Energy EXCHANGE

A Publication of the National Energy Education Development Project September 2005

Youth Awards 2005

During the 2005 Youth Awards Program for Energy Achievement, teachers and students from around the country celebrated NEED's 25th Anniversary while learning new NEED activities, touring the capital, dancing to DJs, cruising on the Potomac River, learning about energy careers, and sharing the successes of their energy projects. Congratulations to all of our winners!

Distinguished Service Awards
Elizabeth Dudley-Aramco Services Company
Marietta Devine-Mississippi Energy Division
Linda Hutton-North Carolina

Students of the Year
Christina Edwards-New Mexico
Jennifer Robinson-Rhode Island
Caterina Spaziano-Rhode Island

State of the Year
Tennessee

Region of the Year
Escambia County School District-Florida

District of the Year
Westerville City Schools-Ohio
Project Adviser-Chris Doolittle

Primary School of the Year
Huntingdon Primary School-Tennessee
Project Adviser-Connie Bond

Elementary School of the Year
Cherrington Elementary School-Ohio
Project Adviser-Katie Winters

Junior School of the Year
Meece Middle School-Kentucky
Project Adviser-Cindy Ham

Senior School of the Year
Noxubee High School-Mississippi
Project Adviser-Lucille Hatcher

Special Category
Walters State Community College
Project Adviser-Dr. Harold Hayes

To see a slide show of the weekend's activities, or for more information about these national award winning projects, visit www.NEED.org.

Energy Ant and the Eastham Energizers explore the WWII Memorial during Youth Awards in Washington, DC.

Renew Your NEED Membership Today

It's time to renew your NEED membership. Materials have been updated for 2005-2006, and new activities are available. With your membership, you'll receive both the *Energy Exchange* and our new *Career Currents* newsletters. To receive your 2005-2006 NEED Membership Packet, email info@need.org, call 800-875-5029, or visit www.need.org and download the 2005-2006 NEED Resource Catalog.

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 on our website and in our Annual Report.

Energy Exchange is published five times a year by the National Energy Education Development Project for educators and students, and is available on NEED's website.

Educators may reproduce articles and activities for classroom use.

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

New at NEED in 2005-2006

Welcome back to school! As a result of the hard work of NEED's Teacher Advisory Board and partners, there are many new things in the NEED materials this year. New topics have been added, new activities have been created, and completely new units are available from NEED, thanks to the support of our great sponsors and partners. To renew your membership, contact NEED at info@need.org or call 1-800-875-5029 to verify your membership status and update your address.

H_2 Educate (Grades 6-12)
This hands-on unit teaches students about hydrogen as an energy carrier. Background information is provided on hydrogen, atomic structure, the periodic table, electrolysis, fuel cell technology, and the hydrogen economy. Student activities include mastering information through graphic organizers, role playing in a hydrogen jigsaw, creating element models, participating in a PEM fuel cell simulation, electrolyzing water, and reviewing information in a game. The hands-on kit, which includes a teacher guide and class set of student guides, focuses on electrolysis and includes a fuel cell powered car.

Energy on Public Lands (Grades 5-8)
Students learn and teach others about how energy resources on public lands are managed through background information and hands-on activities.

Energy Games and Icebreakers (Grades K-12)
This year, three critical thinking activities have been added to Energy Games and Icebreakers. Look for Energy Source Detective, Energy Source Puzzle, and Energy in the Round.

Energy Projects and Activities (Grades K-12)
Changes have been made to the 2005-2006 Youth Awards categories and requirements. Be sure to review the changes before you begin your energy projects and scrapbooks for this year.

A New Face at NEED

NEED is pleased to announce the addition of Jamie Botjer in our Northern Virginia headquarters. Jamie's responsibilities center on managing the financial accounts. In her own words, she "truly enjoys doing accounting," and has spent the past ten years doing bookkeeping and accounting.

Originally from Bogotá, Colombia, Jamie lived much of her pre-college life abroad in countries such as Kenya, Switzerland, and Saudi Arabia. Now settled in Virginia, Jamie enjoys traveling, visiting with family, and fitness. Welcome, Jamie!

CALENDAR OF EVENTS

For more information, email info@need.org or call 1-800-875-5029.

September

8	NEED Presentation at the International Energy Policy Conference – Denver, CO
8-11	Kentucky Association for Environmental Education Conference – Prestonburg, KY
11-13	NEED Participation at the National Association of State Energy Officials – New York, NY
14	Energy Industry Study Program – Washington, DC
15-16	NEED Presentations at the Biodiesel Symposium – Boise, ID
16	NEED Workshop at the Alternative Energy Festival – Boise, ID
17	International Coastal Cleanup Day (www.coastalcleanup.org)
20	NEED Presentation at the Kansas Renewable Energy and Energy Efficiency Conference – Topeka, KS
21	Energy Industry Study Program – Washington, DC
24	NEED Workshop at the California Industrial and Technology Education Conference – Petaluma, CA
28	Energy Industry Study Program – Washington, DC
30	NEED/Mississippi Energy Office Workshop

October – Energy Awareness Month

1-2	BP's A+ for Energy Training – Palm Springs, CA
3-6	Alaska Energy Conference – Anchorage, AK
5	New York Energy Smart Students Workshop – Syracuse, NY
5	Energy Industry Study Program – Washington, DC
6	PG&E Solar Schools Workshop - Santa Clara County, CA
6-8	NEED Presentations at the National Ocean Industries Association Conference – Colorado Springs, CO
9-11	Solar 2005 Interstate Renewable Energy Council Annual Meeting – Washington, DC
11	NEED Presentation at the Keeping Indiana Warm Conference – Indianapolis, IN
11	New York Energy Smart Students Workshop – Plattsburgh, NY
12	Energy Industry Study Program – Washington, DC
14-15	NEED Sessions at the Washington Science Teachers Association Conference – Wenatchee, WA
19	Energy Industry Study Program – Washington, DC
20	NEED/Michigan Oil and Gas Association Workshop – Mt. Pleasant, MI
20-22	NEED Workshops at the Regional NSTA Conference – Hartford, CT
22	NEED Workshops at the California Ag in the Classroom Conference – Sacramento, CA
25-29	North American Association for Environmental Education Conference – Albuquerque, NM
26	Energy Industry Study Program – Washington, DC
27	New York Energy Smart Students Workshop – Albany, NY
27-28	New York State Technology Education Association Conference – Oswego, NY
27-30	NEED Sessions at the California Science Teachers Association Conference – Palm Springs, CA
29	BP's A+ for Energy Session at the California Science Teachers Association Conference – Palm Springs, CA
TBA	PG&E Solar Schools Workshops – San Luis Obispo, Santa Clara, and Yolo County, CA

November

2	Connecticut Energy Workshop – Niantic, CT
2-4	NEED/NASULGC 4-H Energy Training – Golden, CO
3-5	Kentucky Science Teachers Association Conference – Lexington, KY
6-8	Science Teachers Association of New York State Conference – Ellenville, NY
7	Virginia Association of Independent Schools Conference – Richmond, VA
10	Deadline – PG&E Solar Schools Bright Ideas Grants Program
10-12	NEED Sessions at the NSTA Regional Conference – Chicago, IL
11	NEED H_2 Educate Hydrogen Workshop at the NSTA Regional Conference – Chicago, IL
15	America Recycles Day (www.americarecyclesday.org)

December

1-3	NEED Sessions at the NSTA Regional Conference – Nashville, TN

NEED News

PG&E Solar Schools

One hundred twelve educators attended the Pacific Gas and Electric Company's PG&E Solar Schools Conference in August. The California educators were provided four days of training on NEED curriculum and a deeper study of solar energy and the resources available to them as part of the PG&E Solar Schools program. With support from PG&E, schools in their service area can apply to receive photovoltaic installations or Bright Ideas Grants of $2,500 or $5,000 and may register to attend regional workshops scheduled for Santa Clara, Yolo County, San Luis Obispo and other locations this fall. For more information, visit www.need.org/pgesolarschools.

Congratulations to the following recipients of Solar Installations: Glenview Elementary School – Oakland; Walnut Grove Elementary School – Pleasanton; Barry School – Yuba City; Gold Oak Arts Charter School – Placerville; Winship Middle School – Eureka; Evergreen 6th Grade Academy – Paradise; Redwood Elementary School – Fort Bragg; Admiral Akers Elementary School – Lemoore; Roosevelt High School – Fresno.

Congratulations to the following recipients of Bright Ideas Grants: Mt. Diablo High School (Tom Azwell/Sandy Johnson-Shaw) – Concord; Plainfield Elementary (Ruth Barajas) – Woodland; Lake Don Pedro Elementary (Loree Ann Burroughs) – La Grange; Martin Luther King, Jr. School (David Chandler) – Seaside; Diamond View School (Lisa Scotti) – Susanville; Clovis West High School (Becky Avants) – Fresno; Jack L. Boyd Outdoor School (Peter Leinau) – Fish Camp; Pioneer Elementary School (Andrea Hardman) – Brentwood; San Joaquin County Juvenile Camp (Barry Scott) – French Camp; East Palo Alto Charter School (Catherine Umana) – East Palo Alto.

BP's A+ for Energy Program

NEED is pleased to partner with BP on the A+ for Energy Program. In July, BP awarded $2,000,000 in grants, classroom curriculum, and training opportunities to California teachers. With the support of BP, over 500 educators attended five day NEED conferences to learn more about energy and innovative ways to teach energy in the classroom. The 2006 A+ for Energy Program will launch in January. To view a list of A+ for Energy grant recipients and learn more about the program, visit www.aplusforenergy.com.

National Energy Conferences for Educators

With the leadership of a dedicated team of NEED facilitators, the 2005 summer conference series was a great success. Educators attending represented over 25 states and three U.S. territories. These conferences are a great way to increase energy knowledge, prepare for implementing energy education programs in the classroom or begin development of a regional NEED program. Over 250 educators attended the conferences in Alexandria, VA; New Orleans, LA; and Las Vegas, NV. Many thanks to the companies, organizations, and government agencies that sponsored teachers to attend and hosted the field trips to BP Solar, the International Petroleum Exposition, and Hoover Dam. Sponsorship of 2006 conference attendees is $1,000 and includes lodging, meals, and all materials. The summer 2006 schedule will be finalized by the end of September. Watch NEED's website and newsletter for information.

Las Vegas conference attendees experiencing a hard hat tour of Hoover Dam.

Passport to Energy Careers – A Huge Success!

The 25th Anniversary Youth Awards for Energy Achievement was a perfect location for NEED's first Passport to Energy Careers Fair. Participating companies and organizations provided sponsorship for NEED's Youth Leadership Award (a scholarship provided to extraordinary NEED students and those interested in careers in energy). Thanks to the following organizations for their participation: American Electric Power, Dominion Nuclear, American Public Power Association, U.S. Department of Energy, Texas Independent Petroleum and Royalty Owners Association, National Ocean Industries Association, Cape Light Compact, and the Energy Information Administration.

WWW.NEED.ORG

Many of NEED's materials are available on-line, including the Energy Infobooks, Energy Infobook Activities, Solar Curriculum, U.S. Energy Geography, the popular Energy and Greek Mythology Unit, and the NEED Songbook.

H_2 Educate Materials Available Soon!
We're making the final revisions to the H_2 Educate materials for NEED's new hydrogen education program sponsored by the U.S. Department of Energy. The materials will be available online at www.need.org/hydrogen by the end of September. NEED is in the process of planning its 2005-2006 H_2 Educate workshop series. If your agency or organization would like to host or co-sponsor one of the workshops, please contact Mary Spruill at mspruill@need.org.


Youth Awards participants explore NEED's H_2 Educate materials.

Connecticut
With support from Dominion, NEED is conducting a Connecticut Energy Workshop on November 2, 2005 in southeastern Connecticut. All Connecticut teachers are invited to attend this K-12 workshop. To register or request more information, please contact NEED at 800-875-5029.

Indiana
With support from the State of Indiana and the electric and gas utilities in the state, NEED workshops are planned for fall 2005 and winter 2006. To receive information about the workshops, please contact info@need.org.

Kentucky
The Kentucky NEED Project is currently scheduling fall teacher/student workshops. These one day workshops for students in grades 5-8 will be held across the state. If you would like information about a workshop in your area, please contact Karen Reagor at kreagor@need.org.

Tennessee
Congratulations to Tennessee and the Tennessee Energy Education Network! In June 2005, Tennessee was recognized as the NEED State Program of the Year. Congratulations to Chyrall Dawson, Anne Allen, Ramona Nelson, Ginny Hendricks, and the great teachers and students in the TEEN program for many years of great energy education programs.

Beverly Ramsey, science teacher at West Elementary in McMinnville, is the recipient of the 2004 Presidential Award for Excellence in Elementary Science for Tennessee. Beverly's winning lessons focus on energy and use resources available through TEEN. Congratulations Beverly!


Participants of NYSERDA's Energy Leadership Training Conference in Syracuse, NY touring a wind farm.

New York
The New York Energy Smart Students Program is off to a great start. The Energy Leadership Training Conference conducted in Syracuse in July trained over 50 educators to become NEED leaders in their classrooms and communities. New for the New York program this year is a series of mini-grants for energy outreach and hydrogen education. Visit www.need.org/newyork to register for workshops, apply for grants, and more! Thanks to NYSERDA for the sponsorship of these programs.

North Carolina
The North Carolina Department of Administration, State Energy Office continues to support NEED programs for North Carolina schools. As part of the North Carolina Schools Going Solar program, six schools were selected to receive solar panels. The panels will be installed in early fall, and training and classroom materials will be provided. Workshops are being planned across the state. If you'd like a workshop in your region, please contact Amy Constant at aconstant@need.org.

NEED Workshops
Now that school is back in session, NEED workshops are being scheduled throughout the NEED network. If you would like to schedule a workshop in your area, please contact NEED at 800-875-5029 or info@need.org to get on the schedule.

NEED Partners with the ENERGY STAR Leaders Program

Energy management is vital to schools in the United States. In addition to helping school districts save up to 30% on their energy bills each year, effective energy management prevents greenhouse gas emissions and improves learning environments. The U.S. Environmental Protection Agency (EPA), through its ENERGY STAR partnership program, provides schools with energy management guidelines, tools, resources, and technical support to help partner districts achieve their energy goals.

Currently, school districts across the country have rated the energy performance of more than 8,400 school buildings using EPA's 1-100 point Energy Performance Rating System, representing about 13% of the school market. More than 400 schools have earned the ENERGY STAR by achieving a rating of 75 or higher. ENERGY STAR rated buildings use about 40% less energy than average buildings.

The ENERGY STAR Challenge encourages commercial and institutional building owners to improve the efficiency of their buildings by 10% or more and to capitalize on the environmental benefits and cost savings that result. The Council of Education Facility Planners International (CEFPI), the Association of School Business Officials (ASBO) International, and the Council of the Great City Schools (CGCS) are part of this challenge, encouraging member school districts to:

1. Assess the amount of energy school districts use now;
2. Establish efficiency improvement goals of 10% or more district-wide; and
3. Make efficiency improvements wherever cost effective.

EPA recognizes individual school districts that achieve a 10, 20, or 30% improvement as ENERGY STAR Leaders.

For information about the ENERGY STAR Challenge or ENERGY STAR Leaders Program, visit www.energystar.gov, or call 888-STAR-YES.

Schools & Energy

- U.S. school districts spend $8 billion annually on energy.
- Energy costs represent a typical school district's second largest operating expense after salaries – more than the cost of computers and textbooks combined.
- In a typical school, one-third of the energy used goes to waste, due to old and poorly functioning equipment, poor insulation, and outdated technology like that found in many lighting systems.
- Schools that are well lit, well ventilated, and in good repair create a healthy, comfortable learning and teaching environment. A better physical environment is one factor that contributes to increased learning and productivity in the classroom, which in turn affects performance and achievement.
- Many schools can improve efficiency without new capital funds. By working with energy service companies, performance contracting schools can pay for improvements over time with the savings from their energy bills.
- ENERGY STAR can improve a district's energy efficiency and lower its energy bill 30% or more.

Summarized from www.energystar.gov.

Meet Two New York ENERGY STAR Leaders

South Colonie Central School District, Albany, NY
South Colonie Central School District's eight schools have a total K-12 enrollment of more than 5,700 students. The District has measured the energy efficiency of all of its school buildings and, through a strong energy management program, improved the overall efficiency by over 10%, with substantial savings in energy costs. With that success in hand, South Colonie plans to pursue more energy efficiency investments and educate staff, students, and the community about the financial and environmental benefits of energy efficiency.

Rochester City School District, Rochester, NY
Rochester City School District (RCSD) educates 34,000 students in more than 50 school buildings. RCSD's success in improving its energy efficiency by 10% reflects the superintendent and chief financial officer's understanding that energy efficiency and sound fiscal management go hand-in-hand. In partnership with the New York State Energy Research and Development Authority, RCSD assessed the efficiency of all its facilities and conducted a district-wide energy audit. This allowed RCSD to make smart investments in high-efficiency lighting, energy management and HVAC systems, add vending machine motion sensors, and make other cost-effective energy upgrades. RCSD estimates that these improvements are reducing its energy bill by more than $850,000 annually.

"Our energy conservation program and our commitment to renewable energy sources make good sense both environmentally and financially. We are proud to be recognized as an environmentally conscious school district, and proud of the enthusiastic response of our students and staff in making that possible."
Dr. Manuel J. Rivera, Superintendent, Rochester City School District

Primary/Elementary Activity: Exploring Solar Beads

Solar energy beads, also called ultraviolet light detecting beads, are not only fun to watch as they change colors, but they can be used to teach about ultraviolet light and possible harmful effects of solar radiation.

How Do Solar Energy Beads Work?

Solar beads have a chemical substance embedded in their plastic containing a pigment that changes color when exposed to ultraviolet (UV) radiation. The beads are not affected by visible light, such as the light from a light bulb, and remain white, or pale, indoors as long as they are kept away from windows or doors through which UV light can enter a room.

Ultraviolet radiation in sunlight reacts with the chemical in the beads to cause the change in color. Each bead will change color about 50,000 times before the pigment no longer responds to UV light.

What Is Ultraviolet Light?

Solar energy beads allow us to detect wavelengths of radiant energy called ultraviolet light. The energy in the ultraviolet region of the light spectrum is not visible to the naked eye.

Ultraviolet light is made of long and short waves. Long wave ultraviolet light (300 to 400 nanometers) is often called "black light." This is the light that makes objects appear to glow in the dark. Long wave UV light passes easily through plastic and glass.

Short wave ultraviolet light (100 to 300 nanometers) is used to kill bacteria, speed chemical reactions, and identify fluorescent minerals. Short wave UV light can't pass through most plastics or glass. The shortest UV wavelengths in the air are absorbed by oxygen molecules and convert the oxygen into ozone.

UV Radiation Can Damage Eyes And Skin

When bare skin is exposed to sunlight for a long time, it can burn or tan. UV radiation wavelengths are short enough to break chemical bonds in skin tissue. Over a long period of time, and with repeated exposure to UV radiation, skin cells can be damaged; skin may wrinkle or skin cancer may develop.

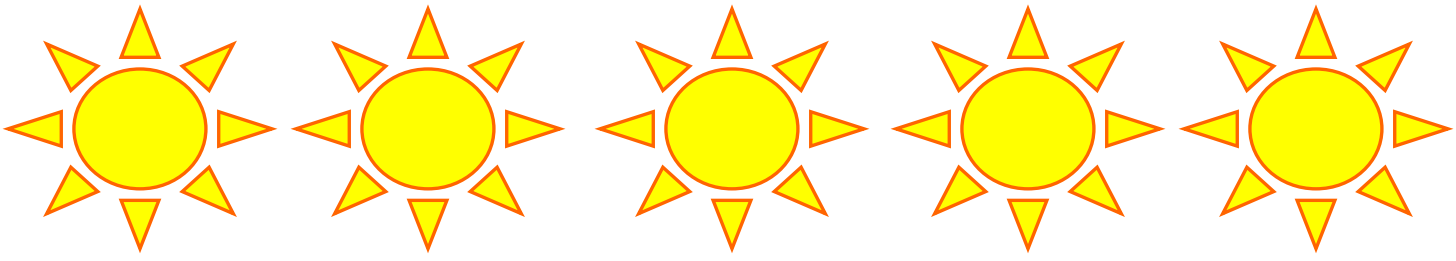
Sunglasses and sunscreens absorb UV photons, which protects your eyes and skin from solar radiation. You can test the protective quality of sunglasses and sunscreen with UV detecting solar energy beads.

- Test your sunglasses by placing them in sunlight and covering a few solar energy beads with the lenses (or shadow of the lenses). Place a few beads in direct sunlight next to the sunglasses for comparison. If the beads under the sunglasses remain white, then the sunglasses are blocking harmful ultraviolet rays.
- Test the effectiveness of sunscreen by coating a few beads in the palm of your hand. Hold a few uncoated beads in your other hand for comparison. Place your hands in direct sunlight. If the coated beads remain white, then your sunscreen is blocking harmful ultraviolet rays.

UUUUUUUUUUUUUAdditional Test Ideas

- Place beads near fluorescent lights or "black light."
- See if beads change color on a cloudy day.
- Observe beads exposed to sunlight at different times of day.
- Test a variety of glass and plastic containers to determine which materials block out UV light.

For more information, visit the Florida Solar Energy Center's website at www.fsec.ucf.edu. To order solar energy beads, visit www.teachersource.com.



Intermediate Activity: Energy in the Round - Solar

A QUICK LOOK AT ENERGY IN THE ROUND

Energy in the Round is a quick, fun game to reinforce information about energy sources, forms of energy, and general energy information from the Intermediate Energy Infobook.

GRADES: 5-8
PREPARATION: LOW
TIME: 20-30 MINUTES

GET READY

- Copy one set of the Energy in the Round cards onto card stock and cut into individual cards. Have a class set of the Intermediate Energy Infobooks available for quick reference.

GET SET

- Distribute one card to each student. If you have cards left over, give some students two cards so that all of the cards are distributed.
- Have the students look at their bolded words at the top of the cards; give them five minutes to review the information about their words using the infobooks.

GO

- Choose a student to begin and give the following instructions:
- *Read the question on your card: The student with the correct answer will stand up and read the bolded answer, "I have _____."*
- *That student will then read the question on his/her card, and the round will continue until the first student stands up and answers a question, signaling the end of the round.*
- If there is a disagreement about the correct answer, have the students listen to the question carefully (forms versus sources, for example) and discuss until a consensus is reached about the correct answer.
- More topics and cards can be found on the website at www.need.org.

I have energy. Who has two major gases that make up the sun?	**I have the speed of light.** Who has the form of energy that sunlight is converted to when it is absorbed by the Earth?	**I have a passive solar home.** Who has a home with solar collectors and other solar equipment to heat it?
I have hydrogen and helium. Who has the process in which hydrogen atoms combine to form helium and energy?	**I have thermal energy.** Who has the color that absorbs more sunlight than other colors?	**I have an active solar home.** Who has the energy produced by uneven heating of the earth's surface?
I have nuclear fusion. Who has the form of energy emitted into space during fusion?	**I have the color black.** Who has a system that captures solar energy and turns it into usable heat?	**I have wind.** Who has organic matter that has absorbed energy from the sun?
I have radiant energy. Who has the amount of time it takes the sun's energy to reach the earth?	**I have a solar collector.** Who has the process of using the sun's energy to heat buildings?	**I have biomass.** Who has the energy sources that can be replenished in a short time?
I have eight minutes. Who has 186,000 miles per second?	**I have solar space heating.** Who has a home that relies on orientation and construction materials to capture the sun's energy for heat?	**I have renewable.** Who has the source of energy that is stored in fossil fuels?

I have solar energy. Who has the process that traps the sun's energy in the atmosphere and makes life on Earth possible?	**I have concentrated solar**. Who has the word that means light?	**I have silicon**. Who has the system 1.5 million U.S. homes use to increase the thermal energy in their water?
I have the greenhouse effect. Who has the process plants use to convert radiant energy into chemical energy?	**I have photo**. Who has tiny bundles of light from the sun?	**I have solar water heater**. Who has the direction solar collectors should face in the U.S.?
I have photosynthesis. Who has evaporation, condensation, and precipitation driven by the sun?	**I have photons**. Who has the form of energy directly produced by solar cells?	**I have south**. Who has a major reason that capturing sunlight is difficult?
I have the water cycle. Who has an object that can be used to cook food on a sunny day?	**I have electrical energy**. Who has the technical word abbreviated as PV?	**I have solar is spread out**. Who has the renewable energy source that is NOT produced by the sun's energy?
I have a solar oven. Who has the system that uses mirrors to capture the sun's energy?	**I have photovoltaic**. Who has the common ingredient used to make a PV cell?	**I have geothermal**. Who has the ability to do work or make a change?

Secondary Article: Emerging Solar Technology

Power Plastic™ Converts Light to Energy - Anywhere

Konarka Technologies, Inc., in Lowell, Massachusetts, is developing the next-generation of photovoltaic technology that can be woven into plastics and textiles. Improving upon rigid, glass-panel solar cells, Konarka has developed light-activated power plastic™ that is flexible, lightweight, lower in cost, and more versatile in application than traditional silicon-based solar cells.

Just as a plant absorbs sunlight and turns it into chemical energy for growth, power plastic™ uses nanomaterials (1,000 times smaller than the diameter of a human hair) to absorb sunlight and convert it into electrical energy. This direct current (DC) electrical energy can be used to power electrical devices or charge batteries for later use.

Energy can be absorbed from both the sun and indoor light. Because this technology utilizes a wider range of the light spectrum then conventional solar cells, all visible light sources, not just sunlight, can be used to generate power.

Konarka's photovoltaic fibers and durable plastic bring power-generating capabilities to structures including tents, awnings, roofs, windows and window coverings. Consumer electronics such as cell phones, portable music players, laptops, and PDAs could use this technology to operate and recharge without using wall outlets.

The U.S. Army will use this technology to recharge electronic devices in the field by connecting them with sunlight-soaking plastic sheets printed in a camouflage pattern. This will replace the need for disposable batteries (which are heavy to carry to remote areas), and the need for diesel fuel to power noisy, polluting generators.

For more information, visit www.konarka.com.

Educators attending NEED's National Energy Conference in Las Vegas, Nevada learned about solar collectors after a field trip to Hoover Dam. This advanced parabolic trough pilot project, located near Boulder City, Nevada, is managed by the UNLV Center for Energy Research.

Short Circuits

Life without the Sun?

Eighty meters beneath the Black Sea, green-sulfur bacteria live without direct light. These bacteria have the most efficient photosynthesis known to exist, soaking up every stray photon that penetrates the water. But how do bacteria, growing deep on the ocean floor, survive without energy from sunlight? Some scientists suggest that photosynthesis does not depend solely on the sun.

Deep-sea hydrothermal vents contain many life forms, including tube worms and eyeless crabs that thrive near the 350ºC water. Because of the superheated water, the vents glow with infrared radiation. The glow is too weak to be detected by human eyes, but has a frequency in the visible spectrum. Researchers don't agree on what causes this deep-sea illumination, but they are studying how it sustains life.

Microbiologists and biochemists studying vents along the volcanically active Pacific Ridge have found a new organism that seems to live off a light source other than the sun. The bacterium, known as GSB1, requires light, sulfur and CO_2 to grow. Where does the light come from? Researchers suggest the vent glow is a chemical reaction in the vent seepage, or sonoluminescence, a flash produced by imploding bubbles.

Summarized from *Science*, Vol.308, June, 2005.

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Putting Energy into Education