DECEMBER 2011/JANUARY 2012

ENERGY EXCHANGE

ENERGY 101

Recently, NEED had the privilege of talking to **Matthew Inman**. A teacher from Spokane, WA, Matthew is serving his second year as an Albert Einstein Distinguished Educator Fellow with the U.S. Department of Energy, Office of Science, Energy Efficiency and Renewable Energy. His project for the last two years has been coordinating the development of the Department of Energy's, *Energy Literacy Guide*.

WHAT WE'RE DOING AND WHY

Current national and global issues, such as safeguarding the environment and our nation's energy security, highlight the need for energy education. To better educate Americans about energy, the U.S. Department of Energy (DOE) is leading a collaborative effort called the Energy Literacy Initiative (ELI), to define and promote energy literacy. If more people had a basic understanding of energy, energy resources, generation, and efficiency, families and businesses could make more informed decisions on ways to save money by saving energy. More broadly, people would better understand the energy landscape, allowing them to better understand local, national, and international energy policy.

THE ELI COMMUNITY

DOE's energy literacy efforts bring together stakeholders from federal agencies, universities, community colleges, professional societies, national labs, power utilities, museums, community organizations, business and industry, interested members of the public and more. Through public meetings and online collaborative tools, these stakeholders have contributed a great deal in forming the document and demonstrating a passion for energy education. Stakeholder input has helped create a thoughtful, measured approach to energy literacy and a quality document.

THE DOCUMENT

Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education is expected to be completed by the end of 2011. This document will follow a model established by previous literacy projects.

Energy Literacy presents energy concepts that, if understood and applied, will help individuals and communities make informed energy decisions. The guide does not seek to identify all areas of energy understanding, but rather focuses on those that are essential for all citizens. An inherently interdisciplinary topic, energy education involves civics, geography, social studies, history, economics, sociology, technology, engineering, and the natural sciences.

See ENERGY 101, page 4

SPONSOR SPOTLIGHT

HAWAII ENERGY

The NEED Project and Hawaii Energy have teamed up to bring energy education resources to teachers and students in Hawaii. The partnership will provide training to 200 local educators, reaching approximately 16,000 students on the islands on Lanai, Hawaii, Maui, Molokai, and Oahu. Attendees will receive hands-on classroom materials which will assist them in teaching about energy and energy efficiency in their schools. Educational grants will be available to educators and extra-curricular clubs interested in educating their local communities on energy efficiency and conservation. NEED looks forward to holding the first Hawaii Energy Education workshops on Oahu and Hawaii in December!

Hawaii Energy is the state energy conservation and efficiency program implemented to help reduce Hawaii's dependence on foreign oil. The mission of Hawaii Energy is to educate, encourage and incentivize the ratepayers of Hawaii to invest in conservation behaviors and efficiency measures to reduce Hawaii's dependence on imported fuels. For more information on Hawaii Energy, visit www.hawaiienergy.com.

Honolulu Botanical Garden

HOW DO WE SAVE ENERGY?

A poem by Amy Shaker, Michelle Rucker, Clark Baker, and Sandra McPhillips

How do we save energy?
Let me count the ways.

People need to follow now
And all the days

Save as much for the generation to come
Don't use a lot, just use some

No running water all the time
To do that would be a crime

All the time, take a five minute shower
You know you definitely have the power

Don't blow a fuse
Just reduce, recycle, and reuse

Step outside and take a breath
Save energy, no greenhouse effect

Don't walk outside and say "whew"
There is way too much CO_2

You're using too much for goodness sake
Please take advantage of the state tax break

Use it up, wear it out
Make it do, or do without

THE NEED PROJECT

The NEED Project
Putting Energy into Education

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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.

Energy Exchange is published by NEED for educators and students. We welcome your questions, comments, and suggestions.

Images courtesy Countdown Entertainment, LLC

LIGHTING UP NEW YEAR'S EVE

In 1904, 200,000 people celebrated the end of the year with an all-day street festival and fireworks show in Times Square. Ever since then, Times Square has been the place to be in New York City to say goodbye to one year and hello to a new one. When fireworks were banned in the city in 1906, Alfred Ochs, the organizer of the celebration, wasn't deterred. He replaced the fireworks with an illuminated ball, now known as the New Year's Eve Ball.

The first New Year's Eve Ball was made of iron and wood and was made of 100 35-watt light bulbs. It was five feet in diameter and weighed 700 pounds. Today, the Ball is 12 feet in diameter and weighs 11,875 pounds. Made by Waterford Crystal, the Ball is composed of 2,688 crystal triangles. Engineers designed the ball, which is actually a geodesic sphere, to withstand high winds, changing temperatures, and precipitation so that it can be displayed on top of One Times Square throughout the year.

While the Ball is always on display, it is on New Year's Eve when the magic happens. Beginning in 2007, LEDs were to thank for the spectacular light show on display as the Ball dropped. Today, a total of 32,256 red, blue, green, and white LEDs light up the Ball. Individual lights are arranged in 672 modules that contain 12 of each color. Technicians program the lights to create more than 16 million colors and patterns on the Ball. The LED lights on the Ball consume the same amount of energy per hour as two traditional home ovens.

EVOLUTION OF AN ICON

A look at how the New Year's Eve Ball has changed since the tradition began:

1907 | wood and iron, 700 pounds, 100 white light bulbs

1920 | iron, 400 pounds

1955 | aluminum, 150 pounds, 180 light bulbs

1995 | aluminum skin, rhinestones, and computer controls added

1999 | crystal ball

2007 | first use of LED technology

TEACHING TEACHERS IN **ABU DHABI**

Teachers in Abu Dhabi, United Arab Emirates wanted information on how to teach their students about energy. So, the Society of Petroleum Engineers and the NEED Project collaborated to produce a video workshop demonstrating hands-on activities from the SPE web site, energy4me, NEED's *Fossil Fuels to Products* curriculum, and an energy4me kit designed for speakers and educators. Marva Morrow, an educational consultant for SPE, and Melanie Harper, a NEED Program Associate, led this assignment. Through the video, teachers learned how to teach their students about density, pressure, sound waves, porosity, core sampling, modeling oil reserves, and oil extraction using hands on activities. Connections between the activities and real world applications were highlighted for the students.

In the Spring of 2012, the energy4me kit will be revised and updated. All of the new materials will be online at www.energy4me.org and will integrate perfectly with NEED curriculum. The *Oil and Natural Gas* book SPE provides to teachers is now printed in Arabic, Chinese, English, French, and Spanish. The lessons and activities have been correlated to the information in the book. For more information, visit www.energy4me.org.

ENERGY 101, continued from page 1

Energy Literacy will touch on all of these subjects.

The guide identifies seven Essential Principles:

1. Energy is a physical quantity that follows precise natural laws. [Physical Science]
2. Physical processes on Earth are the result of energy flow through the Earth system. [Earth Science]
3. Biological processes depend on energy flows through the Earth system. [Life Science]
4. Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination. [Engineering and Technology]
5. Energy decisions are influenced by economic, political, environmental and social factors. [Decisions]
6. The amount of energy used by human society depends on many factors. [Behavior]
7. The quality of life of individuals and societies is affected by energy choices. [Quality of Life]

Supporting each Essential Principle are six to eight fundamental concepts that take the principles deeper. The fundamental concepts have been drawn, in part, from existing education standards and benchmarks.

WHO AND WHAT IS THE DOCUMENT FOR?

Although everyone will be encouraged to read and use Energy Literacy, it is specifically intended for the energy educator across disciplines. The document will be used in multiple contexts and as a guide for energy education at all age levels. For example, formal educators such as K-12 and university educators will use it as a resource for curriculum design, and for standards and assessment development. Community, museum and library educators will use it as a resource when designing education and outreach opportunities specific to their venues and audiences.

In the recently released Framework for K-12 Science Education, The National Research Council's Board on Science Education has recommended that energy be one of a handful of concepts that cut across all of the Next Generation Science Standards (NGSS). Work has recently begun to draft these standards, and the writing committee will soon be receiving a copy of the *Essential Principles and Fundamental Concepts of Energy Education* for reference as they go about their work.

Ultimately, the goal of ELI is to foster a culture of smart energy decisions in business, at home, and throughout our communities on a national level.

WHAT COMES NEXT?

Writing the *Energy Literacy Guide* is just the first phase of the larger energy education goal. A second phase to the project is essential. This phase will focus on developing education and outreach materials to accompany the framework, helping lay a foundation for energy education nationwide. DOE is calling on educators, academic institutions, federal agencies, industry, organizations, and beyond to increase support for energy education. Success in meeting the energy education challenge depends on the involvement and efforts of institutions and individuals nationwide.

WHAT DOES THIS MEAN FOR NEED?

Energy Literacy will have an associated web site. Many of NEED's materials and resources will be available via the site and connected to specific Principles and Concepts from the document. There are also plans to include connections to the Energy Literacy Concepts in NEED materials in the same way those connections to National and State standards are included. NEED Project educators are encouraged to use the framework as a guide as they go about their work in energy education.

HIGHLIGHTS OF NEED'S FIRST ANNUAL BACK-TO-SCHOOL

NATIONAL SOLAR BAKE-OFF

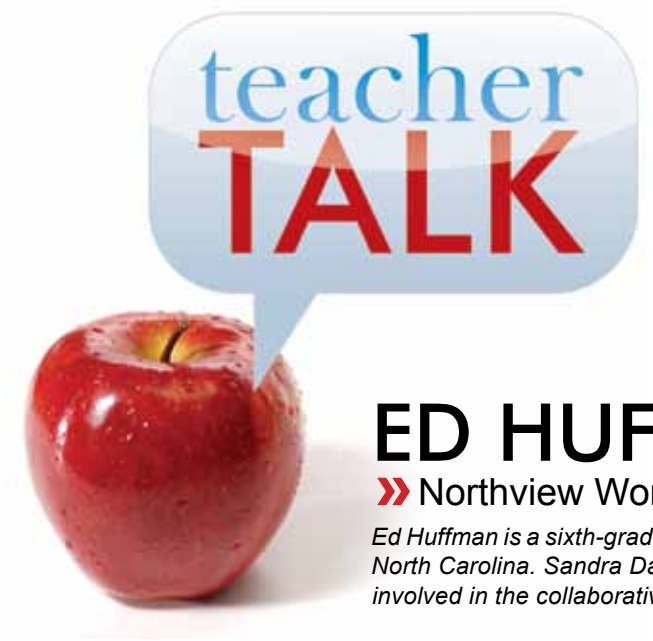
This Fall, NEED held the first ever Back to School Solar Bake-Off. Participants from Raleigh, North Carolina to Bakersfield, CA shared their solar baking endeavors on NEED's Facebook page. Participants baked chocolate chip, sugar, and M&M cookies. They also baked carrots, pizzas, and s'mores! The weather varied in each location. Some schools had the perfect day for baking, while others encountered cloudy skies and drizzling rain. Some results were perfectly cooked, some cookies never fully baked and had to be finished in an electric oven, and in one case, the cookies even burned. No matter what the results were, it is clear that everyone involved had a good time using solar energy for baking.

Check out NEED's Facebook page at www.facebook.com/NEEDProject for pictures of the variety of solar ovens used in the Solar Bake-Off. Also go to www.NEED.org/solarbakeoff to see a summary of the results and to conduct your own analysis of how weather, latitude and longitude played a role in the results.

Students at Pine Branch High School in Burtonsville, MD designed their own solar ovens. While the outside temperature was only 70 degrees Fahrenheit, the inside the ovens it reached 250 degrees. Cookies had to be removed before they burned!

Ms. Stevens' class in Raleigh, NC made their own ovens out of pizza boxes and baked pizzas and s'mores! They report that the pizzas took about an hour to cook and s'mores took about 20 minutes.

Students at the Bosque School, Albuquerque, NM.



ED HUFFMAN

» Northview World School, Statesville, N.C.

Ed Huffman is a sixth-grade science teacher for Northview, which is an IB World School, in Statesville, North Carolina. Sandra Davidson, a math teacher, and English teacher, Rachel Dominic, were also involved in the collaborative hydrosphere unit.

WHY DO YOU FOCUS ON ENERGY IN YOUR CURRICULUM?

In North Carolina, the Standard Course of Study for 8th grade science mandates that these learning essentials be covered. Students will be challenged with these concepts on the NC End-of-Grade Science Test which they must pass as a gateway to high school. So I cover them as required, but I, as do the other teachers here at our IB school, also enrich the topics with further study and learning targets which naturally fit with the state goals and objectives. This creates the opportunity to do interdisciplinary units within the school.

HOW DOES THE USE OF USING NEED MATERIALS AID YOU IN TEACHING ABOUT ENERGY?

NEED has some wonderfully concise and thorough materials which I have used for my own personal learning, as well as implementing these resources in lessons. I have also made these materials available for my students during projects and assignments as source references.

NEED materials further students' learning, assist them with assignments, and provide an excellent source of information and understanding as it applies to science. I have used them not just in 8th grade but additionally in my high school science classes as well.

I have used the resource booklets and written publications the most. Your *Intermediate Energy Infobook* and *Secondary Energy Infobook* are wonderful. Your web site is a great resource. Our Media Center Coordinator has built an excellent resource center in our library through NEED and the services provided and that's available for students and staff.

HOW DO YOU INTEGRATE ENERGY INTO OTHER UNITS SUCH AS ENGLISH, HISTORY, LANGUAGE ARTS, ETC.?

As part of IB, we do interdisciplinary units on a regular basis. One of my state science goals is that students will understand

Students participating in the collaborative hydrosphere unit.

the hydrosphere, water on Earth. Together with the Language Arts and Math Departments, we created a unit centering on the hydrosphere. During the course of this unit we focus our students' learning through the lens of our environment, and students learn to understand the role they must take in preserving water. They explore the illusion of abundance of water which we seem to have. We highlight the concept that students have a responsibility to use our natural resources intelligently and challenge them with this unit question: In what ways is water perhaps the most important natural resource on this planet?

From a science perspective, we explore water's chemistry and unique properties. We explore the distribution, quality, and quantity of water across Earth. Students learn water is not evenly distributed as people die during droughts and in floods at the same point in time. We discuss water's usages, from transportation and recreation to biological and industrial needs. We compare and contrast energy and the role water

K-12 ACTIVITY

HOME ENERGY AUDIT

It takes a lot of energy to keep our homes at comfortable temperatures, heat our water, and power our electronics. The average U.S. family spends about $1,900 each year on home utility bills. Chances are students and their families can take steps to reduce their energy consumption, saving money and energy resources.

With winter break upon us, this month's activity is a home energy audit. Make copies of the Home Energy Audit form on pages 8-9, and encourage students to conduct an audit with their families. With older students, you may want to go over how to calculate the amount of energy a device uses by looking at nameplates. While conducting their home energy audit, students can then determine how much electricity their devices are consuming. For this extension, use Electric Nameplates Investigation and Cost of Using Machines on pages 26-27 in the *Learning and Conserving* Student Guide.

When students return to school in January, have them bring their audits back and discuss what students found when they conducted their audit. Were there machines and lights left on when they weren't needed? What ideas did students think of with their families that would help them save energy?

Inspectors check a home heating system as part of an energy audit.

A professional performs a home energy audit in Colorado.

NEED has a variety of energy management materials to provide students with additional background information on energy consumption, and activities you can do in class as well.

PRIMARY
- Building Buddies
- Using and Saving Energy

ELEMENTARY
- Building Buddies
- Monitoring and Mentoring
- Saving Energy at Home and School

INTERMEDIATE
- Energy Conservation Contract
- Monitoring and Mentoring
- Plug Loads
- Saving Energy at Home and School

SECONDARY
- Learning and Conserving
- Plug Loads
- Saving Energy at Home and School
- School Energy Survey

Coming in 2012 is a brand new module, *Building Science*. Designed for intermediate level tech classes, this module will examine how energy flows in and out of a home, and how that energy can be managed.

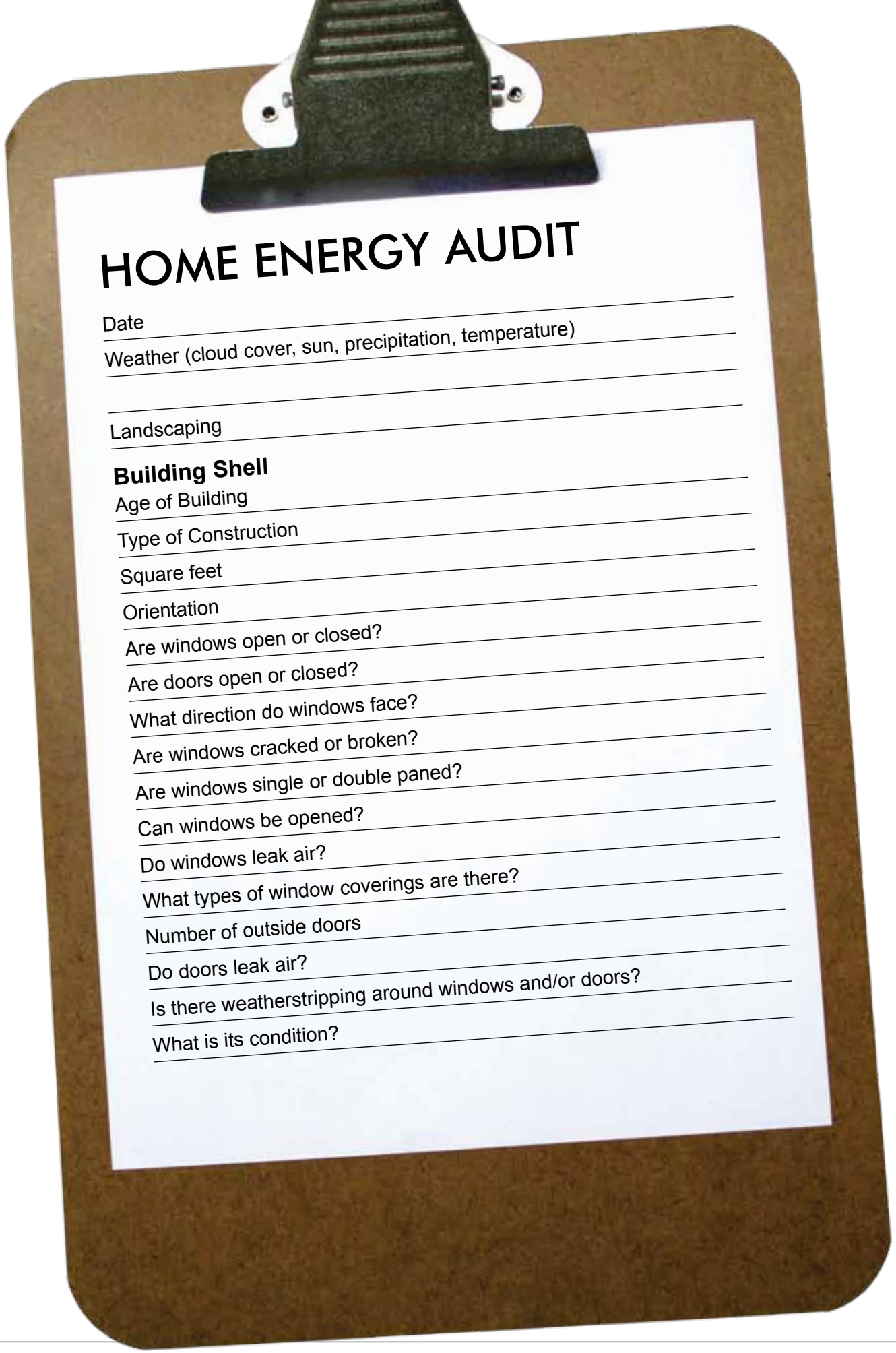
plays in nuclear, fossil fuel, hydroelectric, tidal, geothermal, and other renewable and nonrenewable energy sources. We explore point source and nonpoint sources of water pollution. We discuss the moral, ethical, and legal aspects of water usage. We do this across the curriculum, and this unit lends itself really well to our different disciplines. I have the easier job of it all since I'm teaching the main unit, and our other department teachers do a terrific job of finding ways in which they can incorporate it into their lessons.

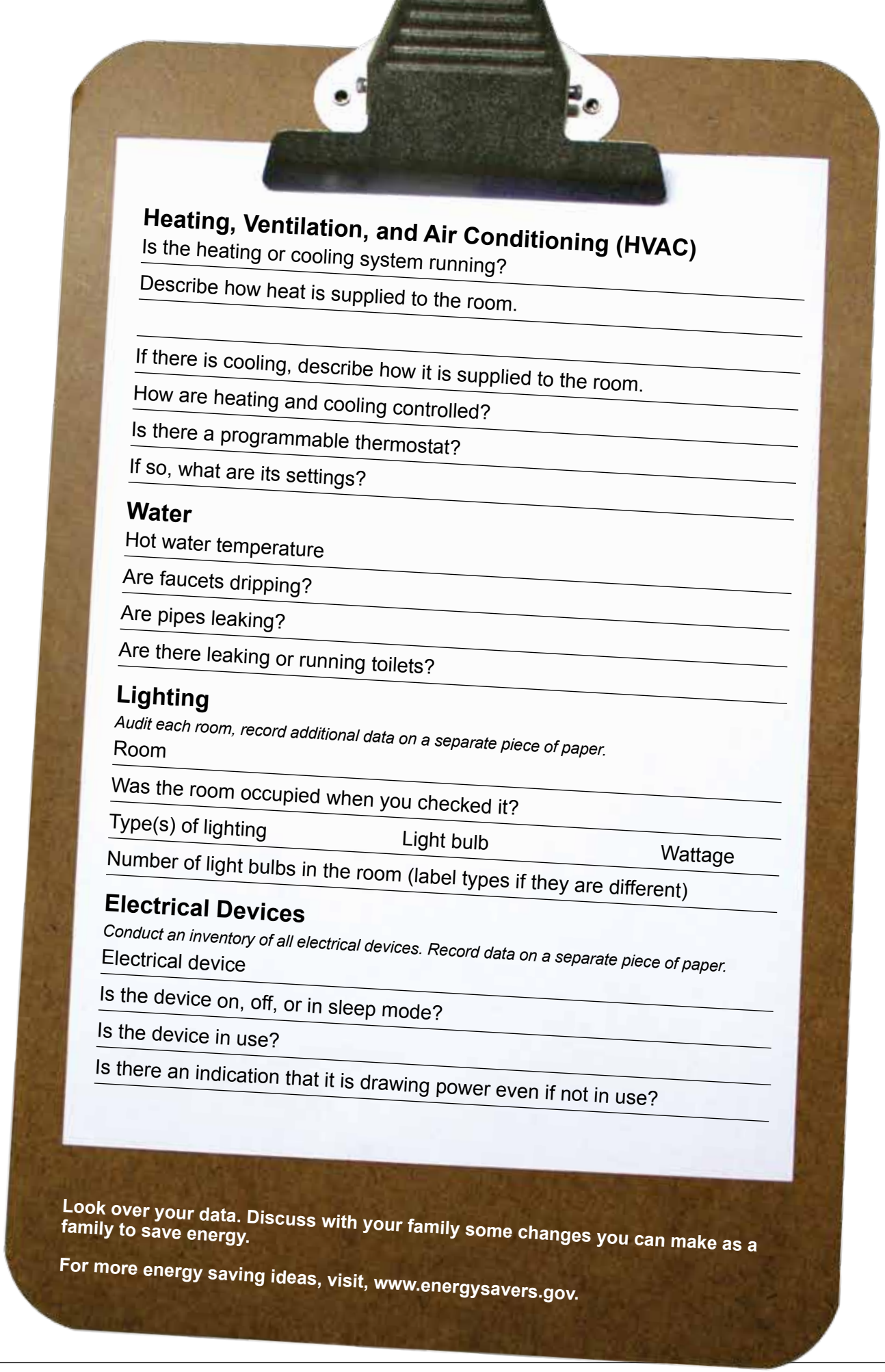
HOW DO YOU INVOLVE YOUR COMMUNITY WITH YOUR ACTIVITIES AND CLASSES?

I have guest speakers join us in class, and of course we can take field trips. I also utilize practical applications such as having students analyze our local water department's Annual Drinking Water Quality Report. I bring in the Water Rate Increase letter I receive from my water provider and this can be used in math classes for lessons. They also provide the cost of water to other commonly purchased goods and services and it makes for a nice math lesson. NC and SC have engaged in water rights legalities over the Catawba River and we look at that. We look at laws concerning county water transfers as there are bill boards along our interstate highways that argue this. These would make for great humanities lessons for our interdisciplinary unit of water.

ANY FINAL THOUGHTS ABOUT ENERGY EDUCATION?

This is one of the best programs our students have ever participated in and they enjoy all of the activities. The materials provided by the NEED organization are relevant and grade appropriate, which makes it easy for the teachers to find the information they need.


HOME ENERGY AUDIT
Date
Weather (cloud cover, sun, precipitation, temperature)
Landscaping
Building Shell
Age of Building
Type of Construction
Square feet
Orientation
Are windows open or closed?
Are doors open or closed?
What direction do windows face?
Are windows cracked or broken?
Are windows single or double paned?
Can windows be opened?
Do windows leak air?
What types of window coverings are there?
Number of outside doors
Do doors leak air?
Is there weatherstripping around windows and/or doors?
What is its condition?



Heating, Ventilation, and Air Conditioning (HVAC)

Is the heating or cooling system running?

Describe how heat is supplied to the room.

If there is cooling, describe how it is supplied to the room.

How are heating and cooling controlled?

Is there a programmable thermostat?

If so, what are its settings?

Water

Hot water temperature

Are faucets dripping?

Are pipes leaking?

Are there leaking or running toilets?

Lighting

Audit each room, record additional data on a separate piece of paper.

Room

Was the room occupied when you checked it?

Type(s) of lighting Light bulb Wattage

Number of light bulbs in the room (label types if they are different)

Electrical Devices

Conduct an inventory of all electrical devices. Record data on a separate piece of paper.

Electrical device

Is the device on, off, or in sleep mode?

Is the device in use?

Is there an indication that it is drawing power even if not in use?

Look over your data. Discuss with your family some changes you can make as a family to save energy.

For more energy saving ideas, visit, www.energysavers.gov.

NEW AND NOTEWORTHY

NEED EDUCATOR, DEBBIE FITTON HONORED

NEED is proud to congratulate Debbie Fitton on being named Science Educator of the Year for Barnstable County by the Massachusetts Association of Science Teachers. Debbie has been involved in science education for over 35 years. She began her career as a wetland scientist and interpretive field biologist, then was a science education specialist. Today Debbie is the Energy Education Programs and Outreach Coordinator for Cape Light Compact. Debbie manages the education and outreach programs in all the schools on Cape Cod and Martha's Vineyard. Debbie's energy education efforts include providing classroom presentations, graduate level energy education courses for teachers, presenting teacher workshops and trainings, and hosting Energy Days, Energy Carnivals, and a Youth Energy and Sustainability Film Festival. NEED thanks Debbie for her hard work and dedication to educating teachers and students about energy.

INTERNATIONAL YEAR OF CHEMISTRY

NEED, Shell Chemicals, the International Council of Chemical Associations, and the American Chemistry Council have joined together to bring teachers and students a deeper look at chemistry in daily life, and the chemical industry's contribution to energy efficiency. Visit http://chemistry.NEED.org for background information and hands-on activities to do with your students.

YOUTH AWARDS PROGRAM

It's not too early to start planning your Youth Awards Project and portfolio! For information on how to participate in NEED's Youth Awards Program for Energy Achievement visit www.NEED.org/Youth-Awards.

H_2 EDUCATE WORKSHOPS WERE BUSY THIS FALL

As the sixth year of the U.S. Department of Energy funded Hydrogen Education Program comes to a close, NEED has reached over 8,000 educators with the popular and fun H_2 Educate curriculum and teacher workshops. In September and October, hydrogen workshops were hosted in Syracuse, Denver, Washington, D.C., and Las Vegas. The October 29, 2011 H_2 Educate workshop was co-hosted by NEED's award-winning schools Estes McDoniel and Sue Morrow Elementary Schools in Las Vegas. More than 85 educators participated in the workshop. NEED thanks Dr. Mike Rodriguez, Principal of McDoniel Elementary, for his leadership and support.

NEED AND THE ENERGY INFORMATION ADMINISTRATION PARTNER ON THE ENERGY INDUSTRY STUDY PROGRAM

NEED and EIA worked together to bring the seventh year of the Energy Industry Study Program to EIA employees. The 16 week program includes speakers from a wide spectrum of the energy industry and a series of energy field trips – allowing EIA employees to see the energy they analyze and forecast at a local level. NEED thanks its partners and sponsors for providing presentations and opening facilities for field trips. The program is fun, engaging, and enlightening to all.

OFFSHORE ENERGY WORKSHOP IN COLORADO?

But there's no offshore anything in Colorado! The National Ocean Industries Association and NEED partnered to host the NOIA Energy Awareness Month Offshore Energy Workshop in conjunction with NOIA's Fall Meeting in Colorado Springs, Colorado. Fifty educators were treated to presentations and discussions with leaders in offshore energy including Oceaneering, the International Association of Geophysical Contractors, NOIA, and the Marine Spill Response Corporation. Presentations are available to view on NEED's multimedia page at www.NEED.org.

SHELL WORKSHOPS ARE A BIG HIT

The new Shell-sponsored NEED workshop was a huge hit for 65 educators in Houston, Texas. The agenda included the new NEED-developed *Chemistry and Energy Efficiency* module. NEED is proud to work with Shell in the company's effort to provide teachers the opportunity to more deeply integrate energy into their classrooms in hope of encouraging students to seek careers in science and engineering.

THE NEED ENERGY CONFERENCE FOR EDUCATORS IS JULY 15-19, 2012

Join NEED for the 2012 National Energy Conference for Educators to be held in Arlington, Virginia. The conference is designed to provide participants with five days of energy education content and classroom tools. Hosted in Arlington, Virginia (Metropolitan Washington, D.C.) the conference promises to energize teachers and provide valuable professional development for all attendees. NEED seeks sponsors willing to provide scholarships for interested teachers. Registration to the conference is $1,100. To apply, visit www.NEED.org/summertraining.

ENERGY PRE/POST POLLS ONLINE!

As part of a 2011-2012 evaluation, NEED seeks volunteers to commit to use the online polls with their students before and after using NEED materials in the classroom. Teachers should have students take the Pre-Poll at the appropriate grade level and return after students learn about energy to take the Post-Poll. Email info@NEED.org to volunteer! Participating classes will be entered to win a NEED Energy Kit ($400 value) of their teacher's choice!

NEED IS BLOGGING!

Are you looking for more resources and details about the things we do each day at NEED? Read NEED's brand new blog to get an inside glimpse of all we do to produce energy curriculum, host teacher trainings, and programming. Find our blog at http://blog.NEED.org. Do you have a blog idea or would like to share what you are doing in your classroom? We would love to have you as a guest blogger! Send your blog and a photo to info@NEED.org.

U.S. DEPARTMENT OF EDUCATION
GreenRibbonSchools

GREEN RIBBON SCHOOLS

The U.S. Department of Education is recognizing schools that implement energy conservation measures, undertake environmental and behavioral changes, and promote environmental education through the brand new Green Ribbon Schools award. To participate, schools must be nominated by their state department of education. To find out more information including on how to encourage your state to participate visit http://www2.ed.gov/programs/green-ribbon-schools/index.html.

SURRY WORKSHOP

In October, NEED hosted a one day professional development workshop for teachers from Surry County Public Schools at Dominion's Surry Nuclear Information Center. Teachers spent the day with NEED facilitator Vernon Kimball learning about energy forms and sources, electricity generation, nuclear energy, and energy efficiency.

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IN THIS ISSUE

Energy 101

The U.S. Department of Energy is currently developing the *Energy Literacy Guide*. NEED chats with Matthew Inman, an Einstein Fellow at DOE about the guide's impacts on energy education.

Lighting Up New Year's Eve

Did you know that the famous Time's Square New Year's Eve Ball only requires the same amount of energy as two standard ovens?

Solar Bake-Off Recap

We look back at NEED's first Solar Bake-Off from September.

Teacher Talk

Also in this issue, NEED sits down with Ed Huffman for Teacher Talk. Ed is a teacher at Northview World School, in Statesville, N.C.

Activity: Home Energy Audit

With winter break upon us, this month's activity is a home energy audit. Find out how much energy your home is using and how to save money this winter.

SUMMER SOLAR FUN

Students at the St. Margaret's School Summer Solar Camp learn about solar energy transformations with a solar balloon. For more solar activities, visit www.NEED.org.