

energy EXCHANGE

A publication of the National Energy Education Development Project

January 2001

NSTA—St. Louis, MO

NEED is pleased to announce its participation in three workshops at the upcoming National Science Teachers Association Convention in St. Louis, Missouri, March 21–24, 2001. NEED is partnering with Blanche Sheinkopf of the Florida Solar Energy Center to conduct a short course to encourage renewable energy education in the classroom. WV-NEED Teachers Linda Fonner (Presidential Math and Science Award Winner) and Wayne Yonkelowitz (Milken Award Winner) will conduct a NEED workshop for 50 participants. NEED will also facilitate an Exhibitor Workshop in partnership with the U.S. Minerals Management Service. Students from Parkway School District, lead by Jean Settle, will help conduct the workshop.

Best of all, NEED will be hosting a NEED Teachers Reunion during the convention. Please e-mail info@need.org if you will be attending the convention and would like to attend.

Summer 2001

Check out the NEED website for up-to-date information on the Youth Awards Conference in June and the Energy Conferences for Educators in July at www.need.org.

Bob Stewart Retires from NOIA

Robert Stewart, long-time President of the National Ocean Industries Association, retired effective January 1, 2001. Bob's leadership as Chair of the NEED Board of Directors in the early 1990s guided NEED's growth and provided the continuing financial support to create new activities for schools nationwide. NEED wishes Bob well and is pleased that he plans to include NEED in his retirement activities.

Fuel Cell Power Plant

The most energy-efficient power plant in the world will soon provide electricity for the Environmental Science Center at Fort Meade, MD. The hybrid system will combine a solid state fuel cell and a microturbine to generate 1,000 kilowatts of electricity. Fueled by natural gas, this revolutionary system will be twice as efficient as a conventional fossil fuel plant, with a much lower environmental impact.

Combining the fuel cell and the microturbine will boost the system's generating efficiency to nearly 60 percent. Most power plants convert only 35 percent of a fuel's energy into useful electricity. The high efficiency also means that the system will generate much less carbon dioxide than a conventional plant. Since there will be no combustion, it will produce virtually none of the traditional power plant pollutants.

This project, a joint effort of the Department of Energy and the Environmental Protection Agency, is expected to open the door to an entirely new way to generate electricity—more like a battery than a boiler. The system is expected to begin operation in mid-2002. See www.fe.doe.gov.

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CALENDAR OF EVENTS

For more information about the events listed, call 1-800-875-5029. Many NEED events are being planned – watch this section for updates. If you have NEED programs or workshops in your state that you would like to add to the calendar, email your information to info@need.org.

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The NEED Project is a 501(c)(3) nonprofit education association providing professional development, innovative materials correlated to the National Science Education Content Standards, ongoing support and recognition to educators nationwide.

A list of NEED sponsors is available on our website and in our Annual Report.

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Call 1-800-875-5029 for information on NEED programs in other states.

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January 2001

1/6 Connecticut Energy Education Day Workshop – Southington, CT
1/9 Primary EnergyWise Schools Workshop – Cranston, RI
1/9 The Science of Energy Workshop – New Albany, IN
1/19-21 Illinois Student Advisory Board Meeting – Bloomington, IL
1/23 Navarro Middle School NEED Workshop – Rosenberg, TX
1/25 Houston Regional NEED Workshop – Houston, TX
1/29 Virginia NEED Workshop – The Plains, VA
TBA Alabama NEED Workshop – Baldwin and Mobile Counties, AL

February 2001

2/9-11 Energy Training Certification – Bloomington, IL
2/9 NEED Board of Directors Meeting – Washington, DC
2/19 Brevard County NEED Workshop – Florida Solar Energy Center, FL
2/19 Charlotte-Mecklenburg NEED Workshop – Charlotte, NC
TBA Virgin Islands NEED Workshop
TBA Western North Carolina NEED Workshop
TBA Pasquotank/Elizabeth City Schools NEED Workshop – Elizabeth City, NC
TBA Dare County NEED Workshop – Kitty Hawk, NC

March 2001

3/21-24 NSTA Convention and NEED Teachers Reunion – St. Louis, MO
Come check out the NEED related workshops at the convention!
TBA Alaska NEED Workshop – Anchorage, AK

April 2001

4/15 Youth Awards Projects Due to State Coordinators/NEED Offices
4/21 Renewable Energy Education Workshop – Washington, DC
In partnership with the Florida Solar Energy Center and the American Solar Energy Society

June 2001

6/22-25 National Youth Awards Program – Washington, DC.
Registration fee is \$500.00

July 2001

7/7-11 NEED National Energy Conference for Educators – Albuquerque, NM
Registration fee is \$800.00
7/14-18 NEED National Energy Conference for Educators – Williamsburg, VA
Registration fee is \$800.00
7/15-20 Camp KEEP (Kids for Energy and Environmental Protection) – Springfield, IL
7/23-28 Camp KEEP – Algonquin, IL
7/23-29 NEED activities at the National Boy Scout Jamboree – Ft. AP Hill, VA

NEED NEWS

Correlations to State Standards of Learning

We have correlated all NEED materials to the standards of learning of the following states: **Florida, Illinois, North Carolina, Rhode Island, Kentucky, New York, and South Carolina.** Copies of the national and state correlations can be found on our website at www.need.org or obtained by calling 1-800-875-5029.

Energy Fair

A new NEED activity, **Energy Fair**, to teach elementary students the scientific method and experimental design is available on our website or by calling NEED Headquarters. Suggestions for science fair projects are included.

This Mine of Mine

Teach students about mining with this new hands-on activity in which elementary students build a plot of land, mine it for the coal, then reclaim it. Call or email NEED Headquarters to obtain a copy.

NEED NEWS

A Winner in Nebraska

St. Isidore Elementary School in Columbus, Nebraska, has been awarded first place by *Keep America Beautiful* in their Waste Minimization division for schools. Mary Lou Green, a long-time NEED teacher, accepted the prestigious award in Washington, DC, in December 2000. St. Isidore has represented the state of Nebraska for many years in the Youth Awards Program for Energy Achievement, capturing several national NEED awards.

KY Teacher Receives Governor's Environmental Award

The winner of this year's KY Environmental Excellence Award for Energy Conservation was presented to Robin Thacker, a NEED teacher at Graves County High School. Robin helped organize "E.N.E.R.G.Y" (Eagles Nest Endeavors Reaching Graves' Youth). The program educates students in Graves County on energy and energy conservation. Robin presents NEED Energy Management for Schools workshops in other states, too.

West Virginia

Many thanks to NEED Lead Teacher Dawna Boley for presenting a NEED workshop at the recent West Virginia Science Teachers Association meeting in Morgantown, WV. Dawna teaches at Summersville Junior High and has been active in NEED for four years. A statewide WVEED Energy Conference will be held March 2-3, 2001.

Rhode Island

It was cold and snowy, but 80 middle and high school students from across Rhode Island came together for the RI EnergyWise Schools Conference in December. These students completed energy audits of Cranston East High School and Park View Middle School while learning how to develop energy management plans for their own schools. NEED Lead Teachers Robin Thacker (KY) and Joanne Spaziano (RI) and NEED Advisory Board Member Jeri Preddy (NC) facilitated the workshop. Rhode Island EnergyWise Schools is a program of NEED and Narragansett Electric.

An elementary level EnergyWise Workshop was conducted by Megan Carlton of Lillian Feinstein Sackett Street School to introduce younger students to concepts of energy and conservation.

Illinois

The Illinois Teacher Advisory Board met in Chicago to plan workshops and programs for the coming year. Educators representing all grade levels serve on the Board and assist ILEED and NEED staff as they plan and present ILEED Energy Workshops, NEED Energy Management for Schools programs for middle and high school students, and a summer training program, Camp KEEP, for intermediate students.

Florida

Thanks to the hard work of NEED Lead Teachers Carolyn Wuest and Nancy Stanley and their students at Workman Middle School, the Pensacola Regional NEED Workshop was a great success! Classroom materials and training are provided to Florida Panhandle schools thanks to the support of Chevron, USA and the U.S. Minerals Management Service.

TEACHER RESOURCES

www.netl.doe.gov/fireintheice: Students can keep track of scientists investigating methane hydrate deposits a mile deep in the Gulf of Mexico on this interactive website, **Fire in the Ice**, maintained by the Department of Energy's National Energy Technology Laboratory.

www.epa.gov/otag: The Environmental Protection Agency has launched a new website to help consumers make more informed choices when purchasing vehicles. The Vehicle Emissions Guide lists pollution levels for all 2000 and 2001 passenger vehicles sold in the United States. Consumers and students can compare the emissions of vehicles on the market today.

www.eia.doe.gov/kids: The EIA Kid's Page has lots of information about energy. NEED continues to work with EIA to expand the site.

www.energy.gov: The Department of Energy website has up-to-date information about energy. It also has information and activities for kids at **www.energy.gov/kidz/kidzone.html**.

www.eren.doe.gov/consumerinfo: Check out this Department of Energy website for up-to-date information about ways to save energy at home and at school.

www.sciam.com: The Scientific American website has up-to-date information on new technologies and discoveries in all areas of science. Teachers can also receive a free Teacher's Kit by calling 1-800-377-9414.

www.propanecouncil.org: The Propane Education and Research Council has lots of up-to-date, interesting information about propane on its website.

www.science.doe.gov: This Department of Energy website has fascinating articles about new technologies and discoveries in the world of science, with related articles and links.

www.villagepower2000.org: Students can follow the development of this project to provide electricity and Internet access to Porvenir, an isolated village of 600 indigenous people in the Amazonian rainforest of Bolivia.

PRIMARY ENERGY STORY: The Tale of Fern Fossil



Once upon a time, a beautiful fern tree grew in a swamp. All day, she soaked up sunlight and stored it in her fronds. The sun's energy helped her grow tall.

The biggest frond was Fern Fossil. Every day she stretched closer to the sun. She was proud to be the tallest frond on the tree.

One day, the sky grew dark and a strong wind blew. The other fronds huddled together. They gave each other strength. But Fern was too high. She was all alone. There were no fronds tall enough to help her.

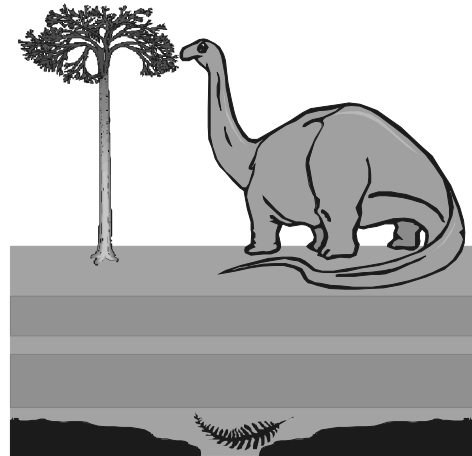
The wind blew harder and Fern's stem snapped. She fell from the tree into the dark water. Fern sank to the bottom of the swamp. She thought her journey was over.

Nature had a different plan for Fern. For a long time, she lay in the swamp. More plants fell into the water. They covered Fern like a blanket.

After many years, the water dried up and the swamp turned into land. Dinosaurs roamed over the earth. Fern lay under the ground, buried deeper and deeper.

The weight of the dirt and the heat of the earth changed Fern. She was no longer green. She lost her leafy shape. But she still had the sun's energy stored in her.

Fern Fossil had turned into a shiny black rock full of energy. She was a piece of coal. Fern and many other plants were now a big seam of coal buried under the ground.



One day, a big machine dug into the earth. It took away the dirt on top of the coal. It lifted Fern from the earth and put her into a huge truck. She was taken to a building where she was washed, then put on a train.

The train chugged through the night to a power plant. Fern was put into a boiler and burned. Her energy produced a lot of heat.

The power plant used Fern's energy to make electricity. It traveled through a power line to a house. A little boy turned on a light so that he could read.

The energy that Fern had gotten from the sun millions of years ago was lighting the night. Fern had traveled a long way.



ELEMENTARY EXPLORATION: LOCATING SOUND

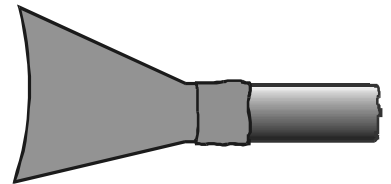
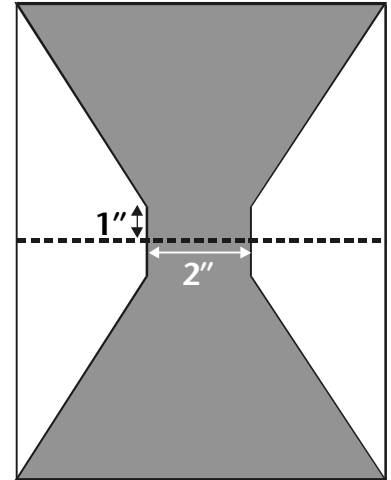
GOAL: To explore how the ear locates the direction of sounds from the relative time it takes sounds to reach our ears. (For example, a sound on our left will reach our left ear before it reaches our right.)

MATERIALS:

- Two 4' lengths of 1/2" soft plastic tubing*
- Two pieces of construction paper
- Scissors
- Tape
- Paper and pencils

PREPARATION:

1. Cut the construction paper as shown in the template on the right, so that you have four pieces of paper in the shape of the dark areas of the template.
2. Tape the sides of the pieces of paper together to make four funnel-shaped *sound gatherers* and tape them to the ends of the tubing, as shown in the diagram on the right.



PROCEDURE:

1. Set up a center with the tubing.
2. Schedule the students in groups of four to explore the center at five minute intervals.
3. Make a poster with the following instructions for the center:

How do you locate sounds? Without seeing what is making a sound and where it is coming from, how do you know the direction of the sound? Write your hypothesis on a sheet of paper.

1. Student A—hold one tube to each ear.
2. Two students (B & C)—hold the other ends of the tubes behind Student A as shown in Diagram 1.
3. Student D—make tapping sounds with two pencils behind Student A—to the left, to the right, and directly behind. Can Student A correctly locate the position of the sounds?
4. Student B—cover the end of your tube and see if Student A can correctly locate the direction of the tapping sound.
5. Students B & C—hold the ends of the tubes behind Student A as shown in Diagram 2.
6. Student D—make tapping sounds as you did in Step 3. Can Student A correctly locate the position of the sounds?
7. Each student take a turn as Student A.
8. As a group, discuss your results and write a conclusion to answer the question. Was your hypothesis correct?

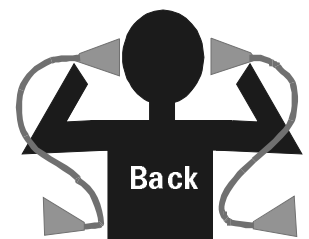


Diagram 1

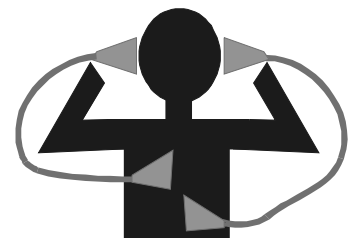


Diagram 2

* for information about obtaining inexpensive tubing, call 1-800-875-5029, or check your local aquarium supply store.

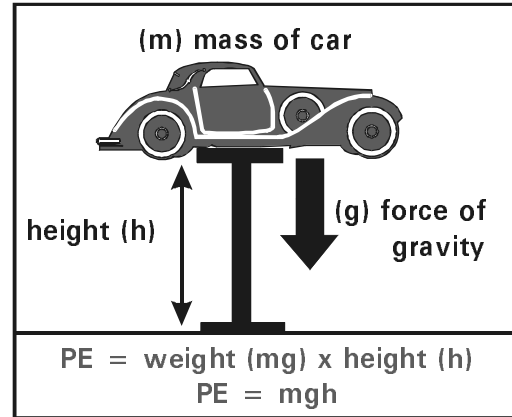
INTERMEDIATE ACTIVITY: EXPLORING POTENTIAL ENERGY

GOALS: To develop students' critical thinking skills and introduce them to concepts of potential energy.

To reinforce students' ability to calculate the potential energy of an object as the product of the object's weight and the height the object is raised ($PE = mgh$).

MATERIALS:

- 6 free-rolling metal toy cars
- 12 heavy magnets
- 6 spring scales
- 6 wooden ramps (2' long)
- 6 meter sticks



PROCEDURE:

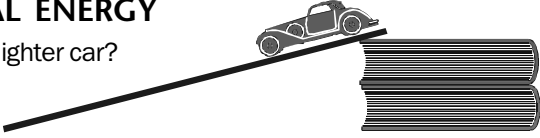
1. Place students into six groups. Give each group a spring scale, meter stick, ramp, toy car, and two magnets. Have the students use four books (of the same size) to raise the height of the ramp.
2. Using the diagram above and the formula, explain that the weight of an object equals the force of gravity applied to the object's mass. Instruct the students to work together to complete the assignment below.
3. After 20 minutes, discuss and evaluate the activity with the students.

POTENTIAL ENERGY

Questions: Will a heavier car roll proportionally farther than a lighter car?
If the height of a ramp is doubled, will a car roll twice as far?

Formula: The potential energy of an object is the product of the weight of the object and the height the object is raised. Potential Energy (PE) = weight (mg) X height (h) $PE = mgh$

Hypotheses:



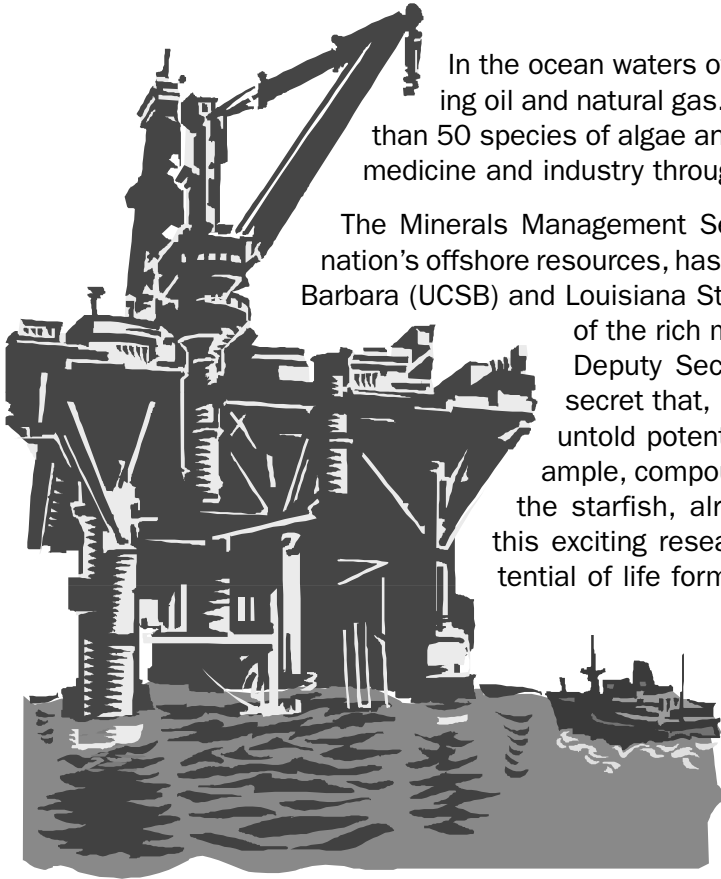
Procedure:

1. Make a ramp with two books. Calculate the potential energy of the car at the top of the ramp.
2. Roll the car down the ramp five times, measuring the distance it travels each time. Calculate the average distance the car traveled.
3. Make a ramp with four books. Calculate the potential energy of the car at the top of the ramp.
4. Determine the average distance the car rolls with five trials.
5. Place one magnet on the car. Repeat Step 1 and estimate the distance the car will roll.
6. Repeat Steps 2–4.
7. Place both magnets on the car. Repeat Step 1 and estimate the distance the car will roll.
8. Repeat Steps 2–4.

Results:

Conclusion: Were your estimates correct? What factors may have affected your results?

SECONDARY ARTICLE: MARINE LIFE ON OFFSHORE RIGS



In the ocean waters off the California coast, there are 27 platforms producing oil and natural gas. These platforms provide an artificial habitat for more than 50 species of algae and invertebrates, many of which have potential uses in medicine and industry through applied biotechnology.

The Minerals Management Service (MMS), the federal agency that manages our nation's offshore resources, has provided grants to the University of California at Santa Barbara (UCSB) and Louisiana State University (LSU) to investigate the potential uses of the rich marine life growing on and around these oil platforms. Deputy Secretary of the Interior David Hayes stated, "It is no secret that, like the rainforests, the oceans harbor life forms with untold potential for commercial and pharmaceutical uses. For example, compounds from some species of marine invertebrates, like the starfish, already show promise as tumor-fighting agents. From this exciting research, we hope to gain additional insight into the potential of life forms and marine organisms."

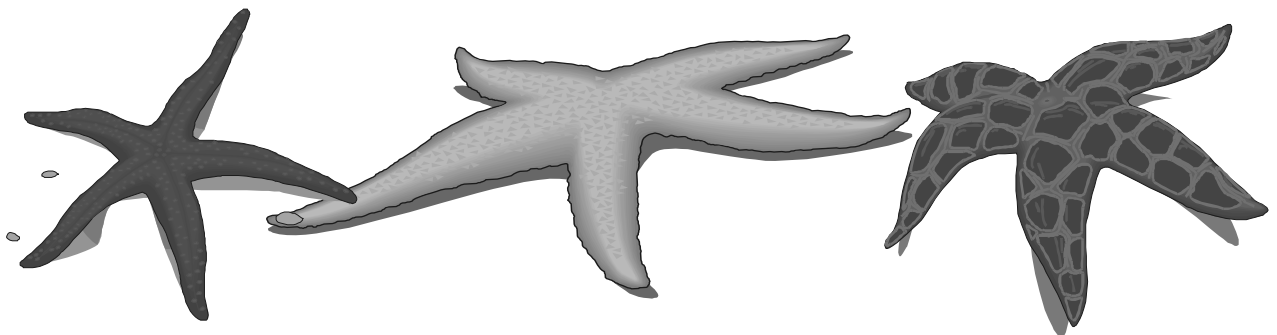
The marine life will be investigated for specific compounds with potential wound-healing, anti-inflammation, and anti-cancer activity. A compound from marine coral is currently being used as an implant in the treatment of bone fractures. Compounds from red algae have been discovered that imitate the anti-inflammatory actions of human hormones. One of the marine invertebrates may contain an important drug that can be used in the treatment of leukemia.

Researchers will also study the community and population ecology of the platforms. They will study the factors that affect the resident species, as well as the differences between natural populations and those around the platforms.

The research will analyze marine life around platforms in the Santa Barbara channel and the Gulf of Mexico without disturbing the naturally occurring reef systems. Many organisms, in fact, will be harvested as the platforms are cleaned. In some areas of southern California, mussels are already systematically harvested from oil platforms for human consumption.

Walt Rosenbusch, Director of MMS, explained some of the benefits of the research, "If the man-made offshore oil and gas structures prove to be a viable **substrate** (*an ecological foundation on which organisms live*), then this type of marine bio-harvesting could significantly lessen the need to harvest organisms from the natural ecosystem. This could help protect the marine habitat as well as provide a sustainable source for beneficial natural products."

For more information on this research, visit the Minerals Management Service website at www.mms.gov or the UCSB website at www.instdv.ucsb.edu.



Short Circuits

Greener, Cleaner National Parks

The National Park Service and Department of Energy are providing \$1.6 million in funding for 70 new projects under the Green Energy Parks program. This program provides both renewable energy and efficiency technologies, as well as alternative fuels, to the National Park System. Anacostia Park in Washington, D.C. will receive funding to install solar powered lighting in its Urban Tree House, an outdoor environmental education center. Other projects include ground-source heat pumps, solar water heating and photovoltaic-produced power. Educational displays will explain how the technologies save energy and protect the environment. See www.energy.gov.

Capturing Coal Mine Methane

Millions of cubic feet of methane escape every day from active coal mines. The Department of Energy is funding three new research projects that capture the gas and convert it to useful energy. One project in Marion County, WV, will convert methane into liquefied natural gas (LNG) to fuel heavy trucks. Another project will build a combination gas-processing/power generation system to produce consumable natural gas, as well as electricity. The third project will field test a fuel cell power plant using methane from a coal mine in Cadiz, Ohio. See www.fe.doe.gov.

Climate Change and Desert Wildfires

A new study conducted at the Nevada Desert FACE (Free-Air-CO₂-Enrichment) Facility predicts that rising levels of carbon dioxide in the atmosphere will disrupt sensitive desert ecosystems. The change may favor the growth of plants that invade the desert ecosystem over native desert species, providing more fuel for wildfires. The boom in plant growth could also upset the delicately balanced ecosystem by changing the nutrient cycle and the distribution of water. See www.science.doe.gov.

Economic Growth and Energy Demand Forecasts

Long-term U.S. economic growth is expected to average 3.0 percent per year through 2020, increasing projected U.S. energy demand from 96 quads in 1999 to 127 quads in 2020, according to the Energy Information Administration in its Annual Energy Outlook 2001. See www.eia.doe.gov.



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