

ENERGY EXCHANGE

A publication of the National Energy Education Development Project

January 2006

2006 National Energy Conferences for Educators

The five-day National Energy Conferences for Educators have been scheduled for 2006.

- Denver, Colorado: July 9-13
- Cambridge, Massachusetts: July 16-20
- Seattle, Washington: July 26-30

The registration fee for the conference is \$1,000 and includes lodging, meals, local transportation, and conference and classroom materials. Graduate credit is available. To receive a conference brochure or to sponsor a teacher or group of teachers, contact NEED at info@need.org. Conference brochures will be available February 1, 2006.

Praise for EIA Kid's Page

In partnership with NEED, the Energy Information Administration of the U.S. Department of Energy has a great website dedicated to energy education. With games, riddles, a glossary and many other resources, www.eia.doe.gov/kids is an excellent source for students to learn about energy. Here's what a teacher who recently visited the site had to say:

"I am an 8th grade science teacher and we have just begun our unit on energy. Your website is a wonderful resource. It is hard to find current lists of energy consumption and explanations at the middle school level. Your site is full of excellent, relevant and fun information. Thanks! You have made my life a little easier and the kids' knowledge a little deeper. I have never seen my students so interested in a topic!"

Happy New Year!

NEED sends out a big thank you to all the educators, students, sponsors and partners for a great 2005! We have energetic plans for 2006!



NEED Youth Awards for Energy Achievement

Mark your calendars now for the NEED Youth Awards for Energy Achievement in Washington, DC from **June 23-26, 2006**. The 2005 program had over 600 teachers and students in attendance. We hope to have even more this year! Group scrapbooks are due for state-level review on **April 15, 2006**. For questions or to receive a copy of the Projects and Activities Guide, contact NEED at 800-875-5029 or info@need.org. Changes for 2006 include the elimination of the District Level category and the addition of a Special Project category created to include community colleges, camps, student groups and other energy education programs.

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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.

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

Energy Exchange is published five times a year by NEED for educators and students, and is available at www.need.org.

NEED welcomes questions, comments, and suggestions. Please contact info@need.org.

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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 800-875-5029

January

- 4-5 Launch of BP's A+ for Energy Program for California
- 4-5 Energy Education Forum - Washington, DC
- 12 Kentucky NEED Workshop - Union, KY
- 12 Rhode Island ESL Workshop - Cranston, RI
- 14 Houston ISD Workshop - Houston, TX
- 24-28 California Clean Energy Roundtable - San Francisco, CA
- 26 School Energy Efficiency Workshop - San Jose, CA

February

- 3-8 NEED sessions at National Biodiesel Conference - San Diego, CA
- 15 School Energy Efficiency Workshop - San Jose, CA
- 18 BP's A+ for Energy/NEED Sessions at Greater Los Angeles Science Teachers Association Meeting - Los Angeles, CA
- 22 NEED Workshop - Roscommon, MI
- 23 Energy Smart Students Program at Engineering Day Conference - New Paltz, NY
- 27 NEED Workshop - Flint, MI
- TBA Indiana NEED Workshops - statewide
- TBA Indiana School District Energy Management Conferences - statewide

March

- 1 NEED Workshop - Wayne, MI
- 3-4 American Solar Energy Society Meeting - Denver, CO
- 6 NEED Workshop - Santa Barbara, CA
- 8 NEED Workshop - Ventura, CA
- 13 NEED Sessions at California Association of Independent Schools Workshop - North Hollywood, CA
- 23-24 Kentucky High Performance Schools Workshop - Hebron, KY
- 24 BP's A+ for Energy Texas Applications Due
- 24-25 Puerto Rico NEED Workshop - San Juan, PR
- 28-30 National Ocean Industries Association Meeting - Washington, DC
- 29-31 Energy Smart Students Sessions at New York State Technology Education Association Conference - Syracuse, NY

April

- 5-9 NEED Sessions at National Science Teachers Association Conference - Anaheim, CA
- 7 BP's A+ for Energy California Applications Due
- 7-8 Technology Students Association Competition - Oswego, NY
- 15 NEED Energy Project Scrapbooks Due
- 18 Energy Smart Students Workshop - Yorktown Heights, NY
- 26 NEED Youth Awards Review - Washington, DC
- 27 Energy Smart Students Workshop - Spencerport, NY
- 28-30 NEED Teacher Advisory Board - Washington, DC



NEED Scrapbooks are due April 15, 2006!

NEED News

California

Thanks to support from Pacific Gas and Electric Company (PG&E), the PG&E Solar Schools Program has been launched for the third year. PG&E provides photovoltaic systems to schools, Bright Ideas Grants for \$2,500 or \$5,000, teacher training, and classroom curriculum packages with hands-on experiments and activities. To learn more about the PG&E Solar Schools Program, visit www.pge.com/solarschools or call NEED at 800-875-5029. Workshops and additional opportunities are planned for 2006.



Connecticut

Forty-five new NEED teachers attended the Connecticut Energy Workshop sponsored by Dominion in November. These teachers received curriculum materials and kits and have been trained to take NEED back to their schools and districts to help students learn more about energy and to help NEED expand its programs in the state. To become part of the Connecticut program, email info@need.org.



Indiana

Cinergy/PSI, Vectren, Indianapolis Power and Light, Citizens Gas, the Governor's Office of Energy and NEED are pleased to launch a substantial energy education program for Indiana teachers and schools. The program partners are providing NEED curriculum, hands-on kits, and home and school energy efficiency kits and materials to participating schools. NEED Teacher workshops are planned for February and March. NEED will also conduct two Energy Management for Schools Building Operator Conferences. To learn more about the program and to be added to the workshop list, contact info@need.org or call 800-875-5029.



Michigan

Thanks to support from the Michigan Energy Office, the Michigan Oil and Gas Producers Education Foundation (MOGPEF), and Dart Container, Michigan workshops are planned throughout the year. The MOGPEF workshop in Mt. Pleasant was bursting at the seams with excitement. Two Michigan Energy Office/National Biodiesel Board sponsored workshops in Oakland and Grand Rapids had over 80 educators in attendance to learn more about biofuels.



New York

The New York Energy Smart Students program wrapped up the fall with great success and is ready for more fun in 2006. Over 275 teachers attended fall workshops; seven workshops are planned for the spring. The NY Energy Bike program has launched as a new tool in the program for schools. The support of the New York State Energy Research and Development Authority makes the program a substantial aid for classroom educators—helping teachers improve their energy knowledge and working with students to learn about energy so that they and their families can become smarter energy consumers. Also new for 2005 were H₂ Educate Mini-Grants and Community Connections Mini-Grants for schools. Congrats to Bill Rock (Somers Middle School), Paul Geary (School of the Arts), Leif Johnson (Lancaster Middle School), Cora Walter (St. James Middle School), Carol Burch (Hannibal Central School), Mike Sierzchula (Kenmore West High School), Tonya Chavers (Emmet Belknap Middle School), Carol Gath (Frontier Middle School) and David Baden (Hamburg).



Rhode Island

Lots of big energy education programs are happening in Rhode Island. Thanks to Park View Middle School teacher Joanne Spaziano and her students, workshops have been held for Rhode Island schools this fall, and more are planned for winter and spring. National Grid and the Rhode Island State Energy Office provide funds for teacher training, student projects, curriculum, and hands-on NEED kits. To be added to the workshop announcement list, contact info@need.org.



NEED News

Texas

In January, BP launches its A+ for Energy Program in Texas. Building on the success of the program in California, the grant, curriculum and training opportunity is available to teachers in Harris, Brazoria, Ft. Bend, Chambers, and Galveston Counties. “We are very excited to bring the A+ for Energy program to Texas, the energy capital of the world,” said Ross Pillari, President of BP America, Inc. “It was developed to capture the spirit of innovation. We want to recognize those Texas teachers who inspire learning in their students by creating exciting and memorable experiences around the subject of energy.”



BP continues A+ for Energy in California for the third year. To learn more about BP’s A+ for Energy Program, visit www.aplusforenergy.com.

4-H and the National Association of State Universities and Land Grant Colleges (NASULGC)

With support from the U.S. Department of Energy, NEED and NASULGC embarked on the second year of a program designed to provide 4-H and Cooperative Extension leaders with hands-on kits, student activities and leader training. The first year’s **Light and Lighting Module** received great reviews and the new **Heat and Heating Module** promises to be fun for students while allowing them to learn about energy and take home valuable energy lessons. The 2005 training workshop was held in Golden, Colorado at the National Renewable Energy Laboratory with fourteen 4-H programs in attendance. Congratulations to **Nevada, Vermont, Washington, Texas, Tennessee, Arkansas, Iowa, Illinois, Kentucky, Maryland, Louisiana, West Virginia, Nebraska, and North Dakota** for their participation in the program! These states will be working with 4-H Afterschool, clubs, summer camps and other programs with students involved in 4-H activities.

Energy Education Forum

The Energy Policy Act of 2005 called for the U.S. Department of Energy to bring together individuals and entities representing all aspects of energy production and distribution to discuss the opportunities and challenges in the development of a national, self-sustaining energy education program. Attendees from around the country met on January 4-5, 2006 to consider the opportunities and challenges of implementing a national energy education program. NEED was pleased to assist in the facilitation of the Forum and continues to expand its programming to help achieve the goals of the Energy Policy Act of 2005 and to help improve energy knowledge nationwide.

Online Bibliography at www.need.org

Thanks to the hard work of several NEED Teacher Advisory Board (TAB) Members, a new online bibliography of fiction and non-fiction energy books will be available in February 2006. The list will be sorted by energy subject areas and grade levels. It will have a search engine to assist teachers as they search for literacy connections to energy. Thanks to Amy Constant, North Carolina TAB Member, for leading the effort. If you have books to recommend or have a book review, please send information to info@need.org.

School Energy Efficiency Program

Partnering with D&R International’s School Energy Efficiency Program, NEED hosted a workshop in Bakersfield, CA in November and has two more planned for San Jose, CA in 2006. This program, funded under the auspices of the California Public Utility Commission, allows schools to integrate energy efficiency practices and classroom education. To learn more about the program, visit www.schoolenergyefficiency.com.

Second Annual Passport to Energy Careers Fair

The Second Annual NEED Passport to Energy Careers Fair will take place on June 23, 2006 at the Hyatt Regency Crystal City. For companies and organizations interested in hosting a booth or table, please contact NEED at 800-875-5029.

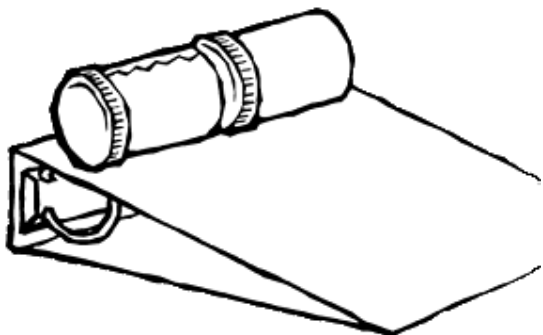
EIA employee, Stacy MacIntyre, with Energy Ant during the NEED Passport to Energy Careers 2005.



PRIMARY Activity: Racing Jars

Take two identical clear jars (6 oz baby food jars), leave one empty, and fill one with water. Put the lids on both jars and tighten. Place a large, three-ring binder on a level floor (carpet works well), and start the jars from the top of the "ramp" the binder forms.

Which one will get to the bottom of the ramp first? Which one will roll the farthest? Release both jars at the same time and observe.



At first, the water-filled jar moves down the ramp faster than the empty one, because the water-filled jar has more mass and, therefore, more gravitational potential energy to turn into kinetic energy. But as the jars begin rolling along the carpet, the greater mass of the full jar causes more friction between the jar and the carpet than with the empty jar. The full jar slows down, allowing the lighter, empty jar to take the lead!

Language Arts Connections Elementary Book Reviews

energy connections

Alternative Energy, by Christine Petersen, Children's Press, 2004

This book is in textbook format with a table of contents that lists chapters very clearly. The print is large and contains photographs with colorful captions. This book is appropriate for third grade readers.

Energy, by Robert Snedden, Heinemann Library, 1999

This book is set up like a textbook with a clear table of contents, short chapters and well organized pages. The photographs are interesting and have color coded captions that correlate to facts inserted at the end of the chapter in specific colors. Each chapter ends with an experiment suggestion that is also color coded. With some challenging science vocabulary, this book is appropriate for third grade readers.

New Energy Sources, by Nigel Hawkes, Copper Beech Books, 2000

The table of contents for this book is well organized and easy to use. The pages are very busy, which makes it difficult for some students to focus. The graphic sources are very good and provide great labels with explanations. Students found this book to be very interesting. This book is appropriate for readers at the high third grade level.

Pass the Energy, Please!, by Barbara McKinney, Dawn Publications, 1999

This picture book, with beautiful illustrations that support the limited text on each page, is well organized with link clues. With a more complex level of understanding needed for comprehension, this book is not recommended for independent reading. The reading level is appropriate for second and third grade readers.

Renewable Energy, by Steven Chapman and Nigel Saunders, Raintree, 2000

This book, set up in text book format, has a clear table of contents. The print on the pages is small and the pages are very busy. Many inserts on pages may be distracting to some readers. This book is appropriate for fourth grade readers.

Thanks to Debbie Fitton,
Massachusetts TAB member,
for these book reviews.

What energy books do your students use in class? Send educator or student written energy book reviews for future newsletters, including reading level, to NEED at info@need.org.

ELEMENTARY/INTERMEDIATE Activity: Simple Machines-Pulleys

Concepts

- Simple machines make work easier.
- A pulley is a simple machine.
- Mechanical advantage is a ratio of output force to input force.



Time

Ten to fifteen minutes

Materials

2 Brooms 25 feet strong cord/rope 3 volunteers

Background

A pulley is a simple machine used to change the direction and/or the magnitude of an applied force.

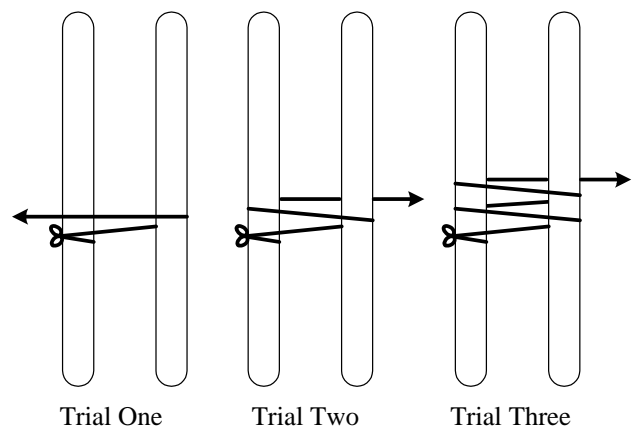
Elevators operate using motors and pulleys and are designed to move people up and down inside buildings. However, the first elevator was built to *hide* someone—the King of France. In 1743 an elevator was built in the majestic Palace of Versailles for King Louis XV. The elevator was operated by hand and moved the king secretly between the floors of the palace.

When two or more pulleys are connected together, they lift a heavy load with less force than if only one pulley is used. A combination of pulleys working together is known as a compound pulley or a block and tackle system.

The mechanical advantage of a pulley is equal to the number of rope lengths supporting the load. Mechanical advantage is a ratio of the output force compared to the input force. The greater the mechanical advantage is for a system, the greater the output force is compared to the input force, and the easier it is to do the work. In the demonstration below, the more times the rope is wrapped around the broomsticks, the greater the mechanical advantage is for the puller. However, the trade-off in a compound pulley is that while the lengths of rope equally share the weight of the load, making the effort easier, you must pull on the rope a greater distance to move the load.

Procedure

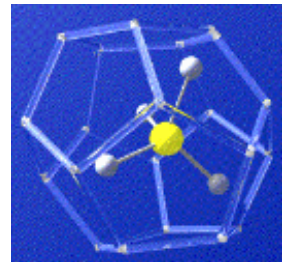
1. Assign two “strong” volunteers as broomstick holders and a “weak” one as the rope puller.
2. Broom holders should stand five to six feet apart, extending their arms towards each other with the broomsticks parallel to the floor at waist level.
3. Tie one end of the rope to the middle of one of the broomsticks.
4. Wrap the rope around the middle of the other broomstick and give the free end to the rope puller. The rope puller should stand so that the rope will be pulled perpendicular to the length of the broomsticks.
5. Have the two broomstick holders try as hard as they can to prevent the broomsticks from coming together as the rope puller pulls on the rope. Can the single rope puller draw the two broomsticks together? Note: Be careful of pinching fingers between the broomsticks.
6. Repeat a few more times, wrapping the rope around the broomsticks additional times for each trail. How much more difficult is it for the holders with each new trial? How much easier is it for the puller?



SECONDARY Article: Energy on Ice-Methane Hydrates

What are the energy sources of the future? Some scientists believe methane hydrate is one of the answers. But what, exactly, is it? A gas hydrate, such as methane hydrate, is a crystalline solid known as a clathrate. The word clathrate has its origins in the Latin word meaning “to enclose with bars.” It follows then that clathrates are a class of chemical substances made of two unique materials, one of which encloses the other in an open, lattice-like cage. There is no chemical bonding to hold the two materials together, only the physical structure. The most abundant naturally forming clathrate is methane hydrate.

Methane hydrate is formed when water molecules freeze around a molecule of methane gas. It is typically found in two distinct geologic areas—on land in permafrost regions or in ocean sediments under at least 500 meters of water. Pressure, temperature, and the amount of gas present are the determining factors in how much hydrate develops. When hydrates form, they fill in porous space in the sediment, creating a cement-like barrier. This barrier can act as a trap for additional gas.



Methane hydrate
Credit: USGS

As early as 1890, scientists were studying hydrates. At that time, they were considered a laboratory oddity, mostly because they often form well above the freezing point of water. It wasn't until 1930, when natural gas pipelines were extended into colder climates, that methane hydrates received more attention. Engineers discovered that ice was not the problem for the pipeline and flow in the colder regions, the real culprit was methane hydrate. Even with this discovery, this clathrate was considered a nuisance rather than a resource.

In 1964, the attitude of laboratory oddity or engineering nuisance changed to one of potential resource when a Russian drilling crew in northern Siberia encountered naturally occurring methane hydrate. This frozen natural gas discovery started a worldwide search for more deposits. By the 1970s, methane hydrate had been located in ocean sediments.

Most methane hydrate deposits in the U.S. are located in the Alaskan Outer Continental Shelf, with additional deposits along both the western and eastern continental coastlines. The U.S. Geological Survey (USGS) estimates the U.S. to have about 200,000 trillion cubic feet of methane hydrate. This number dwarfs the estimated 1,400 trillion cubic feet of recoverable conventional methane from natural gas reserves and reservoirs. Worldwide estimates of methane hydrate deposits reach the overwhelming number of 400 million trillion cubic feet—far outdistancing the 5,500 trillion cubic feet of proven worldwide gas reserves.

The U.S. relies on natural gas for heating, cooking, transportation, industry and products. As national and worldwide supplies become more scarce, new resources for methane are a domestic priority. According to the U.S. Department of Energy, Office of Fossil Energy, “If only one percent of the methane hydrate resource could be made technically and economically recoverable, the United States could more than double its domestic natural gas resource base.” To that end, Congress approved the Methane Hydrate Research and Development Program in 2000. This program provided over \$40 million in funding for research and development of methane hydrate as an energy resource. More recently, in November 2005, the U.S. Department of Energy announced \$2 million in funding for five research projects focused on the energy potential, safety and environmental impacts of methane hydrate exploration and development.

Scientists are researching specific concerns about methane hydrate recovery and use which include drilling safety issues due to the depth of the majority of deposits, potential influence on global climate change as methane is a hydrocarbon and the release of vast quantities currently in sinks would affect the global carbon cycle, cost effective transportation of the gas to the surface, and possible impact of hydrate removal on ocean floor stability.

As natural gas supplies decrease and the demand for cleaner fuels increases, methane hydrates are sure to play a role in the U.S. energy portfolio.

For more information about methane hydrates, visit:

U.S. Department of Energy Office of Fossil Energy: www.fe.doe.gov/programs/oilgas/hydrates

U.S. Department of Energy National Energy Technology Laboratory:

www.netl.doe.gov/scngo/NaturalGas/hydrates/rd-program/GOM_JIP/index.html

U.S. Department of Interior U.S. Geological Survey: <http://woodshole.er.usgs.gov/project-pages/hydrates>

Short Circuits

Propane for Your Health

Avian influenza (bird flu) has resulted in the deaths of more than 60 people overseas. Concerns over a potential outbreak in the United States have increased. Poultry producers in Texas became all too familiar with one strain of the avian flu last year when the disease shut down several major poultry operations in the state. Many poultry producers use chemicals to inhibit the spread of the disease. But these methods are becoming increasingly less successful. The search for another way to control further spread of the disease has producers looking towards a familiar energy source—propane. For years, poultry growers have used and trusted propane as the main heat source in their buildings. Now, with the help of a propane-powered poultry house sanitizer called the Red Dragon, propane can be used in a different facet of production—cleaning and sanitization.

The Red Dragon, a new technology from Flame Engineering, Inc. (LaCrosse, KS), utilizes six liquid propane torches that project intense, sweeping flames underneath a steel hood. The heat from the flames stays constant at approximately 1400°F, which is hot enough to effectively eliminate harmful pathogens.

Mark Leitman, Director of Agriculture Programs for the Propane Education & Research Council (PERC), said “Hopefully, growers will see these positive results from Texas and seek out flame sanitation in their area.”

For more information on the Red Dragon, visit www.flameengineering.com.

For more information on PERC and its programs to promote the safe and efficient use of propane in agriculture, visit www.agpropane.com.



Photo Credit: Flame Engineering, Inc.

