

# Energy EXCHANGE

A publication of the National Energy Education Development Project

December 2000

## Announcing July 2001

The **2001 Energy Conferences for Educators** are coming to cities you don't want to miss. Two conferences are scheduled for next summer: July 7–11 in Albuquerque, New Mexico, and July 14–18 in Williamsburg, Virginia. These five-day conferences are designed to prepare educators and curriculum specialists to implement hands-on NEED programs and introduce the program to others. Many energy professionals also find the conferences helpful. Watch for the conference brochure to land in your mailbox next week.

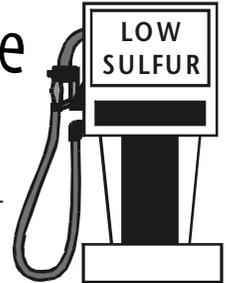


## This Mine of Mine

**This Mine of Mine** is a new activity available to NEED teachers who want to explore coal with their elementary students in a hands-on way. Students learn about the geology of the earth, natural resources, surface mining, and reclamation by building their own plots of land, recovering the coal, then reclaiming the plots. A teacher guide, student guide, worksheet and review are included, as well as extension activities. The materials required are inexpensive and easy to find. The activity is correlated to the National Science Education Content Standards. Call NEED at 1-800-875-5029 to obtain a copy.

This activity was developed by the Ohio Energy Project with funding from the Ohio Coal Development Office/Department of Development, and has been revised by NEED for distribution to NEED teachers with permission.

## A New Gasoline on the Market



BP has introduced a cleaner, low-sulfur gasoline in several Eastern cities, including Washington, Richmond, Baltimore and Philadelphia. The new gasoline has 80 percent less sulfur than the premium gasoline usually sold at the pump. The company has decided to introduce the new gasoline now, even though stricter federal standards reducing the sulfur content in gasoline do not take effect until 2004. The switch will have the environmental effect of removing 40,000 cars from the roads in these four cities, according to a BP spokesperson, who also stated that the new gasoline will be priced competitively with other premium brands.

BP has become a leader among petroleum companies in its environmental efforts. It has withdrawn from a coalition of oil companies, automakers and utilities opposed to the Kyoto Protocol on global warming, and is involved in many research projects to utilize solar energy in a variety of applications.

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# CALENDAR OF EVENTS

For more information about the events listed, call 1-800-875-5029. Many NEED events are being planned – watch this section for updates. If you have NEED programs or workshops in your state that you would like to add to the calendar, email your information to [info@need.org](mailto:info@need.org).

## 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.

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

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### November 2000

11/9 NEED Workshop – Union County, NC  
11/14-15 RI NEED EnergyWise Schools Workshops – Providence, RI  
11/16-17 NSTA Regional Convention: NEED session – 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  
11/29-30 RI NEED Workshop – Providence, RI

### December 2000

12/1 KyNEED Workshop – Lexington, KY  
12/5 KyNEED Workshop – Olive Hill, KY  
12/4-8 Rescheduled Virgin Islands NEED Workshop  
12/11 KyNEED Workshop – Bardstown, KY  
12/10-12 RI EnergyWise High School Energy Management Training – Providence, RI  
12/14-16 IL NEED Teacher and Student Advisory Board Meeting – Chicago, IL  
TBA Pensacola NEED Workshop – Pensacola, FL  
TBA AL NEED Workshop – Mobile & Baldwin Counties, AL  
TBA Pasquotank/Elizabeth City NEED Workshop – Elizabeth City, NC  
TBA Johnston County NEED Workshop – Johnston, NC  
TBA Charlotte-Mecklenburg NEED Workshop – Charlotte, NC  
12/26-29 NEED Headquarters Closed



## Happy Holidays!

from  
Mary, Martha, Karen, Jim & Paul



### January 2001

1/9 NEED Workshop – New Albany, IN

### February 2001

1/9-11 Energy Training Certification – Bloomington, IL

## NEED NEWS

### Milwaukee, Wisconsin and Baltimore, Maryland

NEED Lead Teachers hosted two mini-workshops at regional NSTA meetings in Milwaukee and Baltimore this fall. These sessions introduced teachers to NEED's curriculum materials and programs. Our thanks to Cheryl Shong (WI), Bill Timm (IL), Susie Ostrum (IL), and Scott Sutherland (RI)!

### Charlotte-Mecklenburg, North Carolina

NEED is pleased to announce a partnership with the Charlotte-Mecklenburg School District to become the six-week energy unit for their entire fifth grade. Educators will implement Science of Energy activities and much more.

### Rhode Island EnergyWise Schools Program

With the support of Narragansett Electric, NEED is expanding its Energy Management for Schools program. Seven NEED workshops were held this fall, with support from Narragansett Electric and the Rhode Island Energy Office. An **EnergyWise Schools** conference was conducted to train students to monitor energy consumption in their schools and reduce energy costs for the school system. For more information, contact NEED at [mspruill@need.org](mailto:mspruill@need.org).

# NEED NEWS

## Correlations to State Standards of Learning

In addition to correlations to the National Science Standards, NEED has correlated our materials to the standards of learning in the following states: **Florida, Illinois, North Carolina, Rhode Island, Kentucky, New York, and South Carolina.** Copies of the national and state correlations can be downloaded in pdf format from our website at [www.need.org](http://www.need.org) or obtained by calling 1-800-875-5029.

## Illinois

With the help of Peggy Chamness and Sara Ettinger of the Department of Commerce and Community Affairs, NEED staffer Jim Grieshaber, and ILEED Lead Teachers, the Illinois Energy Education Development program conducted 16 workshops this fall. The participating schools will help create wiser energy users in the state. For more information about the Illinois program, contact Jim Grieshaber at [jgrieshaber@need.org](mailto:jgrieshaber@need.org).

## Mississippi

NEED Lead Teachers Carolyn Wuest and Nancy Stanley (Pensacola, FL) traveled to Tupelo to lead a NEED Workshop at the Mississippi Science Teachers Association meeting. This workshop will set the stage for a strong MS-NEED program. For more information about the Mississippi program, contact Gayle Sims, Mississippi Division of Energy, at (601) 359-6600.

## New Mexico

The largest ever Southeastern NM-NEED Workshop was held September 28, 2000, with schools across southeastern New Mexico participating. The support of Gerald Harrington and more than 30 businesses and associations in the Roswell region made this workshop possible. For information about the Roswell program, contact NEED at [mspruill@need.org](mailto:mspruill@need.org).

## Michigan

Thanks to the support of the Dart Foundation and the Michigan Oil and Gas Association, two MI-NEED Workshops were conducted this fall at Grand Valley State University. Shelly Baumann and her NEED team from North Rockford Middle School hosted 30 educators at a teachers-only workshop in September, followed by a student-teacher workshop in October. For information on the MI-NEED Program, contact NEED at [mspruill@need.org](mailto:mspruill@need.org).

## Kentucky

The KyNEED program continues to educate Kentucky students, teachers, parents, and community members about energy and energy issues. Thanks to the hard work of KyNEED Director Karen Reagor, 30 workshops and inservices have been held in Kentucky this fall, with the help of dedicated NEED Lead Teachers and their student NEED Teams. KyNEED also participated in the Student Weatherization and Audit Training (SWAT) program sponsored by the Kentucky Division of Energy. Thanks to the support of Union Light, Heat and Power, KyNEED programs in Northern Kentucky are reaching more teachers than ever. KyNEED offers classroom visits and NEED's Energy Management for Schools program in that region. For more information about Kentucky programs, contact Karen Reagor at (859) 578-0312 or [kreagor@need.org](mailto:kreagor@need.org).

## TEACHER RESOURCES

**www.villagepower2000.org:** Students will love following the development of this project to provide electricity and Internet access to Porvenir, an isolated village of 600 indigenous people in the Amazonian rainforest of Bolivia. The project is supported by American Electric Power, a sponsor of NEED. Daily updates on the progress of the project can also be found at [www.porvenir.solarquest.com](http://www.porvenir.solarquest.com).

**www.rbrc.org:** This website contains classroom activities with background information on recycling rechargeable batteries from Rechargeable Battery Recycling Corporation, developed by Keep Indianapolis Beautiful, an affiliate of Keep America Beautiful. The lesson plans can be downloaded free of charge and offer a way for students to be involved in recycling the rechargeable batteries they use in their toys.

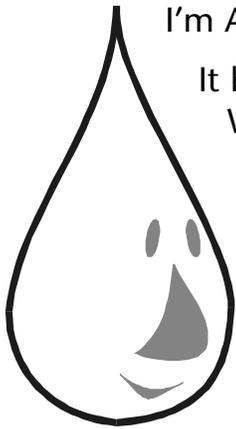
**www.hydro.org:** The National Hydropower Association has developed *Water Works*, a curriculum (Grades 3–8) that explores water and the energy it produces. NHA also has information about hydropower on its website, as well as a handbook, *Relicensing Hydroelectric Power Projects*, that describes the complete relicensing procedure. The handbook can be downloaded from the website. Additional hydropower curriculum materials, such as *The Nature of Water Power* and *Kids in the Creek* can be downloaded from the Foundation for Water and Energy Education's website, [www.fwee.org/education](http://www.fwee.org/education).

**www.eia.doe.gov/kids:** The new EIA Kid's Page is live on the web, thanks to a partnership between NEED and EIA. Take a look and let us know what you think.

**www.energy.gov:** The Department of Energy website has a new look—it's been redesigned to be a helpful stop on the web for up-to-date information about energy. It also has information and activities for kids, such as an interactive periodic table in the Science Room, at [www.energy.gov/kidz/kidzone.html](http://www.energy.gov/kidz/kidzone.html).

**www.eren.doe.gov/consumerinfo:** Check out this DOE website for up-to-date information about ways to save energy at home and at school.

# PRIMARY ENERGY STORY: The Tale of Annie Soakley



I'm Annie Soakley. I am a world traveler. Let me tell you about my last trip.

It began in the Pacific Ocean. I was floating in the waves with my friends. We were bobbing up and down, watching the sun rise over the mountains. What a beautiful sight!

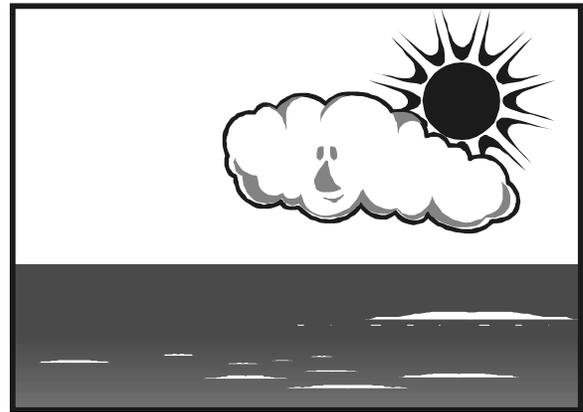
The sun climbed higher in the sky. I began to get warm. I got warmer and warmer. Suddenly, I rose out of the water. I floated toward the sky. I grew bigger and bigger. My molecules got farther and farther apart. I **expanded**.

I didn't look like a drop of water anymore. I was invisible. I had turned into water vapor. I had **evaporated**!

I rose high into the sky. Many of my friends came with me. They had evaporated, too. Together, we formed a cloud.

The wind pushed us through the sky. We sailed over the ocean toward land. The people on the beach were sad to see us. We blocked the sun.

We passed over them and headed for the mountains. The wind kept pushing us.



We reached the mountains as the sun set. The air on top of the mountains was cold. It made me cold. As I cooled, I grew smaller. My molecules got closer together. I turned into a drop of water again. I **condensed**.



I was too heavy for the cloud to hold me. I began falling toward the earth. I was a rain drop! My friends condensed, too. We fell into a small creek and began flowing down the mountain.

The creek flowed into a mighty river. Gravity was pulling us down the mountain. We were moving very fast. We had a lot of energy.

Suddenly, we found ourselves in a long tunnel. A machine called a **turbine** was at the end of the tunnel. We rushed through the turbine, making it spin. The turbine used our energy to make **electricity**.

We flowed back into the river. The river made its way through farms and towns until it reached the ocean. I floated out into the waves, glad to be home again. It had been an exciting trip through the **water cycle**.

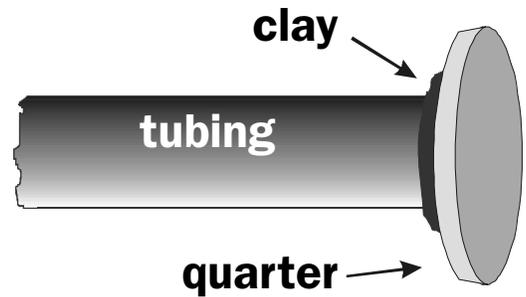
# ELEMENTARY EXPLORATION: SOUND & STATES OF MATTER

**GOAL:** To explore how sound waves travel in different states of matter.

To answer the question: Does sound travel better in solids, liquids, or gases?

## MATERIALS:

- 2—8' length of 1/2" soft plastic tubing\*
- 6—Quarters or tokens of similar size
- Clay
- Pencils, paper, & tape
- Water
- 8' table



## PREPARATION:

1. Fill one of the tubes with water, seal both ends with small amounts of clay, and label it Tube 2. Seal the ends of the other tube so that it is filled with air and label it Tube 1.

## PROCEDURE:

1. Set up a center on the 8' table with the tubes, clay, cups, quarters, pencils and paper.
2. Schedule the students in groups of four to explore the center at five minute intervals.
3. Make a poster with the following instructions for the center:

**Does sound travel better in solids, liquids or gases? Write your hypothesis on a piece of paper. Conduct the experiment to find out.**

1. Stretch out Tube 1, which is filled with air, along the table. Attach a quarter to each end of the tube with a small amount of clay.
  2. Two students (A & B) hold the ends of the tube and two students (C & D) lift the tube off the table.
  3. Student A hold the quarter flat to your face right in front of your ear. Student B tap the quarter with a pencil, barely making a noise. Student A observe the loudness of the sound.
  4. Student B listen and Student A tap.
  5. Students A & B hold the tube, while Students C & D listen and tap.
  6. Conduct Steps 1 through 5 with Tube 2, which is filled with water. Make sure you tap with the same amount of energy.
  7. Stick quarters to both ends of the table with a small amount of clay. Conduct the same experiment with sound traveling through the table.
  8. In which experiment was the tapping loudest? Each person write his/her observations on the paper.
  9. As a group, come to a conclusion to answer the question. Was your hypothesis correct?
4. As an extension, experiment with different solids to see if some solids transfer sound energy better than others—wood versus metal, for example.

\* for information on obtaining inexpensive tubing, call 1-800-875-5029, or check your local aquarium supply store.

# INTERMEDIATE ACTIVITY: EXPLORING DENSITY

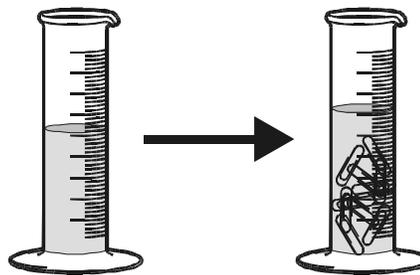
**GOALS:** To develop students' critical thinking skills and introduce them to the relationship between mass, volume and density by having them determine if two objects are made of the same material when given information and equipment, but not the procedure for determining volume by the amount of water an object displaces.

To reinforce students' ability to calculate an object's density using its mass and volume ( $D = m/V$ ).

## MATERIALS:

1. Make the following equipment and materials accessible to the students, but do not tell them which equipment to use. For example, tell the students they can use any of the equipment on a given shelf.

- 6 triple beam balances
- 6 graduated cylinders (100 ml)
- 180 large metal paper clips
- 180 small metal paper clips
- Water
- Calculators (optional)



## PROCEDURE:

1. Place students into six groups. Give each group approximately 30 large paper clips, 30 small paper clips, and the assignment below. Tell them where the equipment is that they can use.
2. Instruct the students to work together to determine a procedure and complete the assignment.
3. If a group has difficulty devising a procedure, ask questions to guide them in the right direction, but do not tell them how to proceed. (For example, how can you use water to determine the volume of the paper clips?)
4. After 15 minutes, evaluate the activity with the students. (The mass of the paper clips is determined using the triple beam balance. The volume is determined by measuring how much water the paper clips displace in the graduated cylinder. The density is determined by dividing the mass in grams by the volume in cubic centimeters.)

**EXTENSION/ALTERNATIVE:** Determine if small pieces of anthracite and bituminous coal have different densities. Teachers may obtain free coal samples from the American Coal Foundation at [www.wgcn.com/acf.htm](http://www.wgcn.com/acf.htm).

**Question:** Are the small and large paper clips made of the same material?

**Hypothesis:**

**Facts:** Mass ( $m$ ) is the amount of matter in an object. Mass is measured in grams ( $gm$ ).  
Volume ( $V$ ) is the amount of space an object takes up and is measured in cubic centimeters ( $cc$ ).  
Density ( $D$ ) is the amount of matter in a specific volume and is calculated as  $D = m/V$ .  
Different materials have different densities.

**Conversion:** One cubic centimeter is equal to one milliliter ( $1cc = 1ml$ )

**Procedure:**

**Results:**

**Conclusion:**

## SECONDARY ARTICLE: THE SOLAR SAILOR

The **Solar Sailor** is the first sun-and-wind-powered passenger boat in commercial use. Launched in Sydney Harbor in June as a ferry boat, the vessel can carry up to 100 passengers. It uses solar panels on its deck to capture sunlight and has additional panels on solar wings, which can function as sails when they are raised. It also has a battery to store power and a gas-powered engine for emergencies. The 69-foot boat can reach speeds of 15 knots on solar and wind power alone.

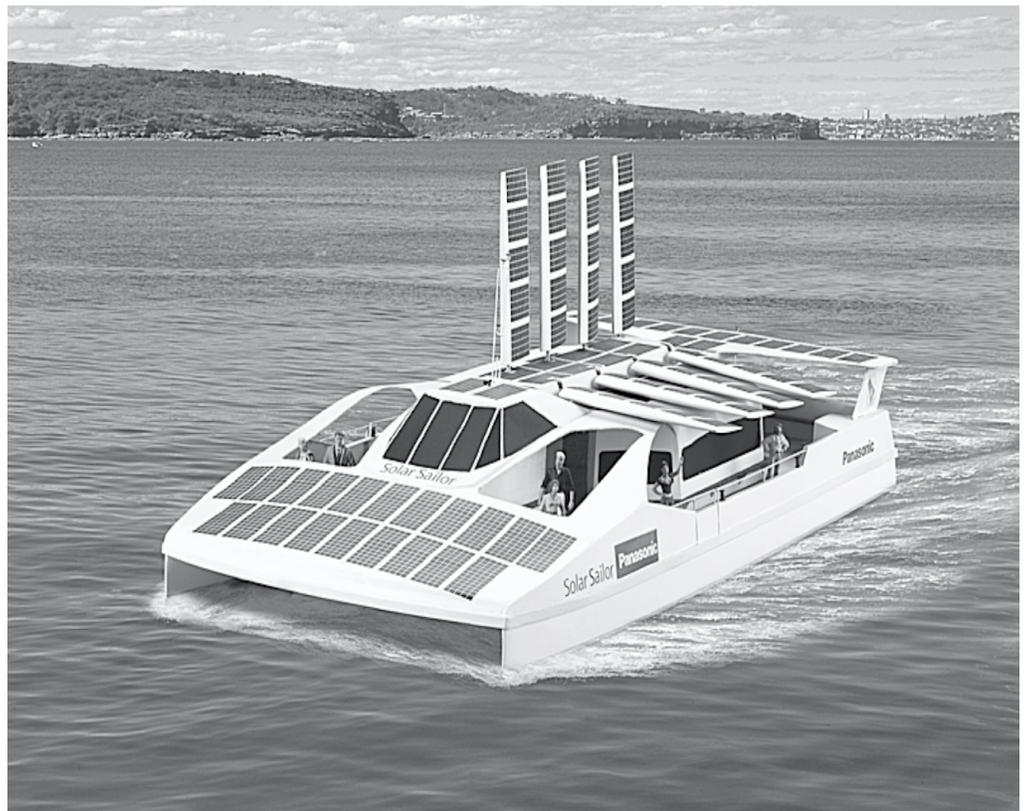
The unique feature of the **Solar Sailor** is its revolutionary solar wings. These solar wings are pivotally mounted at the base—like a bird's wings—to allow multi-plane movement to adapt to prevailing wind and sun conditions. The wings can also be reefed (lowered) and furled (raised) from zero to 100 percent, so that the sail area exposed to the wind can be controlled, altering the boat's center of gravity to make it seaworthy in different weather conditions. The wings can be completely reefed, for example, during a storm.

The **Solar Sailor** is the brainchild of Dr. Robert Dane, an Australian doctor. In 1996, Dr. Dane attended the annual Advanced Technology Boat Race in Canberra. What he saw that day sparked an idea that led him to sell his medical practice to build a boat that would win the next year's event. Twelve months later, a working prototype, the Marjorie K, used only the energy of the sun and the wind to complete more laps of Lake Burley Griffin than any of its 40 national and international competitors. This prototype achieved a steady boat speed of 6 knots on wind power alone while diverting the solar power into batteries. When power was transferred to the electric outboard motor, the Marjorie K reached speeds of 12–15 knots.

Dr. Dane then set about building a team to make **Solar Sailor** commercially viable. With the assistance of people like surfboard maker Bruce Heggie, who helped bring the solar wings to life, and Max Hayward, an ex-British Aerospace employee, Dr. Dane and his team designed and constructed the world's first **Solar Sailor**. The vessel was awarded the gold medal at the 1999 Asian Innovation Awards and recently won a \$1 million grant from the Australian Federal Government. The New South Wales Government also provided \$45,000 in funding and included the **Solar Sailor** as part of the Australian Technology Showcase.

The **Solar Sailor** represents benefits for both passengers and the environment. Under any form of propulsion, the **Solar Sailor** creates minimal noise, fumes, vibrations, air pollution, greenhouse gas emissions and no water pollution. Dr. Dane's company believes the design can be used for making any sized vessel, including ocean liners, and plans to build more boats for use in sensitive environmental areas.

For more information on the **Solar Sailor**, go to [www.solarsailor.com.au](http://www.solarsailor.com.au).



# Short Circuits

## **A Solar Mower that Mows the Lawn All by Itself**

It looks like a turtle, but its shell contains solar cells. The Solar Mower is an environmentally friendly method of cutting the grass, new from Husqvarna and scheduled for release in Spring 2001. It is a fully-automatic, silent and emissions-free cutting machine, powered by sunlight alone. The Solar Mower can cut from sunrise to sunset, roaming across the lawn in a random pattern with sensors so that it avoids objects. How does it operate? Self-propelled and computer driven, the mower is powered by solar cells, which convert sunlight into electricity. A low voltage boundary wire, stapled or buried on your lawn, defines the mowing area. For more information, go to [www.husqvarna.com](http://www.husqvarna.com).

## **The Internet and Energy Consumption**

The U.S. Department of Energy projects that Americans will use about 470 billion kilowatthours of electricity in 2000 to run their computers. That's almost ten times more electricity than our computers consumed in 1993. Maybe, however, the Internet is reducing our travel—while the economy grew about 5.6 percent annually in the last six years, annual energy consumption only grew about 1.4 percent.

## **Lasting Effects of Chernobyl**

Fourteen years after the Chernobyl nuclear accident, crops grown in contaminated land surrounding the power plant show a mutation rate six times higher than normal, an unexpectedly high rate, leading researchers to suggest that chronic exposure to low levels of radiation might have effects that aren't yet known.

## **Winter Fuel Outlook Bleak**

In its Winter Fuels Outlook released on October 6, the Energy Information Administration predicts that natural gas prices will increase for consumers this winter by 40–50 percent over last winter, an average of \$240 per consumer home. Home heating oil prices are expected to rise by \$190 per home from last year's high prices in the Northeast, while electricity prices could increase by as much as 12 percent. EIA's price predictions are based on normal winter weather, and projected costs could be higher if the weather is colder than normal. You can get the complete EIA report at [www.eia.doe.gov/emeu/steo/pub/contents.html](http://www.eia.doe.gov/emeu/steo/pub/contents.html).



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