

ENERGY EXCHANGE

A publication of the National Energy Education Development Project

January 2002



Youth Awards

June 21-24, 2002

Plans for the June 2002 Youth Awards Program are in full swing. Now is a good time to begin putting your energy scrapbook together and planning your fundraising activities. Last year was our biggest conference ever and we want to make 2002 even bigger and better.

Attending Youth Awards is a wonderful way to reward your students, get to know our nation's capital, and make new friends from across the country.

!! Register NOW !!



Galveston, TX ★ Charleston, SC

Summer Conferences are Filling Fast

Sign up now to attend one of NEED's energizing summer training conferences: July 13-17 in Galveston, TX, or July 20-24 in Charleston, SC. Explore NEED's new materials, take interesting energy field trips, and hear about energy from the experts. If you don't have a conference brochure, give us a call at 1-800-875-5029 or visit our website at www.NEED.org.

NEW ACTIVITIES

NEED is in the process of developing student workbooks to reinforce the information and vocabulary in the **NEED Energy Infobooks**. NEED's Teacher Advisory Board met in May and recommended the development of these activities.

The student workbooks include reasoning, matching, vocabulary and short answer worksheets, graphing activities, and crossword puzzles for teachers to use to reinforce information and evaluate student comprehension.

Drafts of the **Primary** and **Intermediate Energy Activities** workbooks have been completed and will be available for review on the NEED website, www.NEED.org, by the 15th of December, along with the teacher guides. A draft of the workbook for the **Secondary Energy Infobook** should be on the website by the first of January. Teachers can print out the complete workbooks and teacher guides or individual worksheets as they need them.

NEED plans to make class sets of the workbooks available for the 2002-2003 school year. If you use the draft materials on the website, please send us your comments and suggestions.

See pages 4-5 for sample activities from the primary and intermediate workbooks.

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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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Educators may reproduce articles and
activities for classroom use.

CALENDAR OF EVENTS

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

January

- 9 Rhode Island NEED Primary Workshop - Cranston, RI
22 Wake County Fifth Grade NEED Energy Curriculum Workshop - Raleigh, NC
Webster Building (4:15 - 6:45 pm). For information contact Tammy at (919) 850-1820.

February

- 20 Energy Efficiency in Schools Forum - National Building Museum, Washington, DC
TBA ILEED Energy Education Conference for Teachers
TBA Southeastern New Mexico NEED Workshop
TBA California NEED Workshop - Carpinteria, CA
TBA Plaquemines Parish NEED Workshop - Plaquemines Parish, LA
TBA Colorado NEED Workshop - Bayfield, Ignacio, Durango, CO

March

- 7 Michigan NEED Workshop - Lansing, MI
8-9 WV-NEED Workshop - Morgantown, WV
27-30 NEED Workshops and Short Course: National Science Teachers Association National Convention - San Diego, CA. NEED will host a reunion for NEED teachers; contact mspruill@need.org to RSVP.

April

- 15 Youth Awards Projects Due to State Coordinators or National Headquarters
15 ILEED Energy Training Certification Evaluation Packets Due
15 ILEED Youth Energy Leadership Award Applications Due
21 NEED session at the National Hydropower Association/Hydropower Research Foundation Annual Convention

May

- 1 ILEED Youth Awards Luncheon
7 KyNEED Youth Awards Luncheon
TBA ILEED EnergySmart Schools Forums - Chicago, IL and Springfield, IL

June

- 15-20 NEED Sessions at Solar 2002: the National Convention of the American Solar Energy Society
21-24 National Youth Awards for Energy Achievement - Hyatt Regency Crystal City, VA

July

- 6-11 ILEED Camp KEEP (Kids for Energy and Environmental Protection) - Algonquin, IL
8-12 KyNEED Energy Conference for Educators
13-17 NEED National Energy Conference for Educators - Galveston, TX
13-19 ILEED Camp KEEP (Kids for Energy and Environmental Protection) - Cantrall, IL
20-24 NEED National Energy Conference for Educators - Charleston, SC

* for a listing of Ohio workshops, see www.ohioenergy.org/workshops2.htm

Great Success this Fall!

Thanks to the support of NEED's partners and sponsors, more than 200 NEED workshops were conducted this fall across the country. The growth and success of the NEED network are a result of the hard work of our Lead Teachers and Workshop Presenters, our Teacher Advisory Board, and our loyal sponsors. Watch for more great things in Spring 2002!



NEED NEWS

Are You Using NEED and Saving Energy at School? Let Us Know! Blanche Sheinkopf of the Energy\$mart Schools program has asked NEED to collect data from schools that are saving energy as a result of their NEED programs. Please contact your building administrators and/or energy personnel to collect data on how much energy your school has saved. You can give us specific dollar amounts if that's easier. This data collection is part of the Energy\$mart Schools initiative to show that education really makes a difference in energy consumption. Please send the information, including the activities your school has undertaken, to NEED at P.O. Box 10101, Manassas, VA 20108, or to info@need.org.

Helpful Hint for Youth Awards in June

As you plan your trip to the National Youth Awards Recognition Ceremonies in June, remember that airline security has increased since September 11. Many airlines now require students traveling without parents to present a government-issued identification card. Most state Departments of Motor Vehicles will issue student ID cards for a small fee. School-issued ID cards are usually accepted if they have a photo. Make sure your students have acceptable IDs before making flight plans for Washington, D.C.

Helpful Energy Education Resources

The Energy Information Administration, National Energy Information Center, has released its 2001-2002 Energy Education Resources guide, which includes names, addresses, and program descriptions of organizations and agencies offering energy education activities to schools. To request a free copy of the guide, call The National Energy Information Center at 202-586-8800 or email infoctr@eia.doe.gov. The guide is also available on-line at www.eia.doe.gov/bookshelf/eer/kiddietoc.html.

NEED at NSTA National Convention

We are again conducting workshops and sessions at the National Science Teachers Association National Convention in San Diego, CA, March 27-30, 2002. We will be partnering with the U.S. Minerals Management Service (www.mms.gov) and the Department of Energy's Energy\$mart Schools program on the exhibit floor and in our hands-on sessions. As always, NEED will host a "NEED Teachers and Friends Reunion!" Please email Mary Spruill at mspruill@need.org to let us know you'll be attending and/or to volunteer to help at the booth and sessions.

Chicago Public Schools Go Solar

The Illinois Department of Commerce and Community Affairs, NEED, and the Chicago Public Schools launched a Schools Going Solar project that brings new solar panel installations to six Chicago Schools. NEED and IL-DCCA worked together to bring new solar kits to the participating schools. The Kick-Off Workshop was held November 9, 2001, at Reilly School with 40 teachers and administrators participating. Blanche Sheinkopf of the U.S. Department of Energy's Energy\$mart Schools program and Robi Robichaud of the National Renewable Energy Laboratory provided their expertise at the workshop.

Wake County Students Spread the Word

Wake County students, sponsored by the EnergySavers program, gathered to show their expertise in energy to citizens from around the state at the North Carolina Green Conference. The S.T.A.R. team from Knightdale Elementary and S.U.N. team from Lockhart Elementary demonstrated NEED experiments and hosted an energy game they had designed.

TEACHER RESOURCES

www.eia.doe.gov/kids: The EIA Kid's Page is updated regularly with new information about energy. Check out the adventures of **EnergyAnt** as he travels to an off-shore oil rig, a coal mine, a waste-to-energy plant and a liquefied natural gas facility.

www.epa.gov/sunwise: The Environmental Protection Agency's **SunWise School Program** has free materials available for schools. These materials teach about solar energy and sun safety. Teachers who want to participate in the program must register as a SunWise Partner School and adopt at least one of the SunWise activities, which include teaching cross-curricular classroom lessons, measuring UV radiation and reporting on the Internet, school infrastructure enhancements, sun safety projects, or community outreach. The program provides all of the materials free of charge, including UV meters and UV-sensitive flying discs.

www.energy.gov: The Department of Energy's **Energy\$mart Schools Program** has a new CD-ROM available—*Get Smart About Energy*—with lessons for students covering energy sources, production, environmental impacts, and how to save energy with new technologies and behavior modification. A poster is also available entitled *Buildings in the American Century*, which shows construction technologies, materials, and energy usage. Both CD-ROM and poster are available free of charge by calling 1-800-DOE-3732 or on the Energy\$mart Schools website.

www.evchallenge.org: The Carolina EV Challenge provides high school students across the country with a hands-on opportunity to learn about the transportation challenges facing the nation today.

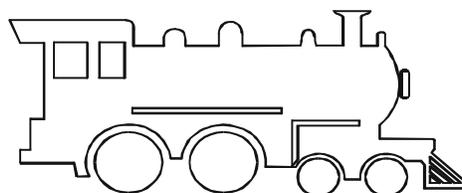
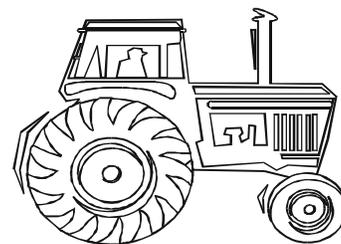
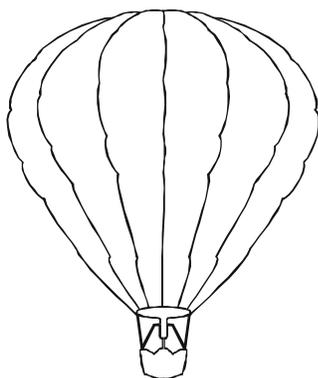
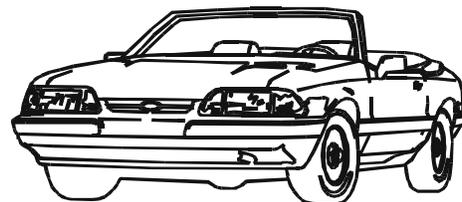
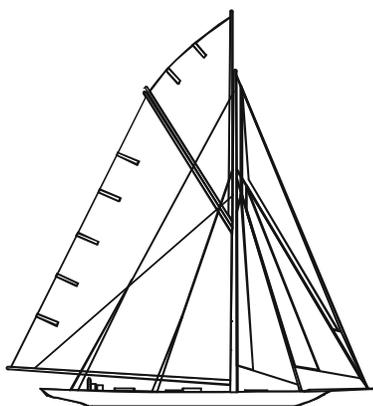
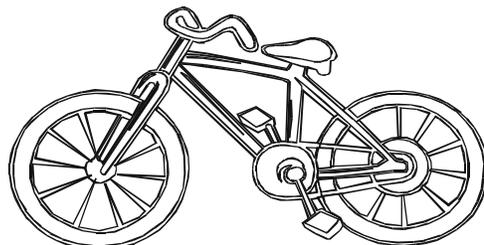
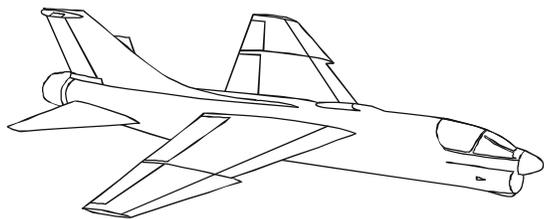
www.ornl.gov/news/pulse: The Pulse is a newsletter that provides information on the newest research at the Department of Energy's national laboratories.

www.pnl.gov/energyscience: This Department of Energy website has in-depth articles on new discoveries and issues in science and energy.

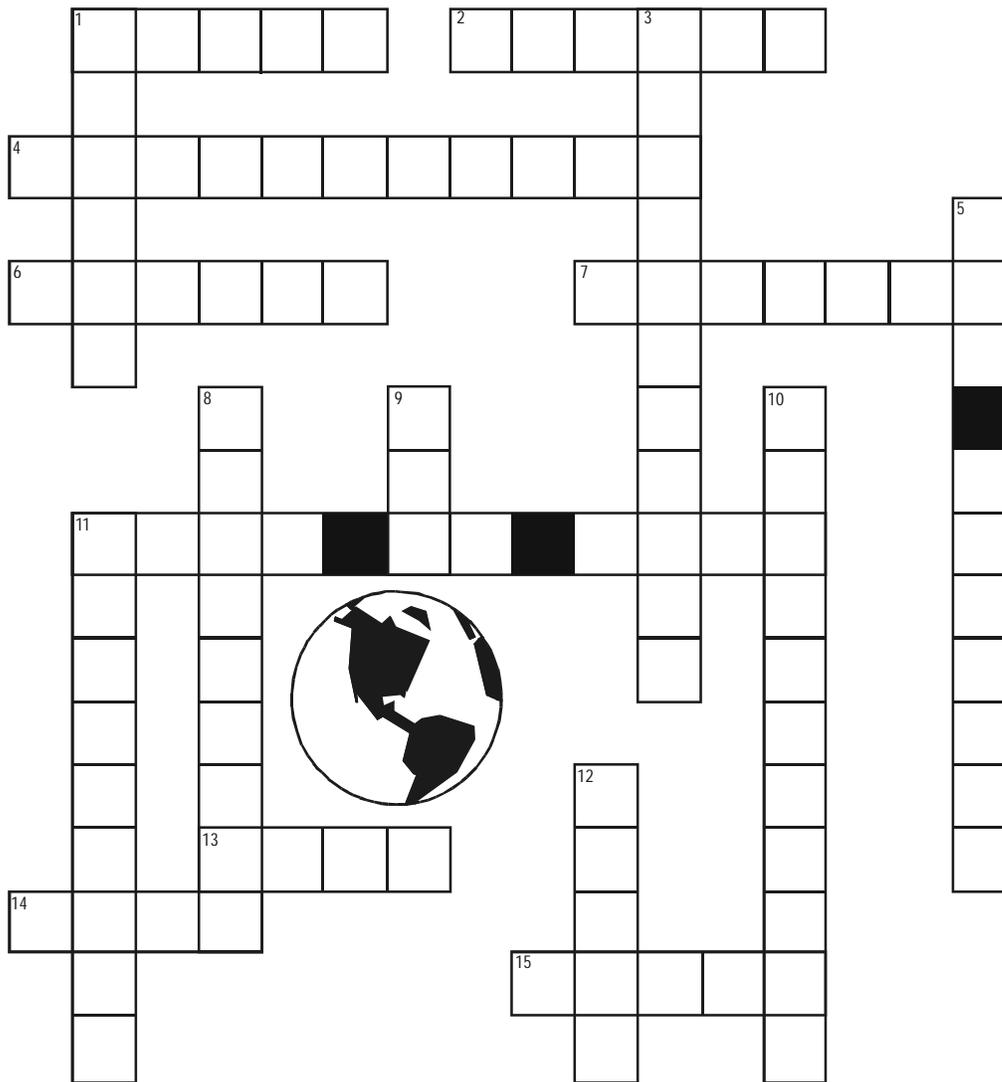
The Skeptical Environmentalist: Measuring the Real State of the World: This book by Bjorn Lomborg, a former Greenpeace member, is a well-documented scientific analysis of the major environmental issues facing the world. Lomborg concludes that the world is not being destroyed and that current environmental problems are manageable.

PRIMARY ENERGY ACTIVITY: Motion

Make a circle around the objects that burn fuel to move.
Color the objects that need people power to move.



ELEMENTARY CROSSWORD PUZZLE: Geothermal Energy



ACROSS

1. Melted iron
2. Greek word for heat
4. Where geothermal energy is located
6. The Earth's crust is in giant pieces called ____
7. Mountain with geothermal energy
11. Area of Pacific with geothermal resources
13. Produced by volcanoes
14. Center of the earth
15. Outer layer of the earth

DOWN

1. Earth layer with magma and rock
3. Geothermal energy is caused by ____ decay
5. Geothermal resource good for bathing
8. Replenished in a short time
9. Greek word for earth
10. Produced by geothermal plant
11. Underground geothermal pool
12. Greek word for water

INTERMEDIATE ACTIVITY: Natural Refrigeration

GOAL: To build a refrigerator that doesn't need electricity. (*This system is used by many desert dwellers in Africa who have no access to electricity.*)

MATERIALS:

- | | |
|--|--|
| <input type="checkbox"/> 5 large earthenware flower pots | <input type="checkbox"/> 5 smaller earthenware flower pots that will fit inside large ones |
| <input type="checkbox"/> 5 small bags of sand | <input type="checkbox"/> 5 lids to cover large flower pots (dinner plates will work) |
| <input type="checkbox"/> 5 thermometers | <input type="checkbox"/> water |
| <input type="checkbox"/> cardboard | |

PREPARATION:

1. Prepare five sets of materials listed above for five groups of students.
2. Make a copy of this page for each group.
3. Place the students into five groups.

SCIENTIFIC CONCEPTS:

1. Thermal energy is required to change a liquid into a gas (heat of vaporization).
2. When water evaporates, it absorbs thermal energy from its surroundings.

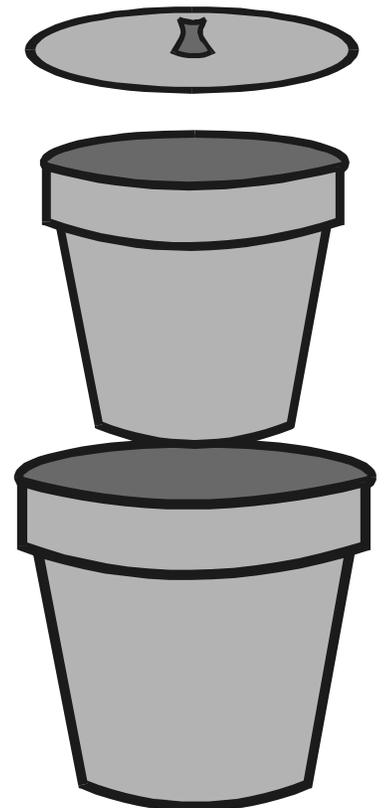
PROCEDURE:

1. If there is a hole in the bottom of the large flower pot, cover it with a piece of cardboard.
2. Pour a one centimeter layer of sand into the bottom of the large flower pot. Dampen the sand with water.
3. Place the smaller flower pot inside the larger pot. Fill in the space between the two pots with sand.
4. Dampen the sand with water.
5. Place the thermometer inside, cover the pots, and let stand for two minutes.
6. Remove the lid and record the temperature. Use this as your control temperature.
7. Place the thermometer back in the pot, cover, and place in a dry sunny place. Record the temperature after 10, 20, and 30 minutes.
8. Record the temperature every day for several days, noting the weather conditions and the dampness of the sand.
9. Compare your results with the results of the other groups of students.

RESULTS:

CONCLUSIONS:

QUESTIONS: Why did the experiment call for earthenware pots? Would metal, glass or plastic containers work as well?



SECONDARY ARTICLE: Harnessing Waste Heat

Almost every energy transformation involves the generation of heat, which usually dissipates into the atmosphere and is unrecoverable.

ENECO, Inc., a company focused on developments in energy sciences, has invented a semiconductor technology that converts heat from a wide variety of sources to electrical energy using solid state thermionics. ENECO expects that its new technology, which is based on solid state thermionics, will have profound implications for the recovery of waste heat, primary generation of electrical power, and efficient cooling.

The most immediate application of this technology could be the recovery of billions of dollars of wasted heat energy that literally goes up in smoke from stacks and tailpipes every year. Funneling waste heat through an ENECO device may recover a significant portion of that wasted heat energy and convert it directly to electricity.

ENECO's new devices could yield conversion efficiencies approaching thirty percent, more than twice that of the current conversion technology. ENECO technology is also considered a green technology, because its conversion process produces no pollution and reduces emissions per kilowatt-hour of electricity generated, regardless of the energy source.

ENECO's technology is expected to have a significant impact on the future of power generation and has potential applications in a wide-spectrum of industries. Devices developed from this technology will be able to generate electricity from two categories of energy sources, waste heat or primary heat.

Waste Heat Conversion

In the process of producing electricity, many generators expel a considerable portion of available fuel energy as waste heat. The technology promises to reduce fuel consumption, thereby reducing harmful emissions per unit of electrical power. ENECO devices can improve overall generation efficiency because no additional fuel will be consumed and are projected to have low operating and maintenance costs per unit of electricity.

In addition to power generation, mobile engines found in automobiles, trucks, ships and aircraft are producers of waste heat energy. The heat lost through engine exhausts may be captured by ENECO technology and converted into electricity to augment or replace a vehicle's electrical and air conditioning systems.

Direct Conversion of Primary Heat

For many applications it will be appropriate to generate electricity solely from ENECO technology, rather than harvesting waste heat from another process. Fossil fuels such as gas, oil and coal, as well as renewable fuel sources such as straw, wood products and biomass-derived methane are examples of potential primary heat sources. The heat of external combustion of these primary fuels, when channeled through ENECO devices, can not only produce electricity but also can simultaneously cogenerate useful heat and reduce pollution.

Consumer and commercial applications will focus on standby power. For example, ENECO devices could provide backup electricity during power outages to operate furnaces, fans and associated heating control electronics. On a larger scale, back-up power for an entire residence or business may become practical.

ENECO technology can also produce electricity directly from concentrated solar power. High efficiency, compactness and quiet operation make it suitable for space and terrestrial power generation. The technology may prove competitive with conventional photovoltaic cells currently in use in many satellites.

ENECO's solid state devices could also provide power at remote sites. The living conditions and economies of small villages could be improved if ENECO devices were used to provide dependable, efficient and affordable electricity to power cottage industries, medical facilities and critical communications.

Efficient Cooling

Solid state thermionics may also be reversed to provide an efficient cooling process if an electrical current is passed through an ENECO device. The electrical current causes the device to absorb energy from one surface and expel it on the opposite surface. The result is a cooling process, similar to a heat pump, that requires no compressor and no chlorofluorocarbons such as freon gas. This offers a variety of possibilities in everything from consumer electronics to satellites and commercial aircraft.

More information on this emerging technology can be found on Eneco's website: www.eneco-usa.com.

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Methane Hydrates
Methane hydrates are a mixture of natural gas and water frozen into ice crystals under the ocean. Scientists estimate that tapping into just one percent of these hydrates along our shores could double the amount of natural gas available in the U.S. The Department of Energy is funding several research projects to determine if methane hydrates can be safely tapped, without causing underwater landslides and other damage to the ocean floor.

Strategic Petroleum Reserve
President George Bush directed the Secretary of Energy to increase the Strategic Petroleum Reserve (SPR) up to its 700 million barrel capacity, a move that will add 108 million barrels of crude oil to the nation's emergency stockpile. The SPR is the country's stockpiled reserve of oil to protect against a sudden drop in supply from foreign countries. The United States depends on foreign countries for about two-thirds of its petroleum supply.

Security Issues in the Energy Industry
The FBI has issued an alert that terrorists may have plans to attack U.S. natural gas supplies if either Osama bin Laden or Taliban leader Mullah Mohammed Omar is captured or killed. The country's oil and gas industries have stepped up security measures in response, especially at the above ground compressor stations located every 75-100 miles along pipelines. There are thirty major pipelines (180,000 miles of pipelines) traveling through nearly every state.
Nuclear power plants have also increased security, though experts admit there is little that can be done to shield nuclear plants from air attacks like those on the World Trade Center and the Pentagon. In addition to the nuclear reactors themselves, the storage facilities for spent radioactive fuel are also a concern. Both the reactors and storage facilities at all nuclear plants are surrounded by thick layers of concrete that would protect them from most attacks.
Another risk is to the electricity grid itself with its thousands of miles of high-voltage transmission lines. Attacks on key intersect points could trigger vast power outages in the country.
The final major threat to the energy industry is not to facilities but to its communications systems. Cyber attacks could cripple the energy industry's ability to transport and control energy.

Short Circuits

