare, as well as short video profiles of the energy challenges facing each country.

Activity

1. Begin by asking the students if they know what's expected to happen to U.S. energy demand over the next few decades. *(Students may know that our energy demands are expected to increase.)* What about global energy demands? *(Global energy demand is also on the rise. In fact, by 2050, the world's energy demand is expected to double.)*

2. Next ask your students if they think we should be concerned about the projected increase in energy demand here and around the world. What challenges and opportunities could the world community face in trying to meet that demand? *(Answers will vary depending on the students' previous knowledge about energy. They may recognize that trying to meet this demand could result in greater amounts of pollution, the need to upgrade our energy transportation and delivery systems, potential conflicts getting access to enough energy resources, and rising prices. It also offers opportunities for new technological developments that make energy use more efficient or tap new energy sources. It could also mean changes in lifestyles as energy abundance changes or as we switch to new sources of energy.)* What steps are being taken in this country to address these issues? *(Answers will vary. Students will discover some answers to these questions when they view "Global Energy Connections." They may also want to investigate these questions further after completing this activity.)*

3. Pass out a copy of pages 28-29 to each student. Have them work individually, in pairs, or in small groups to explore "Global Energy Connections" and complete the sheet. Make sure they understand that they can move through this segment in any order and fill out the worksheet as they come across the information they need.

4. Analyze how changes in technology, transportation, and communication impact social, cultural, economic, and political activity; and
5. Analyze how conflict and cooperation shape social, economic, and political use of space.

F: A STUDENT SHOULD BE ABLE TO USE GEOGRAPHY TO UNDERSTAND THE WORLD BY INTERPRETING THE PAST, KNOWING THE PRESENT, AND PREPARING FOR THE FUTURE.
3. Analyze resource management practices to assess their impact on future environmental quality.

Overview:
Students examine the energy challenges facing different nations and the steps those nations are taking to meet their energy needs.

Objectives:
Students should be able to explain that meeting rising world energy demand may require different solutions in different places.

Subjects:
Science, Social Studies

4. Review "Global Energy Connections" with the students using the answer sheet on pages 30-31. You can also use the following questions for discussion:

   - Do you think China's increasing use of nuclear power is a good thing? Why or why not? *(Answers will vary. Students should know that nuclear power plants can generate a lot of power without emitting any of the pollutants associated with burning coal and other fossil fuels. Meeting the growing energy demands of 1.3 billion people without generating these emissions would be a boon to the environment—both in China and around the world. Students may also express concern over the safe operation of these plants, the safe disposal of nuclear waste generated by them, and potential security issues associated with the plants including the potential theft of nuclear material for weapons-making purposes.)*

   - What motivated the French to pursue nuclear power? *(The prime motivation was the desire for more energy independence precipitated by the oil embargo of the 1970s.)* Is greater energy independence a good goal for the United States? Is it attainable? What challenges and opportunities do we face in trying to become more energy independent? *(Answers will vary. Greater energy independence might make us less vulnerable to world oil price fluctuations. Students may cite improvements in technology that are making alternatives more economical, efficient, and reliable; opportunities to develop new energy technologies that we could also sell to the world; and as factors that could spur us toward energy independence. Students may cite higher costs of alternatives, economic impacts from switching to new energy sources, the lack of availability of alternative energy sources in some places, the lack of supporting infrastructure, and people's reluctance to change as obstacles to greater energy independence.)*

   - One thing that links people in different nations is trade. What energy-related examples of international trade were given in the videos? *(France imports uranium from several countries and exports electricity to other European nations; El Salvador is part of an electricity transmission system that links several Central American nations; El Salvador imports oil; Nigeria exports oil; Sri Lanka imports oil; the United States imports over half its oil.)*

   - When companies from wealthy nations are operating in less developed nations, what responsibilities should they have to local people? What environmental protection regulations should they adhere to—those in place in the country that they're working in or those they must follow in their own country? What if the regulations are stricter at home? Stricter in the country where they're working? *(Students will have different opinions on corporate responsibility and global citizenship. Students should draw on the example of Nigeria,* *where oil development caused severe environmental degradation and failed to adequately consider the needs of local people.)*

- What lessons did you draw from viewing "Global Energy Connections"? *(Answers will vary. Students should recognize that our energy challenges are complex, that there likely is not one solution that will fit all countries, and that many challenges may require a mix of solutions. They should also recognize that solutions to energy challenges can vary by place and that a nation's best options will be shaped by many factors, including its history, culture, political systems, access to resources, and geography.)*

Information Resources on the Web:

- CIA World Factbook—www.cia.gov/cia/publications/factbook/index.html
- Energy Information Administration's International Homepage—www.eia.doe.gov/emeu/international/contents.html
- World Resources Institute—http://earthtrends.wri.org/

Related NEED Activities to Try (see page 32):

- Mystery World Tour
- Global Trading Game
- Energy Around the World

Global Connections

Using information from the country profiles, fill in this table.

Country	Population	Per Capita CO_2 Emissions	Per Capita Energy Consumption
China			
El Salvador			
France			
Nigeria			
Sri Lanka			
United States			

Using the table above, answer these questions:

1. Does a larger population size mean greater per capita energy consumption? Does it mean greater carbon dioxide emissions? ____________________

2. Which country has the greatest per capita energy consumption? Why might energy consumption be high in this country? ____________________

Using the videos for each country, answer these questions:

3. What are two of the steps China is taking to curb air pollution as it increases its energy output to meet the needs of its people? ____________________

4. In what ways is geothermal power a benefit to El Salvador? ____________________

5. a. What approach has France taken to meet its energy demands? What advantages has it gained from this approach? ____________________

b. What challenges is France facing now with its energy program? ____________________

____

6. a. What two steps taken by the Nigerian government to lessen the impacts of oil development were highlighted in the video? ____

____

b. In what ways is the Nigerian government working to provide more reliable electricity to its people? ____

____

7. What advantages have Sri Lankans enjoyed through the expanded use of solar power?

____

____

8. a. What potential energy source was highlighted in the United States video? _____________

b. What advantages were given for it? ____

c. What challenges were mentioned that remain to be overcome if this energy source is going to become widely used and available? ____

____

Global Connections

Using information from the country profiles, fill in this table.

Country	Population	Per Capita CO_2 Emissions	Per Capita Energy Consumption
China	1,286,975,468	2.5 metric tons	880 metric tons of oil equivalent
El Salvador	6,470,379	1.0 metric tons	690 metric tons of oil equivalent
France	60,180,529	6.3 metric tons	4,230 metric tons of oil equivalent
Nigeria	133,881,703	0.7 metric tons	850 metric tons of oil equivalent
Sri Lanka	19,742,439	0.4 metric tons	390 metric tons of oil equivalent
United States	290,342,554	19.9 metric tons	7,960 metric tons of oil equivalent

Using the table above, answer these questions:

1. Does a larger population size mean greater per capita energy consumption? Does it mean greater carbon dioxide emissions? No, per capita energy consumption and carbon dioxide emissions vary from country to country but are not directly linked to population size. Standard of living, industrial activity, and the ways people meet their energy needs all affect energy consumption and carbon dioxide emissions.

2. Which country has the greatest per capita energy consumption? Why might energy consumption be high in this country? The United States. Energy consumption might be high because of industrial production, high standard of living, and/or wasteful practices.

Using the videos for each country, answer these questions:

3. What are two of the steps China is taking to curb air pollution as it increases its energy output to meet the needs of its people? Better controls on existing power plants; increasing use of hydro (Three Gorges Dam), nuclear, and wind and solar power; developing natural gas reserves; exploring cleaner coal technologies.

4. In what ways is geothermal power a benefit to El Salvador? It helps lessen El Salvador's dependence on foreign oil, fuels the country's economic recovery, and reduces air pollution.

5. a. What approach has France taken to meet its energy demands? What advantages has it gained from this approach? France developed its use of nuclear power, becoming less dependent on foreign oil and able to export electricity to other European nations.

b. What challenges is France facing now with its energy program? Finding a permanent solution for nuclear waste disposal, expanding its use of nuclear power, or developing other sources of energy.

6. a. What two steps taken by the Nigerian government to lessen the impacts of oil development were highlighted in the video? Implementing stricter environmental regulations; awarding new oil field contracts based on past performance of companies.
b. In what ways is the Nigerian government working to provide more reliable electricity to its people? Improving the country's electrical power system by repairing existing power plants, building new power plants, and establishing 9000 miles of new electrical transmission lines.

7. What advantages have Sri Lankans enjoyed through the expanded use of solar power? Greater access to electricity for rural residents without increasing air pollution, incurring the tremendous expense of expanding the grid, or increasing foreign oil imports.

8. a. What potential energy source was highlighted in the United States video? Hydrogen.
b. What advantages were given for it? Does not create emissions like fossil fuels do.
c. What challenges were mentioned that remain to be overcome if this energy source is going to become widely used and available? The need for a hydrogen energy delivery infrastructure.

NEED Activity Connections

The NEED Project is a nonprofit education association dedicated to promoting a realistic understanding of the scientific, economic, and environmental impacts of energy so that students and teachers can make educated decisions. The NEED program includes curriculum materials, professional development, evaluation tools, and recognition. The table below lists activities developed by NEED that tie in well with activities in this guide. You may want to try one or more of these activities after completing other activities in this guide. You may also wish to explore NEED's energy information books online at www.need.org/infobooks.htm. For more about NEED, including ordering information for their curriculum materials, go to **www.need.org.**

Activity Title	CD-ROM Connection	NEED Activity Tie In
Getting Energized!	Energy Snapshot	**Current Energy Affair—**student reporters create television shows about electricity.
Quiz Mania	Watt Do You Know?!	**Energy Jeopardy—**provides questions and directions for a Jeopardy!® game based on energy. **Energy Source Expo—**students create hands-on exhibits about energy sources. **Energy Enigma—**students investigate major energy sources.
Making a Federal Case	Energy and Public Lands	**U.S. Energy Geography—**a series of online resource maps for students to develop an understanding of energy production and use. **The Great Energy Debate Game—**students evaluate the advantages and disadvantages of the major energy sources in an innovative debate format.
Power Up!	The CEO Challenge	**Current Energy Affair—**student reporters create television shows about electricity. **Mission Possible—**students develop energy plans to provide more electricity to a growing country.
Going High Tech	New Technology	**Alternative Fuels: The Future Is Today—**students learn about alternative transportation fuels and participate in several activities to teach others.
Energy Stars	Conservation and You	**Energy House—**students learn about energy conservation and efficiency by using various materials to insulate a cardboard house. **Saving Energy at School: Learning & Conserving—**activities that explore energy use, efficiency, and conservation using the school as a lab.
North to Alaska	Alaska's Energy Story	**Transparent Energy—**students make presentations on energy sources and energy carriers. **Energy in the Balance—**charting and graphing activities that evaluate the advantages and disadvantages of major energy sources.
Global Connections	Global Energy Connections	**Mystery World Tour—**students explore energy sources and unique attributes of countries around the world. **Global Trading Game—**role play activity in which students analyze their country's resources and needs and trade with other countries. **Energy Around the World—**students explore energy use in other countries and compare it to energy use in the United States.

Glossary

alternative fuel—a popular term for "non-conventional" transportation fuels made from natural gas (propane, compressed natural gas, methanol, etc.) or biomass materials (ethanol, methanol). An alternative-fuel vehicle (AFV) is designed to operate on an alternative fuel.

barrel—a unit of volume equal to 42 U.S. gallons. Barrel is abbreviated as bbl.

biomass—any organic (plant or animal) material that is available on a renewable basis, including agricultural crops, wastes, and residues; wood and wood wastes and residues; animal wastes; municipal wastes; and aquatic plants.

British thermal unit (Btu)—the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit; equal to 252 calories.

carbon dioxide—a colorless, odorless, noncombustible gas with the formula CO_2 that is present in the atmosphere. It is formed by the combustion of carbon and carbon compounds (such as fossil fuels and biomass); by respiration, which is a slow combustion in animals and plants; and by the gradual oxidation of organic matter in the soil.

climate change—a term used to refer to all forms of climatic inconsistency, but especially to significant change from one prevailing climatic condition to another.

coal—a fossil fuel formed by the breakdown of vegetable material trapped underground without access to air. A power plant that uses coal to generate electricity is called a coal-fired power plant.

diesel fuel—a fuel composed of distillates obtained in petroleum refining operation or blends of such distillates with residual oil used in motor vehicles. The boiling point and specific gravity are higher for diesel fuels than for gasoline.

DOE—U.S. Department of Energy.

DOI — U.S. Department of the Interior.

drilling—the act of boring a hole to determine whether minerals are present in commercially recoverable quantities and to get the minerals out of the ground (*produce* them).

electricity generation—the process of producing electric energy or the amount of electric energy produced by transforming other forms of energy. Commonly expressed in kilowatthours (kWh) or megawatthours (MWh).

emission—a discharge or something that is given off; generally used to refer to discharges to the air.

energy—the ability to do work or the ability to move an object. Electrical energy is usually measured in kilowatthours (kWh), while heat energy is usually measured in British thermal units (Btu).

fossil fuels—fuels (coal, oil, natural gas, etc.) that have resulted from the compression and heating of ancient plant and animal life over millions of years.

fuel—any material that can be burned to make energy.

generator—a device that turns mechanical energy into electrical energy. The mechanical energy is sometimes provided by an engine or turbine.

geothermal energy—the heat energy that is produced by natural processes inside the Earth.

global climate change—gradual changing of Earth's climates caused by the buildup of greenhouse gases in the atmosphere. Many scientists believe the increased concentration of greenhouse gases is being caused by human activity.

global warming—an increase in the average near surface temperature of the Earth as a result of the greenhouse effect.

greenhouse effect—the result of gases in the Earth's atmosphere trapping heat from the sun in much the same way as the walls and roof of a greenhouse do. The two major greenhouse gases are water vapor and carbon dioxide. Lesser greenhouse gases include methane, ozone, chlorofluorocarbons, and nitrogen oxides.

hydroelectric power plant—a power plant that uses moving water to power a turbine generator to produce electricity.

hydropower—energy that comes from moving water.

kilowatt—a unit of power, usually used for electric power or energy consumption (use). A kilowatt equals 1000 watts. A kilowatthour (kWh) is a measure of electricity defined as a unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. One kWh is equivalent to 3,412 Btu or 3.6 million joules.

megawatt—a unit of electrical power equal to 1000 kilowatts or one million watts.

miles per gallon (MPG)—a measure of vehicle fuel efficiency. MPG is computed as the ratio of the total number of miles traveled by a vehicle to the total number of gallons consumed.

natural gas—an odorless, colorless, tasteless, non-toxic clean-burning fossil fuel. It is usually found in fossil fuel deposits and used as a fuel.

nonrenewable—fuels that cannot be easily made or "renewed." Oil, natural gas, and coal are all nonrenewable fuels.

nuclear energy—energy that comes from splitting atoms of radioactive materials, such as uranium.

oil—a black liquid fossil fuel that is the raw material that petroleum products, such as gasoline and most plastics, are made from.

petroleum—generally refers to crude oil or the refined products obtained from the processing of crude oil (gasoline, diesel fuel, heating oil, etc.)

photovoltaic cell—device, usually made from silicon, that converts some of the energy from light (radiant energy) into electrical energy. Also called a solar cell.

power plant—a facility where electricity is generated.

production (oil and gas)—the lifting of oil and gas to the surface and then gathering, treating, field processing (as in the case of processing gas to extract liquid hydrocarbons), and field storage.

radioactive waste—material left over from the production of electricity at nuclear reactors. Radioactive waste can be harmful to living things for tens of thousands of years.

refinery—an industrial plant that separates crude oil (petroleum) into chemical components that are then made into different useful products.

renewable energy sources—fuels that can be easily made or "renewed." We can never use up renewable fuels. Types of renewable fuels are solar, wind, and hydropower energy.

rolligon—specially equipped transports that move heavy equipment over the tundra. Rolligons have large tires that put less pressure on the snow and ice causing less damage to the tundra.

spent fuel—hot, highly radioactive fuel that is left over after being used in a nuclear reactor.

tanker—vessel that transports crude oil or petroleum products.

transmission line—a set of conductors, insulators, supporting structures, and associated equipment used to move large quantities of power at high voltage, usually over long distances between a generating or receiving point and major substations or delivery points.

turbine—a device with blades that is turned by a force, such as that of wind, water, or high pressure steam. A generator converts the mechanical energy of the spinning turbine into electricity.

uranium—a heavy, naturally-occurring, radioactive element.

Watt—a metric unit of power, usually used in electric measurements, which gives the rate at which work is done or energy used.

well—a hole drilled in the earth for the purpose of finding or producing crude oil or natural gas.

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