

energy EXCHANGE

A publication of the National Energy Education Development Project

October 2000

What's New!

Energy Exchange has been transformed from a twice-a-year magazine into a newsletter to serve you better. Beginning with this issue, we will be sending out **Energy Exchange** to our members and sponsors six times a year to let you know what's happening in the energy world and at NEED. It will also be posted on our website, www.NEED.org, in pdf format.

Our goal is to get information to you about upcoming programs, professional development opportunities, and new materials in a more timely manner. Let us know what you think!



Energy Fair

How do you explain to young learners the difference between dependent and independent variables? NEED believes the scientific method of problem-solving can become an on-going process in every classroom with fun, easy-to-implement activities.

Energy Fair is a new NEED activity for grades two through six that teaches students the **experimental design** model through short, simple classroom experiments. A student guide and suggested science or energy fair experiments are included. Call NEED at 1-800-875-5029 for a copy or download the document in pdf format from our website at www.NEED.org.

SWINGING INTO ACTION



The NEED Project welcomes Jim Grieshaber (right) as our Assistant Program Director. Jim, a former science teacher and ILEED Teacher Advisory Board member, joined NEED in August. In this photo, Jim is practicing his form for boarding a crew boat to take him to an offshore oil rig during our Ventura Conference for Educators.

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CALENDAR OF EVENTS

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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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www.need.org

Educators may reproduce articles and activities for classroom use.

For more information about any of the events listed, contact info@need.org or 1-800-875-5029. Many NEED events are being planned – watch this section for updates. If you have NEED events or workshops in your state and would like to add them to our master calendar, send your information to info@need.org.

September 2000

9/23-26 Student Weatherization and Audit Training – Lake Cumberland, KY
9/27–10/6 KyNEED Workshops – Campbell County, KY
9/28 Michigan NEED Workshop – Grand Valley State University
9/28 Southeastern New Mexico NEED Workshop – Roswell, NM
9/28 Illinois NEED Workshop – Charleston, IL

October 2000

10/4 Illinois NEED Workshop – Kankakee, IL
10/7 KyNEED Presentation – Kentucky Association of Environmental Education
10/10 Illinois NEED Workshop – Bloomington, IL
10/11 Illinois NEED Workshop – Springfield, IL
10/12 Illinois NEED Workshop – Alton, IL
10/12 Illinois NEED Workshop – Macomb, IL
10/13 Illinois NEED Workshop – Normal, IL
10/16-19 Virgin Islands NEED Workshops – St. Croix and St. Thomas, VI
10/17 Illinois NEED Workshop – Metropolis, IL
10/18 Illinois NEED Workshop – Mt. Vernon, IL
10/19 Mississippi NEED Workshop – Tupelo, MS
10/20 NEED Workshop – NSTA Regional Convention – Milwaukee, WI
10/20 NEED Board of Directors Meeting – Washington, DC
10/23 Illinois NEED Workshop – Bellville, IL
10/24 Illinois NEED Workshop – Rolling Meadows, IL
10/26 NEED Presentation – PBPA Annual Meeting – Midland, TX
10/26 Illinois NEED Workshop – Peoria, IL
10/26 Michigan NEED Workshop – Grand Valley State University
10/27-28 Illinois NEED Workshop – IL Science Teachers Meeting – St. Charles, IL
10/27-28 Illinois NEED Workshop – Mt. Vernon Regional Education Center, IL

November 2000

TBA Arkansas NEED Conference – Little Rock, AR
TBA Florida NEED Workshops – Pensacola and Indiantown, FL
TBA Alabama NEED Workshop – Mobile, AL
11/1-3 Rhode Island NEED Workshops – Providence, RI
11/2 KyNEED Workshop – Kentucky Science Teachers Association
11/3 Illinois NEED Workshop – Rockford, IL
11/8-9 Rhode Island NEED Workshops – Providence, RI
11/10 KyNEED Workshop – Knott County, KY
11/10 Illinois NEED Workshop – Mt. Carroll, IL
11/13 KyNEED Workshop – Perry/Leslie Counties, KY
11/14 KyNEED Workshop – Letcher County, KY
11/14 Illinois NEED Workshop – Crystal Lake, IL
11/16 NEED Workshop – NSTA Regional Convention – Baltimore, MD
11/20 KyNEED Workshop – Paducah, KY
11/21 KyNEED Workshop – Murray, KY
11/28 KyNEED Workshop – Henderson, KY
11/29 KyNEED Workshop – Owensboro, KY

Upcoming 2001

6/22-25, 2001 NEED Youth Awards National Recognition Ceremonies – Washington, D.C.
7/14-18, 2001 National Energy Conference for Educators – Williamsburg, VA
7/21-25, 2001 National Energy Conference for Educators – TBA

CORRECTIONS—PLEASE NOTE

Blueprint for Success: Page 5: The correct answer to Question 10 in the Unit Exam is c, not b.

Games and Icebreakers: Page 15: There are two wind icons – and no hydropower icon – for the Energy Chants. A hydropower icon can be found on page 18.

NEED NEWS

UPDATE your address book and rolodex! NEED is now online at www.NEED.org and emails for the staff have been changed to:

info@need.org

pdonovan@need.org

mspruill@need.org

kreagor@need.org

mcallan@need.org

jgriehaber@need.org

Congratulations to Linda Fonner (WV-NEED Lead Teacher) and Peggy Welch (KyNEED Lead Teacher) for receiving Presidential Awards for Excellence in Mathematics and Science Teaching in Washington, D.C. on June 20, 2000. Both Fonner and Welch highlighted their energy activities as major components of the projects for which they were recognized.

The 2000 Youth Awards Program for Energy Achievement

was held June 23-26, 2000, in Washington, D.C. With more than 400 students, teachers, and parents in attendance, it was one of NEED's biggest events yet. The national winners were: Chimneyrock Elementary, TN (Primary); Kitty Hawk Elementary, NC (Elementary); Park View Middle School, RI (Junior); Anderson High School, OH (Senior); and School District #47, IL (District). North Carolina's NEED Program received the State of the Year Award and the Florida Panhandle NEED Program received the Region of the Year Award. Project summaries of state and national award winners are highlighted in the NEED 2000 Annual Report. To receive a copy, call 1-800-875-5029 or email info@need.org.

The 2001 Youth Awards Program will be held June 22-25, 2001. The \$500.00 registration fee covers lodging, local transportation, tours, and most meals.

NEED's National Energy Conferences for Educators

were a big hit this summer for more than 100 teachers. A boat trip to an offshore oil platform and a tour of a waste-to-energy facility were highlights of this year's conferences. The programs are designed to prepare educators to implement energy programs in their classrooms and facilitate workshops and inservices for their peers.

Two NEED conferences are scheduled for 2001: July 14-18 in Williamsburg, VA and July 21-25 in a location to be determined. The registration fee of \$800.00 covers lodging (double occupancy), meals, field trips, and conference materials. For more information, check out www.need.org/schedule or email mspruill@need.org.

By now, your **2001 NEED Membership Packet** should have arrived at your door. This year, the packet is filled with great activities for use in your classroom and community. If you have not renewed your membership or are unsure if you are a member of NEED, call 1-800-875-5029 or email info@need.org. Annual membership is \$35.00. Sponsorship is available in some areas.

NEED something new for your classroom? Check out NEED's newest hands-on activities—**EnergyWorks** (exploring heat, light, motion, and sound) and **ElectroWorks** (exploring magnets, batteries, circuits, and static electricity), both of which are included in your membership packet.

TEACHER RESOURCES

www.eia.doe.gov/kids: Get ready, get set, gooooo to the new and improved Energy Information Administration's Kid's Page, designed and developed through an on-going partnership between EIA and NEED. The site is filled with energy information and we want NEED students and teachers to let us know what they think about the website. Have your students take a look at it and email your comments to mspruill@need.org.

American Coal Foundation

The American Coal Foundation has just released ***Coal Today: Without Coal the Lights Go Out***, a new CD-ROM for the classroom. This new tool makes learning the facts about the nation's leading source of domestic energy interactive, high-tech fun for fifth through eighth graders. The CD-ROM includes a series of four interactive games and activities that illustrate the basic facts about energy, electricity, and the coal industry. This is the latest in a series of classroom activities designed by ACF to teach students about coal and its uses. Call 1-800-325-8677 or email coal@westglen.com. The CD-ROM is available for \$7.50.

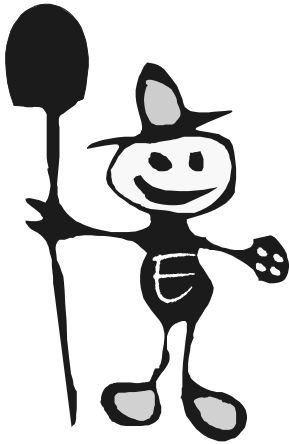
Bayer Corporation

According to a recent report issued by Bayer Corporation, with the pace of scientific discovery expected to accelerate significantly in the next millennium and science literacy expected to take on an increasingly greater role, many Americans are concerned about the quality of science education. ***What America Thinks About Science Education Reform*** is the result of a survey of pre-college science teachers, scientists, pre-college students, business executives, elementary school principals and teachers, and parents. You can check out the findings at www.bayerus.com. Bayer Corporation also has a great educational website and a fantastic On-line Periodic Table.

U.S. Environmental Protection Agency Office of Solid Waste

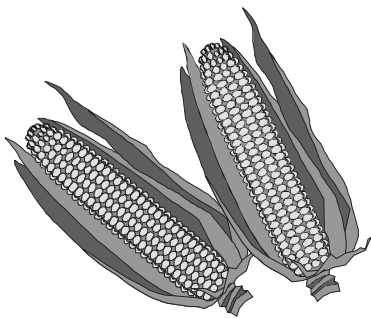
The US EPA Office of Solid Waste has recently placed the updated version of ***A Resource Guide of Solid Waste Educational Materials*** on the EPA website. Check out www.epa.gov/epaoswer/general/bibliogr/educatn.htm.

PRIMARY ENERGY STORY: The Tale of Johnny Energy Seed



I'm Johnny Energy Seed. I plant energy seeds in a big field on my farm.

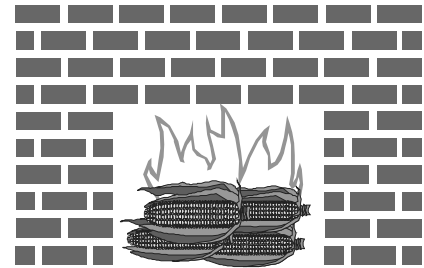
The sun shines. There is energy in the sun's rays. It helps my seeds grow into tall plants. My plants store the sun's energy in their roots, stalks, leaves and ears. Soon my energy plants look like this.



I can use the energy in my plants for many things. I can eat the seeds for energy for my body. This energy will help me grow and move and think.

I can feed my energy plants to my chickens, pigs, cows and horses. The energy will make my animals grow big and strong.

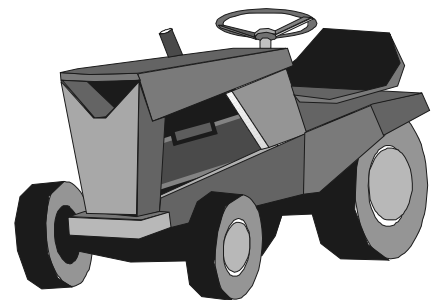
I can hang my energy plants in my barn to dry. Then I can burn them in my fireplace. The energy in my plants can keep me warm on cold winter nights.



I can put my energy plants into a big container that keeps out the air. As my plants decay, they can make a gas that I can burn in my stove to cook my food.

I can also turn my energy plants into fuel for my tractor. I turn them into alcohol, like grapes are turned into wine. This alcohol fuel, called ethanol, can run my tractor.

As you can see, a seed of corn really is an energy seed. Why don't you plant some corn seeds and explore the ways you can use the energy in the plants you grow.



ELEMENTARY EXPLORATION: Seeing the Light

GOAL: To develop students' critical thinking skills by exploring angles of reflection of light.

To answer the question: How does a periscope work?

MATERIALS:

- Flashlight
- 2 Books
- 4 Mirrors with mirror clips*
- Toy periscope
- Paper and pencils

PROCEDURE:

1. Set up a center with the materials listed.
2. Make a sign with the diagram to the right (leaving out the mirrors and the path of the light) and the following instructions for the center:

Examine the periscope. How does it allow you to see in a different direction?

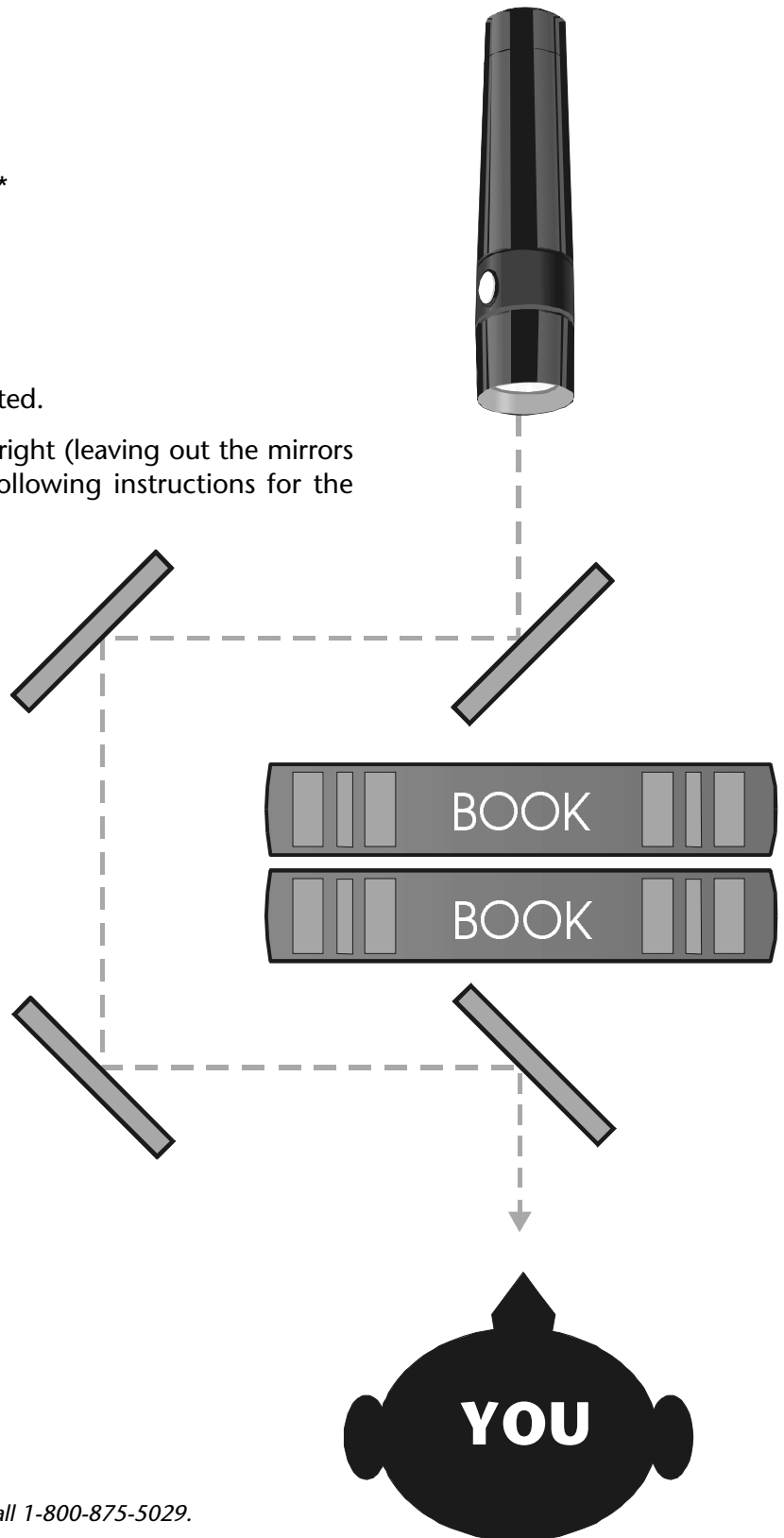
Set up the flashlight and the books like in the diagram so that you can not see the flashlight.

Arrange the mirrors so that they reflect the light from the flashlight around the books and to your eyes. Remember that light will reflect off a mirror at the same angle it hits the mirror.

Draw a picture of the flashlight, the books, and you. Show how you arranged the mirrors in order to see the light.

Draw the path of the light from the flashlight to you, showing how it was reflected by the mirrors. Do the angles look the same?

Can you explain how the periscope works?



* for information on obtaining mirrors with clips, call 1-800-875-5029.

INTERMEDIATE ACTIVITY: Calibrating Thermometers

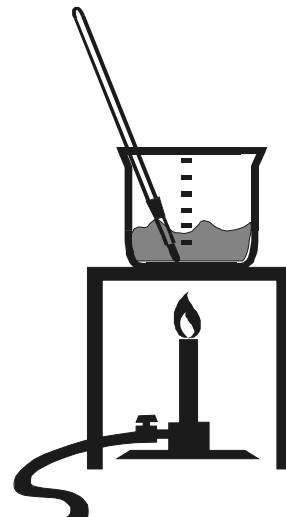
GOALS: To develop students' critical thinking skills and introduce them to concepts of heat transfer by having them calibrate thermometers with guidance, but without specific instructions.

To reinforce students' ability to convert temperature from Fahrenheit to Celsius and vice versa.

PREPARATION & MATERIALS:

- 1 Place students in six groups.
- 2 Make the following equipment and materials accessible to the students, but do not instruct them in which equipment or materials to use. For example, tell the students they can use any of the equipment and materials on a given shelf.

- 6 Uncalibrated thermometers*
- 6 100 ml beakers
- 6 Permanent, fineline, waterproof markers
- 6 Ring stands or tripods
- 6 Bunsen burners or alcohol lamps
- Lab tongs
- Safety glasses
- Water
- Ice



PROCEDURE:

- 1 Give each group of students an uncalibrated thermometer and a marker.
- 2 Instruct the students to work together to devise a method to calibrate their thermometers from -10°C to 120°C . *Another option is to require them to calibrate the thermometers to both Celsius and Fahrenheit scales.*
- 3 Instruct each group to write down the materials they will need and the procedure they plan to use, and show it to you for approval. If the list of materials and the procedure are safe and reasonable, allow the group to proceed, even if they may not accomplish the objective.
- 4 If a group has difficulty devising a plan, ask questions to guide them in the right direction, but do not tell them how to proceed. *(For example, under what conditions could you predict the temperature of water?)*
- 5 If students require additional materials or need to modify their procedure as they progress, instruct them to obtain your approval before proceeding.
- 6 After 15–30 minutes, evaluate the activity with the students, checking their calibrations by placing the thermometers in boiling water (100°C — 212°F) and at the top of a beaker of ice water (0°C — 32°F). The calibrations between these markers should be uniform. Students can use body temperature (37°C — 98.6°F) to validate the calibrations.

EXTENSION: Converting from Fahrenheit to Celsius and Vice Versa

Have students estimate the the Fahrenheit correlation of several Celsius temperatures (10, 38, 64, 85) using their thermometers. Have students estimate the Celsius correlation for several temperatures (49, 89, 172, 225) using their thermometers. Have the students determine the exact correlations by using the following conversion formulas:

$$\text{Celsius to Fahrenheit: } t^{\circ}\text{F} = 9/5(t^{\circ}\text{C} + 32^{\circ})$$

$$\text{Fahrenheit to Celsius: } t^{\circ}\text{C} = 5/9(t^{\circ}\text{F} - 32^{\circ})$$

t = temperature

Students can check their conversions on the Internet at www.megaconverter.com.

* Call NEED at 1-800-875-5029 for information about obtaining uncalibrated thermometers.

SECONDARY ARTICLE: Offshore Wind Energy

Offshore oil rigs need electricity to run their machinery and provide a safe, comfortable environment for their workers. Platforms can't very well run cable from land-based power plants if they are miles at sea. So, how do these rigs get the electricity they need?

Offshore rigs have generators, most of which are fueled by diesel oil, to provide the electricity needed on the platforms. Some small, unmanned platforms have solar panels to provide electricity, while a few rigs use natural gas from the wells.

Most rigs use diesel fuel, a petroleum product, which is delivered by tankers. The Discoverer Enterprise, a new drillship operated by Transocean Sedco Forex, has a diesel generator which produces 40 megawatts of power—enough electricity to power 40,000 homes—and has 1600 miles of cable and wiring to distribute the electricity. It takes a lot of nonrenewable fuel to keep an oil rig working.

Researchers are developing new technologies to provide electricity offshore. The new **Spar-WARP** wind machine developed by ENECO can produce and store clean, safe electricity offshore in many areas where there is sufficient wind speed. Most offshore areas provide good sites for wind technology. A good land site usually has mean wind speeds of 13 to 17 mph, while typical offshore mean wind speeds range from 15 to 20 mph.

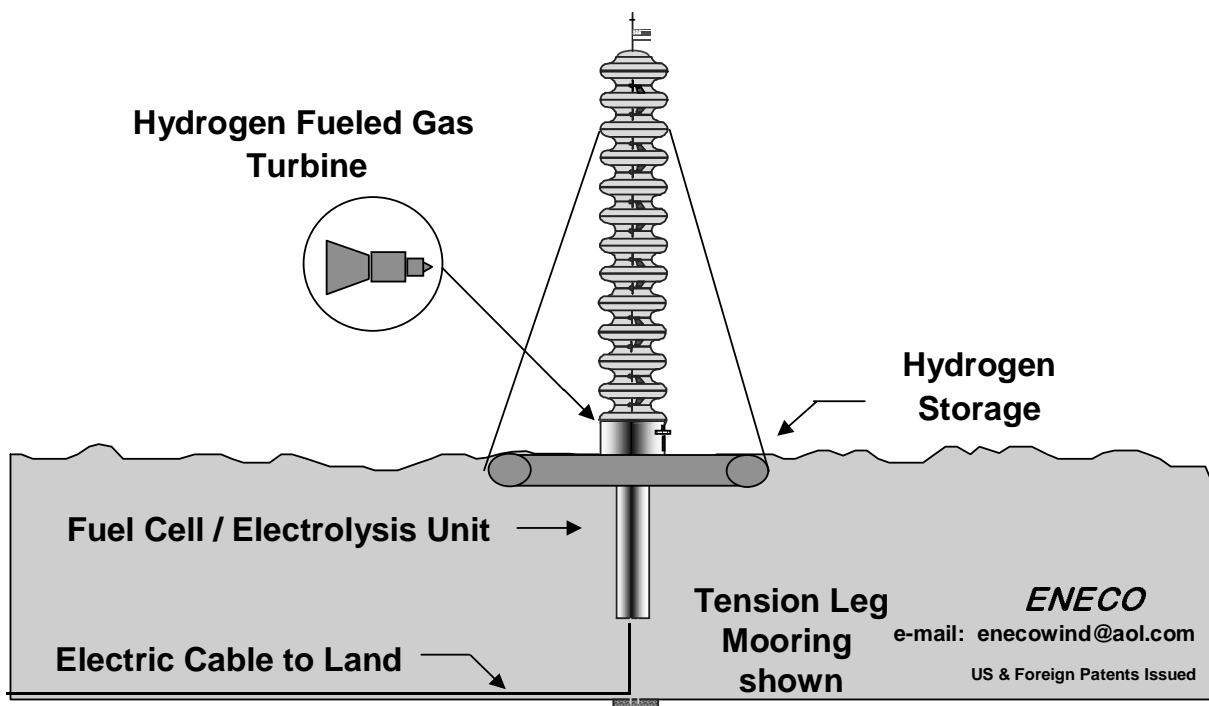
The WARP, which stands for **Wind Amplified Rotor Platform**, is designed to further amplify wind by as much as 50 to 80 percent, and has many advantages for providing electricity in offshore areas. It can be installed in any depth of water—on a foundation in shallow water or on a floating platform tethered to the bottom by cable in deep water.

Its simple modular design is economical and low maintenance, and facilitates easy assembly in shipyards or on site without the need for large rigging. And capacity can be increased by installing additional units. The WARP design also allows for the integration of PV technology and the incorporation of natural gas and fuel cell plants.

There are many potential applications of offshore WARP technology in addition to powering oil platforms. If these wind machines are sited near land, cables can be run to provide electricity to nearby towns. In the diagram below, the Spar-WARP system incorporates a hydrogen fueled gas turbine with the wind technology to provide power onshore.

For more information about new wind energy technology, check out the Offshore Wind Energy Network website at www.owen.org.uk, as well as NEED's *Secondary Energy Infobook*. For more information on the drillship Discoverer Enterprise, check out www.deepwater.com.

Spar-WARP™ Operating Baseload with Fuel Cells or Hydrogen Fueled Gas Turbines



Short Circuits

From **Energy Savings at Your Door – Energy Decisions July/August 2000**

You see them every day in your school building, yet have you ever wondered what impact they have on your building's energy use? Exit signs are often overlooked as an opportunity to reduce both energy and maintenance costs. The vast majority of the estimated 100 million exit signs installed in buildings today represent an old technology that uses more energy and requires more maintenance than some new technologies. Switching to a new, high-efficient exit sign can cut the energy the sign uses by nearly 90 percent, while extending the life of the lamp inside the sign. The typical incandescent exit sign, powered by one or two 20 watt incandescent lamps, uses between 175 and 350 kilowatt hours of electricity each year. That's \$17.00 worth of electricity and you have to change the bulbs almost three times a year—at an additional cost of \$36.00. Consider how many exit signs are in your building. How much electricity would those use each year? Newer exit signs with compact fluorescent lamps use about 96 kwh each year and cost about \$5.00 for electricity and \$8.00 to change lamps, since CFLs last so much longer. A few small changes can add up to a big difference!

Office of Naval Research

Researchers at the Naval Undersea Warfare Center conducted a demonstration in which a high-energy electric power source, a semi-fuel cell, propelled an unmanned undersea vehicle continuously for 37 hours. In the Navy of the future, unmanned undersea vehicles will conduct shallow-water surveillance, information gathering, and mine detection. A semi-fuel cell combines features of a fuel cell and a standard battery to provide a cheaper, safer source of power.

French Fries as Fuel?

Natural, renewable resources such as vegetable oils and recycled restaurant greases can be chemically transformed into clean-burning biodiesel fuels. As its name implies, biodiesel is like diesel fuel except that it is organically produced. It is also safe for the environment, biodegradable, and produces significantly less air pollution than diesel fuel. It even smells better than diesel fuel—it smells like french fries, donuts or barbecue. Ever thought of making a cross-country road trip? Check out www.veggievan.org to see fun information about making that trip fueled entirely by biodiesel.



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