

energy EXCHANGE

A publication of the National Energy Education Development Project

FEB-MAR 2004

NEED Summer Conferences

NEED is pleased to announce the 2004 National Energy Conference for Educators series to be conducted in:

Hyannis, Massachusetts: July 11-15

Galveston, Texas: July 17-21

Long Beach, California: July 25-29

The Long Beach Conference will accept California teachers primarily, and others on a first-come, first-selected basis if availability permits. This conference is sponsored by BP and the registration fees for California teachers are included in the sponsorship.

The conferences promise to provide excellent opportunities to increase energy knowledge, visit energy facilities and interact with energy experts, receive classroom curriculum materials, and network with other teachers. Sponsorship as available is given to teachers who have not attended a conference before, with remaining funding provided to those interested in attending again. Graduate credit is also available. The registration brochure is available at www.need.org. For more information, email info@need.org or call NEED at 1-800-875-5029.



Energy Ant, the Energy Information Administration mascot, accompanied 2003 delegates on the field trips.

NEED Youth Awards Info

The NEED Youth Awards Program for Energy Achievement's National Recognition Ceremonies are scheduled for **June 25-28, 2004**, at the Hyatt Regency Crystal City in Arlington, Virginia. Scrapbooks are due to state committees by **April 15, 2004**. If you are unsure where to send your scrapbook, please call NEED at 1-800-875-5029.

The National Review Panel will select national winners on **April 28, 2004**. If you'd like to volunteer to review the scrapbooks, please contact NEED at info@need.org.

The registration fee (which includes lodging, most meals, and tours) is \$500.00 per person. The Awards Ceremony will be held at the Yates Auditorium in the U.S. Department of the Interior Building at 10:00 a.m. on Monday, **June 28, 2004**.

Coming Soon from NEED— Biodiesel Materials & Workshops

NEED is pleased to be a part of the winning proposal for biodiesel education and outreach with the National Biodiesel Board of Jefferson City, Missouri. NBB and NEED received a grant from the U.S. Department of Agriculture to create classroom materials and training programs for teachers and school decision-makers on biodiesel products and their use in everyday life and in school bus fleets, as well.

For more information about the project, contact NEED at info@need.org. For more information about the National Biodiesel Board, visit www.biodiesel.org.

Inside this issue....

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

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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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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

February

- 2- 4 NEED participation at the National Biodiesel Board Annual Conference – Palm Springs, CA
- 8-11 NEED participation at the National Association of State Energy Officials Winter Meeting – Washington, DC
- 25 San Joaquin NEED Workshop – San Joaquin County, CA
- 26 NEED session at Albuquerque Public Schools Curriculum Fair – Albuquerque, NM
- 26 Energy Industry Study Program – Energy Information Administration – Washington, DC

March

- 4,11,18 Energy Industry Study Program – Energy Information Administration – Washington, DC
- 9 Colorado NEED Workshop - Denver, CO
- 9 Santa Barbara Regional NEED Workshop – Carpinteria, CA
- 11 Santa Barbara Regional NEED Workshop – Carpinteria, CA
- 20 NEED activities at Earth Fest – Audubon Zoo – New Orleans, LA
- 25-28 NEED Teacher Advisory Board – Corolla, NC
- 30 NEED Workshop – Victoria, TX

April

- 1,15 Energy Industry Study Program – Energy Information Administration – Washington, DC
- 1- 4 NEED Workshops at the National Science Teachers Association Convention – Atlanta, GA. If you're attending the convention, please let Mary Spruill know at mspruill@need.org.
- 15 NEED Youth Awards for Energy Achievement Projects Due to state coordinators.
- 22 NEED Take Your Kid to Work Day Workshop – U.S. Department of Energy – Washington, DC
- 22,29 Energy Industry Study Program – Energy Information Administration – Washington, DC
- 23-24 NEED participation in the New York State Technology Student Association Annual Event – Oswego, NY
- 26 NEED Youth Awards Projects due to NEED Headquarters
- 28 NEED Youth Awards for Energy Achievement Project Review – Washington, DC

May

- 6 Illinois Youth Awards Program – Springfield, IL
- 6,13 Energy Industry Study Program – Energy Information Administration – Washington, DC
- 26 Kentucky NEED Youth Awards Luncheon – Holiday Inn, Frankfort, KY

June

- 14-18 Kentucky NEED Energy Conference for Educators. For information email kreagor@need.org.
- 25-28 NEED Youth Awards – Washington, DC

July

- 11-16 Illinois Camp KEEP (Kids for Energy and Environmental Protection) – Cantrall, IL
- 11-15 NEED Energy Conference for Educators – Hyannis, MA
- 17-21 NEED Energy Conference for Educators – Galveston, TX
- 19-24 Illinois Camp KEEP – Algonquin, IL
- 25-29 NEED Energy Conference for Educators – Long Beach, CA

NEED NEWS

Real World Applications of the Science of Energy Kit

Overheard by NEED Leader Lisa Benatar at her Palo Alto Elementary School as a boy walked passed a group of girls playing jacks, " Good thing that's not a sad ball!"

Kentucky

Kentucky NEED EnergySmart Schools is conducting a survey to benchmark energy usage in Kentucky schools. Kentucky NEED recently completed year one of a three-year project with ULH&P Cinergy to promote energy efficiency at home. Cinergy provided an energy efficiency take-home kit for each participating student. Companion lessons were designed by Kentucky NEED staff and 14 teachers were trained using NEED's Monitoring and Mentoring activity. A total of 350 students participated in the pilot project.

Hydrogen Kits

Thanks to NEED's partnership with the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, NEED has five Thames and Kosmos Fuel Cell Car kits available in a loaner program for schools interested in beginning their study of hydrogen and fuel cells. Although the activity guide that accompanies the kit is not very "teacher friendly" NEED is completing a companion piece to the kit that will make teaching about hydrogen and fuel cells with this kit much easier in the classroom. The kits are available for middle school and high school classroom use. For more information, please contact Mary Spruill at mspruill@need.org.

NEED NEWS

Massachusetts

October 18th was the date of the Cape Cod Energy Fair, hosted by Cape Light Compact with the help of the new Energy Club, “Macomber’s Energy Alert LearnerS” or MEALS, as they are known at Chatham Elementary School. The brainchild of Cindy Macomber, fourth grade teacher and NEED workshop graduate, MEALS has been meeting during lunch every other Wednesday since the beginning of the school year. They have learned about the importance of energy conservation through energy efficiency, recycling and different energy sources. In addition to demonstrating various experiments and creative inventions, the MEALS club conducted a poll to test the level of knowledge on energy issues and will compile their results for the Cape Light Compact for use towards energy efficiency efforts. As an extra incentive to take the poll, participants were given the opportunity to enter a raffle for an EnergyStar DVD player!

Florida

The EnerJags from Workman Middle School in Pensacola, Florida, were recently invited to tour the new General Electric Wind Energy Plant. After a briefing on the construction of the wind turbines that are made at the plant, the students and teachers were given a tour of the manufacturing site. The picture shows the EnerJags standing beside one of the turbine blades.



California

Thanks to the dedication of science educator Lisa Benatar, the Palo Alto schools will be receiving NEED materials and training in the coming months. Lisa’s outreach programs are part of BP-sponsored NEED programs in California. One-day workshops in several school districts throughout California are planned for late winter and early spring. In addition, BP is providing support for the upcoming energy conference at the Hyatt Regency Long Beach, from July 25-29, 2004. California teachers who would like to increase their energy knowledge and curriculum portfolios are invited to attend free of charge. For more information, contact Mary Spruill at mspruill@need.org or call 800-875-5029.

Colorado

Thanks to the support of Xcel Energy Foundation, NEED conducted a Colorado Energy Workshop in December. Over 45 teachers from Colorado and Wyoming attended the workshop and received more than \$500 of classroom materials. In addition to NEED activities, the attendees toured the National Renewable Energy Laboratory traveling classroom, participated in renewable energy activities, and received NREL lab kits for their schools.

EIA Kid’s Page Receives Award

Congratulations to the Energy Information Administration and its Kid’s Page Committee! We are happy to announce that the site, www.eia.doe.gov/kids has been selected for inclusion in the American Library Association’s Great Web Sites for Kids, located at www.ala.org/greatsites in the General Science section. NEED is proud to be a partner in the Kid’s Page providing content, design advice, and marketing for the site. The notice from the ALA reads, “Great Web Sites for Kids are those considered the best web sites for ages birth to 14, outstanding in both content and conception. As applied to web sites for young people, ‘great’ should be thought to include sites of especially commendable quality; sites that reflect and encourage young people’s interests in exemplary ways. During this Great Web Sites selection process, your site was one of 25 sites selected as a 2003 Great Web Sites for Kids addition.” Energy Ant and his friends at EIA should be proud!

After School Programs Are Great Successes

The NEED After School Program at Carl Lauro Elementary in Providence, Rhode Island, has about 100 fifth grade students spending two hours a week learning about energy while having a great time. The students have been really receptive to the “hands on” approach to learning. The actual “doing” has made all the difference in the world. NEED teacher Kim O’Connell said, “I think that it has really improved their self esteem. The activities are so diverse that all students can shine and learn. Many of our students are also motivated because they know that 10 of them will be picked to be “teachers” for the next session of third grade students.” This program is helping the students become more aware of their environment as well as teaching them that they can make a difference.

If you see some kids at West Orange Elementary in California building windmills, or solar ovens, or designing bridges after school, you probably are looking at some future scientists or engineers. These 30 kids are participants in West Orange Elementary’s Future Scientist and Engineer Energy Club. The students experiment with hands-on materials and experiments from the Future Scientist and Engineers of America (FSEA) and the NEED Project. The club provides students with opportunities to be real scientists, exploring technology, math, engineering, and science experiments using the scientific process. In fact, one of the club goals this year is for the members to become energy experts and work to conserve energy at school and at home. The club members are also training to become energy leaders at a proposed science camp at West Orange Elementary this summer. So if you look to the future, what will you see? Lots of scientists and engineers coming from West Orange Elementary.

Illinois

Mary Anderson opened her classroom of fifth graders at Illinois School for the Deaf to Mary Mazzaroli, veteran NEED student leader, for the fall semester of 2003. During that time, she taught an electricity unit, using NEED curriculum that she adapted to suit the language needs of the students. They learned, through traditional lessons, plays, stories, and experiments about how electricity is made in this area (coal plants), what electricity does, and the different forms of electricity (current, static, and magnetic fields). They also learned about the basic structure of the atom and the jobs that the protons, neutrons, and electrons play in the different forms of electricity that were discussed.

Congrats on National Board Certification!

Congratulations to NEED Teachers Mollie Grim Mukhamedov of White City Elementary School in Ft. Pierce, FL and Laura Headley of Andrew Jackson Middle School in Titusville, FL for receiving National Board Certification!

PRIMARY ACTIVITY: Lift A Grown-up!

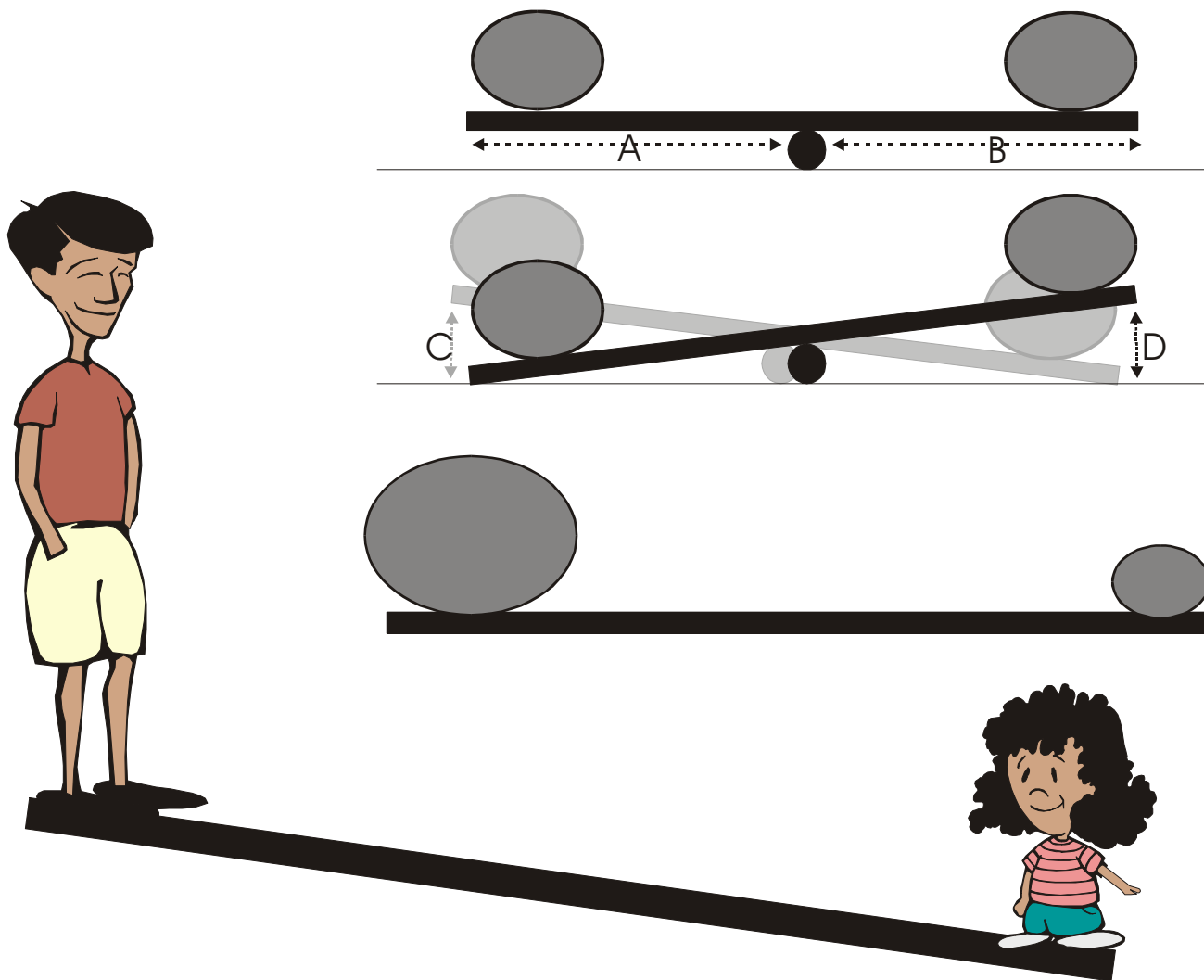
Concepts: Simple machines can make work easier.

A lever can help you lift a heavy object.

With a lever, a light object must move a longer distance to move a heavy object a short distance.
(work = mass X distance.)

Materials: 1 pencil 1 craft stick
1 ruler 1 large ball of clay

- Procedure:**
1. Divide the ball of clay into two equal parts and put one part on each end of the craft stick.
 2. Put the craft stick across the pencil and move it until the stick is balanced on the pencil. Measure distances A, B, C and D with the ruler and compare them.
 3. Divide the clay into one big ball and one small one and put them on the ends of the craft stick. Make a mark on the picture below where you think the pencil will be when the stick is balanced. Balance the stick and measure distances A, B, C, and D.
 4. Multiply $A \times C$ and $B \times D$. Compare the results.
 5. Draw a triangle under the board to show how the child could lift the man. For the child to lift the man, who has to move the longer distance?



INTERMEDIATE ARTICLE: LNG—Liquefied Natural Gas

Liquefied natural gas (LNG) is the liquid form of the natural gas people use in their homes for heating and cooking. LNG is natural gas cooled and condensed into a liquid. LNG is mostly methane with small amounts of ethane, propane and other gases. A large refrigeration system is used to liquefy natural gas by cooling it to minus 260 degrees Fahrenheit (-260°F). Converting natural gas to a liquid reduces its volume by a factor of 600 to one. Liquefying natural gas makes it economical to transport natural gas by tanker and easier to store it.

LNG is transported in large, specially designed ships. These ships are double-hulled and are fitted with a special system inside the inner hull to maintain the LNG at atmospheric pressure and minus 260 degrees Fahrenheit. There are about 150 ships currently in the LNG fleet and more than 55 additional ones are being built.



LNG Storage Tank at Cove Point, MD

At LNG storage and distribution facilities, LNG is stored in insulated tanks, where it can be turned back into a gas and sent to customers by pipeline. The tanks consist of a stainless steel inner tank surrounded by about four feet of insulation, which is contained by an outer steel tank.

LNG is non-toxic, odorless, non-explosive, non-cancer causing and, in liquid form, non-flammable. LNG only burns when gasified and mixed with air at a rate of five to 15 percent gas to air. Since LNG as a liquid contains no oxygen, it cannot burn and, if it does catch fire, there is no chance of explosion. LNG, if spilled, vaporizes and dissipates. If spilled on water, LNG stays on top where it vaporizes, because its density is only 45 percent that of water.

Safety is a high priority with companies that move and distribute LNG. Ship safety features include radar, positioning systems, automatic distress systems, automatic shut down systems and gas and fire detection equipment. On-shore, facilities such as docks, storage tanks, vaporizers, and other equipment to turn LNG from a liquid to a gas have their own safety features. Closed circuit television, methane detectors, and fire detectors are used along with preventative measures such as restricted access, personnel training, offsite monitoring and emergency procedures to ensure safety.

In the event of a leak or spill, gas, flame, smoke, and high or low temperatures are all monitored. While LNG vapors have no odor or color, if an LNG release occurs, LNG's low temperature would cause water vapor to condense in the air and form a visible white cloud that would be readily apparent.

In the 19th century, British chemist and physicist Michael Faraday was the first to liquefy natural gas. The first liquefied natural gas plant was built in West Virginia in 1912. Today there are about 115 LNG facilities in the United States. In January 1959, the world's first LNG tanker, the *Methane Pioneer*, carried LNG from Lake Charles, Louisiana to Canvey Island, United Kingdom. This voyage demonstrated that large quantities of LNG could be transported safely across the ocean.

LNG supplies come primarily from locations where large gas discoveries have been made, such as Algeria, Trinidad, Venezuela, Nigeria, Norway, Qatar, Oman and Australia. Some LNG is produced in Alaska, as well. Many of these locations are in remote areas that do not have high demand for natural gas, so transporting it to other markets as LNG makes good sense economically.

One special use of LNG is as fuel for vehicles. Currently, there are about 2,000 vehicles in the U.S. that run on LNG and are mostly owned by the government. There are just 44 LNG-fueling stations at this time. The advantage of using LNG in vehicles is a smaller fuel tank than is needed for the more common compressed natural gas (CNG) vehicles, because natural gas takes up less space as a liquid than a gas. Because LNG must be stored at very low temperatures, these vehicles must use fuel to keep the tank cold and specially trained persons must refuel the vehicle, since skin contact with LNG can cause frostbite.

For more information on LNG, see www.eia.doe.gov, www.afdc.doe.gov, www.netl.doe.gov and www.dom.com.

SECONDARY ARTICLE: The E-Plane—Fueled by Hydrogen Fuel Cell

The Foundation for Advancing Science and Technology and education (FASTec), along with NASA, is funding the development of the world's first fuel-cell-powered electric airplane (E-plane). The E-plane is a small, two-seat carbon composite plane powered by a 100-hp motor and the same batteries that power the Toyota Prius, a popular hybrid electric vehicle.

The E-plane is being developed in three stages. First, the plane will be designed and flown powered by advanced high-energy, lithium-ion batteries. It will have about a 100-mile range. Then, it will be equipped with a combination of the batteries and a 10-15kW fuel cell, and will have a 250-mile range.

In its final form, it will fly solely on the power of its hydrogen fuel cell and have a 500-mile range, with emergency back up from reserve batteries. Two pounds of hydrogen fuel will be able to fly the plane for an hour.

Fuel cells, unlike batteries, generate electricity rather than just store it. They are fueled by hydrogen, a fuel not found as a gas on Earth. The fuel cells are expensive to produce now, as is hydrogen gas, but rapid advances are being made in fuel cell technology, which will greatly reduce the cost of both the cells and the hydrogen fuel. It is also believed that hydrogen fuel cell vehicles are the transportation of the future. The Federal government is supporting research and education programs on hydrogen fuel cell technology.

Researchers foresee widespread use of electric planes in the future because they are simpler to build and maintain, produce zero emissions, and are inherently quiet. Although expensive today, they could ultimately be less costly than traditional aircraft.

The E-plane, when completed, will be used in worldwide education programs to demonstrate emerging technologies such as fuel cells, electric drive systems and advanced propeller technology. The design and development of the E-plane is being conducted by Advanced Technology Products, Inc., (ATP) of Worcester, Massachusetts, a leading manufacturer of advanced batteries and starting systems, with the assistance of Lockwood Aviation and Worcester Polytechnic Institute.

FASTec was founded in 2000 and supports the exploration and application of emerging technologies, especially alternate energy technology such as fuel cells, for all types of transportation vehicles. Its chief goal is to provide education and stir interest among students and the general population in science and technology.

For more information, see www.aviationnow.com, www.aviationtomorrow.com, avweb.com, and www.inflightusa.com/tech/o.tech_6.html.





Short Circuits



Floating High-Speed Train in China

The Shanghai Transrapid Maglev Line in China is the world's first high-speed commercial commuting system that uses the most advanced electromagnetic levitation (maglev) technology. With a top speed of 430 kilometers per hour (267 miles per hour), the high-speed train takes only eight minutes to make the 19.5-mile trip from the Pudong International Airport to the Longyang Road Station, a downtown subway station. The ride of the train is exceptionally smooth, comfortable and quiet due to the maglev technology and the specially designed windows. Its noise level is less than 60 decibels at a speed of 186 mph.

The train, which floats half an inch above its track, takes about four minutes to reach its peak speed of 267 mph. Electromagnetic force is used to make the train hover above the track. Changes in the electric current in the track control the train's movement, while the power for the levitation system is supplied by the train's onboard batteries, which recharge whenever the train is moving.

Walking Your Way to a More Sustainable World—Ecotiles

Every step you take puts a force on the ground. Most of the time, that energy goes to waste, but a new technology called Ecotile has been developed to use that energy. Envisioned for public places such as sidewalks, metro stations, and airports, Ecotile converts the wasted energy from thousands of walking people into electricity that could be used to power street and traffic lights.

Ecotile uses a property of some crystalline materials known as piezoelectricity (pressure electricity) that creates voltage proportional to the pressure applied. The design of the tile allows for maximum voltage from each step taken. The charge produced is sent through built-in circuitry to a battery where it is stored until needed.

Don't worry about this tile feeling funny underfoot. Since it only recesses two millimeters when walked on, it feels like normal tile. Ecotile is still in the concept phase and is expensive, but if it can be mass-produced, it could become an economically viable option for a sustaining energy source.

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CORRECTION
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