

energy EXCHANGE

A publication of the National Energy Education Development Project

September 2002

NEED RECEIVES RECOGNITION

Rebuild America Award

On August 1, 2002, the NEED Project received the **2002 Energy Champion Award** as Rebuild America's Strategic Partner of the Year. The award was presented by the U.S. Department of Energy's Rebuild America Program at the 2002 State Energy Program/Rebuild America Annual Conference. NEED was recognized for its commitment to helping communities save energy and dollars and stimulate local economies by making energy-efficiency improvements to buildings.

NEED partners with Rebuild America/*EnergySmart Schools* to help school districts implement energy education programs to reduce energy use in schools and promote the use of energy efficient technologies.

Interstate Renewable Energy Council Award

Last year, the Illinois Department of Commerce and Community Affairs partnered with NEED to implement a Schools Going Solar Program in the Chicago Public Schools. To date, six schools have received solar panel installations, with an additional 10-25 school installations planned for 2002 and 2003. The program is funded through the state of Illinois with support from BP Solar, Spire Corporation, ComEd, and Schott Applied Power.

On June 18, 2002, at the 2002 National Solar Conference, IREC presented one of its **2002 Innovation Awards** to NEED and IL-DCCA for the Chicago Schools Going Solar program. The IREC Innovation Awards recognize state and local governments and schools (K-12) that have implemented innovative projects that promote and accelerate the adoption of renewable energy technologies.

Energy Awareness Month

It's Back to School and October is Energy Awareness Month! There are so many things you can do to raise awareness of energy, focus on energy in the classroom and community, and just have fun! To find exciting, innovative energy activities and ideas for Energy Awareness Month, go to the our page on the NEED website, www.need.org/energyawarenessmonth. Teacher guides, links, and student activities are available to help you plan great events. If you have something amazing already planned, email info@need.org! You can also send photos for the NEED Photo Gallery and connect to other teachers in the NEED Discussion Forums.

NEW ENERGY POLLS

NEED's new Energy Polls are now on-line and ready to go. The polls include multiple-choice questions, along with statements designed to determine what students think about energy and how they feel about assuming leadership roles in the classroom. The Energy Polls are available at four reading levels—Primary, Elementary, Intermediate, and Secondary—and focus on the information presented in NEED's basic energy units, which have been developed to meet the National Science Standards.

Teachers are encouraged to use the Energy Polls as pre- and post-program assessment tools. The on-line poll program provides teachers with class-based results, so they can determine baseline knowledge and evaluate the effectiveness of their energy units. For teachers who do not have Internet access, the **Blueprint for Success** (included in NEED's Membership Packet) has the Energy Polls, which can be copied for classroom use.

Inside this issue....

What's New	1
NEED Info & Calendar	2
NEED News	3
Primary	4
Elementary	5
Intermediate	6
Secondary	7
Short Circuits	Back

The NEED Project

National Energy Education Development
P.O. Box 10101
Manassas, VA 20108
TEL 1-800-875-5029
FAX 1-800-847-1820
EMAIL info@need.org
WEB ADDRESS www.need.org

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.

NATIONAL STAFF

Paul M. Donovan
Executive Director

Mary E. Spruill
Program Director

Martha Wise Callan
Curriculum Director

Karen Reagor
Regional Program Director

Pam Proctor

KY EnergySmart Schools Coordinator

David Graham

Administrative Assistant

NEED STATE COORDINATORS

Peggy Chamness, IL
(217) 785-3411

Karen Reagor, KY
(859) 578-0312

Peter Zack, ME
(207) 625-7833

Keith Etheridge, MI
(517) 351-1816

Gayle Sims, MS
(601) 359-6613

Shauni Nix, Columbus, OH
(614) 785-1717

Deb Yerkes, Cincinnati, OH
(513) 688-1717

Julie Capobianco, RI
(401) 222-3373

Angie Perry, SC
(803) 366-6603

Chyrrall Dawson, TN
(615) 741-6671

Leila Muller, VI
(340) 773-3450

Copyright 2002: National Energy Education Development Project. All rights reserved. *Energy Exchange* is published five times a year and is available on NEED's website.

Educators may reproduce articles and activities for classroom use.

CALENDAR OF EVENTS

For more information, email info@need.org or call 1-800-875-5029

October – Energy Awareness Month (visit www.need.org/energyawarenessmonth)

- 4 School Tour Day – Solar Decathlon – Washington, DC
- 8 North Carolina *EnergySmart Schools* Conference – Chapel Hill, NC
- 8 Southwestern Michigan NEED Workshop – Cook, MI
- 8 ILEED Workshop – Pontiac, IL
- 9 ILEED Workshop – Bourbonnais, IL
- 10 ILEED Workshop – Chicago, IL
- 16 Joliet School District 3rd Grade *Schools Going Solar* Workshop – Joliet, IL
- 16 ILEED Workshop – Carterville, IL
- 16 KyNEED Workshop – Owensboro, KY
- 17 KyNEED Workshop – Paducah, KY
- 17 ILEED Workshop – Schaumburg, IL
- 17-18 Naperville, Indian Prairie & Glen Ellyn School Districts *Schools Going Solar* Workshops – IL
- 18 KyNEED Workshop – Murray, KY
- 19 Joliet School District 5th Grade *Schools Going Solar* Workshop – Joliet, IL
- 22 ILEED Workshop – Macomb, IL
- 22 KyNEED Workshop – Boone County, KY
- 23 ILEED Workshop – Springfield, IL
- 23 ILEED Workshop – Belleville, IL
- 24 ILEED Workshop – Charleston, IL
- 23-25 NEED presentation at the Energy Services Coalition Convention – Chicago, IL
- 24 NEED presentation at the National Science Teachers Association Regional Convention – Louisville, KY. *If you are attending, contact Karen Reagor at kreagor@need.org.*
- 25 Virgin Islands NEED Workshop – St. Thomas, USVI
- 28 Virgin Islands NEED Workshop – St. Croix, USVI
- 29 ILEED Workshop – Peoria, IL
- 29 KyNEED Pre-Service Workshop – Northern Kentucky University
- 31 NEED presentation at the National Ocean Industries Association Annual Meeting – West Palm Beach, FL

November

- 1 NEED presentation at the National Ocean Industries Association Annual Meeting – West Palm Beach, FL
- 5 Ohio Energy Project Workshop – Zanesville, OH
- 6 Ohio Energy Project Workshop – Dayton, OH
- 6 KyNEED Workshop – Kenton County, KY
- 7 KyNEED Workshop – Maysfield, KY
- 8 Ohio Energy Project Workshop – Lima, OH
- 11-15 KyNEED Workshops – Knott, Letcher & Perry Counties, KY
- 13 ILEED Workshop – Godfrey, IL
- 13 Ohio Energy Project Workshop – Akron, OH
- 14-16 NEED session at the National Science Teachers Association Regional Convention – Portland, OR. *Email mspruill@need.org if you are attending.*
- 14 Ohio Energy Project Workshop – Cleveland, OH
- 15 ILEED Workshop – Mt. Carroll, IL
- 19 KyNEED Workshop – Campbell County, KY
- 20 Ohio Energy Project Workshop – Springfield, OH
- 21 Ohio Energy Project Workshop – Toledo, OH
- 21 KyNEED Workshop – Danville, KY
- 21-23 ILEED/NEED activities at IL Association of School Boards Convention – Chicago, IL
- TBA Florida NEED Workshop – Pensacola, FL
- TBA Alabama NEED Workshop – Baldwin County, AL

December

- 5-6 ILEED Teacher Advisory Board Meeting – Chicago, IL
- 5-6 NEED Short Course at the National Science Teachers Association Regional Convention – Albuquerque, NM. *If you are attending, contact Barbara or Robert Lazar at lazar@aps.edu.*
- 10 Ohio Energy Project Workshop – Athens, OH
- 11 Ohio Energy Project Workshop – Ironton, OH

March 2003

- 27-31 NEED workshops at the National Science Teachers Association National Convention – Philadelphia, PA. *A NEED teacher reunion is planned; if you are attending, contact mspruill@need.org.*

June 2003

- 9-14 (Tentative) Nebraska NEED Workshops – Columbus, NE
- 20-23 National Youth Awards for Energy Achievement – Hyatt Regency Crystal City, VA

NEED NEWS

KyNEED Traveling Conference

Energy and Education – Making the Connection was the title for the first KyNEED Energy Conference for Educators. The traveling conference, held July 8–11, 2002, introduced 23 Kentucky educators to Eastern Kentucky's abundant and varied energy resources. Goals of the conference included site visits to help teachers learn more about Kentucky's energy resources, both renewable and nonrenewable, and to give them instruction on using NEED curriculum materials in their classrooms. The teachers met in Winchester, KY at the corporate headquarters of East Kentucky Power. They boarded a tour bus and headed south to the Somerset Refinery in Somerset, KY. During the next four days, the teachers explored the Laurel River Dam Hydropower Plant, the Kentucky Coal Museum and Portal 31, Perry County Coal's Starfire surface mine, the Kentucky Division of Fish & Wildlife Resources Wildlife Management Area on a reclaimed coal mine site, Equitable Resources' Hydrocarbon Plant, Big Sandy's coal-fired power plant, and coal loading facilities in Ceredo, WV. A stop was also made at Paul Blazer High School in Ashland, where a solar panel has been installed to operate equipment in its industrial arts program. Travel time on the bus and evening sessions at several of Kentucky's most beautiful state parks were spent learning about NEED's curriculum materials. Evening highlights also included keynote speaker Michael Smith, Assistant Secretary of Fossil Energy, U.S. Department of Energy, who joined the teachers for a day of touring. The Energy Conference was provided free of charge to teachers through the generous support of three primary sponsors—the Kentucky Coal Council, the Kentucky Division of Energy, and American Electric Power. Next summer's conference will be held July 21-25, 2003, focusing on the energy resources of Western Kentucky.

Illinois Camp KEEP

Camp KEEP (Kids for Energy and Environmental Protection) had record-breaking attendance this summer. The large number of new and returning campers shows that Illinois kids are more motivated than ever to increase energy education in their schools and communities. Sponsored by the Illinois Department of Commerce and Community Affairs, Camp KEEP 2003 is scheduled for July 13-18 in Cantrall and July 21-26 in Algonquin, IL.

NEED Summer Conferences

Who says training programs can't be fun? Michele Paternoster of Fairbury, Illinois, provides her account of NEED's National Energy Conference for Educators, "I spent July 20-24 in beautiful Charleston, SC. We worked hard, ate well, and laughed often! The agenda was set so we could learn about energy and how to implement energy programs in the classroom – but we also could explore! I left the conference with a greatly expanded knowledge of energy, an amazing amount of teaching materials (all correlated to the National Science Education Standards), an extensive network of friends and colleagues, and the desire to encourage my students to become energy leaders and to be EnergySmart!"

The 2002 conferences trained 200 educators at its summer conferences, thanks to the support of the energy industry and local, state, and federal energy agencies. To see photos from the events, go to www.need.org/gallery/.

If you are interested in attending in 2003, mark your calendars now:

July 12-16: Chicago, IL

July 19-23: Galveston, TX

July 26-30: Denver, CO

NEED Students Wow Rebuild America/State Energy Program Conference

Many thanks to the EnerJags students, along with NEED Lead Teachers Carolyn Wuest and Nancy Stanley from Workman Middle School in Pensacola, FL for presenting NEED activities at the U.S Department of Energy Conference in New Orleans in August. The 400 attendees learned about energy efficiency and NEED from a student perspective!

NEED Recognizes Outstanding Students and Teachers!

Thanks to the support of PG&E National Energy Group*, NEED's annual Youth Awards for Energy Achievement was a great success – over 400 teachers and students exchanged energy ideas for the classroom, toured Washington, met new friends, and set goals for their energy education activities for the coming year. Secondary level students received a special tour of PG&E National Energy Group's energy trading floor. For a list of winners and to see photos from the event, go to www.need.org/awards.htm.

New at www.need.org!

Visit the photo gallery section to see NEED events in action. Several NEED schools are posting their school energy education pages on our website—see what these kids are doing at www.need.org/webkids.htm. NEED also has several online discussion groups for teachers to exchange ideas, post questions and more!

NEED School Goes Solar

Park View Middle School (Cranston, RI) – the NEED Junior Level School of the Year for 2002 – recently received a Photovoltaic (PV) System from Solar Works. The solar panels will generate electricity, help students learn more about solar energy, and be showcased at the Rhode Island NEED Workshops planned for fall.

Primary Students—Grab Your Crayons!!!

NEED has teamed with the National Ocean Industries Association (NOIA) and the U.S. Department of Energy Office of Fossil Energy to provide primary (K-4) teachers with a fun activity for October – Energy Awareness Month. Thanks to DOE support, NEED and NOIA will be providing teachers with class-sets of **Discoveries for Everyone** – a coloring poster that highlights interesting things about offshore oil and gas production. The poster includes drill ships, floating rigs, and remotely operated vehicles. NEED has developed a Teacher Guide for the poster, which will be included with the class sets. It is also available at www.need.org/energyawarenessmonth. To order posters free of charge, email info@need.org or call 1-800-875-5029 with complete shipping (No P. O. Boxes) information. Tell your friends, too!

* PG&E National Energy Group and any other company referenced herein that uses the PG&E name or logo are not the same company as Pacific Gas and Electric Company, the regulated California utility. Neither PG&E National Energy Group nor these other referenced companies are regulated by the California Public Utilities Commission. Customers of Pacific Gas and Electric Company do not have to buy products from these companies in order to continue to receive quality regulated services from the utility.

PRIMARY EXPLORATION: How Does A Thermometer Work?

BACKGROUND: We use a thermometer to measure how hot or cold an object is.

QUESTION: How does a thermometer work?

PURPOSE: To make a thermometer.

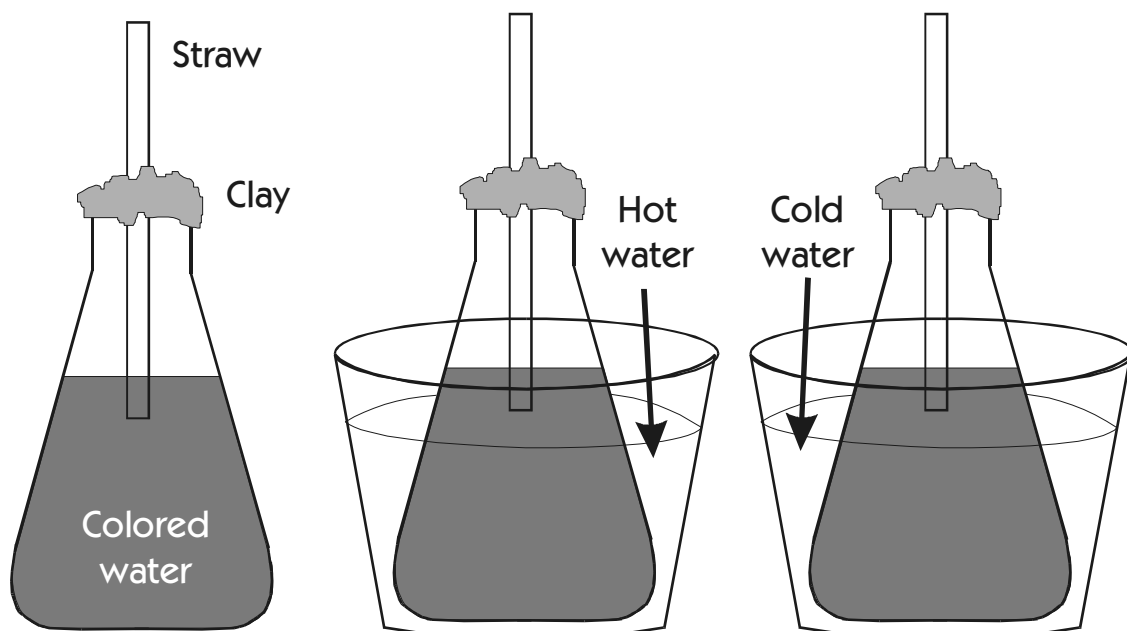
MATERIALS: 1 clear straw Cold, room temperature, and very warm water
1 glass bottle Dark (blue or green) food coloring
2 large containers Clay

PREDICTION: Read the procedure. Write what you think will happen when the bottle is placed in hot water and cold water.

- PROCEDURE:**
1. Fill the glass bottle with 400 ml. of room temperature water. Add 10 drops of dark food coloring to the water in the bottle.
 2. Hold the straw in the bottle so that its end is in the water. Mold the clay around the top of the bottle to hold the straw. Make a tight seal.
 3. Put the bottle into a container. Pour in hot water until it is almost full. Observe the water in the straw for three minutes.
 4. Put the bottle in the other container and fill it with cold water. Observe the straw for five minutes.

DATA: Record your observations.

CONCLUSION: Write how you think the thermometer works.



ELEMENTARY EXPLORATION: Simple Machines: Lever

Background: You and your best friend are on the playground. Your friend weighs 100 pounds and you weigh 50 pounds. He dares you to lift him and hold him up for 5 minutes. A simple machine called a lever can help you.

Question: Can you lift an object much heavier than you are?

Hypothesis: I think I ...

Materials: 2 pencils (hexagonal - not round)
3 pennies
Tape
Ruler

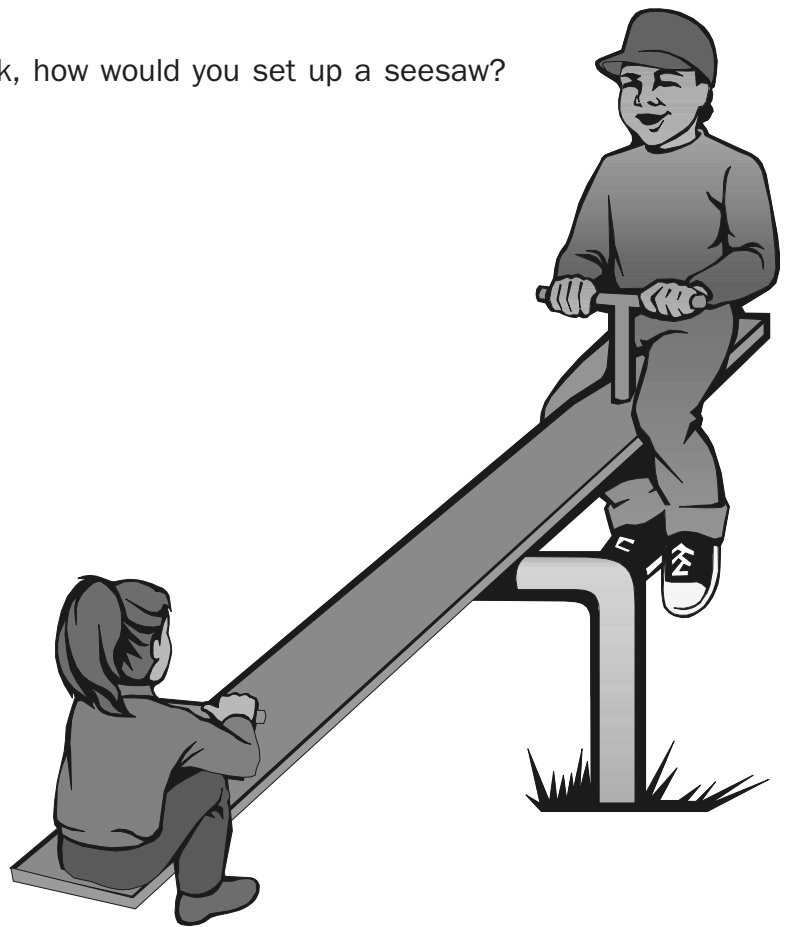
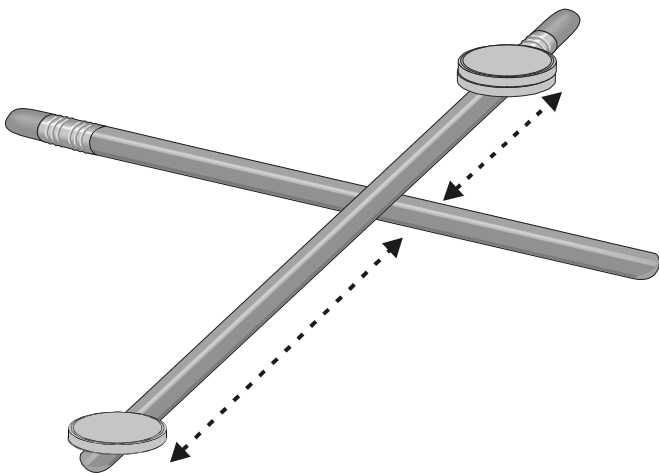
Procedure:

1. Make a lever with two pencils. Tape one penny to each end of the top pencil.
2. Move the top pencil until the lever is balanced. Measure the distances from the middle of each penny to the fulcrum. Are the distances the same?
3. Tape two pennies to one end of the top pencil and one penny to the other end.
4. Move the top pencil until the lever is balanced. Measure the distances from the middle of the pennies to the fulcrum. Which distance is longer?

Conclusion: How would you set up a seesaw so that you can lift your friend?

If you want to lift a 200 pound rock, how would you set up a seesaw?

The top pencil is the **LEVER**.
The bottom pencil is the **FULCRUM**.



INTERMEDIATE ARTICLE: The New Wind Turbine

The old windmills of Holland are a far cry from the sophisticated wind machines of today. Research is being done all the time at many facilities, including the National Wind Technology Center, to design and build more efficient wind machines.

The basic components of a modern wind machine are:

1. **Blade** Modern blades are specially designed to capture more energy from the wind. They are made from light, but strong, composite materials to enable them to survive gusty winds (over 45 mph). They use aerodynamic controls or 'brakes' to control the speed of the blades.
2. **Rotor Hub** The latest rotor hub designs are flexible. This ability to move allows the rotors to be more efficient, reduces the load on the structure of the machine, and minimizes the risk of damage to the power train.
3. **Generator & Power Train** Innovative low-speed, direct-drive designs allow new wind turbines to produce power at changing rotor speeds. These new designs allow researchers to make machines more efficient and easier to control, reducing the size of expensive gear boxes, or eliminating them altogether.
4. **Tower** Advanced construction materials and special tower designs allow researchers to use taller towers that place the turbine higher, where the wind is stronger and more energy is available.
5. **Power Control System** Advanced power control systems improve the control of the wind turbine in constantly changing wind conditions, continually optimizing the power produced while minimizing wear and tear on the machine.

Today, entire systems can be modeled using computer programs that allow designers to try out advanced components in different configurations. Data on wind variations at specific sites can be incorporated so that machines can be designed to produce the most power in a given location. Then tests with prototypes (models built for experimentation) help refine the design by suggesting where final changes should be made.

The National Wind Technology Center is part of the National Renewable Energy Laboratory of the U.S. Department of Energy.

For more information on advanced wind technologies, go to NWTC's website at www.nrel.gov/wind and the American Wind Energy Association website at www.awea.org.



INVESTIGATE WIND ENERGY IN YOUR STATE

1. Find out if there are any wind machines in your state. If so, how many are there, where are they located, and how much power do they produce? Are there plans to install more in the near future?
2. Find out what areas of your state have wind resources that would produce power economically if wind machines were installed.

SECONDARY ARTICLE: Drilling a Well Today

Drilling an oil or gas well involves much more than making a hole in the ground. It entails the integration of complex technologies, requiring the producer to make decisions about unexpected pressures and rock formations. The well will be the only conduit to move the oil or gas from the reservoir to the surface; it must be a conduit that will last at least 50 years and be flexible enough in design to allow for the application of future technologies.

Drilling operators must confront and solve extremely difficult technical and safety problems as they bore through layers of subsurface rock to access the strata that contain oil and gas. In addition, the drilling must be performed in a way that protects the geologic formation, the production capacity of the well, and the surface environment.



Problems that arise during drilling must be diagnosed using the data that is transmitted from the bottom of the well to the surface, where the information is collected on the rig floor. Depending on the depth of the well, valuable time can be lost before the problem is addressed, leading to the possibility that the situation worsens and drilling operations must be halted. The greatest economic risk occurs when drilling is stopped after much time and work have been invested.

Dealing with serious unforeseen problems is the greatest challenge during the drilling process and the primary reason for developing advanced drilling technologies. The U.S. Department of Energy has formed partnerships with industry, national laboratories and universities to conduct research and develop new technologies to reduce the costs and risks of drilling, reduce potential damage to geologic formations, and protect the environment. The research goals include:

Drilling Faster...This element addresses the need for increased efficiency during the drilling phase. Drilling rig time is the most expensive part of the operation, comprising 30-35 percent of total cost. Technologies are being developed to reduce equipment failure, extend the life of drill bits, and reach the target area with as few course corrections as possible.

Drilling Deeper...This aspect addresses the complex geologic environments that affect the drilling phase. Technologies and strategies are being developed that use the specific characteristics of a geologic formation itself to help drill the well. An example of this is the deeper, harder rock formations that contain natural gas. The most efficient strategy is to focus on the brittle nature of the rock itself, which breaks into large chips when hit. It is more efficient to break up the rock by hitting it than to crush and grind it into powder, as is usually done.

Drilling Cheaper...There is still no substitute for drilling. The goal of this aspect, then, is to develop drilling technology that is cost effective. Costs are measured in terms of impact on the environment, lifespan of the well and its machinery, and long-term productivity of the well. This requires drilling wells that will last a long time in the precise location needed to achieve maximum recovery of oil and gas, without damaging the environment.

Drilling Cleaner...An important objective of today's research is minimizing the environmental impact of drilling activities. This includes reducing the amount of surface disturbance and responsibly disposing of wastes generated by the drilling. The development of small bore wells has led to a 75 percent reduction in the amount of surface disturbed and waste generated. Operating costs are also reduced by 50 percent. The goal is to develop drilling technologies that are environmentally neutral, or even friendly.

Drilling for the 21st Century...The focus of this research is the development of 'smart well' technologies that will enable drilling without rigs—systems that will leave no footprint. There is also research into advanced drilling systems that anticipate problems and make adjustments automatically. Using lasers for drilling is another focus of the research. High-power laser technology developed by the military for national defense could possibly be adapted to drilling for oil and gas.

For more information on new drilling technologies, go to the Fossil Energy website of DOE at www.fe.doe.gov.



Short Circuits



Cleanest Coal Plant in the U.S.

This fall, the 405-megawatt Big Stone Power Plant in Milbank, South Dakota, will become one of the cleanest coal-fired power plants in the world. A cooperative agreement between the U.S. Department of Energy and the Otter Tail Power Company paves the way for installation of a new type of pollution control device on the plant. When the plant begins operating this fall, the first-of-its-kind device is expected to remove more than 99.99 percent of the microscopic particulate matter released when coal burns—virtually eliminating a pollutant that contributes to haze and can cause respiratory problems.

The new technology will be a hybrid system, combining the best features of baghouses and electrostatic precipitators, the two most common devices used today to reduce particulate emissions from power plants. Baghouses are essentially huge vacuum cleaners that use a series of fabric filters to trap particles in the combustion gases emitted from coal boilers. Electrostatic precipitators rely on a series of plates and electrodes to create an electric field that charges particles in the gas stream. Just as static electricity causes objects to cling together, the charged dust particles cling to the plates.

When flue gas from the boiler enters the device, more than 90 percent of the tiny fly ash particles become electrically charged and stick to the plates. Particles not caught on the plates are trapped by the filter bags. *See <http://fossil.energy.gov>.*

New Gasoline Engines Nearly Pollution-free

Gasoline engines now in production can be nearly pollution-free, according to a three-year study at the University of California-Riverside. The study suggests that Americans can enjoy cleaner air using vehicles with internal combustion engines. Two vehicles with advanced four-cylinder engines—Nissan Sentra and Honda Accord—were tested with low-sulfur gasoline and found to produce very few emissions.

The engines have been sold in small numbers in California, where the low-sulfur gasoline is widely available because of the state's strict anti-pollution statutes. It will probably require a federal mandate for the clean fuel to become available across the country, which would open the door to cleaner-burning engines everywhere.

According to Joseph Norbeck, director of the facility that performed the challenging tests at UCR, "You won't get zero (emissions), but you will get pretty close." *Summarized from USA Today, September 4, 2002.*

RENEW TODAY
Call or email NEED to update your
NEED membership and receive your
2002-2003 Membership Packet:
1-800-875-5029, ext.10
info@need.org

NONPROFIT
ORGANIZATION
U.S. POSTAGE
PAID
MMI

THE NEED PROJECT
P.O. Box 10101
Manassas, VA 20108
TEL (703) 257-1117
FAX (703) 257-0037
www.NEED.org