

# ENERGY EXCHANGE

A publication of the National Energy Education Development Project

APR/MAY 2005

## New NEED Curriculum

*H<sub>2</sub> Educate*, NEED's new middle school hydrogen curriculum, was rolled out at a workshop in Albany on March 22nd, sponsored by NYSERDA, the New York State Energy Research and Development Authority. The curriculum is being field-tested by teachers across the country and will be available this summer. More New York workshops, as well as national hydrogen workshops are planned.

Funded through grants from the U.S. Department of Energy and NYSERDA, the Hydrogen Committee of NEED's Teacher Advisory Board has spent the last year developing an interdisciplinary unit that explores the science of hydrogen, fuel cell technology and the path to a hydrogen society with a hands-on kit and teacher and student guides.

The Hydrogen Committee includes Barbara Lazar and Robert Lazar from NM, Constance Beatty and Robert Thompson from IL, Kim Jenkins from KY, and Shelley Baumann from MI, along with NEED staff. Technical assistance is provided by Sentech.



*NY workshop participants producing hydrogen by electrolysis.*

*Energy on Public Lands*, a middle school unit that explores how energy resources on millions of acres of public lands are managed by the Bureau of Land Management (BLM), is in the final stage of development and will be presented in a series of workshops, with funding from BLM. This interdisciplinary unit teaches students how BLM balances economic, environmental, and societal factors on land belonging to U.S. citizens.

## Dates to Remember

### Youth Awards Projects

Due To State Coordinators  
April 15, 2005

Due To NEED Headquarters  
April 22, 2005

### Youth Awards Program

Washington, DC  
June 24-27, 2005

## National Energy Conferences

July 9-13 Washington, DC  
July 16-20 New Orleans, LA  
July 24-28 Las Vegas, NV

Register ASAP

Go to [www.need.org](http://www.need.org) for information and registration forms.

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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.*

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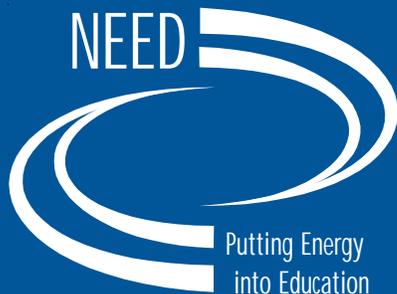
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# CALENDAR OF EVENTS

For more information, email [info@need.org](mailto:info@need.org) or call 1-800-875-5029

## April 2005

- 7-10 NEED Teacher Advisory Board Meeting-Chicago, IL
- 7-9 NYSUT Conference-Albany, NY
- 12-14 North Carolina Energy Workshops-NEED & KidWind-Asheville & Wilmington, NC (Locations TBA)
- 16 Science Council of New York City Conference-Manhattan, NY
- 23 Energy Smart Students Workshop for Pre-Service Teachers-Oswego, NY
- 27 H2 Educate, Middle School Teacher Workshop-Rochester, NY
- 28 Hydrogen 101, Public Leadership Workshop-Rochester, NY
- 29-30 Technology Students Association Competition-Oswego, NY

## May 2005

- 2 H<sub>2</sub> Educate Middle School Teacher Workshop-East Amherst, NY
- 10-11 KY High Performance Schools Workshop-Frankfort, KY
- 14 Energy Smart Students Workshop-Manhattan, NY
- 15 PG&E Solar Schools Conference Applications Due
- 15 PG&E Solar Schools Grant Applications Due
- 17 KY Youth Awards Luncheon-Frankfort, KY
- 19 Michigan NEED Workshop-Traverse City, MI
- 19 School Energy Efficiency Workshop with D&R International-Bakersfield, CA
- 20 PG&E Solar Schools Grant Review-San Francisco, CA

## June 2005

- 2 Florida NEED Workshop-Orlando, FL
- 9 NEED Session at the National Agriculture in the Classroom Conference-Indianapolis, IN
- 13-17 Kentucky Energy Conference for Educators
- 24-27 25<sup>th</sup> Annual NEED Youth Awards for Energy Achievement-Washington, DC
- 28-30 PG&E Energy Institute-Calistoga, CA

## July 2005

- TBD New York Key Leader Conference-Syracuse, NY
- 9-13 NEED Energy Conference for Educators-Washington, DC
- 16-20 NEED Energy Conference for Educators-New Orleans, LA
- 16-20 A+ for Energy/California NEED Energy Conference for Educators-San Diego, CA
- 23-27 A+ for Energy/California NEED Energy Conference for Educators-Palm Springs, CA
- 24-28 NEED Energy Conference for Educators-Las Vegas, NV
- 24-28 A+ for Energy/California NEED Energy Conference for Educators-Long Beach, CA
- 30-8/3 A+ for Energy/California NEED Energy Conference for Educators-San Francisco, CA
- 31-8/4 A+ for Energy/California NEED Energy Conference for Educators-Universal City, CA

## August 2005

- 4-8 A+ for Energy/California NEED Energy Conference for Educators-San Francisco, CA
- 6-8 NEED sessions at the International Symposium for Renewable Energy Education-Orlando, FL
- 14-17 NEED/PG&E Solar Schools Conference-Sacramento, CA



## NEED NEWS



### New Jersey

Congratulations to NEED Lead Teacher Joseph Caravella of TransOptions, Inc.! The Alliance of New Jersey Environmental Education (ANJEE) presented its 2004 *Excellence in the Field of Environmental Education* (non-formal) award to Joseph for his development of an educational program that complements and broadens the organization's focus on traffic congestion and the impact on the region's air quality and health of its residents. Classroom presentations began in January 2003 with little publicity and, by the end of the school year, over 2600 students in 23 schools had reaped the benefits of the program. In the 2003-2004 school year, 4001 students were reached. NEED is proud to have its materials and training programs included as part of Joseph's environmental education programs.

# NEED NEWS

## ***International Symposium for Renewable Energy Education***

The ISREE-11 symposium will be held in Orlando, Florida, August 6-7, 2005. Educators, renewable energy enthusiasts and others are invited to attend this year's symposium at no charge. This event will highlight a variety of energy educational programs for students and teachers in school education programs, ranging from K-12 to college level courses. Attendees and presenters will include leading energy educators from around the world, discussing energy curricula and activities, courses and materials, and other subjects of interest to anyone involved in energy education. NEED will be presenting its hands-on solar components. To register, email [sheinkopf@fsec.ucf.edu](mailto:sheinkopf@fsec.ucf.edu) with your name and contact information.

To celebrate the 50th anniversary of the International Solar Energy Society and bring special meaning to this important occasion, ISES, in conjunction with the American Solar Energy Society, is conducting an international student art and essay competition called Solar Schools–Brighter Future. Submittals are encouraged from students attending schools throughout the world, from elementary through high school, that incorporate solar energy in any form, including natural daylighting, photovoltaics, solar water heating, passive heating, wind power, or even methane digesters. All submittals must be received by May 20th, 2005. The winning school and students will be notified by May 27th. For more information, go to [www.solarschools-brighterfuture.org](http://www.solarschools-brighterfuture.org).

## ***Kansas***

"The presidents (of Desk & Derrick) first shared the NEED materials with their club members, their companies and bosses. The companies were very impressed with the materials that NEED provides for the teachers. Many clubs hope that their companies will offer a donation to their local Desk & Derricks to purchase NEED materials in the future. Because of the NEED packets I distributed in January at the Leadership/Training Seminar, Region VI is successfully educating many students in many schools across Kansas and Oklahoma. Thank you, NEED, for all the support and help you have given us." ***Sharon Hiss, Great Bend Desk & Derrick, Region VI Education Rep***

## ***California***

LearnOnLine, Inc, based in Camarillo, CA, is developing the Renewable Energy Education Lab (REEL) Power Program—the first national renewable energy project where students can participate in experiments with miniature solar panels, wind turbines and fuel cells in the classroom with the voltage data portrayed as real-time graphic plots on the classroom computer. LearnOnLine has developed a wide range of renewable energy training aids and is focused on project-based learning using the Internet and for courseware content and student/teacher collaboration. In project-based learning, students work in teams to explore real-world problems and create computer-generated presentations to share what they have learned. The resources have good applications in NEED classrooms. For more information, go to [www.learnonline.com](http://www.learnonline.com).

## ***American Electric Power Grants***

Sometimes all that stands between a teacher and an innovative educational experience is the money to make it happen. That's why AEP's Teacher Vision Grant program offers grants of \$100 to \$500 to educators who have creative ideas for projects to improve academic achievement. Educators of grades Pre-K through 12 who live or teach in AEP's service area or in communities with major AEP facilities may apply. The AEP service area includes parts of Tennessee, Ohio, Kentucky, West Virginia, Virginia, Michigan, Indiana, Arkansas, Texas, Oklahoma and Louisiana. Priority is given to alumni of AEP Workshops for Educators and other teachers involved in AEP programs. Learn more about the program and apply online at [www.AEP.com/go/teachergrants](http://www.AEP.com/go/teachergrants). The application deadline is April 22. If you have any questions, please call 614-716-1668.

## ***Alabama***

Thanks to the support of the Alabama Department of Economic and Community Affairs – Science, Technology, and Energy Division, NEED conducted three workshops for 120 teachers in Mobile, Birmingham, and Montgomery in March.

## ***North Carolina***

I have to tell you a story: A couple of weeks ago while out to eat, I ran into a former student who is a junior in college now and we were talking about him being back in fifth grade. I asked him if he was in my class when I did the first full year of the NEED program. I said, "You know, the light sticks, and vinegar and baking soda, etc." and he said, "Oh yeah, with happy and sad balls." He proceeded to tell me he had so much fun doing the experiments and games—it really showed him that science could be fun. He is majoring in physics because of 5th grade. I could have cried. I felt so good knowing I had made a difference. It's such an affirmation of what NEED can and does accomplish. ***Renee Roddick, NEED Lead Teacher, Raleigh, NC***

## ***Youth Awards***

The NEED Project's 25<sup>th</sup> Anniversary will be celebrated in style at the 25<sup>th</sup> Annual Youth Awards for Energy Achievement June 24 – 27, 2005 at the Hyatt Regency Crystal City. This event brings together outstanding student leaders and teachers from across the country to celebrate energy education. Scrapbooks are due to state coordinators on April 15, 2005, and to NEED by April 22, 2005. The National Awards Review is April 27, 2005. For more information, contact NEED at 800-875-5029 or email [mspruill@need.org](mailto:mspruill@need.org).

## ***Congratulations to NYSERDA!***

NYSERDA was awarded the 2005 ENERGY STAR Corporate Commitment Award. This award is designed to recognize an organization that demonstrates outstanding success with ENERGY STAR throughout many areas of its business—demonstrating that ENERGY STAR truly is an organization-wide commitment. NYSERDA was selected based on its residential energy efficiency programs; home improvement program; and commercial building efforts for state buildings, schools, and other commercial buildings. NYSERDA is the first public organization to receive this honor.

# PRIMARY/ELEMENTARY *ACTIVITY: Energy Source Puzzles*

**Concepts:** There are renewable and nonrenewable energy sources.

Discovering patterns can help solve puzzles.

**Time:** 20-45 minutes

**Materials:** One puzzle per student Crayons, colored pencils or markers Scissors

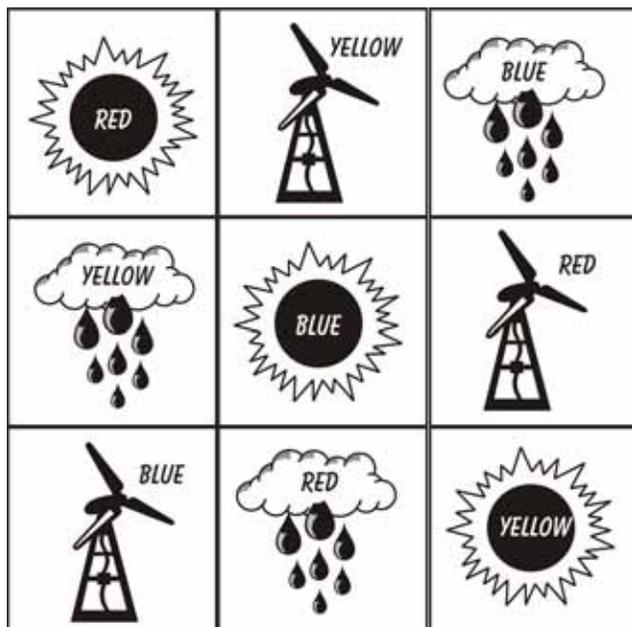
- Procedure:**
1. Choose a puzzle from page 5.
  2. Make one copy of the puzzle for each student and distribute.
  3. Instruct the students to color the squares in each column using the key at the top, then cut apart the squares. While students are doing this, discuss the energy sources the icons represent, how they are used, and whether they are renewable or nonrenewable.
  4. Explain to the students that the goal is to arrange the squares so that only one icon and one color is in each row and column.
  5. Remind the students that there are several ways to solve the puzzle. Encourage students to look for patterns while solving the puzzle. *Hint: The key to solving the puzzles is to find a pattern, such as beginning with a diagonal row of the same icon or the same color.*

**Conclusion:** Ask the students if they see any patterns in the solved puzzles.

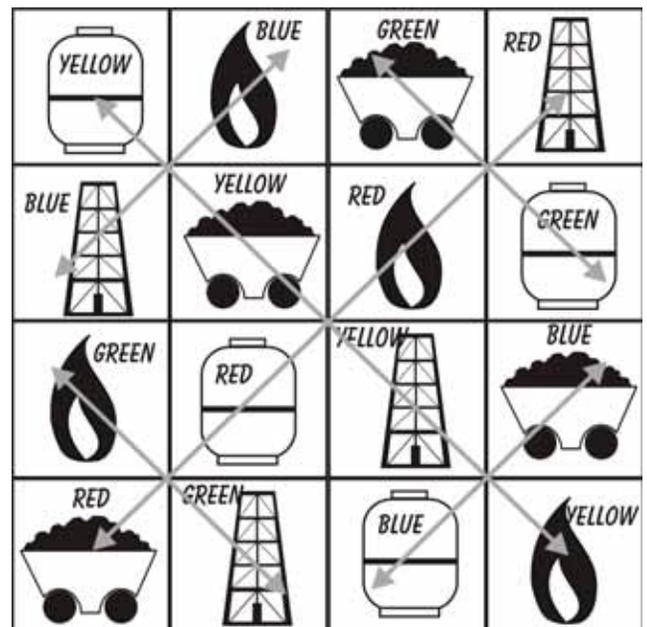
**Extensions for the 4x4 puzzle squares:**

**Memory Game:** Have groups of two students turn the puzzle pieces over and take turns matching pairs of either icons or color combinations.

**Tic-Tac-Toe:** Write a simple question and answer about the energy source on the back of each square (or have the students do this). Sort the squares by color. Draw a large tic-tac-toe grid on the board. Divide the class into two teams and have each team choose a color. To play, the read a question from a colored square corresponding to the team color for the team to answer. If the team answers correctly, it places the square on the tic-tac-toe grid and the other team takes a turn. A team wins by placing three squares of the same color in a row.

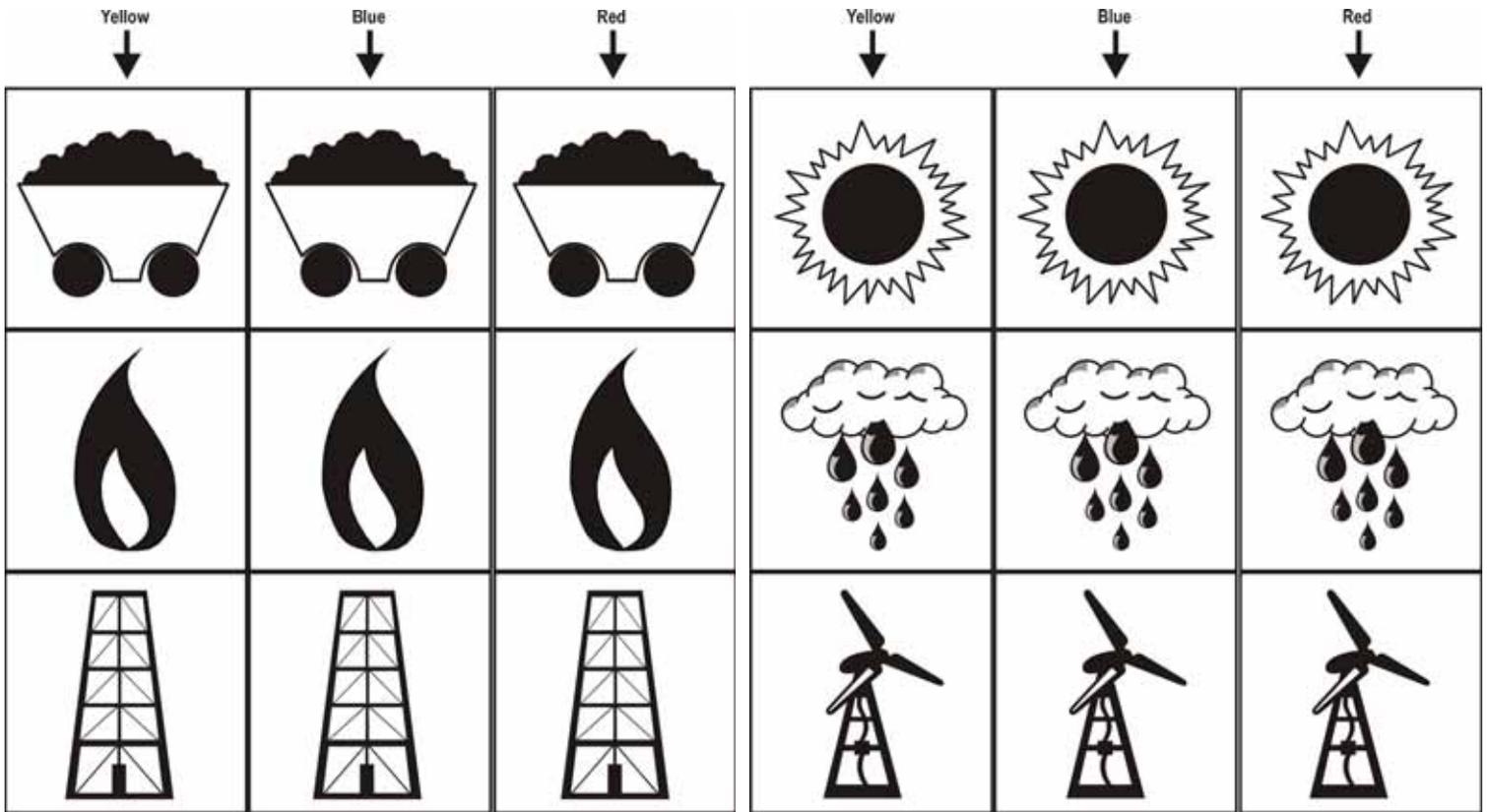


*SAMPLE SOLUTIONS*

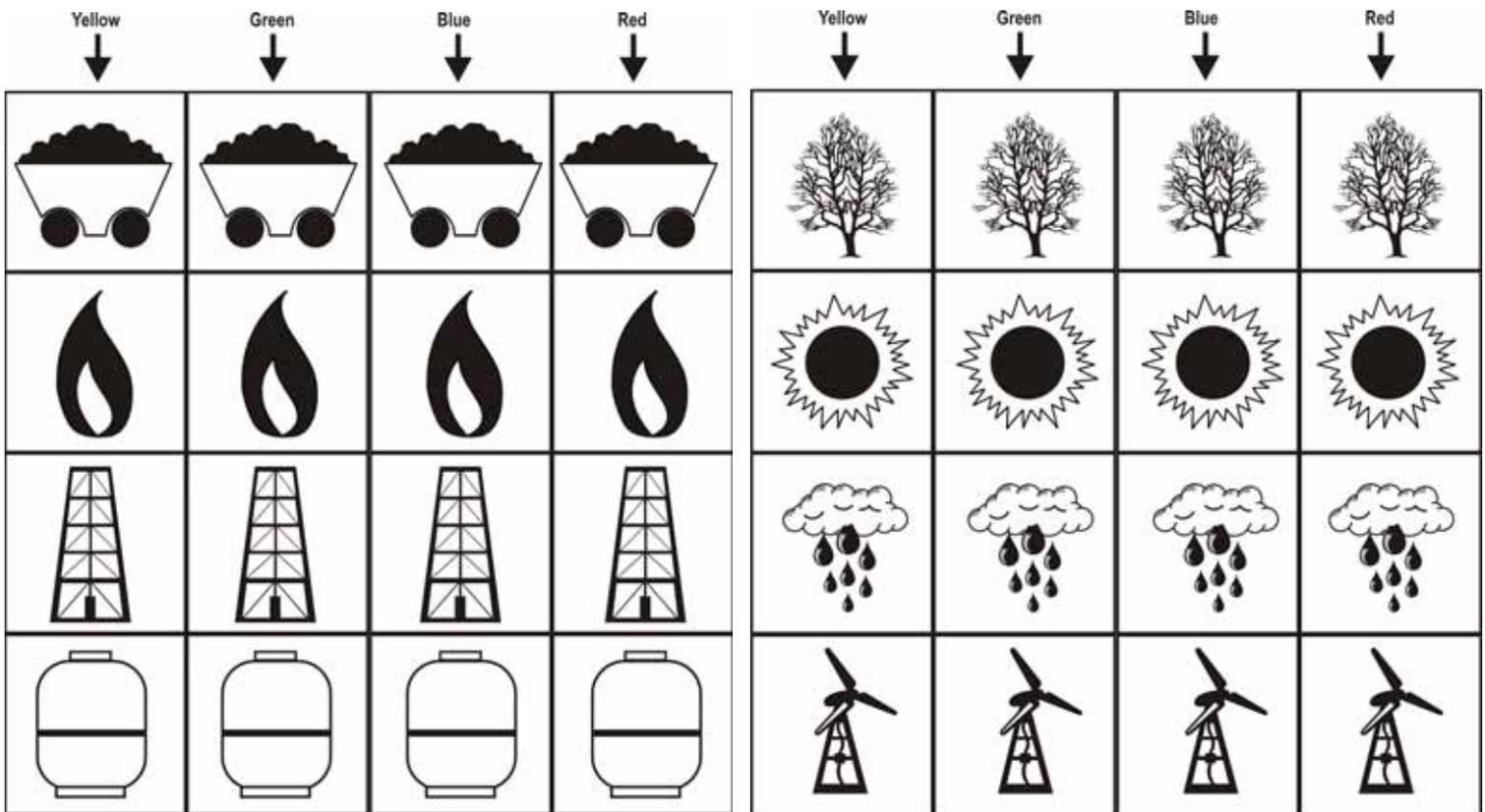


*This activity was designed by Melanie Harper, a member of NEED's Teacher Advisory Board from Odessa, Texas.*

# 3x3 Energy Source Puzzles



# 4x4 Energy Source Puzzles



# INTERMEDIATE/SECONDARY *ARTICLES: New Technologies*

## *Increasing Solar Cell Efficiency*

The recent focus of research and development in the solar industry is on increasing the efficiency and decreasing the cost of solar cells. A new material is being investigated for its ability to generate electricity from a segment of the solar spectrum that conventional solar cells are unable to use. Conventional solar cells absorb only visible light, which comprises about six percent of the solar radiation available. The ability to tap more of the solar spectrum has the potential to increase solar cell efficiency.

To reach more of the spectrum, researchers are looking at extremely small particles with semiconducting properties called *quantum dots*. Depending on their size, different parts of the infrared spectrum are absorbed by the quantum dots. When the dots are mixed with a polymer that conducts electricity and attached to electrodes, the result is a solar cell with the ability to generate electricity using the *infrared spectrum*. This new solar cell does not move electrons very efficiently yet, but researchers are developing ways to improve electron flow.

The next step for improved solar cell efficiency is to put together a solar cell that can absorb both the visible and infrared spectrum. This pairing could increase a solar cell's efficiency up to 30 percent.

*Summarized from the January 22, 2005 edition of Science News.*

## *Power from the Sea*

Harnessing the energy of the ocean is a technological nightmare. Tidal power is predictable, but not constant. Wave energy is being used for small-scale applications, but not for meeting the needs of large communities. Corrosive seawater erodes any metal or wire that is used. Fish, mammals, invertebrates, and plants dominate the environment. Yet one company, Florida Hydro, is attempting to master all of these hurdles by developing a system to utilize the energy in ocean currents.

The large, energy rich ocean current known as the Gulf Stream flows between the coast of Florida and the Bahamas. It is here that Florida Hydro and its spin off company, Gulf Stream Energy, is focusing its research, licensing, and patent rights.

A new underwater generator has been developed to harness the energy of flowing water in the ocean. The new style of turbine has two open rings. The outer ring remains stationary, while the inner ring spins as water from the Gulf Stream flows through it. With the center open, these turbines are more "fish-friendly" than generators designed for land use. Florida Hydro anticipates installing as many as 1,000 new turbines in the next ten years to provide electricity from a previously untapped renewable energy source.

*For more information, go to [www.floridahydro.com/Technology.htm](http://www.floridahydro.com/Technology.htm) and [www.popularmechanics.com/science/technology\\_watch/1288106.html](http://www.popularmechanics.com/science/technology_watch/1288106.html).*



## *Clean Coal Technologies*

Emissions free coal power plants? Is that possible? The scientists working on the FutureGen research project think it is. Funded by the U.S. government and the coal industry, FutureGen is planning to build the world's first zero-emission coal gasification power plant, which will cost an estimated one billion dollars. The FutureGen power plant will produce both electricity and hydrogen.

The U.S. has vast resources of coal, which is a vital component of the mix of energy sources meeting our energy needs, but reducing emissions from coal-fired power plants is imperative. The FutureGen plant will incorporate some of the newest clean coal technologies, including advanced gasifier fuel cells and carbon sequestration. The new gasifiers will convert coal into a gas fuel that can be used to make hydrogen to power fuel cells.

To reduce carbon dioxide emissions, FutureGen scientists are studying geologic formations to determine the potential for permanent storage. To implement this technology, a liquid form of carbon dioxide is injected into a suitable geologic formation, such as an underground salt water reservoir. Injecting the carbon dioxide could also work in combination with enhanced oil and gas recovery systems.

While still in the planning stages, FutureGen has the potential of keeping coal the energy source of choice for generating electricity in the United States for years to come.

*For more information, go to <http://fossil.energy.gov/programs/powersystems/index.html> and [www.distributedenergy.com/de\\_0503\\_clean.html](http://www.distributedenergy.com/de_0503_clean.html).*

# ENERGY CAREER CORNER: *Careers in Petroleum–Offshore Oil Rigs*

There are more than 5,000 oil and gas drilling companies in the world; most are located in the oil-bearing regions of North America, United Arab Emirates, Saudi Arabia, Kuwait, Nigeria and Venezuela. As the world's demand for oil increases, career opportunities in the oil industry expand.

Working aboard an oil rig in the ocean is hard work. If the rig is far from the coast, workers live on the rig (where the facilities may equal those of a hotel), or on ships anchored nearby. A worker on a rig spends a great deal of time away from family and friends, but there are some great benefits to working on an offshore rig—all food, housing, laundry, and travel expenses are paid for by the employer and most personnel work a 14/14 or 14/21 day rotation. This means they work on the rig for 14 days (usually 12 hours a day), then have 14 or 21 days off.

Most employment opportunities in the oil industry are in entry-level positions. There is often room for advancement for hard-working, dependable employees who are able to learn skills on the job or who are able to work with computers. Since operations on an offshore rig can be more challenging than those on land, most offshore entry-level positions require experience working on land. When workers have mastered entry-level positions on rigs, they may have the opportunity to progress to positions with more responsibility or to more difficult tasks. To advance, an employee may also need classroom training, on-the-job training, job shadowing, mentoring, or coaching. Two entry-level positions on an offshore oil rig are roustabout and roughneck.

A **roustabout** is a general laborer who completes general rig maintenance, works on construction, and helps unload supplies from support ships. The work often requires working outdoors in all types of weather. To be successful, physical stamina is important because long periods of standing, lifting heavy objects, and climbing may all be part of a normal day's work. The salary ranges from \$310-\$345 per day, or \$42,000 to \$46,000 per year.

A **roughneck**, also known as a rotary-driller helper, is a drill deck worker. This job is a promotion from roustabout. The job of a roughneck is to carry out specific tasks during the drilling operation, such as guiding pipes to well openings and connecting pipe joints. This job requires a lot of hard, physical labor while working on a team. The job is ideal for people with experience and knowledge working with mechanics and welding. A roughneck can earn up to \$355 per day, or \$47,500 per year.

Additional members of a drilling crew include derrick operators, rotary-rig engine operators, and rotary drillers. Drilling superintendents oversee the drilling crews, while petroleum engineers plan and supervise the operation and maintenance of the drillsite. An offshore rig may also need ship captains, electricians, mechanics and engineers.

*For more information on careers in the petroleum industry, go to:*

**American Association of Petroleum Geologists**  
[www.aapg.org](http://www.aapg.org)

**American Geologic Institute**  
[www.agiweb.org](http://www.agiweb.org)

**Bureau of Labor Statistics**  
[www.bls.gov](http://www.bls.gov)

**Oil Rig Jobs**  
[www.oil-rig-jobs.com](http://www.oil-rig-jobs.com)

**Society of Petroleum Engineers**  
[www.spe.org](http://www.spe.org)



# PG&E Solar Schools Program



The NEED Project is pleased to announce a new partnership with Pacific Gas and Electric Company (PG&E) of San Francisco, California. The PG&E Solar Schools Program includes the NEED curriculum and training, photovoltaic (PV) installations, and \$250,000 in grants to schools in PG&E's service area.

In 2005, 400 teachers will be eligible receive training and NEED's curriculum, 20 schools will be eligible to receive solar installations, and grants of \$2,500 or \$5,000 will be provided to schools who submit winning proposals that highlight inclusion of solar energy into their classroom curricula and programs.

NEED is excited to partner with PG&E and the Foundation for Environmental Education on this project.

To learn more about the PG&E Solar Schools Program, apply for a solar installation for your school or apply for a grant, go to [www.need.org/pgesolarschools](http://www.need.org/pgesolarschools).

