

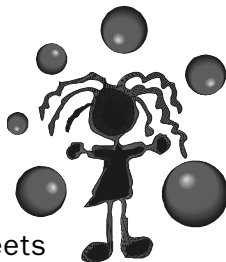
energy EXCHANGE

A publication of the National Energy Education Development Project

May 2001

Primary Science of Energy Kit

NEED has been busy developing a new hands-on energy kit for our youngest students. Our **Primary Science of Energy** unit meets the National Science Education Content Standards for K-4 by focusing on the fundamental concepts of energy. Students explore the science of motion, heat, sound, and light with a series of simple activities that incorporate both English and metric measurements, using safe and age-appropriate thermometers, balances, rulers, measuring tapes, beakers and graduated cylinders. Primary students learn to make observations, measure, record results, compare and contrast, categorize, make predictions, analyze and graph results, and draw conclusions.



The **Primary Science of Energy Kit** includes a comprehensive, step-by-step Teacher Guide with background information on the energy topics covered, transparency masters, and instructions for each activity; correlations to the National Science Education Content Standards; a class set of Student Guides; and the materials needed for the students to conduct the experiments.

The curriculum unit will be field tested this spring, introduced at the Energy Conferences for Educators in July, and will be available to all NEED members in September 2001. Teacher and Student Guides will be included in the 2001-2002 NEED Membership Kit.

To preview and evaluate the **Primary Science of Energy** Teacher and Student Guides, call Martha Callan at 1-800-875-5029 or email her at mcallan@need.org.

★-New NEED Info-★

Make a Note/Change Your Database: NEED Project Headquarters is moving into new office space on May 1, 2001. Here are our new addresses and phone numbers:

P.O. Box 10101
Manassas, VA 20108
or
8408 Kao Circle
Manassas, VA 20110

TEL: (703) 257-1117
FAX: (703) 257-0037

Our toll-free number remains the same:
1-800-875-5029

Our web address remains the same:
www.NEED.org

Our email remains the same:
info@need.org

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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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Call 1-800-875-5029 for information on NEED programs in other states.

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Energy Exchange is published five times a year and is available on NEED's website.

Educators may reproduce articles and activities for classroom use.

CALENDAR OF EVENTS

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

April 2001

4/19 Nebraska Public Power District NEED Workshop - Minden, NE
4/19-20 Alaska NEED Conference - Girdwood, AK
4/19 Abilene NEED Workshop - Abilene, TX
4/20 Alabama NEED Workshop - Baldwin County, AL
4/21 Renewable Energy Education Workshop - Washington, DC - in partnership with the Florida Solar Energy Center and the American Solar Energy Society
4/26 National Take Your Kid to Work Day - NEED Workshop at the Minerals Management Service - Herndon, VA
4/26 National Take Your Kid to Work Day - NEED Workshop at the Energy Information Administration - Washington, D.C.
4/27 NEED Strategic Planning Meeting - Manassas, VA
4/30 National Youth Awards Review Panel - Energy Information Administration - Washington, DC

May 2001

5/1 ILEED Youth Awards Program - Springfield, IL
5/1-5/3 NEED Presentation at the Offshore Technology Conference - Houston, TX
5/1 NEED Headquarters moves to new offices - Manassas, VA
5/3 Nebraska Public Power District NEED Workshop - Beatrice, NE
5/3 KyNEED presentation at the Franklin County Family Science Extravaganza
5/10 Kentucky NEED Youth Awards Program - Frankfort, KY
5/7-8 NEED Workshop at the New York State Energy Research and Development Authority Energy Smart Schools Conference
5/7 NEED Workshop - Wilmington, NC
5/8 California NEED Workshop - Carpinteria, CA
5/15 Ohio Energy Project Youth Awards Program - Columbus, OH
5/18-20 NEED Curriculum and Program Teacher Review Session - Manassas, VA
5/23 NEED Board of Directors Meeting - Manassas, VA
5/30 Kentucky NEED/Kentucky Oil and Gas Association Annual Golf Tournament
TBA NEED Workshops - Durango, CO and Farmington, NM
TBA NEED Workshop - Denver, CO

June 2001

6/11-14 Southcentral Instructional Improvement Academy - Anchorage, AK
6/22-25 National Youth Awards Program - Washington, DC
Registration fee is \$500 and includes most meals, lodging, local transportation and tours.

July 2001

7/7-11 NEED National Energy Conference for Educators - Albuquerque, NM
Registration fee is \$800 and include lodging, meals, and materials.
7/14-18 NEED National Energy Conference for Educators - Williamsburg, VA
Registration fee is \$800.
7/15-20 Camp KEEP (Kids for Energy & Environmental Protection) - Springfield, IL
7/23-28 Camp KEEP - Algonquin, IL
7/23-29 NEED activities at the National Boy Scout Jamboree - Ft. AP Hill, VA



NEED NEWS

Florida

Congratulations to NEED Educator Blanche Sheinkopf, who has become Coordinator of the Department of Energy's **Energy Smart Schools** initiative. For information about the NEED partnership with Energy Smart Schools, email NEED at info@need.org or Blanche at bsheinkopf@aol.com.

Washington, DC

Over 25 educators participated in the Sun Day Teachers Workshop as part of the American Solar Energy Society's Annual Conference April 21-25, 2001. The educators learned how to implement NEED in their classrooms, along with programs like Junior Solar Sprint, Schools Going Solar from the Interstate Renewable Energy Council (www.irecusa.org) and the Solar Matters Curriculum from the Florida Solar Energy Center (www.fsec.ucf.edu/ed/teachers).

NEED NEWS

Connecticut

CEED (Connecticut Energy Education Development) Day was celebrated January 6, 2001, and the CEED Junior Directors (student leaders) were ready! They spent weeks preparing for the big day and their preparation paid off. Participating students and teachers completed the Energy Education poll, participated in GOAPE (a leadership activity to help students plan goals, objectives, activities, preparation, and evaluation), and put together Great Energy Rock Performances! Many thanks to all the Junior Directors for a job well done!

Michigan

NEED students at Rockford Middle School, and their teacher, Shelly Baumann, have covered Michigan this year conducting training programs, including one at the Michigan Middle School Convention. Working with Grand Valley State University, the students have trained 60 educators to implement NEED programs! Michigan NEED programs are sponsored by The Dart Foundation.

South Carolina

Greer Middle School students, and NEED Lead Teacher Susan Key, hosted the Annual Energy Expo on April 17, 2001. Attendees were wowed with the knowledge of Greer's 6th, 7th, and 8th grade students, who had put together creative displays and presentations about energy. NEED also made a presentation about its energy management initiatives to the Carolina Recycling Association's annual meeting in Myrtle Beach, South Carolina, at the invitation of Bill Culler of the SC Department of Health and Environmental Control.

Texas

The Permian Basin Petroleum Association had a breakfast meeting with some very special attendees. Students from Melanie Harper's class (Blackshear Middle School - Odessa) presented several NEED activities to help the PBPA membership become more aware of the importance of energy education. NEED joins the PBPA in thanking Mrs. Harper, Kurtis Sawyers, Andrew Rios, Rossalyn Salcido, Danielle Burns, Noe Villela, Christina Hernandez, Taniaja Hill, and Gary Garihan for a great job!

The NEED students of Ranger High School presented an Abilene NEED Workshop in April. Many thanks to Cindy Tribble, NEED Lead Teacher, and her students!

Missouri

NEED was excited about the turn-out for its NEED Teacher Reunions in St. Louis, Missouri, during the National Science Teachers Association conference. It was rewarding to see so many familiar faces and hear about the innovative NEED programs that are being conducted so many schools across the country. During the four day conference, NEED co-hosted four workshops and introduced 200 educators to the NEED program. Partnering with the Minerals Management Service and the Solar Energy Education Coalition, NEED also had a strong presence in the exhibitor hall.

Alaska

It was cold and beautiful, but over 40 Alaska educators participated in the first Alaska NEED Energy Conference at the Alyeska Prince Hotel in Girdwood. Sponsored by the United States Department of Interior, Minerals Management Service, and Marathon Oil, this workshop prepared educators to implement NEED energy units in their classrooms. Many thanks to Patty Underwood, NEED Lead Teacher at Campbell Middle School in Anchorage, for putting the conference together.

TEACHER RESOURCES

NEED Program and Curriculum Review: On May 18-20, 2001, NEED will conduct a Program and Curriculum Review Session with 12 of NEED's veteran educators to review and revise NEED's programs and curriculum materials.

Would you like to help improve NEED programs? Do you have new ideas? Please complete the evaluation in the March 2001 newsletter or download one from our website and fax it back to us. NEED programs will continue to meet your "needs" if you help us continue to improve!

Energy: From the Wiess Energy Hall to Your Classroom: A Summer Science Institute offered by the Houston Museum of Natural Science on July 10-12 from 9:00-2:00 pm in Herman Brown Hall. Fee \$45.

Investigate the science and technology of oil and natural gas and discover the energy sources that may fuel our future. Marvel at cutting-edge computer graphics, virtual reality displays and interactive exhibits as you tour the HMNS Wiess Energy Hall. Become an amateur geologist as you participate in hands-on activities and experience energy technologies on a field trip to an industry site. Receive lesson plans, the CD-ROM "Petroleum 101" and the Science Quest video "From Fossil Fuels to Future Fuels." For additional information about programs, go to www.hmns.org (click on Education). Educators may also email at teachers@hmns.org.

www.eia.doe.gov/kids: The EIA Kid's Page is updated regularly with new information.

NEED Energy Conferences for Educators: Sign up now for the NEED Energy Conferences for Educators (July 7-11, 2001, in Albuquerque, NM and July 14-18, 2001, in Williamsburg, VA). There are sponsorships available in certain states—email info@need.org for information.

NEED Youth Awards for Energy Achievement: On June 22-25, 2001, NEED students and teachers will be attending the 21st Annual National Recognition Ceremonies. The registration fee is \$500 per person. To request a registration packet, call NEED at 1-800-875-5029.

www.irecusa.org: The Interstate Renewable Energy Council has many educational resources for schools. Their **www.SchoolsGoingSolar.org** program highlights different ways schools are utilizing renewable resources in their construction and energy management.

PRIMARY ENERGY STORY: The Tale of Wendy Wizard



Wendy lived in a lighthouse with her father, who was a powerful wizard. Wendy was his only child and he gave her whatever she wished.

Wendy loved the lighthouse, which stood on a high cliff above the ocean. She loved to play outside in the sun. She loved the seagulls that soared through the sky. She loved to swim with the fish.

The only thing she didn't like was the wind. On the cliff, the wind blew all the time. If Wendy had a picnic, the wind blew away her napkin. It carried her potato chips up to the seagulls. It blew sand into her drink.

One day, Wendy's father gave her a new wizard hat. It was beautiful. Silver stars and moons glittered on it. Wendy shouted for joy and ran outside to show the seagulls.

Suddenly, a gust of wind grabbed the hat and blew it over the ocean. "Stop!" Wendy cried, "Bring back my hat!" But the wind blew the hat away from her.

Wendy ran inside. She was furious. "Father, Father, the wind took my new hat. I want you to make the wind stop forever!"

"Wendy, I don't think you understand what you are asking," said her father.

"Yes, I do, Father! Make the wind go away! Do this if you love me!" And her father, the great wizard, could not deny his daughter.

The next morning when Wendy woke up, it was cold and dark. The air was still. There was no wind. She smiled, then shivered. Why was it so cold and dark? She ran to find her father.

"Thank you for stopping the wind, Father. But why is it so dark and cold? The sun should be up by now."

"I had to send the sun away to grant your wish, child. A dark, cold world is the price you must pay to stop the wind," explained the wizard.

"I love the sun, Father, I just wanted the wind to stop," cried Wendy, "Please bring back the sun!"

"But it is the sun that makes the wind. The sun warms the land and the air over the land rises. The cool air over the ocean rushes in to take its place. To stop the wind, I had to send away the sun. That was your wish."

Wendy looked at her father and grinned. "You did this to teach me a lesson, didn't you? I needed to know about the sun and the wind. I needed to learn to respect all of nature's energy. Now bring back the sun and the wind, and stop spoiling me!"

ELEMENTARY EXPLORATION: LIQUIDS

GOAL: To explore the concept that liquids have a definite volume, but not a definite shape. Liquids take the shape of their container.

MATERIALS:

- 1—100 ml beaker to measure volume in milliliters (ml)
- 1—100 ml graduated cylinder to measure volume in milliliters (ml)
- 1—triple beam balance to measure mass in grams (g)
- 1—pitcher of water

TEACHER PREPARATION:

1. Set up a center with the materials listed.
2. Schedule the students in groups of four to explore the center at five minute intervals.
3. Make one copy of this page for each student.

STUDENT PROCEDURE:

1. Weigh the empty beaker. Record the weight.

_____ g

2. Weigh the empty graduated cylinder. Record the weight.

_____ g

3. Pour exactly 100 ml of water into the beaker.

4. Weigh the beaker with the water. Record the weight. _____ g

5. Pour the water from the beaker into the graduated cylinder. Record the volume. _____ ml

6. Weigh the graduated cylinder with the water. Record the weight. _____ g

7. Calculate the weight of the water that was in the beaker by subtracting weight of the empty beaker from the weight of the beaker with the water.

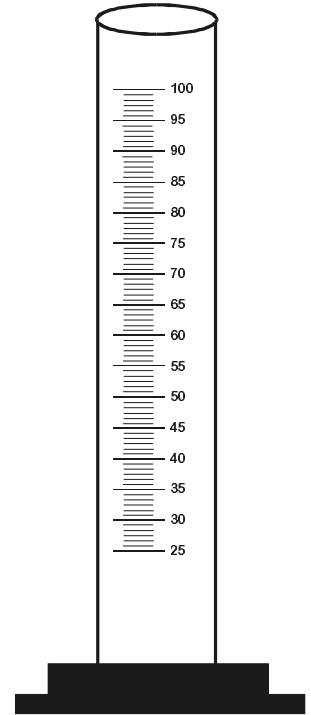
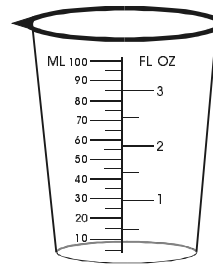
Weight of water = Weight of beaker and water – Weight of empty beaker = _____ g

8. Calculate the weight of the water in the graduated cylinder by subtracting the weight of the empty graduated cylinder from the weight of the graduated cylinder with the water.

Weight of water = Weight of cylinder and water – Weight of empty cylinder = _____ g

9. Compare the answers from steps 7 & 8.

10. Write a conclusion about the volume and shape of liquids that you have learned from this experiment.



A National Report on America's Energy Crisis

Reprinted in part from remarks by U.S. Secretary of Energy Spencer Abraham at the U.S. Chamber of Commerce's National Energy Summit on March 19, 2001

"America faces a major energy supply crisis over the next two decades. The failure to meet this challenge will threaten our nation's economic prosperity, compromise our national security, and literally alter the way we live our lives.

"Three overriding facts starkly define the challenge of America's energy needs over the next two decades:

First, demand for energy is rising across the board, but particularly for natural gas and electricity;

Second, supplies are being limited by a regulatory structure that, in many respects, has failed to keep pace with advances in technology and an uncertain political environment that often discourages investment in desperately needed facilities;

And third, our energy infrastructure—that network of the generators, transmission lines, refineries and pipelines that convert raw resources into usable fuel—is woefully antiquated and inadequate to meet our future needs.

"Unless these challenges are addressed, America's energy supply will be continually at risk ... our citizens will encounter blackouts and other lifestyle-altering disruptions ... and our economy will be hobbled by rising energy prices. Let me briefly outline some of the major issues on the horizon:



"In the next 20 years, according to estimates by the Energy Information Administration, America's demand for oil is projected to increase by 33 percent. Yet as consumption surges, U.S. production continues to drop precipitously. We now produce 39 percent less oil than we did in 1970, losing nearly 4 million barrels a day in the process. And unless energy policy is changed, production will slip further—to just 5.1 million barrels per day by 2020—down from a high of 9.4 million a day 30 years ago.

"This widening gap between demand and domestic supply will make us increasingly dependent upon foreign imports. Back in 1973—at the height of the oil crisis—America imported just 36 percent of its oil from abroad. Today, we import 54 percent. And, if we allow this trend to continue, we will soon be forced to look abroad for some 64 percent of our oil. This will put more power in the hands of foreign suppliers—power they are not reluctant to use, as we just saw when the OPEC cartel decided to reduce oil output by one million barrels a day.

"While this administration does not agree with OPEC's decision, that decision demonstrates the importance of increasing America's production of oil. Securing an affordable, reliable and adequate supply of crude is a critical challenge. But it is only half the oil story. Since 1980, the number of American refineries has been cut in half. There hasn't been a new refinery built in the United States in over 25 years. New regulatory interpretations limit the ability of existing refineries to expand capacity. Add to that regulations that require the production of more than 15 different types of gasoline—and you have a refining industry strained to capacity, leaving us dangerously vulnerable to regional supply disruptions and price spikes.



"Many of the same issues confront the future of natural gas. America's demand for natural gas is projected to rise even more rapidly than oil. If Department of Energy projections are correct, by 2020 Americans will consume 62 percent more natural gas than we do today. More than 9 out of 10 of the announced new electric generating plants will be fired by natural gas.

"Right now, an estimated 40 percent of potential gas resources in the United States are on federal lands that are either closed to exploration or covered by severe restrictions. The last lease sale in some areas of the Gulf of Mexico was more than a decade ago. New discoveries of natural gas in the United States have fallen for three straight years, creating increasing pressure for more imports.

"Even if we find the supplies, moving that gas to market will require an additional 38,000 miles of transmission pipeline and 255,000 miles of distribution lines—at an estimated cost of \$120–\$150 billion. Today's pipeline system can hardly handle the supplies we know exist. Alaska's Prudhoe Bay, for example, produces about 8 billion cubic feet of natural gas a day—approximately 13 percent of America's daily consumption. But that gas never reaches the market. Instead, it is just pumped back into the ground, waiting until a pipeline is built to connect the Alaska fields to the U.S./Canada distribution system.

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A National Report on America's Energy Crisis *continued from previous page...*



"As everyone knows, we also face a real challenge in generating enough electricity to light our homes and run our businesses. Over the next 20 years, the Department of Energy estimates that electricity demand in the United States will increase by 45 percent. That rising growth rate will require the construction of over 1,300 new power plants— about 65 every year. Yet, the last time we added that much power was 1985.

"Furthermore, there is reason to believe that this could turn out to be a conservative estimate. During the 1990s, electricity consumption far outstripped projections, driven by the energy-hungry information economy. Some experts calculate that the demands of the Internet already consume some 8–13 percent of electricity. If demand grows at just the same pace as during the last decade, we'll need nearly 1,900 new plants by 2020—or more than 90 every year—just to keep pace.

"Hundreds of new generating plants will place even greater pressure on our already strained and aging power grid. America's network of transmission lines, substations and transformers was built when utilities were tightly regulated monopolies providing service to assigned regions. Interconnections between suppliers were strictly an emergency backup measure to guard against rare service interruptions. The system was simply not designed for long-haul swapping of power in a highly competitive market.



"Coal has historically been America's number one source for affordable electricity; it currently powers half of America's electricity generators. At today's recovery rates, our nation has enough coal to keep those plants running for the next 250 years.

"Coal generators have already been called upon to make broad reductions in emissions. The Bush Administration supports those efforts—and we will back it up with greater incentives for investment in clean coal technology. But the administration will not regulate coal out of existence ... and we will not support measures that will threaten electricity supplies and significantly raise electricity prices. President Bush made the right decision last week not to impose new federal mandates on emissions of carbon dioxide. If America is to have reliable electricity over the next 20 years, coal must continue to play a major role.



235 "Coal is not the only energy source facing an uncertain future. There hasn't been a new nuclear power plant permit granted since 1979. Many of the 103 existing nuclear plants are not even expected to file for a renewal of their licenses as they expire over the next 15 years.

"Even hydroelectric power generation is expected to fall sharply. Relicensing a hydro facility can take a decade or more and cost millions. And now, even though consumers are faced with potential blackouts and chronic electricity shortages in the West, activists and some political leaders want to breach one or more of the four federal dams on the Snake River to help young salmon on their trek to the sea.



"The challenges are formidable ...the warning signs are obvious ...but I am optimistic because I know this administration's commitment is equal to the task.

"Our national energy policy will be comprehensive. It will reach across every department that touches the energy marketplace—from the Interior Department and the EPA to the Transportation Department and the Department of Energy.

"Our national energy policy will be hemispheric. It will be based on the understanding that our policy cannot stand in isolation from our neighbors throughout the Americas.

"Our national energy policy will stress the need to diversify America's energy supply. It will be founded on the understanding that diversity of supply means security of supply ... and that a broad mix of supply options—from coal to windmills, nuclear to natural gas—will help protect consumers against price spikes and supply disruptions.

"And our national energy policy will be balanced. It will leapfrog the myths that stifle change—rejecting the notion that there is no middle ground between environmental protection, regardless of the cost and energy exploration, regardless of the impact.

"In America, resources become scarce only when our imagination languishes. By engaging that imagination, I am confident we can meet the challenges of today—if complacency yields to action... if we resolve to strike a rational balance between our energy needs and our environmental concerns... and if a national energy policy becomes an urgent priority."

The complete text of the March 19 Report can be viewed at www.energy.gov/HQDocs/speeches/hqspeeches.html.



Short Circuits



Solar Navigator

A new solar lantern is on the market. Only three inches thick, the Solar Navigator can be recharged via an electric outlet or its solar panels. Eight hours in the sun will give consumers three hours of light at night. A full charge from an outlet will provide up to seven hours of use. The lantern also features an AM/FM radio and costs about \$80. See www.skycity.com.hk.

Energy Wall

The Department of Energy is installing a solar wall on its headquarters building in Washington, DC. The 32,100 square foot wall will be the largest photovoltaic array on any federal building in the country and will generate 200 kilowatts of electricity, enough to power sixty homes. See www.doe-sunwall.org.

Strong Growth in World Energy Demand Projected

Worldwide energy consumption is projected to grow by 59 percent over the next two decades, according to the Energy Information Administration (EIA). One-half of the projected growth is expected to occur in the developing countries of Asia—including China, India, and South Korea—and in Central and South America, where strong economic growth spurs robust demand for energy over the forecast period. Other highlights of the International Energy Outlook 2001 include:

- ◆ Natural gas is the fastest growing component of primary world energy consumption.
- ◆ Oil provides more energy consumption than any other source and will continue to do so over the forecast period.
- ◆ Renewable energy consumption is expected to increase by 53 percent by 2020, but its percentage of total consumption will drop from nine to eight percent.
- ◆ Carbon dioxide emissions are projected to grow from 5.8 billion metric tons of carbon equivalent in 1990 to 7.8 billion in 2010 and 9.8 billion by 2020.

Nuclear Power

Nuclear power plants in the United States achieved record generation levels during 2000, despite the fact that the industry has only 103 operating reactors, compared to 111 in 1990. The reliable service of the reactors and decreased production costs have led to increased interest in nuclear power plant license renewal. See www.eia.doe.gov/neic.

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