A publication of the National Energy Education Development Project March 2008

2008 Youth Awards

The 28th Annual NEED Youth Awards Program for Energy Achievement is scheduled for **June 20-23, 2008** at the Hyatt Regency Crystal City in Arlington, Virginia. The National Recognition Ceremony will take place on Monday, June 23rd 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, DC.

To participate in the Youth Awards Program, follow the guidelines in NEED's ***Energy Projects and Activities*** available at www.need.org/youthawards.php. Remember that **April 15, 2008**, is the deadline for submission of entries to state committees. If you are unsure where to send your scrapbook, contact NEED at info@need.org or by calling 800-875-5029.

We look forward to seeing you there!

Youth Leadership Awards

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 download an application, visit www.need.org/needpdf/NEEDLeadershipAward2008.pdf or contact Rebecca Lamb at rlamb@need.org.

One of last year's winners, Jake Kesner, said the following about the scholarship program, "I needed NEED. Their generous scholarship provided me with the last bit of money necessary to pursue my university studies. Without their financial support, I would be missing an important piece of my education. NEED's scholarship program is awesome! If you are eligible, I highly recommend that you apply."

2008 Summer Energy Conferences

Galveston, Texas July 13-17, 2008
Las Vegas, Nevada July 20-24, 2008

NEED's popular five-day energy education conferences are coming soon! The registration fee is $1,100 and includes double occupancy lodging, most meals, and classroom materials.

Registration forms and information are available by emailing info@need.org or on the NEED website at www.need.org/summertraining.php. Register today!

TXU Sponsors NEED Programs

On February 26, 2008, TXU Energy (Dallas, Texas) announced it will sponsor the National Energy Education Development (NEED) Project's nationally recognized solar energy education program. The TXU Energy Solar Academy℠ program helps local schools bring the latest solar technology and energy lessons into the classroom. TXU Energy and NEED will select several Texas school districts for the program that will reach more than 36,000 students with science, geography and math activities focusing on renewable energy. Approximately 40 school districts will receive free 1-kW solar arrays that will be Web-based and show real-time data on how much electricity is being generated.

"As TXU Energy continues to push for innovative energy solutions, we are proud to sponsor the NEED Project to help educate our children on the benefits of renewable energy," Jim Burke, CEO of TXU Energy said. "This program reinforces our commitment to renewable energy and education in a way that benefits schools, students and the community by teaching how advanced electricity-generation technologies work." The TXU Energy Solar Academy program will offer solar-powered class project materials and energy-based lesson plans. Approximately 400 teachers across Texas will participate in NEED workshops where they will receive interactive teaching tools and grade-specific lessons from kindergarten through high school.

NEED is grateful for TXU Energy's support and for the support of partner The Foundation for Environmental Education.

PG&E Solar Schools Program

Now entering its 5th program year, the Pacific Gas & Electric Company (PG&E) Solar Schools Program has more than 20 workshops scheduled this spring, and will provide $200,000 in Bright Ideas Grants to schools in the PG&E service area in northern and central California.

To register for a spring workshop, apply for a solar installation or apply for a grant of $2,500 or $5,000, visit www.need.org/pgesolarschools.

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The NEED Project

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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 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.

Calendar of Events

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

March 2008

1	PG&E Solar Schools Workshop – San Luis Obispo, CA
1	PG&E Solar Schools Workshop – Livermore-Pleasanton, CA
4	PG&E Solar Schools Workshop – San Jose, CA
5	PG&E Solar Schools Workshop – Mountain View, CA
6	NEED Sessions at Energy Conference – Henderson, KY
6	Energy Efficiency and Renewable Energy for Schools Conference – Lansing, MI
7	NEED 4H Workshop – Eastern Kentucky
7	BP A+ for Energy Grant Applications Due
7-9	Sacramento Municipal Utility District Solar Workshop – Sacramento, CA
8	PG&E Solar Schools Workshop – Bakersfield, CA
8	PG&E Solar Schools Workshop – Watsonville, CA
9	Cape Light Compact Conference – Hyannis, MA
11	PG&E Solar Schools Workshop – San Rafael, CA
11	NEED Workshop – Borger, TX
12	PG&E Solar Schools Workshop – Mendocino, CA
12	PG&E Solar Schools Workshop – Paradise-Chico, CA
15	PG&E Solar Schools Workshop – San Lorenzo, CA
17-19	Kentucky High Performance/Sustainable Schools Conference – KY
17-21	NEED Week
18	PG&E March Science Madness Workshop – Sacramento, CA
18-20	Renewable Energy Workforce Education Conference – Troy, NY
20	PG&E Solar Schools Workshop – San Francisco, CA
21	NEED Day
26-30	NEED sessions at NSTA National Conference – Boston, MA

April 2008

1	NEED Workshop – Houston, TX
5	PG&E Solar Schools Workshop – Redding, CA
5	PG&E Solar Schools Workshop – Sonora, CA
5	PG&E Solar Schools Workshop – Fresno, CA
5-8	NEED Courses at SchoolDude University – Myrtle Beach, SC
7-9	California Green Schools Summit – CA
9	Cape Light Compact Teacher Conference – Hyannis, MA
12	PG&E Solar Schools Workshop – San Francisco, CA
13-16	NEED Hydropower Workshop at the National Hydropower Conference – Washington, DC
13-19	National Environmental Education Week – www.eeweek.org
15	Youth Awards for Energy Achievement Report Deadline
22	NEED Workshop – Fort Wayne, IN
24	NEED Workshop – Shelbyville, IN
26	West Virginia Energy Workshop – Bridgeport, WV

May 2008

3	PG&E Solar Schools Workshop – Eureka, CA
3-8	NEED Sessions at Solar 2008, the American Solar Energy Society Conference – San Diego, CA
6	Kentucky NEED Youth Awards for Energy Achievement – KY
9	Offshore Technology Conference NEED Teacher Workshop – Houston, TX

June 2008

1	NEED Wind Workshop at Windpower 2008 Conference sponsored by the American Wind Energy Association – Houston, TX
9-13	Kentucky Energy Tour – KY
20-23	NEED Youth Awards for Energy Achievement – Washington, DC

July 2008

13-17	NEED National Energy Conference for Educators – Galveston, TX
20-24	NEED National Energy Conference for Educators – Las Vegas, NV
9-11	West Virginia/Virginia Teacher Conference – sponsored by AEP
TBA	Texas/Louisiana/Oklahoma/Arkansas Teacher Conference – sponsored by AEP

For details on Kentucky programs, contact Karen Reagor at kreagor@need.org.

NEED News

National Environmental Education Week

National Environmental Education Week promotes understanding and protection of the natural world and seeks to enhance the educational impact of Earth Day (April 22nd). This year, EE Week is April 13-19, 2008. EE Week Educators have access to free resources, including standards-based environmental education activities and electronic newsletters that highlight curricula, professional development and funding opportunities. Visit www.eeweek.org for more information.

NSTA National Conference in Boston

NEED will host an exhibit and facilitate a series of workshops at the NSTA National Conference in Boston. In addition, the traditional NEED teacher dinner will be hosted for teachers who actively use NEED in order to provide them an opportunity to network and share experiences. If you are planning to attend the National Conference in Boston, email Mary Spruill at mspruill@need.org to receive more information about the gathering as the event gets closer.

Energy Video Contest

Westinghouse Electric Company is sponsoring a video contest about energy open to the following states: CT, DC, IL, MD, MN, NH, PA, SC, TN, UT, and WA. Middle and high school students are encouraged to enter a creative, yet informative, three-seven minute video on the positive aspects of various forms of energy, including nuclear energy. The school that produces the winning video will receive $3,000 and each student of the team will receive $100 to spend on school supplies. Deadline for entry is May 9, 2008. For more information, visit www.westinghousenuclear.com/Community/student_video_contest.shtm.

New NEED Staffer—Samantha Forbes

NEED is pleased to welcome Samantha Forbes to the NEED Headquarters Staff. Samantha is a Program Associate providing program management support throughout the NEED network. Samantha began her NEED work as a NEED student, from 6th grade in 1995 through her junior year in college in 2005. While a NEED student, she attended, became a counselor, then a student director for two years at the camp Kids for Energy and Environmental Protection (K.E.E.P.) through the award-winning Illinois Energy Education Development (ILEED) program.

You may recognize Samantha from NEED's Illinois workshops or from the National Youth Awards Program. She graduated from the University of Illinois with a degree in Natural Resource and Environmental Science in August 2006 and spent a year being a full time volunteer in Terre Haute, Indiana, where she taught environmental education and was a full time preschool teacher's aide at a Catholic Grade School. She recently moved to the Washington, DC area and is jumping into her NEED work with great energy. In her spare time, Samantha enjoys hiking, backpacking, photography and being a godmother.

New School Energy Survey

NEED recently completed a review of its Energy Management Program – ***Learning and Conserving***, ***Monitoring and Mentoring***, ***Building Buddies***, and ***Saving Energy at Home and School***. We listened to teacher feedback and, for the energy managers and teachers who want to take their school energy management efforts to the next level, NEED has recently developed the ***School Energy Survey*** – designed to teach students about the science of the school building and to help them complete a comprehensive survey of school energy use. The new teacher and student guides are available for download at www.need.org/whatsnew.php.

Hydropower – is flowing right along!

With the support of the Hydropower Research Foundation and the National Hydropower Association, NEED's hydropower team is busy completing backgrounders and hands-on activities for students at all levels as part of this new partnership. Special thanks to the Hydropower Team of Doug Keaton (Kentucky), Don Pruett (Washington) and Hallie Mills (Washington) for their work and collaboration with the subject matter experts as well. The launch of the new kits and curriculum guides is April 16 in Washington, DC at the National Hydropower Conference. A one-day workshop on the science of energy and hydropower is planned for teachers from the local area. Substitute reimbursement, breakfast, lunch, parking, and curriculum materials are provided to participating teachers. Registration will be open soon. For more information, email info@need.org.

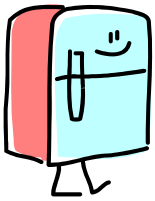
Indiana

With the support of Duke Energy Indiana, the Indiana Office of Energy and Defense Development, and AEP Foundation teacher workshops are scheduled across the state. The program includes a substantial focus on demand-side management and energy efficiency. Participating teachers are eligible to receive class-sets of NEED's ***Indiana Saving Energy Kits*** and home kits designed to help families reduce energy usage at home. To register for the workshops or for more information about the program visit www.need.org/whatsnew.php.

NEED News

Recycle My Old Fridge Campaign is a Great Opportunity for NEED Students to Share Energy Efficiency Knowledge

The ENERGY STAR® Recycle My Old Fridge Campaign provides an opportunity for students to share what they know about energy efficiency with their families and community, encouraging them to make a difference by recycling an old refrigerator or freezer and replacing it, if necessary, with an ENERGY STAR® qualified appliance.



NEED is partnering with the U.S. Department of Energy and ENERGY STAR® providing a teacher guide for the campaign. The teacher guide provides various campaign activity ideas to be used to strengthen students' knowledge about energy, energy efficiency and recycling, and to help students spread the word about the campaign. Some of the activities include: How Does Your Old Fridge Measure Up?; EnergyGuide Labels; Fun Facts for Old and New Refrigerators; Video Challenge; Art Exhibition; Be a Home Detective; and activity suggestions for spreading the word in your community. The teacher guide is available to download by visiting the campaign website: www.RecycleMyOldFridge.com.

The campaign's primary timeframe is April 28, 2008 to July 28, 2008, but you can start working on activities now. One exciting aspect of the campaign is a national video challenge. If your science club or technology students are looking for a fun project, check out the challenge at www.RecycleMyOldFridge.com and click on "Video Challenge."

NEED Summer Training Impacts Teachers and Students

Beverly Hensley, a teacher at Lay Elementary in Kentucky, shared these thoughts about her experience with NEED summer conferences.

"Attending last year's training opened up a whole new world of energy for me. The workshops were intense and fast moving. By the end of the training we were determined to put our new found knowledge to good use in our classrooms. Upon returning home, I pulled out my Kentucky Core Content for Assessment and immediately began planning my energy unit for this year. I had so many new ideas and materials, it was overwhelming. One of the best things I discovered at the conference was NEED's *EnergyWorks Kit*.

"The activities in the *Energy Works Kit* seemed custom made to fit the fourth grade Kentucky Core Content. Up until this point, I had been picking and choosing the best from several sources, to develop my science units. The materials in this kit were so user friendly, I was able to give the heat module to my student teacher to use with my class. Due to the quality of the materials, it was not surprising that she did a wonderful job with it.

Lay Elementary students lead a workshop using NEED materials.

"During this school year I had the privilege of working with a student training team. The sixth grade science teacher and I collaborated to use the Science of Energy Kit to train a team of 14 students. These students in turn, worked at two different student workshops to train other students on how to use the NEED materials. I had wanted to try the ***Kids Teaching Kids*** concept on a larger scale than my classroom for some time, but did not feel adequately trained until after attending the summer conference. That group of students developed a deep understanding of the content as well as feeling great pride in a job well done. They were featured in an article in the local newspaper as well as on the district website.

"Another idea I picked up and ran with was the Change a Light pledge. The new materials that were introduced to me at the summer conference were more kid friendly than the previous materials I had. I was able to do many of the activities we did at the conference with my class. The children were very enthusiastic about sharing their new found conservation knowledge with their parents. At parent conference night, I heard many comments from parents about how energy conscience their children had become. Science is the one area that changes quickly. Your summer conference provides valuable training that I would not be able to receive any other way."

You can register to attend a 2008 conference at www.need.org/summertraining.php.

ConocoPhillips Workshops Continue

In January, NEED launched a 24 city teacher training program with ConocoPhillips. The workshops are underway and dates and locations will be finalized soon. For more information or to register visit www.need.org/conocophillips/. The Houston, Texas workshop filled within hours and another is scheduled for October 2.

Offshore Technology Conference – Teacher Workshop

Coming in May, NEED and the Offshore Technology Conference will again host a one-day teacher workshop designed to train teachers to implement energy education programming in their classrooms and to learn more about the offshore oil and natural gas industry. For more information on this Houston workshop, email info@need.org.

Primary/Elementary Activity: Energy in Food

Background

Food energy is the amount of energy in food that is available for the body to use through digestion. The values for food energy are measured in Calories. One food Calorie is the amount of food energy (heat) that will raise the temperature of one kilogram of water on degree Celsius. The average 4-8 year old child needs 1200-1800 Calories per day and the average 9-12 year old needs 1600-2200 Calories per day, depending on the child's weight and activity level.

Purpose

To explore the amount of energy in different kinds of food.

Procedure

For each group, rank the foods by the amount of energy you think they contain (1-least, 4-most).

_____ Cheeseburger	_____ Milk	_____ Banana
_____ Plain Hot Dog on Bun	_____ Soda	_____ Large Carrot
_____ 6 Chicken Nuggets	_____ Orange Juice	_____ Cup of Broccoli
_____ Small Taco	_____ Water	_____ Slice of Cheese

_____ Slice of Pepperoni Pizza	_____ Bowl of Cheerios & Milk	_____ 2 Peanut Butter Cups
_____ Nachos with Cheese	_____ Granola Bar	_____ Cup of Ice Cream
_____ PBJ Sandwich	_____ Bagel & Butter	_____ Bag of Potato Chips
_____ Medium French Fries	_____ Sausage Egg & Biscuit	_____ Cup of Sunflower Seeds

Conclusions

Answer the following questions in your science journal:

1. Into what forms of energy does your body convert food energy?

2. What happens if your body takes in more food energy than it needs?

3. What happens if your body does not get the food energy it needs?

4. What other things besides energy content do you need to consider when choosing food to eat?

Extensions

- Examine the packages of several foods to determine the amount of food energy they contain.
- Make a list of the plants that can be used for food and for other types of fuel.

Cheeseburger 360 Milk 135 Banana 105 Pepperoni Pizza 180 Cheerios & Milk 250 2 Peanut Butter Cups 230
Plain Hot Dog Bun 240 Soda 155 Large Carrot 25 Nachos with Cheese 350 Granola Bar 530 Cup of Ice Cream 290
6 Chicken Nuggets 350 Orange Juice 130 Cup of Broccoli 30 PBJ Sandwich 430 Bagel & Butter 280 Bag of Potato Chips 490
Small Taco 370 Water 0 Slice of Cheese 90 Medium French Fries 460 Sausage/Egg Biscuit 580 Sunflower Seeds 260

Intermediate/Secondary Activity: Chemical Models

Goals
- To construct models of the hydrocarbon gases that compose raw natural gas.
- To balance chemical equations of the combustion of hydrocarbon gases.

Concepts
- The gases that compose natural gas are hydrocarbons.
- When burned, hydrocarbons produce carbon dioxide and water.

Time
45 minutes

Materials
- Copies of student worksheets
- Science journals
- Molecular model set or three colors of clay and toothpicks for each group

Preparation
- Gather the needed materials.
- Divide the students into groups of two to three.
- Review with students the process for balancing chemical equations.

Procedure
1. Explain to the students that raw natural gas is typically a mixture of gases. These gases are hydrocarbons consisting of carbon and hydrogen atoms.
2. The gases found in raw natural gas are alkanes; the prefix of the alkane indicates the number of carbon atoms present. Review the background information with the students.
3. Distribute the worksheet and have students look at the list of alkane prefixes. Ask the students if they have any questions and give them time to complete the Molecular Formulas section of the worksheet.
4. Review the molecular formulas with the students. Allow students time to complete the Molecular Models and Balancing Equations sections of the worksheet.
5. Review the equations with the students. Allow students time to complete the Hydrocarbon Combustion section. Make the connection between the balanced equations and the combustion models.
6. Review and discuss in terms of the concepts listed above.

Extensions
- Have students explain what impact burning hydrocarbons has on the environment. Emphasize that carbon dioxide is the major greenhouse gas associated with global climate change.
- Have students determine the molecular formulas for gasoline and diesel. Discuss the environmental impact of using these fuels and possible alternatives to hydrocarbon fuels (biodiesel, ethanol).

Answer Keys
Molecular Formulas: Methane: CH_4 Ethane: C_2H_6 Propane: C_3H_8 Butane: C_4H_{10}

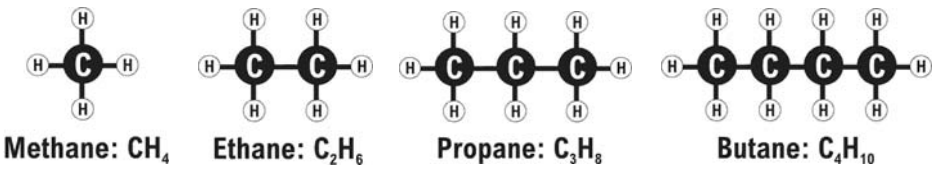
Balancing Equations & Models:

$1\ CH_4 + 2\ O_2 \longrightarrow 1\ CO_2 + 2\ H_2O$

$2\ C_2H_6 + 7\ O_2 \longrightarrow 4\ CO_2 + 6\ H_2O$

$1\ C_3H_8 + 5\ O_2 \longrightarrow 3\ CO_2 + 4\ H_2O$

$2\ C_4H_{10} + 13\ O_2 \longrightarrow 8\ CO_2 + 10\ H_2O$



HYDROCARBONS

Background

Hydrocarbons are molecules composed only of carbon and hydrogen atoms. Carbon atoms have four electrons available to bond. When one carbon atom bonds with hydrogen, it needs four hydrogen atoms. This hydrocarbon is known as methane.

When a hydrocarbon molecule has as many hydrogen atoms bonded as possible, it is considered saturated and is part of the alkane group. Alkanes are named for the number of carbon atoms present. The alkanes form a straight chain of carbon atoms with hydrogen atoms bonding with the remaining open electrons.

The generic formula for alkanes is C_nH_{2n+2}. This formula can be used to determine the molecular formula for the gases that typically compose raw natural gas.

Alkane Series Prefixes

meth- one carbon atom
eth- two carbon atoms
prop- three carbon atoms
but- four carbon atoms

In your science journal, write the answers to the following problems:

Molecular Formulas

Use the generic formula for alkanes to determine the molecular formula for the following gases: methane, ethane, propane, and butane.

Molecular Models

Use the model sets or colored clay to make three-dimensional models of the four alkanes. Use one color to represent hydrogen and another for carbon. Use the third color to make several oxygen molecules, which consist of two oxygen atoms bonded together (O_2). Draw a picture of each model (methane, ethane, propane, butane, oxygen) in your science journal.

Balancing Equations

When a hydrocarbon burns, it combines with oxygen to form carbon dioxide and water. Write and balance each chemical reaction equation for methane, ethane, propane and butane.

$$\text{alkane} + O_2 \xrightarrow{\text{heat}} CO_2 + H_2O$$

Hydrocarbon Combustion

Using the chemical models of methane and oxygen, determine the products of methane combustion. Draw models of the molecules formed in the reaction. Repeat this procedure for ethane, propane, and butane.

Short Circuits

Butanol: Biofuel of the Future

By now, most people know that ethanol is an organic fuel alternative to gasoline. New on the biofuels scene is **butanol** (butyl alcohol). Butanol is similar chemically to ethanol and is made using comparable fermentation methods. It has the potential to become a major player in the biofuels industry.

Butanol has some advantages over ethanol. Butanol has a higher energy content than ethanol—closer to that of gasoline. Butanol is not as corrosive as ethanol and can most likely be transported using the existing pipeline infrastructure. Additionally, butanol is less volatile than ethanol, so it can be mixed with gasoline at higher ratios than ethanol.

Butanol can be made from the same feedstocks as ethanol—corn, wheat and sugarcane. However, making butanol is currently not as efficient as making ethanol, due primarily to the fact that butanol is more toxic to the microbes that ferment the sugars into alcohol. BP and DuPont are working together to improve the yield of feedstocks for butanol. How? By genetically engineering microbes that can stand up to the toxicity of butanol. Tougher microbes mean that more butanol can be produced from the same amount of the feedstock.

For more information, go to www.bp.com and search for butanol. Summarized from Popular Science, February 2008.

Green Cities

Popular Science magazine recently released its top picks for green cities in America. Looking at electricity use, transportation habits, green living and recycling, PopSci ranked cities with more than 100,000 residents. Where does your city rank? Go to www.popsci.com/environment/article/2008-02/americas-50-greenest-cities.

How would you rank the following cities? Ann Arbor, MI; Boston, MA; Chicago, IL; Fort Worth, TX; Honolulu, HI; Lexington, KY; Portland, OR; San Francisco, CA; Seattle, WA.

1. Portland, OR; 2. San Francisco, CA; 3. Boston, MA; 8. Seattle, WA; 9. Chicago, IL; 14. Honolulu, HI; 15. Fort Worth, TX; 24. Ann Arbor, MI; 25. Lexington, KY

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Putting Energy into Education