

energy EXCHANGE

A publication of the National Energy Education Development Project

February 2007

2007 Youth Awards

The NEED Youth Awards Program for Energy Achievement is scheduled for **June 22-25, 2007** at the Hyatt Regency Crystal City in Arlington, Virginia. The Recognition Ceremony will take place on Monday, June 25th at 10:00 am in the U.S. Department of the Interior Auditorium in Washington, DC. The registration fee is **\$525** and includes lodging, most meals, local transportation, a dinner cruise on the Potomac River and tours of Washington.

To participate in the Youth Awards Program, follow the guidelines in *Energy Projects and Activities*, available at www.need.org/youthawards. Scrapbooks are due to state committees by **April 15, 2007**. If you are unsure where to send your scrapbook, contact NEED at info@need.org or 800-875-5029.

We look forward to seeing you there!

Energy Education Report Card

Throughout 2007, NEED will be collecting data from participating classrooms to produce the 2008 Energy Education Report Card. NEED classrooms are asked to utilize the online Energy Education Poll – pre and post – to enter student assessment data which will allow NEED to collect energy knowledge data. To use the Poll in your classroom, visit www.need.org/energypolls. If you need assistance, or prefer to use the pre and post poll in print, contact NEED at info@need.org. NEED is seeking 50 volunteer classrooms to complete the pre and post poll by the end of the 2006-2007 school year. To participate, email info@need.org.

Welcome Dan Cummings

The NEED Board of Directors welcomes Dan Cummings as its newest member. Dan is Senior Advisor with B & D Consulting Group LLC. Previously, he worked in the energy and petrochemical industry for BP, for a member of Congress on Capitol Hill, as a Presidential Appointee in policy and legislative advocacy positions for the senior Bush Administration, and as a Captain in the U.S. Army Reserve's Judge Advocate General (JAG) Corps. Dan was part of the team that brought BP's A+ for Energy Program to California. NEED is pleased to have Dan as part of its leadership team.

2007 National Energy Conferences for Educators

The 2007 National Energy Conferences for Educators registration fee is \$1,000 and covers most meals, double-occupancy lodging, airport transportation, and classroom and conference materials. Registrations are due **April 30, 2007**. For more information, or to register, visit www.need.org/summertraining. 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.

Washington, DC - July 15-19, 2007
Santa Fe, NM - July 22-26, 2007

Youth Leadership Award

NEED is pleased to offer graduating high school seniors and college freshmen and sophomores an 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**.

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.

Inside This Issue

NEED Calendar	2-3
NEED News	3
Energy Play	5-7
Short Circuits	back

The NEED Project

National Energy Education Development
P.O. Box 10101
Manassas, VA 20108
TEL: 1-800-875-5029
FAX: 1-800-847-1820
EMAIL: info@need.org
WEB: 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
Rebecca Lamb—Asst. Program Director
Todd Rogers—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.

February 2007

- 5 Energy Smart Students Energy Literacy Workshop – Queensbury, NY
- 6 Michigan EnergySmart Schools Iron Dickenson ISD Workshop – Kingford, MI
- 6 Energy Smart Students Energy Literacy Workshop – Potsdam, NY
- 7 NEED session at Natl. Association of Conservation Districts Meeting – Los Angeles, CA
- 7-9 NEED sessions at Hoosier Assoc. of Science Teachers, Inc. Conference – Indianapolis, IN
- 13 Energy Smart Students Efficiency Workshop – Pittsford, NY
- 13 Energy Smart Students Efficiency Workshop – Ithaca, NY
- 16-17 NEED sessions at KY Science Teachers Association Conference – Hopkinsville, KY
- 20 Indiana NEED Workshop – Indianapolis, IN
- 21 PG&E Solar Schools Workshop – Clearlake, CA
- 21 Indiana NEED Workshop – Highland, IN
- 22 PG&E Solar Schools Workshop – San Francisco, CA
- 23 NEED participation in KY Schools Board Association Meeting – Louisville, KY
- 27 PG&E Solar Schools Workshop – Fresno, CA
- 28 PG&E Solar Schools Workshop – Bakersfield, CA
- TBD NEED Energy on Public Lands Workshops – NM

March 2007

- 1 Indiana NEED Workshop – Evansville, IN
- 3 West Virginia NEED/KidWind Workshop – Hambleton, WV
- 5 Energy Smart Students Science of Energy Workshop – Auburn, NY
- 5 Energy Smart Students Efficiency Workshop – Queensbury, NY
- 6 PG&E Solar Schools Workshop – Santa Maria, CA
- 6-7 Kentucky High Performance Schools Workshop – Bowling Green, KY
- 7 PG&E Solar Schools Workshop – San Luis Obispo, CA
- 8 Energy Smart Students Science of Energy Workshop – Clifton Park, NY
- 8-9 NEED Workshop – Cape Cod, MD
- 8-10 Kentucky Teaching and Learning Conference – Louisville, KY
- 12-16 NEED Week
- 13 PG&E Solar Schools Workshop – Salinas, CA
- 13 Energy Smart Students Science of Energy Workshop – Ithaca, NY
- 14 PG&E Solar Schools Workshop – San Jose, CA
- 14 Energy Smart Students Efficiency Workshop – Williamson, NY
- 15 PG&E Solar Schools Workshop – San Francisco, CA
- 15 Energy Smart Students Science of Energy Workshop – Clifton Park, NY
- 15-17 NEED participation in National Hydropower Association Conference – Washington, DC
- 16 NEED Day
- 19 Energy Smart Students Energy Literacy Workshop – Auburn, NY
- 20 PG&E Bright Ideas grant deadline
- 21-22 NEED Board of Directors Meeting – Williamsburg, VA
- 23 BP A+ for Energy grant deadline
- 27 PG&E Solar Schools Workshop – Woodland-Davis, CA
- 28 PG&E Solar Schools Workshop – Santa Rosa, CA
- 28-31 NEED sessions at National Science Teachers Association Conference – St. Louis, MO
- 29-31 NEED participation in National Ocean Industries Association Meeting – Washington, DC
- TBD NEED Energy on Public Lands Workshops – NM
- TBD Additional Indiana NEED Workshops – IN
- TBD Virginia Energy Workshops – VA

April 2007

- 15 NEED Youth Awards Scrapbooks due
- 24 Indiana NEED Workshop – Greencastle, IN
- 28-29 NEED Teacher Advisory Board Meeting – Fairfax, VA

May 2007

- 1 PG&E Solar Schools Workshop – Yuba City, CA
- 2 PG&E Solar Schools Workshop – Paradise-Chico, CA
- 2-3 Offshore Technology Conference Teacher Workshop – Houston, TX
- 8 Kentucky NEED Youth Awards for Energy Achievement – Frankfort, KY
- 15 PG&E Solar Schools Workshop – Arcata, CA
- 16 PG&E Solar Schools Workshop – Fort Bragg, CA
- 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

For Ohio Energy Project workshops, visit www.ohioenergy.org.

Calendar of Events, continued

June 2007

- 11-15 Kentucky Energy Tour – Western KY
22-25 NEED Youth Awards for Energy Achievement – Washington, DC

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
TBD BP A+ for Energy Conferences

NEED News

Calling All Teachers in California, Texas, New Mexico and regions of Ohio, Illinois, Indiana, Alabama, and Alberta (Canada)

BP has launched the A+ for Energy Program for the third year and has opened the program to new states and regions. NEED is pleased to be a partner of the A+ for Energy Program. The program provides \$5,000 and \$10,000 grants to teachers who want to be creative and work with their students on exciting and energizing energy programs in their classrooms or clubs. For additional information, or to apply for a grant, visit www.aplusforenergy.com.

Indiana Happenings!

NEED is pleased to have the support of Duke Energy Indiana, Citizens Gas, Vectren Energy Delivery, Indianapolis Power and Light, Northern Indiana Public Service Company, and the Indiana Office of Energy and Defense to provide energy education programming in Indiana. Teachers are provided with more than \$500 in classroom materials and training. School Energy Audits are available from NEED's Energy Management Team, and home energy efficiency kits are provided to over 1,000 families. Teachers are encouraged to contact Karen Reagor at kreagor@need.org for more information.

Central and Northern California Teachers

Have Bright Ideas? Want a solar installation for your school? The Pacific Gas and Electric Solar Schools Program has launched the third year of programming with an investment of \$2.7 million in solar installations, teacher training, and \$2,500 and \$5,000 Bright Ideas Grants for schools seeking to expand their renewable energy education efforts. Training is available for 800 teachers in PG&E's service area and \$250,000 in grants is available. Teachers participating in the program receive NEED Science of Energy and Solar Schools Kits of their choosing. To learn more about the PG&E Solar Schools Program, visit www.pge.com/solarschools or email Barry Scott at bscott@need.org.

New Support from the AEP Foundation

The American Electric Power Foundation has committed to a two-year partnership designed to support energy education training, materials, and field experiences for schools in their service areas in Virginia, West Virginia, Texas, Louisiana, Oklahoma, and Arkansas. Interested schools in AEP service areas should contact Mary Spruill at mspruill@need.org.

H₂ Educate

U.S. Department of Energy sponsored H₂ Educate workshops were conducted in Ohio, Michigan, and West Virginia this past fall. Over 100 educators received hydrogen education materials and hands-on kits. The New York State Energy Research and Development Authority (NYSERDA) renewed its commitment to sponsor H₂ Educate Workshops and provide classroom materials to New York middle schools. Interested in hosting H₂ Educate workshops in your district? Contact Rebecca Lamb at rlamb@need.org.

Energy Hog Update

Thank you to everyone who used the Energy Hog to teach the importance of saving energy at home. Last year in partnership with the Alliance to Save Energy, NEED distributed 900 Energy Hog Challenge classroom kits, reaching more than 26,000 students with information about how kids can take the lead in helping their families save energy. The Energy Hog Challenge includes the Energy Hog Scavenger Hunt and a Family Pledge – two activities in which kids guide their parents in evaluating the energy saving potential of their own homes. The guides are now available free at www.energyhog.org. Download them to help your community find and bust Energy Hogs. For more information contact Maria Ellingson at 303-333-4570 or mellingson@ase.org.

OTC Workshop – Houston, Texas

NEED is pleased to partner with the Society of Petroleum Engineers to host an OTC Teacher Workshop at the Offshore Technology Conference in Houston on May 3, 2007. This one-day workshop will provide teachers with tools to meet Texas standards and an opportunity to learn more about careers in the energy industry. Time will be allotted for a tour of the OTC exhibit floor. For more information email Mary Spruill at mspruill@need.org.

Don't Forget

Change a Light Pledges are still being accepted – visit www.need.org. Teachers in the Duke Energy service areas in North and South Carolina – be sure to check out the Duke Energy/NEED Change a Light Teacher Guide.

New EIA Kid's Page Teacher's Guide

Looking for activity extension ideas for the Energy Kid's Page website? Then check out the new Teacher's Guide at www.need.org. Haven't visited the site yet? Visit www.eia.doe.gov/kids and see what you've been missing.

Energy Play: Harry Spotter and the Chamber of Windy Myths

Teacher Guide

Goal

To understand misconceptions about using wind energy for generating electricity.

Background

This Energy Play uses a familiar story and characters to convey energy information about wind. It can be used at all grade levels, and can be performed as a reader theater or as a more elaborate performance with props and costumes.

Concepts

1. Modern wind turbines do not produce excessive noise; they produce a rhythmic swooshing sound.
2. The sites for wind turbines are studied to ensure that injuries to bats and birds are minimized.
3. Wind energy is reliable and predictable.
4. Appropriate siting of a wind turbine is critical to its success.

Time

The play can take as little as ten minutes to read through in class or one class period to practice and organize props with additional time the next day to perform.

Materials

- One copy of the script for each participant.
- Simple costumes and props, if desired.

Procedure

- Assign parts to students. There is a choral reading part included if using as a reader theater in class.
- Allow students time to rehearse parts and plan props if performing the play.
- Review enriched vocabulary as needed.

Anemometer	Menagerie	Siting (a wind farm)
Bickering	Migration	Sustained
Efficiently	Reliability	
Idling	Rhythmical	
- Assess student comprehension with the following questions:
 - Why did Professor Dieseldore invite Professor Huggdatreaz to teach the Windseekers class at Hogwatts?
 - What makes a location a good site for a wind turbine?
 - What makes a location a poor site for a wind turbine?
 - What is one myth most people believe about wind turbines? How would you convince them this is not true?

Extensions

1. The principal of your school is thinking about adding a wind turbine to the property to generate electricity. Your class is responsible for deciding if this is a good idea, and where the turbine should be located. Write a persuasive speech convincing your principal why she should, or should not, add a wind turbine.
2. Research wind energy and wind turbine technology. Prepare informative expo boards to use to teach other students about wind energy after performing the play for them. The expo boards should cover the following topics:
 - Wind, a renewable energy resource
 - Parts of a wind turbine
 - Siting a wind farm
 - Wind turbines generate electricity
 - Wind energy myths (*See www.awea.org for more information on myths about wind energy.*)

Special thanks to NEED Lead Teachers Amy Constant (NC), Debbie Fitton (MA), and Linda Hutton (NC), as well as Bonnie Bumford for creating this play. Additional thanks to Walter Musial (National Renewable Energy Lab) for his technical review.

Cast of Characters

RONI – a girl

HERMAN – a boy

HARRY SPOTTER – a boy

PROFESSOR HUGGDATREAZ – a science teacher

CLOUDIA – a girl

BREEZUS – a boy

CLASS – chorus

Scene One: Classroom at Hogwatts School

Roni: I'm so excited about this new class. This professor is really supposed to be energetic!

Herman: I just hope I pass this one.

Harry: We'd better hurry, or we're going to be late.

(They enter the classroom and find seats.)

Professor: Welcome to Windseekers Class. This is a new class at Hogwatts. Your first project will impact the entire school. Due to increased enrollment, our current electrical capacity is no longer meeting our needs.

Roni: *(Waving hand excitedly.)* Is that why the lights went off in our dorm last night? I couldn't finish reading ahead for my classes.

Professor: Yes, Roni. Professor Dieseldore invited me to teach this class since I'm an expert in siting wind farms. You are going to assist me in picking the perfect location for a wind turbine.

Cloudia: Cool.

Herman: *(quietly to Harry)* Do you know what he's talking about?

Roni: Shhhhh...

Professor: Can anyone tell me what wind energy is?

(Roni waves her hand wildly.)

Professor: Harry?

Harry: The stuff that blew out the candle last night.

Professor: One point for Harry. But, wind is much more. Breezus?

Breezus: Wind is magic. It helps our broomsticks fly and fills dragons' wings.

Roni: *(shouts)* Wind is moving air.

Professor: One point for Breezus. Yes, wind does seem like magic. Roni, you would receive points too, if you'd waited to be called on. Yes, wind is moving air that we can harness to do work. Class, repeat after me: wind is moving air—energy is there.

Class: Wind is moving air—energy is there.

Professor: For homework tonight, everyone needs to find the perfect location for us to build a wind turbine here at Hogwatts. Class dismissed.

Herman: wind what?

Harry: A wind turbine. It works like a windmill, but the blades catch the wind and turn it into electricity.

Roni: It converts nature's kinetic energy into electrical energy.

Herman: Thank you, HARRY. Roni, how far ahead did you read?

Harry: Stop bickering; let's get this homework done.

Class: *(Exiting the classroom.)* Wind is moving air—energy is there.

Scene Two: The Next Day in Windseekers Class

Professor: It's time to share your ideas. Where should we build the wind turbine?

(Roni waves her hand wildly.)

Professor: Breezus?

Breezus: In the middle of the Frightening Forest, so we don't have to see it. The giant tower and spinning blades will blend right in with the hideous trees and won't ruin our view.

Cloudia: But I think the wind turbine will look cool. I don't want to go into the Frightening Forest to see it.

Professor: Although some people don't like the look of turbines, that shouldn't be our first consideration.

Roni: And the trees in the forest would block the wind, so it would defeat the purpose.

Herman: *(Sighs loudly).* So I guess that means my idea of putting the turbine inside of the science building wouldn't work either?

Professor: That's right, Herman. Any other suggested sites? Remember what wind is?

Class: Wind is moving air—energy is there.

Cloudia: How about near Zagrid's house, or even on his roof?

Harry: But won't the noise keep him and his menagerie up at night?

Professor: Actually, the sound from a wind turbine isn't as loud as you might think, given how big it is and how much energy it makes. The sound it makes is a rhythmical whooshing, sort of like the sound of a dragon's wings flapping—whoosh, whoosh, whoosh. Who can see why building it on the roof wouldn't work?

Breezus: Same reason as the woods, because the wind could be blocked. There can't be anything near it that would block the wind before it gets to the blades. His house is so tiny, even some of the trees are taller.

Roni: How about the roof of the school? It is the tallest building at Hogwatts, so nothing will block the wind's path.

Professor: Good suggestion, Roni; however, it won't work for two reasons.

Herman: Roni's wrong?

Professor: Hogwatts' roof is tall, but the vibrations from the turbine might damage the building AND does anything else use that airspace?

Cloudia: The Owlery is up there. Our owls could fly into the spinning blades!

Breezus: Good thing I don't have an owl.

Professor: Birds are a consideration in siting a wind turbine. We've learned that you need to study the birds in an area before building a wind turbine and avoid areas where there are significant risks of collisions.

Harry: This shouldn't be that hard. It's just wind—you can't even see it!

Class: Wind is moving air—energy is there.

Herman: Does this mean that if we find a perfect location, we'll only have power when there is a storm and it's really windy out?

Roni: No, Herman. Current technology allows a large wind turbine to run efficiently on winds as low as 13 miles per hour.

Cloudia: So we just need to find a location away from tall structures that might block the wind, with a wind speed of at least 13 miles per hour, and in a place that won't disturb wildlife.

Breezus: Maybe there's a windseeker spell to help figure this out!

Professor: Five points to Cloudia for summing up the discussion so nicely. For homework tonight, you can take anemometers out to check wind speed at various locations. Remember, the tower could be up to 100 meters high, so you will have to find a way to get to that height to accurately check the speed.

Scene Three: The Next Day in Windseekers Class

Professor: Good morning class.

Class: Wind is moving air—energy is there.

Professor: It seemed to be pretty windy last night. Did you have fun using the anemometers to measure the wind speed?

Breezus: It was great, until I fell off my broomstick trying to get a reading.

Class: *(Laughs.)*

Breezus: The edge of the cliff had sustained gusts up to 80 miles per hour. We'd get tons of energy from that!

Roni: Actually, that's too much wind. Those gusts would shut the turbine down. They need to protect themselves from incredibly strong winds, so when the wind gets too powerful they shut down. Also, did you notice what direction the wind was blowing?

Harry: The wind came right up the face of the cliff. I actually leaned out over the edge, holding my broom tight in case I fell, and the wind held me up! My cap blew off and flew up, up into the air.

Professor: This is actually another reason why the edge of a cliff will not work. Wind turbines are designed to capture air that is moving parallel to the ground. They cannot capture wind that is moving upwards.

Cloudia: The field where the gardens are planted got between 15 and 25 mile per hour winds the whole time we were there.

Herman: But would we have to move all those plants? Some of them take years to bloom.

Professor: Many wind farms use the land under the towers for farming or grazing. We could continue to use the area around the turbine for plants. There is plenty of room for both.

Harry: I know from flying that the wind changes depending on the weather and the season.

Professor: Ten points to Cloudia for finding a good spot and a point to Harry for noticing that the wind isn't always constant. We only took measurements for one night, which really isn't sufficient for determining a good site, but since it was windy, it will give us a good idea of where to look.

Roni: Wind measurements should really be taken at a site for at least one full year to get an idea of what the wind is like at all times. Many people who are considering where to put a turbine will measure the wind speeds for three years or more!

Breezus: If wind isn't reliable, why use it?

Professor: A point for Roni. As she said, you really need long term data to determine if a site is a good one for a wind turbine. A team of our professors has just finished reviewing many years of Hogwatt's weather records and has determined that winds in the garden area are very reliable. The average wind speed is calculated to be 15 miles per hour. The wind doesn't blow over the garden all of the time, but it is predicted that the turbine will be generating some power for the school 80 percent of the time. What other benefits does this location have?

Cloudia: It isn't near the Owlery.

Breezus: There are no tall buildings or trees near it.

Herman: We probably won't even hear the sound from the turbines when we're inside mixing potions.

Roni: By using wind power, we are using a renewable energy source. We'll never run out of wind energy, and we're taking care of the environment.

Professor: I'm proud of all of you for putting the facts together and deciding on the same site the experts did. We know we will need reliable energy to meet the electrical needs of our growing population of students. For our next assignment...

(Lights go out.)

Harry: I guess Professor Dieseldore was right. We need to use wind energy at Hogwatts.

Class: Wind is moving air—energy is there, and that's why we should care!

Short Circuits

U.S. Energy Use in 2030

The U.S. Department of Energy's Energy Information Administration (EIA) recently released its Annual Energy Outlook 2007. To develop energy production and consumption predictions, EIA looks at many factors, such as energy prices, U.S. economic growth, advances in technologies, changes in weather patterns, future public policy decisions, the influence of developing countries on world-wide energy requirements, and emissions of air pollutants and greenhouse gases.

In the next 25 years, the U.S. will increase its electric consumption 1.5 percent each year. This is a marked decrease over the electric consumption trends in the past. In the 1970s, electric consumption increased 4.2 percent each year, 2.6 percent each year in the 1980s, and 2.3 percent each year in the 1990s.

Nuclear energy will increase its electric capacity by building new power plants, providing 15 percent of total electric demand in 2030 compared to eight percent today. Natural gas will not be used as much as it is now for electric generation. Coal will continue to play a major role in U.S. electricity generation, meeting up to 57 percent of demand in 2030. Renewable energy electric production will increase slowly.

In the transportation sector, rising fuel prices are expected to increase domestic fuel production. Ethanol use will grow from four billion gallons in 2005 to 14.6 billion gallons in 2030; most of the ethanol will be made from corn and blended with gasoline.

To meet our total energy needs, not just electric demand, the U.S. will need to import 32 percent of total consumption in 2030, up from 30 percent in 2005.

For more information, visit www.eia.doe.gov/oiaf/aeo/index.html.

BP to Build Five U.S. Wind Projects

BP Alternative Energy North America Inc. recently announced plans to build five wind farms in 2007. California, Colorado, North Dakota and Texas will host these new wind projects. Construction has already started on the Colorado project, which will have 274 wind turbines producing enough electricity to power 12,000 homes.

For more information, visit www.bp.com.

