

ENERGY EXCHANGE

A publication of the National Energy Education Development Project

April 2007

2007 Youth Awards

The NEED Youth Awards Program for Energy Achievement will take place June 22-25, 2007 at the Hyatt Regency Crystal City in Arlington, Virginia. The Recognition Ceremony will be on Monday, June 25, at 10:00 a.m. in the auditorium of the U.S. Department of the Interior in Washington, DC.



NEED students pose with EIA's Energy Ant in front of the Lincoln Memorial in Washington.

The registration fee of \$525 includes double occupancy lodging, most meals and local transportation, a dinner cruise on the Potomac and tours of Washington, DC.

We look forward to seeing you there!

Hydropower Curriculum

Want your students to learn more about hydropower and the energy in moving water? New enhancements to the NEED curriculum are coming soon. In partnership with the Hydropower Research Foundation and the National Hydropower Association, NEED's curriculum team will be working to create four hands-on hydropower units to be used in connection with NEED's portfolio of energy education curriculum. The units will be complete with backgrounders, assessments and hands-on activities for students in primary, elementary, intermediate, and secondary grades.

National Environmental Education Week

National Environmental Education Week is April 15-22, 2007. It is designed to enhance the educational impact of Earth Day and provide recognition to American educators that are committed to implementing environmental education in their classroom. This year's theme is **energy**. Participants receive free resources, including online environmental education, monthly e-newsletters and the opportunity to apply for the Richard C. Bartlett Award for Environmental Education. For more information, email eeweek@neetf.org or register at www.eeweek.org/register.htm.

Welcome Bob Thompson

NEED is pleased to welcome Bob Thompson of Villa Park, Illinois to its training and curriculum teams. Bob recently left the classroom to join NEED on a part-time basis. Bob serves on the Solar, Wind, and Hydrogen development committees and continues to be a lead trainer for BP's A+ for Energy Program. Please join NEED in welcoming Bob to a workshop or NEED event near you! Bob may be reached by email at rthompson@need.org.



Passport to Energy Careers

The Passport to Energy Careers Fair will be held on June 22, 2007, at the Hyatt Regency Crystal City. Previous participants include BP, National Ocean Industries Association, U.S Energy Information Administration, American Electric Power, U.S. Department of Energy, Dominion, and others. Companies, agencies and organizations interested in hosting booths or tables should contact NEED for more information at 800-875-5029 or info@need.org. The \$100 fee helps fund the NEED Youth Energy Leadership Scholarship Award.

Inside This Issue

NEED Calendar	2
NEED News	3-4
NEED Evaluation	5
Primary Activity: Energy and Machines	6
Elementary Activity: Energy Wasters	7
Student Designed Activity: Hot Lights	8
Intermediate Activity: EnergyGuide Labels	8-9
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: 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.

National Staff

Mary Spruill—Executive Director
Martha Callan—Curriculum Director
Keith Etheridge—Training Director
Karen Reagor—Training Director
Bekki Lamb—Program Associate
Todd Rogers—Program Associate
Barry Scott—Program Associate
Annie Rasor—Curriculum Associate
Cindy Welchko—Curriculum Associate
Zarin Sidiqi—Office Administrator



A list of NEED sponsors is available at
www.need.org 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.

Copyright 2007: National Energy Education
Development Project.
All rights reserved.

Educators may reproduce articles and
activities for classroom use.

Calendar of Events

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

April 2007

- 11 Indiana NEED Workshop – Connersville, IN
- 15 NEED Youth Awards Scrapbooks due
- 18 Indiana Energy Management Conference – Bloomington, IN
- 19 Indiana Energy Management Conference – Lafayette, IN
- 20 Virginia H₂ Educate Workshop – Richmond, VA
- 23 Indiana NEED Workshop – Lafayette, IN
- 24 Indiana NEED Workshop – Greencastle, IN
- 25 Youth Awards Review – Washington, DC
- 26 Take Your Kid to Work Day Events at the Energy Information Administration – Washington, DC
- 26 Michigan NEED Workshop – Wayne, MI
- 26 Wisconsin NEED Workshop – Kewaunee, WI
- 28-29 NEED Teacher Advisory Board Meeting – Fairfax, VA
- TBD BLM New Mexico Workshops

May 2007

- 1 PG&E Solar Schools Workshop – Yuba City, CA
- 1 Energy Smart Students Energy Efficiency Workshop – East Syracuse, NY
- 2 PG&E Solar Schools Workshop – Paradise-Chico, CA
- 2-3 Offshore Technology Conference Teacher Workshop – Houston, TX
- 3 Michigan NEED Workshop – Kalamazoo, MI
- 4 NEED sessions at New Jersey Technology Teachers Conference – Teaneck, NJ
- 5 PG&E Solar Schools Workshop – Fresno, CA
- 7-9 National Association of State Universities and Land Grant Colleges Training Program – Location TBD
- 8 Kentucky NEED Youth Awards for Energy Achievement – Frankfort, KY
- 11 Indiana NEED Youth Awards for Energy Achievement – Indianapolis, IN
- 12 PG&E Solar Schools Workshop – Modesto, CA
- 15 PG&E Solar Schools Workshop – Arcata, CA
- 16 PG&E Solar Schools Workshop – Fort Bragg, CA
- 16 Ohio Youth Energy Celebration – Columbus, OH
- 21 BP A+ for Energy grant winners announcement
- 22 PG&E Solar Schools Workshop – Oakland, CA
- 23 PG&E Solar Schools Workshop – Mountain View, CA
- 31-6/2 NEED sessions at American Oil and Gas Historical Society Energy Education Conference – Oklahoma City, OK

June 2007

- 3 NEED Wind Workshop (in partnership with KidWind and The American Wind Energy Association) at Windpower 2007 Conference – Los Angeles, CA
- 8 Indiana NEED Workshop – Ball State-Muncie, IN
- 11-15 Kentucky Energy Tour – Western KY
- 14 BP A+ for Energy Celebration – Houston, TX
- 22-25 NEED Youth Awards for Energy Achievement – Washington, DC
- 25 BP A+ for Energy Celebration – CA

July 2007

- 9-11 NEED Facilitator Training – Washington, DC
- 15-19 NEED National Energy Conference for Educators – Washington, DC
- 22-26 NEED National Energy Conference for Educators – Santa Fe, NM
- 31-8/2 Georgia BioEnergy Conference – Tifton, GA
- TBD BP A+ for Energy Conferences

Signed your Change-A-Light pledge yet?

Go to www.energystar.gov/index.cfm?fuseaction=cal.showPledge
to sign your pledge today!

NEED News

New York Hydrogen Education Continues

NEED and the New York State Energy Research and Development Authority (NYSERDA) are partnering again to deliver the H₂ Educate Workshops for middle school teachers in New York. Participating teachers receive hands-on H₂ Educate kits and curriculum materials. Visit www.getenergysmart.org/schools/workshops/workshops.asp for workshop locations and dates.

Texas

Congratulations to Nina Corley, a 2007 Crystal Awards for Outstanding Teachers recipient. Nina is a NEED Teacher, Trainer and BP A+ for Energy Grant Award Winner. She teaches fourth and fifth grades at Satori School in Galveston. Since 1993, the Spring Branch Education Foundation has sponsored this annual event in partnership with the Houston Chronicle and other local businesses. Six educators receive honors as Outstanding Teachers and are selected by the Houston Chronicle from over 1,600 nominees from Gulf Coast area public and private schools throughout Harris, Brazoria, Fort Bend, Waller, Montgomery, Liberty, Chambers and Galveston Counties.

Nina Corley was one of six outstanding teachers honored at the 2007 Crystal Awards Celebration on February 16, 2007, at the Westin Galleria Hotel. Nina received a Waterford Crystal Apple, \$750, and a scholarship for six hours of educational classes from a local college. Congratulations, Nina, on this special honor.

Virginia

Chesapeake Public Schools have really been busy this year! The Environmental Club at Deep Creek Middle School conducted an energy audit of their school, recording items that were wasting energy. Gene Whitley, Energy Program Manager, assigned a cost to these inefficiencies so students could see the actual costs if, for example, a computer is left on 24 hours a day. Students also enjoyed using the *watts up? Pro Analyzer* to measure wattage on different electrical appliances and lighting fixtures.

Brenda Ficoturo, a science teacher at Hugo Owens Middle School, developed an Energy Kits table that reduces the work of selecting energy materials for classroom use by grouping grade level with teaching period, energy kit name, and Standards of Learning.

Students at the Chesapeake Center for Science and Technology (CCST) conducted a heating season survey of room temperatures at their school to document the performance of the school's new HVAC system. Students recorded the temperatures in each classroom at different times of day to see if the temperature stayed within a target range of 71 degrees throughout the day. A cooling season survey is also planned for April/May.

Tom Spencer, Engineering Instructor at CCST, has coordinated and produced the CCST Energy Minute Podcast, which is scheduled to debut live online soon, and can be heard on NEED's website. John Sammons, Technology Integration Specialist at Greenbrier Intermediate School, applied for and was awarded a \$5,000 energy grant to be used for an energy conservation project. Projects under consideration are the use solar generated power to control electrical devices used to water plants in the courtyard garden, and installation of five motion sensors that would automatically turn the lights on and off as people entered and exited the five rooms.

Congratulations Doris

NEED extends its congratulations to Doris Tomas who has been appointed the Education Director for the Offshore Energy Center (OEC) in Houston, Texas. NEED and OEC have partnered for many years on curriculum and training related to offshore oil and gas exploration and development. Doris' excellent skills in the classroom and as an administrator make her the perfect candidate for the exciting work of the OEC. NEED looks forward to a continued partnership and wishes Doris well in her new endeavor.

Educational Partnership Grants Available from Dominion

The Dominion Foundation will award approximately \$300,000 in Educational Partnership grants to encourage the development of new programs to strengthen math and science education in kindergarten through twelfth grade. Successful grant proposals should represent innovative and promising ideas, teach math and/or science skills, reach a significant number of students and demonstrate broad-based community support. Grants (up to \$10,000) will be awarded to teachers in targeted geographic areas of CT, MD, MA, NC, OH, PA, RI, TX, VA and WV. Accredited public and private elementary and secondary schools, public school divisions, institutions of higher education, state agencies and 501(c)(3) nonprofit organizations are invited to apply. Applications for Educational Partnership grants for the 2007-2008 school year are now being accepted online. The application deadline is **May 1, 2007**. To learn more about Dominion's Educational Partnership grants or to submit a proposal, visit www.dom.com/about/education/grants/grants.jsp.

NEED News

Student Competition

FIRST LEGO League Power Puzzle Challenge: Alternative Energy Resources - Meeting the Global Demand: *FIRST* LEGO League (FLL) is an exciting and fun international robotics program that ignites an enthusiasm for discovery, science, and technology in kids ages 9 to 14. Each year FLL teams embark on an adventurous Challenge based on current, real-world issues. Guided by a team coach and assisted by mentors, the students research and solve a real-world problem based on the Challenge theme, present their research and solutions, and build an autonomous robot using engineering concepts. Using the yearly Challenges, FLL entices kids to think like scientists and engineers, provides a fun, creative, hands-on learning experience, teaches kids to experiment and overcome obstacles, builds self-esteem and confidence, and inspires kids to participate in science and technology.

Whether it is by creativity, technology, or research, FLL dares kids to test, explore, expand, or completely change thoughts and approaches for different sciences each year. For more information on *FIRST* LEGO League and the 2007 Power Puzzle Challenge, visit www.firstlegoleague.org/default.aspx?pid=70.

NEED Board of Directors

The Board of Directors elected new officers at the March Board Meeting in Williamsburg, Virginia. The Board and staff thank Paul Loeffelman of American Electric Power for his leadership during exciting times at NEED. Paul becomes Immediate Past Chair and continues to serve on the board. Richard Zuercher of Dominion was elected Chairman after his tenure as Vice Chairman and Chair of the Planning Committee that recently put forth NEED's vision for the year 2030. Philip Cochrane of BP was elected Vice Chairman. Loeffelman, Zuercher, and Cochrane serve on the Executive Committee. Many thanks to all members of the board for their leadership and vision as NEED continues to grow.

NEED Facilitator Training

NEED is offering a facilitator training program July 9-11, 2007 in Washington, DC. The three-day program is designed to provide NEED teachers and partners with additional training and implementation resources to present successful energy workshops in their localities. If you are interested in participating, or your company/organization would like to send representatives to train, please contact Keith Etheridge at ketheridge@need.org. Registration fee is \$1,000.

Program and Workshop Evaluations

NEED recently completed its 2005-2006 workshop and program evaluation. Scott Sutherland, Principal of Hope High School in Providence, Rhode Island, completed the analysis and report preparation. NEED continues to receive high marks for its training and curriculum offerings and Mr. Sutherland's recommendations for improvement and enhancement will be implemented in the coming months. Copies of both the Program Evaluation and the Workshop Evaluation will be available on www.need.org.

Wind Curriculum

The NEED Project would like to thank the American Wind Energy Association (AWEA) for sponsoring the development of our wind curricula - debuting this summer during teacher training programs and at the Windpower 2007 Conference in Los Angeles in June. Hands-on kits and curricula will be available for grades K-12. Special thanks to the NEED Lead Teacher development team: Constance Beatty (IL), Sara Brownell (CA), Amy Constant (NC), Regina Donour (KY), and Robert Thompson (IL); to our educational partner Michael Arquin (KidWind); and to our technical advisory team: John Dunlop (AWEA), Richard Lawrence (Cape & Islands Self Reliance), and Linda Lung (NREL).

Youth Leadership Award

NEED is pleased to offer graduating high school seniors and college freshmen and sophomores the opportunity to apply for NEED Energy Leadership Awards. Two awards of \$1,500 will be given to NEED students who have shown exemplary leadership in energy education and who plan to pursue higher education related to energy or education. To request an application, email Rebecca Lamb at rlamb@need.org. Application deadline is **May 14, 2007**.

2007 National Energy Conferences for Educators: Washington, DC - July 15-19 & Santa Fe, NM - July 22-26

You still have time to register for the 2007 National Energy Conferences for Educators! Graduate credit is available. If you wish to provide sponsorship for a teacher or group of teachers, contact NEED at info@need.org or 800-875-5029. Visit www.need.org/summertraining.

Complete the NEED 2006-2007 School Year Evaluation & Get a NEED T-shirt

NEED wants to know what you think. Be one of the first 50 people to send in your evaluation and receive a new NEED t-shirt! Be sure to circle your t-shirt size in the upper right hand corner of the evaluation form in this issue.

NEED 2006-2007 School Year Evaluation

Name _____ State _____ T-shirt Size S M L XL XXL

School Name _____ Phone Number _____

Fax Number _____ Email _____

Number of students taught this year _____ Subject _____ Grade Taught _____

When/How did you find out about NEED? _____

What NEED training have you attended? Please circle all that apply.

One day workshop In-service Multi-day conference Short course session

How did the NEED training contribute to the success of your program? _____

How long was your energy unit (days/weeks)? _____

Did you do community outreach/education as part of your efforts? _____

Did you use NEED materials during the 2006-2007 school year? If no, why not? _____

If yes, which materials did you use? Please circle each item.

Blueprint for Success	Energy Flows	EnergyWorks	Marine Energy	Talking Trash/Museum
Conservation Contract	Energy House	Exploring Energy	Mission Possible	ThermoDynamics
Current Energy Affair	Energy in the Balance	Exploring Magnets	Mystery World Tour	This Mine of Mine
ElectroWorks	Energy Jeopardy	Fossil Fuels to Products	NEED Songbook	Transparent Energy
Energy Analysis	Energy Management Kits	Games & Icebreakers	Ocean Energy	Transportation Activities
Energy Around the World	Energy Math Challenge	Global Trading Game	Primary Science of Energy	Today in Energy
Energy Carnival	Energy on Public Lands	Great Energy Debate Game	Primary Stories & More	U.S. Energy Geography
Energy Enigma	Energy on Stage	Greek Mythology	Projects & Activities	Yesterday in Energy
Energy Expo	Energy Rock Performances	H ₂ Educate	Science of Energy	
Energy Fair	Energy Source Expo	Infobooks & Activities	Solar Kits & Activities	

Is the Blueprint for Success a helpful guide in planning your energy unit? _____

What other resources would be helpful to you for your unit? _____

Do you use the activities in the *Energy Exchange* newsletter? yes no

Do you find the *Career Currents* newsletter valuable? yes no

Would you like to receive the newsletters electronically? (Be sure to include email above) yes no

What improvements could be made to *Energy Exchange* and *Career Currents*? _____

Are there NEED activities or subject areas you would like to see developed or changed? Please explain.

What resources you would like to see on the NEED website, www.need.org? _____

Do you find www.need.org easy to use? yes no (To provide more feedback, email info@need.org.)

Thank you for your response! Please return to NEED:

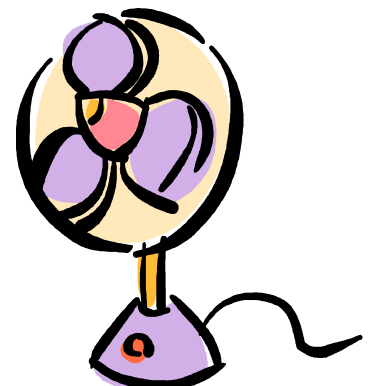
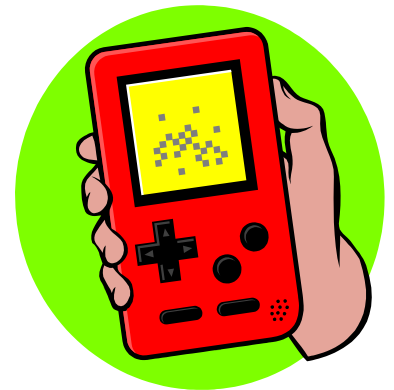
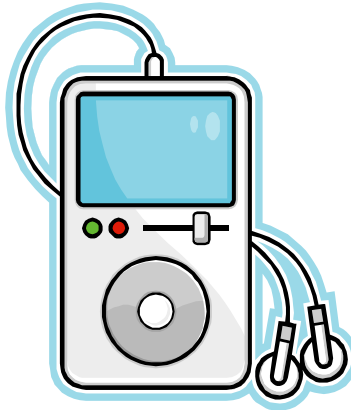
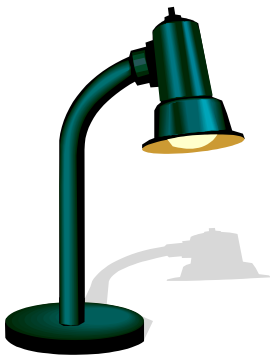
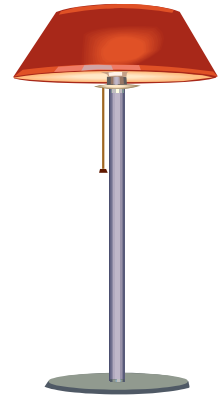
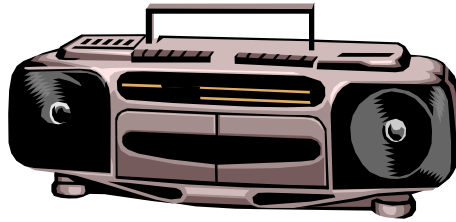
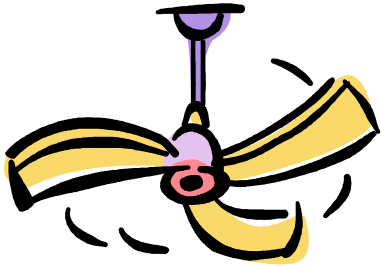
Fax: 800-847-1820

Email: info@need.org

Mail: 8408 Kao Circle * Manassas, VA * 20110

Primary Activity: Energy and Machines

Draw a picture of your room at home. Cut out pictures of all the things in your room that use energy and paste them on your picture. Make a list of ways you can save energy in your room.



Elementary Activity: Most Wanted Energy Wasters

Goal

To increase student awareness of energy use and energy-wasting habits and reinforce energy-saving behaviors.

Materials

Digital or Polaroid camera
Copies of student sheet
Markers, pens and pencils
Water soluble ink pad

Preparation

Make a sample wanted poster.

Procedure

- Explain the activity to the students. Exhibit the sample wanted poster.
- Use a digital or Polaroid camera to take front and side view mug shots of each student.
- Brainstorm with the students a list of ways they use and waste energy daily. Ideas may include:

Leaving the TV and other machines on when they are not in use.

Taking long showers.

Leaving lights on when not in use.

Leaving the water running while brushing teeth or washing dishes.

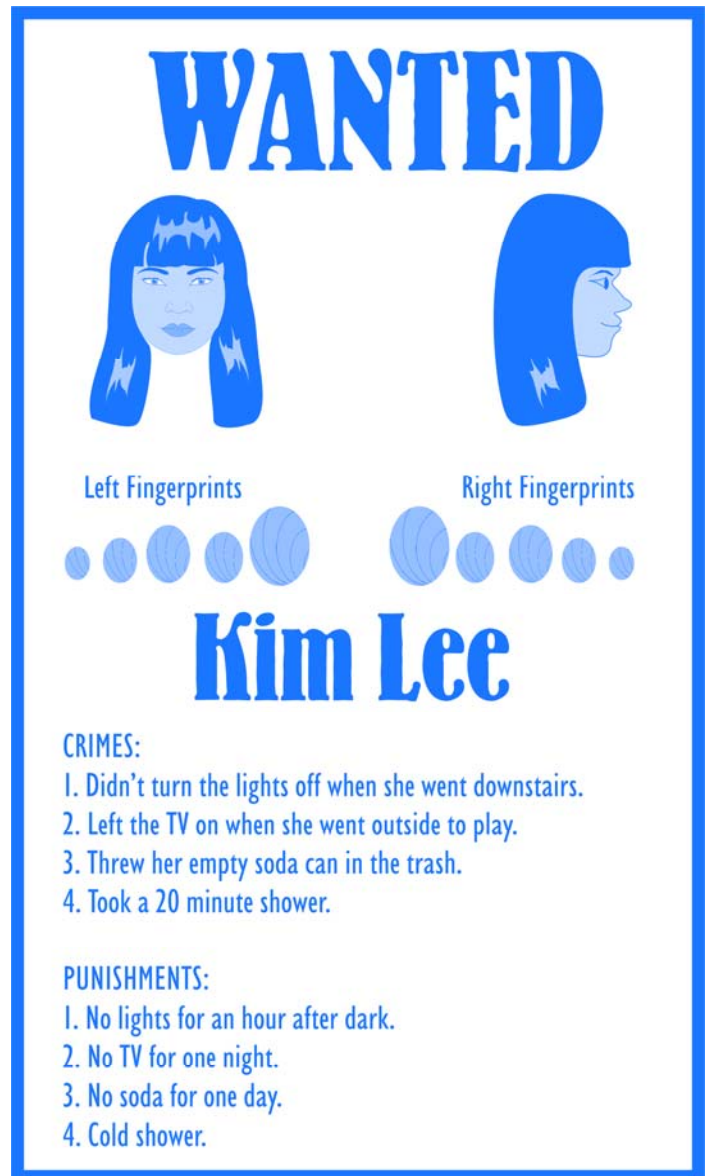
Leaving doors or windows open when heat or air conditioning systems are running.

Asking for a ride when walking or riding a bike would be appropriate.

Using more light than needed for a task.

Not recycling materials that can be recycled.

- Brainstorm appropriate punishments for the energy-wasting crimes. For example, skipping a favorite TV show as punishment for failing to turn off the TV.
- Have each student construct a wanted poster using his/her mug shots. If pictures of the students were not taken, have the students draw pictures of themselves caught in the act of wasting energy. Use a water-soluble ink pad to take fingerprints on the poster for each student. Have each student list at least two individual energy wasting crimes and relevant punishments.
- Hang the posters in the hallway for all of the students in the school to see.
- Brainstorm ways students can save energy—such as installing CFLs in their homes.



Student Designed Activity: Hot Lights

After joining their school energy club and learning about incandescent and compact fluorescent light bulbs (CFL), two fifth grade students set out to experiment on their own.

“The experiment was to prove that incandescent lights get hotter than CFLs. We took two of the same lamps, one with an incandescent and one with a CFL. Unfortunately, we didn’t have a thermostat to see which one got hottest, so we compromised. Instead, we used a candle. First, we kept the two lights on for 10 minutes. Then we held a candle on top of each for two minutes. The incandescent bulb got covered in wax and the CFL didn’t change a bit. We took pictures to give proof, but we wanted to try one more thing. We turned the lights back on for 10 more minutes, but this time we held a spoon of butter on top of the lights. Both the spoons had the same amount of butter on them. The incandescent bulb melted the most butter. Again, nothing happened to the CFL bulb. That was proof that incandescent lights produce more heat than CFLs.”

Special thanks to Angela Daniela Arroyo and Abby Herman of NC for sharing their great experiment with NEED. Want to try this experiment yourself? Try taping a thin piece of tissue paper to the end of a pencil and holding it over the bulbs. Hot air rising from a bulb will make the tissue paper swirl. Be sure to have adult permission and supervision first! Have your students created great energy experiments? Send student written submissions to info@need.org.

Intermediate Activity: EnergyGuide Labels

Goal

To have students develop an awareness of life cycle cost analysis, payback period, and energy-efficient technologies.

Concepts

- Some appliances are more energy-efficient than others.
- The energy efficiency of major appliances can be quantified.
- The federal government requires most major appliances to carry labels to inform consumers of their energy efficiency ratings.
- Efficient appliances are usually more expensive to buy than less efficient models, but the life cycle cost of efficient appliances is usually much less than the less expensive models.
- Payback period is the operating time for an energy-efficient appliance before the higher up-front (purchase) cost is recouped by lower energy costs.

Background

The federal government requires appliance manufacturers to provide information about the energy efficiency of their products to consumers so that they can compare the life cycle cost of the appliances, as well as the purchase price. The life cycle cost of an appliance is the purchase price plus the operating cost over the projected life of the appliance. The law requires that manufacturers place EnergyGuide labels on all new refrigerators, freezers, water heaters, dishwashers, clothes washers, room air conditioners, central air conditioners, heat pumps, furnaces and boilers. The EnergyGuide label lists the manufacturer, the model, the capacity, the features, the average amount of energy the appliance will use a year, its comparison with similar models, and the estimated yearly energy cost.

For refrigerators, freezers, water heaters, dishwashers, and clothes washers, the labels compare energy consumption in kWh/year or therms/year. For other appliances, the rating is not in terms of energy consumption, but in energy efficiency ratings, as follows: room air conditioners—Energy Efficiency Rating (EER), central air conditioners—Seasonal Energy Efficiency Rating (SEER), heat pumps—Heating Season Performance Factor (HSPF), and furnaces and boilers—Annual Fuel Utilization Efficiency (AFUE). The estimated annual operating cost is based on recent national average prices of electricity and/or natural gas and assumes typical operating behavior. For example, the cost for clothes washers assumes a typical washer would be used to wash eight loads of laundry per week. In addition, the U.S. Environmental Protection Agency (EPA) designates the most energy-efficient appliances as ENERGY STAR appliances.

Procedure

1. Introduce the activity to the class, discussing why the federal government is involved in labeling the efficiency of appliances.
2. Review the concepts of life cycle cost and payback period.
3. Allow students time to complete the Comparing Appliances worksheet.

Comparing Appliances

Your parents need to buy a new water heater. You need to help them choose the better one. Water heaters usually last a long time—10 to 20 years—so you can save a lot of money on an energy-efficient one. Use the chart below to calculate which water heater to buy.

How many years will it take before you begin to save money?

How much money will you have saved after seven years?

Water Heater 1 Purchase Price: \$600

Water Heater 2 Purchase Price: \$300

MODEL 1	EXPENSE	COST TO DATE	MODEL 2	EXPENSE	COST TO DATE
Purchase Price			Purchase Price		
Year One			Year One		
Year Two			Year Two		
Year Three			Year Three		
Year Four			Year Four		
Year Five			Year Five		
Year Six			Year Six		
Year Seven			Year Seven		

Based on standard U.S. Government tests

ENERGYGUIDE

Water Heater - 60 gallon
Natural Gas

Model 1

Compare the Energy Use of this Water Heater
with Others Before You Buy.

This Model Uses
185 therms/year

Energy use (therms/year) range of all similar models

Uses Least	Uses Most
Energy	Energy
180	295

Therms/year is a measure of energy use. Your utility company uses it to compute your bill. Only models with first hour ratings of 56 to 64 gallons are used in this scale.

Water heaters using more energy cost more to operate.
This model's estimated yearly operating cost is:

\$248

Based on a 2005 U.S. Government national average cost of \$1.34 per therm for natural gas. Your actual operating cost will vary depending on your local utility rates and your use of the product.

Important: Removal of this label before consumer purchase violates the Federal Trade Commission's Appliance Labeling Rule (16 C.F.R. Part 305)

Based on standard U.S. Government tests

ENERGYGUIDE

Water Heater - 60 gallon
Natural Gas

Model 2

Compare the Energy Use of this Water Heater
with Others Before You Buy.

This Model Uses
275 therms/year

Energy use (therms/year) range of all similar models

Uses Least	Uses Most
Energy	Energy
180	295

Therms/year is a measure of energy use. Your utility company uses it to compute your bill. Only models with first hour ratings of 56 to 64 gallons are used in this scale.

Water heaters using more energy cost more to operate.
This model's estimated yearly operating cost is:

\$369

Based on a 2005 U.S. Government national average cost of \$1.34 per therm for natural gas. Your actual operating cost will vary depending on your local utility rates and your use of the product.

Important: Removal of this label before consumer purchase violates the Federal Trade Commission's Appliance Labeling Rule (16 C.F.R. Part 305)

Short Circuits

An Energy Efficient Internet

Data centers are the workhorses of the Internet. They deliver information through web and email servers to personal computers around the world. They can consume up to 100 times more electricity than a standard office building. U.S. data centers alone consume 45 billion kilowatt-hours of electricity each year. Since data center energy consumption doubled between 2000 and 2005, they are now the focus of energy efficient technologies.

A current way to reduce data center energy consumption includes using software designed to maximize server resources, allowing fewer servers to complete the same number of tasks. Additional energy efficient technologies focus on the cooling costs associated with the waste heat produced by data centers. Waste heat is produced by data centers because alternating current (AC) power is traditionally provided by power companies to residences and businesses. But many electronic components are designed to run on direct current (DC) power, which means they must convert the delivered AC power to DC power. This process uses energy and produces waste heat.

A new approach to saving energy at data centers looks at providing the electricity as DC rather than AC from the start. Initial estimates predict 10-20 percent energy savings and increased reliability over data centers using AC power.

For more information, visit www.eere.energy.gov/news.



Data centers help the Internet run smoothly, but use large amounts of energy.
Photo Credit: DOE

