FROM FILMMAKER JEFF BARRIE

I made *Kilowatt Ours* in the hopes that this film would motivate people to conserve energy, buy green power and become part of the solution to America's energy crisis. My greatest hope is that you will take action after watching *Kilowatt Ours*, and find ways to reduce your electricity usage in your school, home, and community. The curriculum you are about to use has been carefully crafted to result in significant benefits to teachers and students, their communities, and environment. As a bonus, this curriculum may also result in significantly lower energy bills for those who follow it closely.

Thank you for making a difference!

Jeff Barrie

PS: Please help keep the momentum going by sharing your experiences with this curriculum. Email your success stories and feedback to: curriculum@KilowattOurs.org

WHAT IS *KILOWATT OURS*?

Kilowatt Ours: A Plan to Re-Energize America (2007) is the most recent documentary film by Jeff Barrie. The film follows Barrie's three-year journey from the light switch to the sources of America's electricity, exploring the great environmental problems that result from coal- and nuclear-generated electricity. To become part of the solution, Jeff and his wife Heather team up to conserve energy in their apartment, then explore America in search of inspiration and hope on a larger scale.

Kilowatt Ours provides a hopeful look at how energy efficiency and renewable power can improve the quality of life across America. The film offers practical ideas for consumers to lower their energy bills, showcasing successful examples of homes, businesses, schools, and entire cities that are saving big on power costs.

Trust for the Future (TFTF), a 501(c)(3) nonprofit organization, acts as the fiscal sponsor for several projects focused on clean energy and resource conservation, including Kilowatt Ours. TFTF was founded in 1985 to promote environmental protection and conservation of natural resources through research, public education, coalition building, and community organizing.

To donate to Kilowatt Ours and receive a DVD, go to www.KilowattOurs.org.

For information on acquiring public screening rights, email screening@KilowattOurs.org.

TABLE OF CONTENTS
***KILOWATT OURS* COMPANION CURRICULUM**
NATIONAL EDITION

GUIDE TO *KILOWATT OURS: A PLAN TO RE-ENERGIZE AMERICA*
COMPANION CURRICULUM
NATIONAL EDITION

The activities in the companion curriculum are intended to be completed before and after watching the *Kilowatt Ours National Edition* DVD (2007) with students. The material connects directly to the ideas and facts presented in the film. The activities are appropriate for students, grades 4-12, and can be adapted by teachers to match the level of their students, curriculum area, and time constraints. Younger students will also achieve success with the activities with a little modification by the teacher. The activities range from basic, quick, follow-up activities to more in-depth, extended projects, and are designed so that they may be done individually or as a unit. Teachers may choose to do any number of the activities in any order. Also, activities can be adapted to the home or school so that all students can have the opportunity to participate. The activities are tied to curriculum content standards for science, math, social science and language arts, grades 4-12. These connections are all listed at www.KilowattOurs.org/Educators. The appendices include additional materials and resources to complement and support the activities.

Film length: *National Edition* (2007): 24 minutes
38-minute *Original Southeast Edition* (2005) available on same DVD
Grades: 4-12 (easily modified for younger and older students)
Time needed: One class period to several class periods
Curriculum Content Standards: Science, Social Studies, Math, Language Arts

KILOWATT COUNTER (www.CountYourKilowatts.org)
An important piece of lowering energy use is reminding participants that their actions make a difference. Students can track their energy savings and pollution savings on the Internet with the "Kilowatt Counter," a web-based energy-savings calculator. As they make changes at home, students may report their savings data and renewable power purchases to the online system, where the information is recorded and measured. The savings are quantified in terms of dollars, kilowatt-hours, pounds of coal, carbon dioxide, sulfur dioxide, and nitrogen oxide reductions. Participants receive reports of cumulative savings and energy-saving tips each month in automated emails.
Visit www.CountYourKilowatts.org.

Please share the film with your entire school, administration, parents and community. And let us know how many of your students are viewing *Kilowatt Ours!* We greatly appreciate feedback! Please contact curriculum@KilowattOurs.org with any comments or questions. Thanks again for your dedication!

Jennifer Barrie, Youth Initiative Director
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Revised June 2008

WHAT DO YOU KNOW ABOUT ENERGY?
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 1

Overview
The purpose of this activity is to help gauge the students' knowledge and understanding of the topic before watching the film. They will also start to think about energy and their own energy consumption at home. Therefore, their responses and ideas are all valid.

Objectives
1. To understand the topic of energy production and consumption and related problems
2. To identify possible solutions to energy problems
3. To increase awareness and assess personal energy consumption

Skills
Critical Thinking
Observation

Time
1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)

Materials
Kilowatt Ours National Edition DVD (2007)
Before-you-watch *Kilowatt Ours* Activity 1 Student Page (page 6)

Procedure
1. Ask your students to review the questions on the Student Page. They can either write their ideas on the sheet or discuss their ideas briefly. They can work individually or in small groups.
2. Show *Kilowatt Ours: A Plan to Re-Energize America* to your students. During the film, the students may take notes on the Student Page.
3. After viewing the film, once again ask the students to write or discuss their ideas using their new knowledge.
4. This activity can be used as a before-and-after assessment by giving a new Student Page to the students after viewing the film. Collect both the "before" and "after" pages from the students and compare the responses. The students can also compare their responses and discuss their new knowledge and awareness.

WHAT DO YOU KNOW ABOUT ENERGY?
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 1

1. We will be learning how we get our electricity and where it comes from, and we will watch a movie called *Kilowatt Ours: A Plan to Re-Energize America* as an introduction. Why do you think the movie is called *Kilowatt* "OURS" instead of *Kilowatt* "HOURS"?
   The filmmaker, Jeff Barrie, is using a play on words to communicate the message that each one of us plays a crucial role in energy issues. We each have choices to make about our energy use and our impact, and our individual actions DO make a difference.

2. What is a *kilowatt-hour?*
   The kilowatt-hour (kWh) is a measure of electrical energy. It is the product of power in watts and time interval in hours. For example, electricity used at a rate of one watt for 1000 hours , or 10 watts for 100 hours, or 1000 watts for one hour, is equal to one kilowatt-hour of energy (1000 watt-hours = 1 kilowatt-hour). Electricity providers measure kilowatt-hours when billing their customers each month for electricity use.

3. Where do you think your electricity comes from?
   Electricity is generated from a primary energy source, such as a fossil fuel, nuclear power, hydropower, solar, geothermal, or wind energy. An energy producer, such as Austin Energy, uses the primary energy source to produce and then sell electricity directly to the consumers or to a power distributor (utility). The distributor in turn sells it to us, the consumers.

4. What is the difference between electricity and natural gas?
   Electricity is a secondary source of energy produced from a primary source, such as fossil fuels, wind, or solar energy. Natural gas is a fossil fuel and energy source that is commonly used to produce heat and electricity.

5. Make a list of everything that uses energy (electricity or natural gas) in your home and school.
   a) Home: All electric and gas appliances and devices, especially the clothes washer and dryer, refrigerator, dishwasher, hot water heater, heating-and-cooling units, and lights.
   b) School: Lights, heating-and-cooling units, electronic appliances and devices, and hot water heater.

6. What is *energy efficiency?*
   Energy efficiency is the use of technology that requires less energy to perform the same function. Some examples are: replacing incandescent lights with compact fluorescent lights, sealing leaks, adding insulation, and adjusting the thermostat.

7. What is *green power?*
   Green power is generated by energy sources that do not produce waste or emissions and are renewable. Wind, solar, and geothermal energy are examples of green power.

8. How many light bulbs do you have in your home? *Answers will vary.* (Count them!)

WHAT DO YOU KNOW ABOUT ENERGY?
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 1

Name_____ **Date**_____

1. We will be learning how we get our electricity and where it comes from, and we will watch a movie called *Kilowatt Ours: A Plan to Re-Energize America* as an introduction. Why do you think the movie is called *Kilowatt* "OURS" instead of *Kilowatt* "HOURS"?

2. What is a *kilowatt-hour?*

3. Where do you think your electricity comes from?

4. What is the difference between electricity and natural gas?

5. Make a list of everything that uses energy (electricity and natural gas) in your home and school.
   a) Home:

   b) School:

6. What is *energy efficiency?*

7. What is *green power?*

8. How many light bulbs do you have in your home? _____ (Count them!)

YOUR ELECTRIC METER
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 2

Overview
This activity teaches students to read their electric meters, to understand how electricity is measured, and to determine the cost of measured electricity. Students monitor their electric meters at home to begin to develop an awareness of the amount of electricity consumed.

Objectives
1. To learn to read an electric meter
2. To monitor an electric meter at home for a seven-day period
3. To increase awareness of energy consumption
4. To learn to read an electric bill and understand the cost of measured electricity

Skills
Critical Thinking
Comparison and Contrast
Observation
Math

Time
Preparation: 1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)
Activity: 1 hour

Materials
Kilowatt Ours National Edition DVD (2007)
Pre-viewing Activity 2 Student Pages (pages 9-11)
Electric bills
Calculator
Access to electric meters

Preparation
- Have students complete Pre-viewing Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
- Ask students to locate their electric meters at home and to bring an electric bill from home. If they are unable to bring a bill, you may bring example bills from your residence, with your personal information blacked out.
- Check on access to the school meters for students who may be unable to access their electric meters at home.

Procedure
1. Read through the activity with your students.
2. Have students complete the Practice Reading Your Electric Meter sheet. Make sure students understand the chart and the calculations.

3. Remind your students to read their meters every day at the same time and record the readings in the chart. They should also calculate the kWh used and cost for each day. On the second day, check in with them to answer their questions and address any obstacles.
4. After seven days, the students total the kWh used and cost for one week, and then one month, of electricity consumption. They will compare their calculations with their actual monthly bill.
5. Lead a discussion using the follow-up questions. Students may also write their responses.
6. Students may also complete the activity using their natural gas meters or the meters at school. Note that natural gas meters only have four dials!

Follow-up Discussion Questions

1. Did you notice any difference in electricity use on particular days?

2. How did your calculations compare with your electric bill? Try to explain any differences.

3. What did you find interesting about monitoring your electric meter? Did you make any other observations during monitoring?

4. What did you learn about energy consumption?

5. What do you think you can do now?

Answers for Practice Reading Your Electric Meter:

The meter-reading answers are:

Day 1 reading = 15646

Day 2 reading = 18920

Kilowatt-hours used on Day 1 = 3274

This activity was adapted from the NEED Project and Project Learning Tree.

STUDENT PAGE

YOUR ELECTRIC METER
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 2

Name_____ **Date**_____

You will learn to measure how much electricity you use at home by learning to read your electric meter. Every house or apartment has its own meter that measures how much electricity that house or apartment uses. Your local utility company, which supplies electricity to your home, uses that meter to figure out how much you need to pay for your electricity. Each month an employee from your local utility reads the meter and records the number of kilowatt-hours used. Then the utility company uses that number to calculate how much your family owes and sends you a bill to pay, assessing you for your electricity usage.

Most electric meters have dials, while some newer ones do not have dials but are digital. Here is what you need to do:

1. Ask your parents or an adult at home to help you find the meter for your household and determine if it has dials or not. It is usually on the outside of the house, on the side or back of the house. If you live in an apartment, the meters may be together in a separate area.

2. Whether your meter is digital or has dials, you will read your meter at the same time every day for 7 days to find out how much electricity your household is using. Record the numbers in the meter-reading log.

3. Using the readings you recorded, now you can calculate the cost of the electricity:

   Day 2 reading − Day 1 reading = total kilowatt-hours used for Day 1

   Find the cost of one kilowatt-hour (kWh) for your area on your electric bill. You can calculate how much your electricity costs for Day 1 with this equation:

   Total kWh for Day 1 × cost for one kWh = cost of electricity for Day 1

4. And finally, you can figure out approximately how much electricity your family is using in one month and how much it costs for one month:

   kWh used in one week × 4 weeks = total kWh used in one month

   Total kWh used in one month × cost for one kWh = total cost for one month

5. Ask your parents or an adult at home for last month's electric bill. Find out how many kilowatt-hours your family used in one month and how much it cost. See if your calculations match the numbers on the electric bill. Bring the bill to class.

STUDENT PAGE

ELECTRIC METER READING LOG
BEFORE OR AFTER WATCHING *KILOWATT OURS*
ACTIVITY 2

Name_____ **Date**_____

Remember to read your meter at the same time every day!

Day	Date	Day of the week	Time	kWh reading	kWh used	Cost
Day 1					None	None
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						
Day 7						
Day 8						
Total for 7 days	None	None	None	None		

Now compare your calculations with your actual electric bill from home!

From your calculations:
Total kWh for one month = _____

Total cost for one month = _____

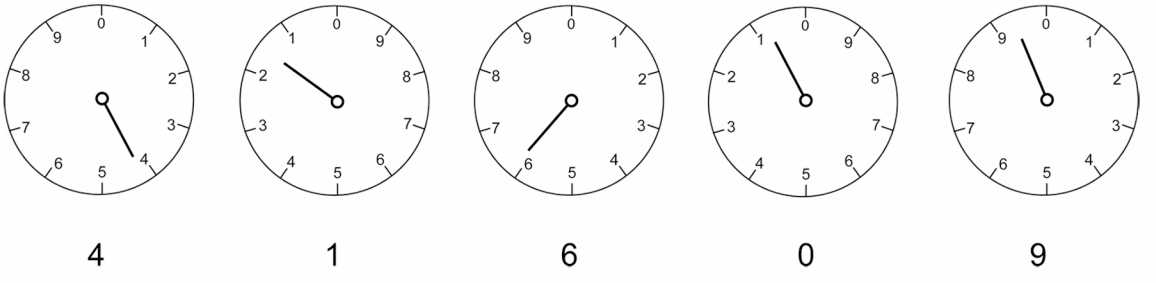
From your electric bill:
Total kWh for one month = _____

Total cost for one month = _____

PRACTICE READING YOUR ELECTRIC METER
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 2

Name_____ **Date**_____

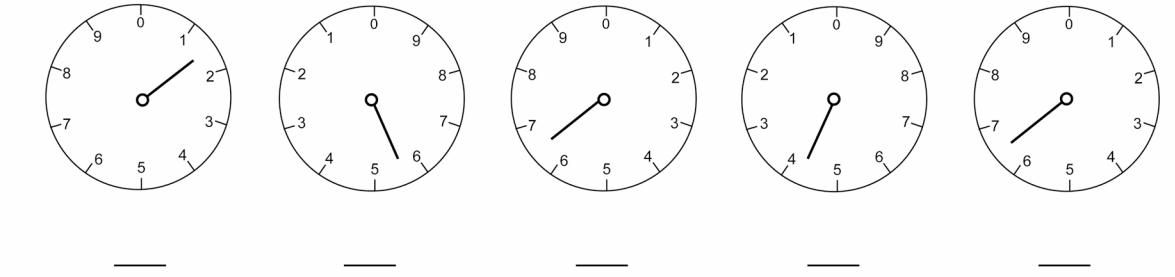
An electric meter consists of five round dials which are numbered 0 to 9. Read the dials from left to right. If the dial points directly to a number, record that number. If it lies between two numbers, always record the smaller number. If the pointer is between 9 and 0, record 9, because 0 represents 10. If the pointer is between 0 and 1, record 0, because 0 represents 0. For example, the reading from the dials below is: **41609.**



4 1 6 0 9

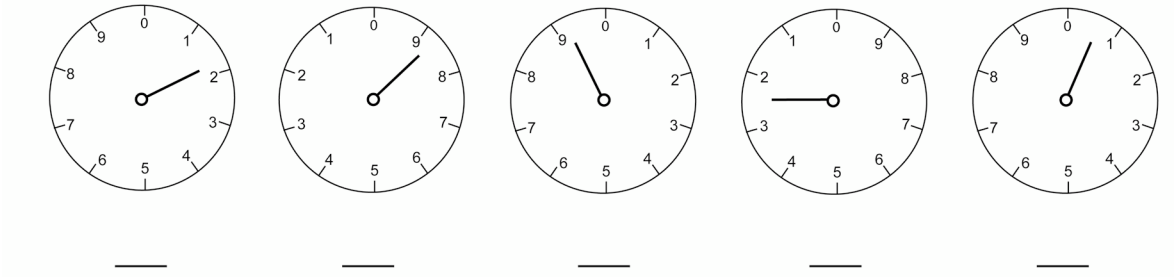
Try these dials for practice:

Day 1



___ ___ ___ ___ ___

Day 2



___ ___ ___ ___ ___

To calculate how much energy your family is using each day, use the following equation:

Day 2 reading − Day 1 reading = total kilowatt-hours used for Day 1

How many kilowatt-hours were used on Day 1 above? _____

YOUR PERSONAL ENERGY SURVEY
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 3

Overview
The purpose of this pre-viewing activity is to encourage students to begin thinking about energy and their own use and habits at home. This activity is not intended to be an assessment, but an introduction to *Kilowatt Ours* and energy.

Objectives
1. To increase awareness of personal energy consumption
2. To understand energy production and consumption
3. To identify possible solutions to energy issues

Skills
Critical Thinking
Observation

Time
1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)

Materials
Kilowatt Ours National Edition DVD (2007)
Pre-viewing Activity 3 Student Pages (pages 13-15)

Procedure
1. Ask your students to respond to the twenty questions in the Personal Energy Survey. They should be as honest and accurate as possible.
2. Answer the students' questions as they work through the survey. If they are not sure how to respond to a question, they should make their best guess.
3. When the students complete the survey, they will total their points. Let them know how they scored, according to the legend.
4. The activity may also be completed at home with assistance from adults.
5. Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
6. Discuss solutions and individual actions that students can take to save energy at home, using the Personal Energy Survey and the Easy Energy Saving Actions from the "Kilowatt Ours Challenge" activity as a guide.

For each survey question, response 1 = one point, response 2 = 2 points, response 3 = 3 points.

27 or less: *You have lots of room for improvement! You can start to make changes to save energy and money. There are many different simple actions you can take, beginning with the ideas in this survey and at www.kilowattours.org.*

28–51: *You have made a great attempt to save energy, but you can still improve your habits to save even more. Think about areas in which you can make changes in your life.*

52–60: *Congratulations! You have done an excellent job with energy conservation! Your habits save both energy and money. Keep it up! (Challenge yourself to save even a little more, support green power, and become a net-zero home!)*

YOUR PERSONAL ENERGY SURVEY
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 3

Name_____ **Date**_____

Circle the most accurate response for each of the questions below:

1. People in my home wait until they have a full load of clothes before doing laundry.
   1 - Never
   2 - Sometimes
   3 - Often

2. I close the refrigerator door quickly after I decide what I want to eat.
   1 - Never
   2 - Sometimes
   3 - Often

3. The thermostat in my house during **winter** is set at (pick the closest one):
   1 - 80° F (degrees Fahrenheit) (very warm)
   2 - 70° F (warm)
   3 - 65° F (cool)

4. When I leave a room, I turn the lights off.
   1 - Never
   2 - Sometimes
   3 - Often

5. My family uses low-wattage light bulbs or compact fluorescent lights when possible, instead of incandescent light bulbs.
   1 - Never
   2 - Sometimes
   3 - Often

6. During the **summer**, the thermostat in my home is set at (pick the closest one):
   1 - 65° F
   2 - 72° F
   3 - 78° F

7. I close the windows and doors when the heat or air-conditioning is on.
   1 - Never
   2 - Sometimes
   3 - Often

YOUR PERSONAL ENERGY SURVEY
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 3

Name_____ **Date**_____

8. When no one is home for 4 hours or more, I adjust the thermostat (lower the temperature to 60° F in the winter and turn it up to 85° F in the summer).
   1 - Never
   2 - Sometimes
   3 - Often

9. I turn off or unplug the TV, CD player, computers and other appliances when no one is around or not using them.
   1 - Never
   2 - Sometimes
   3 - Often

10. When possible, people in my home dry their clothes outside on a clothesline instead of in the clothes dryer.
   1 - Never
   2 - Sometimes
   3 - Often

11. I use fans to help cool my home during the summer.
   1 - Never
   2 - Sometimes
   3 - Often

12. People in my home wait until they have a full load of dishes before using the dishwasher.
   1 - Never
   2 - Sometimes
   3 - Often

13. We recycle in our household (metal, plastic, glass, cardboard and paper).
   1 - Never
   2 - Sometimes
   3 - Often

14. When it is cold in the house, I put on a sweater or hat to help stay warm.
   1 - Never
   2 - Sometimes
   3 - Often

15. In our home we wash our clothes in cold water instead of warm or hot water.
   1 - Never
   2 - Sometimes
   3 - Often

YOUR PERSONAL ENERGY SURVEY
BEFORE-YOU-WATCH *KILOWATT OURS*
ACTIVITY 3

Name_____ **Date**_____

16. I take showers for (pick the closest one):
    1 - 20+ minutes
    2 - 10 minutes
    3 - 5 minutes

17. We set our hot water heater between 120° F and 130° F.
    1 - Never
    2 - Sometimes
    3 - Often

18. When my family leaves the house for more than one day, we adjust the temperature on the hot water heater, thermostat (air conditioner or heater), and refrigerator.
    1 - Never
    2 - Sometimes
    3 - Often

19. I know how to read the electric and gas meters at my home.
    1 - No
    2 - I think so/Sort of
    3 - Yes

20. I look at my electric and gas bills each month to keep track of my household's energy use.
    1 - Never
    2 - Sometimes
    3 - Often

Add up the total score of your responses.

Total = _____

Your teacher will tell you what your score means.

To start saving more energy—and money—at home, you and your family can do the simple actions in this survey. Ask your teacher for more ideas!

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

Overview
The purpose of the discussion questions is to help facilitate discussion after watching the film and to assess students' comprehension of the information presented. The questions may also be used to introduce an additional activity, or as an essay prompt or project topic.

Objectives
1. To recognize the sources and production of electricity and the associated impacts
2. To identify possible solutions to energy issues
3. To engage in a discussion regarding the material presented in the film *Kilowatt Ours*

Skills
Critical Thinking
Problem Solving
Discussion and presentation

Time
Preparation: 1 hour (including viewing of 25-minute *Kilowatt Ours National Edition)*
Procedure: 30 minutes to 1 hour

Materials
Kilowatt Ours National Edition DVD (2007)
After-you-watch *Kilowatt Ours* Activity 4 Student Pages (pages 22-23)

Preparation
- Have students complete Before-you-watch *Kilowatt Ours* Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.

Procedure
The procedure will vary depending on your purpose for the activity. The filmmaker suggests that students take minimal notes during the film so that they are able to focus on the viewing experience. However, you may want to give the students the question sheet to use for quick notes. Then, after viewing, they can use their notes as a reference during a discussion, or to write complete answers as an assignment or assessment. You may also just select some of the questions to adapt the activity to focus on a more specific topic, or to lead into an additional activity. Some of the questions also work as prompts for writing assignments or research projects.

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

1. Where does your electricity come from? (How is your electricity generated?)
   Electricity is sold to consumers by a local distributor/utility (such as Nashville Electric Service) which buys it from a producer/supplier (such as Tennessee Valley Authority). Some producers, such as Austin Energy, also sell electricity to the consumers. The producer may build coal and nuclear power plants, dams for hydropower, or solar, wind, or methane gas facilities. In the United States approximately 52% of the electricity consumed is produced from coal and 20% from nuclear power.

2. What is Austin Energy and what does it do?
   Austin Energy is the nation's 9th largest public-owned electric utility. The company both produces and sells electricity to the consumers, and has created the top performing renewable energy program and a comprehensive residential and commercial energy efficiency program. They have built a "conservation power plant", which in essence has replaced the equivalent of one conventional power plant.

3. (a) Why do you think the energy issue is important NOW? (b) How does it affect you?
   (a) The problems related to energy production are having an increasingly negative impact. Some related problems are air and water pollution; limited energy supply; rising energy costs; global climate change; destruction of mountains, forests, streams and wildlife; toxic waste; human health problems such as asthma, mercury contamination, and higher cancer rates; cultural impacts; and rising consumption.
   (b) The more we consume, the more we need to produce, and the more we will feel the impacts. We are all affected, directly or indirectly, by all of these consequences. HOW?

4. Why do Americans today use so much electricity?
   One main reason is that Americans have so many more electrical appliances and devices (such as hand lotion warmers, TVs, and air conditioners) than they did in the past. Other reasons include our inefficient buildings and population increase.

5. Why do children suffer the impacts of our reliance on coal more so than adults?
   Pound for pound, children breathe in twice the amount of air in each breath while their lungs are still developing. Therefore, they breathe in more pollutants during their crucial and vulnerable growth period of life. Electricity use is one of the root causes for air pollution. The more that we waste and the more that we do inefficiently with the way we generate our power, then the more particulate pollution and ozone pollution we have. Hence the more death and disease we see, including what happens with the asthma burden in our children.

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

6. How is electricity produced from uranium ore?
   Uranium ore is mined from the earth, where it is harmless as long as it is in its natural state. It is processed into yellow cake uranium fuel, leaving behind huge piles of radioactive mill tailings. Before it can be used to produce electricity, the mineral must be enriched in a plant, which produces tons of radioactive waste that is stored indefinitely on-site. The enriched uranium is processed further before going to the power plants as fuel used in the fission process, which releases energy to boil water, spin turbines, and finally produce electricity. After the fuel is used in the process, radioactive waste is leftover, which humans world-wide do not know what to do with.

7. (a) What is energy efficiency? (b) Give two examples of energy efficiency.
   (a) Energy efficiency involves the use of technology that requires less energy to perform the same function.
   (b) For example, a compact fluorescent light bulb uses less energy to produce the same amount of light as an incandescent light bulb. Other examples are: adding insulation, sealing leaks, installing an adjustable thermostat, installing ceiling fans, buying Energy Star products, and installing a geothermal system.

8. (a) What is green power? (b) Is nuclear power a form of green power?
   (a) Green power is energy generated from renewable, nonpolluting energy sources, such as solar, wind, methane and geothermal power.
   (b) Nuclear power is a form of power that is highly debated. Some people consider it a green power source. However, it does produce emissions and large amounts of extremely toxic radioactive waste which humans do not know how to dispose of safely.

9. Why are both energy efficiency and green power necessary to become a net-zero nation? (Step 1 and Step 2)
   In order for green power to be feasible and effective on a broad scale, we need to first reduce our energy consumption by becoming much more energy efficient.

10. Why is replacing light bulbs such an effective way to save energy?
    Incandescent light bulbs are very inefficient. Only about 10% of the total electricity they use is actually converted into producing light; the other 90% is converted into heat, which is wasted energy. Compact fluorescent lights (CFLs), on the other hand, convert about 75% of the electricity they use to produce light, only wasting about 25% on heat. CFLs also last much longer than incandescent bulbs, so do not need to be replaced as often. Replacing incandescent light bulbs with CFLs is relatively cheap and easy to do, pays off quickly, and saves a large amount of energy for the amount of investment.

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

11. What is meant by *Energy Star?*
    Energy Star is a program that labels appliances identified by the US Environmental Protection Agency and the Department of Energy as the most energy-efficient products in their classes. The program compares appliances with similar characteristics. (www.energystar.gov)

12. How are companies and governments around the country saving energy and money?
    Developers in Savannah, Georgia and Detroit, Michigan and Sumner County Schools in Tennessee are using geothermal systems; Smith Middle School in North Carolina and Toyota USA Headquarters in California are using daylighting techniques; Sullivan County Department of Education in Tennessee upgraded all of its school buildings; the city of Birmingham, Alabama and the state of Kentucky switched all street lights to LEDs; the state of California passed emissions legislation; and many states have implemented Renewable Portfolio Standards.

13. What can your school do to save energy?
    Your school can do some of the same things you can do at home. Your school has a budget for maintenance and may be able to do more, like replace windows, upgrade lighting, or even install a geothermal system. Schools save much more by just turning off computers and lights when not in use!

14. How does saving energy improve education?
    When schools save energy, they also save money on their energy bills. The money they save can be used on other needs, such as teacher salaries, materials, computers, or extracurricular activities. Also, schools that use daylighting techniques experience improvement in student behavior, attitude, and test scores.

15. Why does recycling save energy?
    Recycling aluminum and steel cans especially saves a great deal of energy because Americans use so many cans, and so much energy is required to produce them. Making aluminum from recycled aluminum scrap takes only 4% of the energy that it takes to make it from bauxite ore. Right now, recycling of aluminum cans saves about 11.5 billion kilowatt-hours, which is enough electricity to light a city the size of Pittsburgh for six years! (www.iea.doe.gov) Recycling other materials, such as plastic, paper, cardboard and glass, saves energy as well.

16. How are businesses around the country using green power?
    A hog farm in Iowa installed a wind turbine; a dairy farm in Iowa uses a methane digester; Taco Burrito King in Chicago heats its water with a solar system; the World's Largest Laundromat in Illinois uses a solar hot water system; St. Francis Winery and the FedEx Distribution Center in California use solar systems to generate electricity.

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

17. How can you take action on Step 2: "Use green power"?
    Once you are more energy efficient, you can do even more by buying blocks of green power with your savings each month. Just contact your local electric utility to find out how to sign up and support green power!!

18. How can you reduce your energy use at home by 25%?! (Kilowatt Ours Challenge)
    "Kilowatt Ours" *suggests the top ten steps to reducing your energy bill. You can find these steps at www.kilowattours.org. Also try some of the easy energy-saving actions in the Kilowatt Ours Challenge (Activity 6). A few low-cost things to do are: turn off appliances and lights, adjust the thermostat, dress appropriately indoors (instead of blasting the air or heat!), close windows and doors when heat or air-conditioning is on, use fans instead of air-conditioning, replace light bulbs, seal cracks with caulk, seal ducts with sealant, get new "used" appliances that are rated as Energy Star, add insulation, lower the water heater temperature, take shorter showers, and dry your clothes outside on a clothesline.*

19. Can you think of anything else you can do to be part of the solution to the energy issue?
    Some ideas are: Learn more and share your knowledge with others; conduct a home energy assessment; conduct a school energy assessment; organize a screening of "Kilowatt Ours" *in your community; write letters to your elected officials to let them know you care about this issue; start an energy conservation campaign at your school; make a presentation to your school board or PTA/PTO.*

20. Why is the film called *Kilowatt* "OURS" rather than *Kilowatt* "HOURS"?
    The filmmaker is using a play on words to communicate the message that we each play a crucial role in energy issues. We have choices to make about our energy use and impact, and our individual actions DO make a difference.

"Here's a challenge for all of us: Let's reduce our electricity use by 25% or more in every home, school and business…. As our electricity bills go down, let's sign up for green power—at least one block—and put solar technologies on our homes, if we're able. We can DO this! … This effort requires cooperation from public officials and the government; utilities and manufacturers; builders; teachers and students; nonprofit organizations; and everybody — all of us doing our part, starting at home. Come on, get excited! We owe it to the people of Appalachia and to our children. We owe it to ourselves to take this challenge seriously. If we do, I believe one day soon, we'll wonder how we ever let it get so bad in the first place, and we'll marvel at how easy it was to fix it. Thank you for taking this journey with me. The real journey is about to begin."
— Jeff Barrie, Filmmaker, speaking in "Kilowatt Ours"

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

BONUS: Discuss your ideas or write about the following quotes.
a. "We can't afford not to afford it."
b. "Get something for nothing."
c. "We are poisoning our grandchildren."
d. "Why should you take a picture of a mountain?"
e. "We are conducting an unplanned, uncontrolled experiment on the only atmosphere we have."
f. "Electricity use is one of the root causes for air pollution."
g. "Is nuclear power the answer to our energy needs?"
h. "You can't smell it, you can't taste it, you can't even feel it going through your body."

Further discussion and writing ideas

1. The process of coal mining produces toxic slurry waste, which is stored in ponds throughout the Appalachian region. In the fall of 2000 one of the many lakes failed, sending 300 million gallons of sludge into the Big Sandy River in Martin County, Kentucky. The size of the spill was 30 times greater than the 1989 Exxon *Valdez* oil spill in Alaska. A state of emergency was declared. The Environmental Protection Agency considered it one of the worst environmental disasters ever, east of the Mississippi. Yet few people heard about it. Why not?

2. Discuss the advantages and disadvantages of five different sources of energy.

3. Explain global climate change. Do you think it needs to be addressed? How?

4. What do you think is the solution to our energy issues?

5. Explain energy efficiency and how it is part of the solution.

6. Explain green power and why it is, or is not, part of the solution.

7. If technologies such as geothermal heat pumps and daylighting are so effective, why doesn't everyone use them?

8. Discuss the advantages and disadvantages of nuclear power.

9. Discuss the connection between our energy use and human health.

10. Research and discuss three success stories of energy efficiency or green power from your region, or another region of the country.

STUDENT PAGE

DISCUSSION QUESTIONS

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 4

Name_____ **Date**_____

1. Where does your electricity come from? (How is your electricity generated?)

2. What is Austin Energy and what does it do?

3. (a) Why do you think the energy issue is important NOW? (b) How does it affect you?

4. Why do Americans today use so much electricity?

5. Why do children suffer the impacts of our reliance on coal more so than adults?

6. How is electricity produced from uranium ore?

7. (a) What is energy efficiency? (b) Give two examples of energy efficiency.

8. (a) What is green power? (b) Is nuclear power a form of green power?

9. Why are both energy efficiency and green power necessary to become a net-zero nation? (Step 1 and Step 2)

10. Why is replacing light bulbs such an effective way to save energy?

11. What is meant by *Energy Star?*

12. How are companies and governments around the country saving energy and money?

STUDENT PAGE

DISCUSSION QUESTIONS
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 4

Name_____ **Date**_____

13. What can your school do to save energy?

14. How does saving energy improve education?

15. Why does recycling save energy?

16. How are businesses around the country using green power?

17. How can you take action on Step 2: "Use green power"?

18. How can you reduce your energy use by 25%?! (Kilowatt Ours Challenge)

19. Can you think of anything else you can do to be part of the solution to the energy issue?

20. Why is the film called *Kilowatt* "OURS" rather than *Kilowatt* "HOURS"?

BONUS: Discuss your ideas or write about the following quotes.
a. "We can't afford not to afford it."

b. "Get something for nothing."

c. "We are poisoning our grandchildren."

d. "Why should you take a picture of a mountain?"

e. "We are conducting an unplanned, uncontrolled experiment on the only atmosphere we have."

f. "Electricity use is one of the root causes for air pollution."

g. "Is nuclear power the answer to our energy needs?"

h. "You can't smell it, you can't taste it, you can't even feel it going through your body."

ELECTRICITY INVESTIGATION
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 5

Overview

Students will learn to read their monthly utility bill, determine the cost of measured electricity, and recognize patterns in past household electricity use. They will learn more about the energy sources that are used to supply power to their homes. This activity may also be completed with a natural gas bill, or with the school's electric bill.

Objectives

1. To learn to read a monthly electric bill
2. To learn how much electricity a household uses each month and calculate the cost
3. To calculate how much electricity various household appliances use
4. To calculate the amount of coal required to provide the kilowatt-hours used each month and the resulting carbon dioxide (CO_2), sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions
5. To identify the common sources of electricity used by the local electric utility
6. To explain the processes of producing electricity from different energy sources

Skills

Research
Recognizing Patterns
Math
Presentation

Time

Preparation: 1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)
Procedure: 3 hours for all three parts of activity, or 1 hour per section

Materials

Kilowatt Ours National Edition DVD (2007)
After-you-watch *Kilowatt Ours* Activity 5 Student Pages (pages 26-30)
Electric bills
Billing history usage
Calculator
Internet access

Preparation

- Have students complete Before-you-watch *Kilowatt Ours* Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
- Decide which parts of the activity your students will complete.
- Students will need to bring an electric bill from home to class. If they are unable to bring a bill, you may bring example bills from your residence, with your personal information blacked out.

- If you plan to study the billing history usage, the students will need to call the customer service number on the bill to request their histories, and will need their account information to make the request. The history will be mailed to their home addresses. Once again, if the students are unable to acquire the billing history usage, you may use an example from your own residence.
- For any part of this activity, you may also request to use the school's electric bill.

Procedure

Part 1 - Your Electricity Use at Home

1. Help the students find the answers from their electric bills for questions 2 and 3.
2. Review steps 1–8 and the television example, answering the students' questions. Complete one more example with the class if necessary.
3. Once the students estimate the daily hours for each appliance, they will be able to do the calculations and fill in the chart, including the monthly- and annual-totals boxes at the bottom. Ask them to talk to an adult at home to estimate the daily hours.
4. **To calculate a more accurate and customized result, students may find the exact number of watts that different appliances use on the label on the actual appliance in their home.** The numbers given on the chart are average amounts based on many different appliances.
5. Finally, students will answer the questions in number 9. Ask them to work in groups to compare their answers and present their findings to the class.

Part 2 - Billing History Usage

1. Optional: Divide the students into groups of two to three.
2. Examine the billing history usage with the students, so that they understand the information it presents.
3. Review the questions in Part 2 and address any questions the students may have.
4. Ask the students to answer questions 1–7.
5. Have the students report their findings to the class.

Part 3 - Research Your Electricity Distributor and Producer

1. Optional: Divide the students into groups of two to three.
2. The students will find the information requested in questions 1–12 by looking at their electric bills, calling their local provider, and searching on the Internet.
3. You may have the students write a short report including the information they gather.
4. Have the students present their reports to the class.

ELECTRICITY INVESTIGATION
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 5

Name_____ **Date**_____

Part 1 - Your Electricity Use at Home

1. Who pays the electric bill at your home? Ask that person for the last month's bill.

2. How much do you pay per kilowatt-hour of electricity? _____

3. How many kilowatt-hours did your household use in one month? How much did you pay for the kilowatt-hours you used for the month? _____

4. Complete the table below by doing the calculations in steps 5, 6, 7 and 8 for each appliance. Don't forget to add more appliances from your home that are not listed, but do not include appliances that use natural gas.

5. First find out how many watts each appliance uses and estimate how many hours per day the item is used. If an appliance is used less than one hour per day, use fractions. For example, perhaps your microwave is used only about 15 minutes in an average day. You would write 0.25 in the Daily Hours box for the microwave.

6. Then calculate how much electricity different appliances in your home use in one month and how much that costs.

Daily kWh = watts/1000 × hours/day = kWh/day
Monthly kWh = kWh/day × 30 days/month = kWh/month
Monthly Cost = kWh/month × $/kWh = $/month

7. Convert kWh into pounds of coal, carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitrogen oxides (NO_x).

Monthly pounds of coal used = monthly kWh used (1 lb coal required for 1 kWh)
Monthly pounds of CO_2 emitted = monthly coal × 1.4 lb CO_2/1 lb coal
Monthly pounds of SO_2 emitted = monthly coal × 0.006 lb SO_2/1 lb coal
Monthly pounds of NO_x emitted = monthly coal × 0.003 lb NO_x/1 lb coal

ELECTRICITY INVESTIGATION
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 5

Name_____ **Date**_____

8. Finally, calculate the amounts for one year by multiplying by 12 months.

Here is an example to follow:
A television uses an estimated 250 watts. Let's say your TV is turned on 4 hours per day. If you pay $.08 per kilowatt-hour, your annual cost to run your TV would be $28.80.

Daily kWh = 250 watts/1000 × 4 hours/day = 1 kWh/day
Monthly kWh = 1 kWh/day × 30 days/month = 30 kWh/month
Monthly cost = 30 kWh/month × $.08/kWh = $2.40/month

Your estimated monthly cost to run the TV would be $2.40.

Your estimated annual cost to run the TV would be:
$2.40/month × 12 months/year = $28.80/year

The monthly emissions to run the TV would be:
Monthly coal = monthly kWh = 30 lb
Monthly CO_2 = 30 lb coal × 1.4 lb CO_2/1 lb coal = 42 lb CO_2
Monthly SO_2 = 30 lb coal × 0.006 lb SO_2/1 lb coal = 0.18 lb SO_2
Monthly NO_x = 30 lb coal × 0.003 lb NO_x/1 lb coal = 0.09 lb NO_x

9. After you finish the calculations, answer these questions on a separate sheet of paper:

a) Compare your total calculated monthly kilowatt-hours and cost with your actual monthly bill. What differences and similarities do you see?

b) Compare your totals with those of your classmates. What are the class averages?

c) Are your figures higher or lower than the class averages?

d) How do the number of watts and daily hours for each appliance affect the amount of kilowatt-hours and emissions produced?

e) Which figures are most surprising or interesting to you?

f) What is "phantom load" and what can you do to reduce it?

g) Where in your home would it be easiest to reduce your electricity use?

h) What simple actions can you take to conserve electricity?

ELECTRICITY INVESTIGATION
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 5

Electricity Use in Your Home (do not include natural gas appliances)

Appliance	Average Watts	Daily Hours	Daily kWh	Monthly kWh	Monthly Cost ($)	Monthly Coal (lb)	Monthly CO_2 (lb)	Monthly SO_2 (lb)	Monthly NO_x (lb)
Television Example	**250**	**4**	**1**	**30**	**2.40**	**30**	**42**	**0.18**	**0.09**
Clothes washer (cold water)	500								
Clothes dryer	5000								
Dishwasher (hot wash/rinse)	2400								
Oven	3750								
Stovetop range	500								
Air conditioner (window)	4000								
Televisions	250								
Microwave	1100								
Lights (60-watt)	60								
Lights (100-watt)	100								
Ceiling fans	175								
Box fans	125								
Hair dryer	1500								
Freezer	440								
Vacuum cleaner	1000								
Refrigerators	700								
Hot water heater	4500								
Toaster oven	1300								
Stereo system	250								
Computers	350								
Clock radio	5								
Blender	300								
Monthly Totals add columns	n/a	n/a	n/a						
Annual Totals multiply by 12	n/a	n/a	n/a						

(Sources: Corn Husker Public Power District, Seattle City Light, and U.S. Department of Energy)

For appliances that are not listed, you can find the average wattage at these websites:
http://www.ci.seattle.wa.us/light/accounts/stretchyourdollar/ac5_appl.htm
http://www.cornhusker-power.com/householdappliances.asp
http://www.eere.energy.gov/consumer/your_home/appliances/index.cfm/mytopic=10040

ELECTRICITY INVESTIGATION
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 5

Name_____ **Date**_____

Part 2 - Billing History Usage

1. Call your local electric utility to request a billing history usage for the last two years for your home. The phone number is on your monthly bill, in the phone book, and at the website. They will fax it or mail it to the fax number or mailing address you provide. Write down the phone number. _____

2. When you receive the history, compare your electricity use for year one with year two. Did your electricity use increase or decrease?

3. Compare each month throughout the year. What patterns do you see? How does your usage change at different times of the year?

4. What ideas do you have about the patterns you see in your electricity use? What do you think affected your electricity use in different months and in different years?

5. Calculate your average monthly electricity use and average monthly cost.

6. On a sheet of graph paper, create a bar or line graph for your electricity use, including year one and year two.

7. What do you think you can do to lower your monthly usage?

ELECTRICITY INVESTIGATION
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 5

Name_____ **Date**_____

Part 3 - Research Your Electricity Distributor and Producer
Your electricity distributor is also called your local electric utility. Call or find the website of your electricity distributor and try to find the answers to the following questions. You may also need to research the electricity producer if it is separate from the distributor. For example, in Nashville, Tennessee, Nashville Electric Service (NES) distributes electricity to consumers. However, NES does not produce the electricity but buys it from the Tennessee Valley Authority (TVA), which produces it from primary energy sources, such as coal and wind.

1. Is your distributor a privately or publicly owned company? What does this mean?

2. How many customers does your distributor service supply?

3. Does the company produce its own electricity or buy it from a producer? Who is the producer?

4. What primary energy sources are used to produce the electricity and what are the percentages of each? (fossil fuels, nuclear, hydropower, solar, wind, methane…)

5. Where are the power-generation sites located (power plants, wind farms, reservoirs)?

6. Where do the fossil fuels or uranium originate?

7. Does the provider have a program that allows you to support green power sources? What is it called and how does it work?

8. How does the price you pay for electricity compare with other parts of the country?

9. What sort of programs do the distributor and producer have to help protect the environment and natural resources?

10. Find one more fact about how your electricity is produced and distributed that is interesting to you. Has your electricity distributor or producer been in the news lately? Why?

11. Find or create a map of the area your local provider serves. Label your town or city. Draw arrows between the energy sources and your home, showing the percentage of each source used. For example, coal from Appalachia may go to a power plant, and the power goes to your home.

12. Research and explain the processes of producing electricity from coal, nuclear, hydro, solar, wind, and methane energy sources.

KILOWATT OURS CHALLENGE
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 6

Overview
Filmmaker Jeff Barrie presents a challenge to the viewers at the end of *Kilowatt Ours* to reduce their electricity use by 25% or more in every home, school and business. In this activity students will create and implement a plan to reach that goal in their homes. They can also create and initiate a plan for the school.

Objectives
1. To develop an awareness of energy-using behaviors, and ways to reduce energy use
2. To develop and implement a plan to reduce electricity use in the home by 25%
3. To calculate energy- and dollar-savings after implementing their plan

Skills
Critical Thinking
Observation
Math

Time
Preparation: 1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)
Procedure: 1 hour

Materials
Kilowatt Ours National Edition DVD (2007)
Electric bill or billing history usage
After-you-watch *Kilowatt Ours* Activity 6 Student Pages (pages 33-36)

Preparation
- Have students complete Before-you-watch *Kilowatt Ours* Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
- Ask students to call the customer service number for their electricity provider and request a free billing history usage for their residence. Students will need the account information from their electric bills to make the request. The histories will be mailed to their home addresses within a few days, or can be faxed to the school. Alternatively, students may bring in an electric bill from home. The students will use the average monthly kilowatt-hours used in their home to calculate the 25% reduction.
- If students are unable to bring their billing history usage or electric bill from home, you may provide example bills from your residence, and develop a class plan. Your personal information may be blacked out to protect privacy.

Note: If parents or families are not willing to participate in the activity at home, students can do the challenge at school as an alternative.

Procedure

1. Ask the students how difficult or easy they think it will be to reduce their electricity use by 25%. How do they think they can do it?

2. Brainstorm a list of easy actions to take at home to save energy, using the Kilowatt Ours "Top Ten Steps to Save $600" and ideas included in this activity as a guide.

3. Each student calculates 25% of their household's electricity use for one month based on their average kilowatt-hour use, according to their history usage or monthly bill. **25% Reduction Goal = average kWh used in one month × 0.25**

4. Each student meets with their family members and chooses at least 5 actions from the list based on what they and their families think they can realistically do. They write these actions on their Action Pledge, which is their plan.

5. After each chosen action, they specify when the action will be carried out. For example, they may begin the action immediately, in two weeks, or in one month.

6. Students and their families sign their pledges, committing to carry out the actions to reach the 25 % goal.

7. Over a period of one month, students and their families begin to implement their energy-saving action plans, according to the pledges they signed.

8. After one month, students will review the next electric bill they receive at home and compare it to the previous month's bill to determine how many kilowatt-hours they saved and if they reached their goal.

9. If they did not reach their goal of a 25% reduction, they can review and adjust their plan and try again the following month. A meeting with the members of the household to review the plan and make necessary changes may help.

10. Each student will report their actions and results to the Kilowatt Ours energy-savings calculator called the "Kilowatt Counter" (www.CountYourKilowatts.org). Their savings are calculated in dollars, kilowatt-hours, pounds of coal, and carbon dioxide, sulfur dioxide, and nitrogen oxide reductions. Cumulative savings will be reported to students each month in automated emails, and they may also sign up to receive monthly energy-saving tips to continue saving more energy.

11. Students may also keep a weekly journal to write about their observations, experiences, and ideas, while their household is working towards their goal. Reading the electric meter for the household each week could also help them see a reduction in consumption on a weekly basis (see Your Electric Meter activity).

STUDENT PAGE

KILOWATT OURS CHALLENGE

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 6

Name_____ **Date**_____

CIRCLE THE NUMBER NEXT TO THE THINGS THAT YOU ALREADY DO AT HOME. PICK 5 NEW ACTIONS TO TAKE AT HOME WITH YOUR FAMILY TO SAVE ENERGY!

Easy Energy-Saving Actions

No-Cost

1. In the summer, keep your thermostat set at 78° F or higher in the daytime, and 85° F when no one is in the room.
2. In the winter, keep the thermostat set at 68° F or lower in the daytime, and lower it to 60° F when no one is in the room, and at night.
3. Stuff rags, a towel or a rug in the crack under outside doors.
4. Wear a sweater or warm cap to stay warm instead of turning up the heat.
5. In the summer, spend more time in the cool parts of your home, like the lower floor, and in the winter, spend more time in the warmer areas, like upstairs.
6. When you are heating or cooling, keep windows closed and close outside doors quickly.
7. Close the curtains in rooms you are cooling during the summer, and open the curtains to let in sun and heat during the winter.
8. Reverse the direction of ceiling fans during the winter to pull heat down from the ceiling.
9. Close heating-and-cooling vents in empty rooms.
10. Regularly clean or change the filters on the air conditioner and furnace.
11. Close the damper in the fireplace when it is not in use.
12. Turn off unnecessary gas pilot lights during the summer.
13. Turn off lights when no one is in the room, and turn off appliances when not in use.
14. Use power strips that can be switched off.
15. Put your computer in hibernation or standby mode, or turn it off when you are not using it.
16. Limit your use of luxury appliances, such as electric hand lotion warmers.
17. Keep your refrigerator full so that it operates more efficiently. You can put empty containers and bottles in it if necessary.
18. Adjust your hot water heater to a water temperature that is comfortable and not too hot (120° F – 130° F is a good range).
19. Hang your clothes outside to dry when possible rather than using the clothes dryer.
20. If you use your clothes dryer, dry full loads and clean the filter after every load.
21. Wash your clothes in cold or warm water rather than hot water, and only wash full loads.
22. Run your dishwasher only when it is full, and hand wash dishes more often.
23. Cook more than one item in the oven at once, and keep the oven door closed.
24. When cooking on the stove top, cover pans with lids to keep heat in, and use the smaller burners if possible.

STUDENT PAGE

KILOWATT OURS CHALLENGE

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 6

Name_____ **Date**_____

Easy Energy-Saving Actions

More No-Cost

25. Take shorter showers more often, instead of baths.
26. When washing your hands and brushing your teeth, turn water off until you are ready to rinse.
27. Fix leaking faucets.
28. Open and close the refrigerator door quickly.
29. Adjust the temperature of your refrigerator to no lower than 37° F.
30. Set your freezer temperature to no lower than 5° F.
31. Use only one refrigerator.
32. Defrost the freezer when the ice is no more than ¼-inch thick.

Low-Cost

1. Use floor and ceiling fans to stay cool instead of lowering the temperature of the thermostat.
2. Seal cracks around doors and windows, and other gaps in the walls and foundation, with caulk and weather stripping.
3. Replace incandescent light bulbs with compact fluorescent bulbs.
4. If possible, replace old appliances with Energy Star rated ones.
5. Install low-flow showerheads and faucet aerators to reduce hot water use.
6. Insulate the hot water tank with an insulation wrap, and insulate the exposed hot water pipes coming out of the tank, with pre-cut insulation.
7. Use mastic (a gooey substance applied with a paintbrush) instead of duct tape to seal all exposed ductwork joints in the attic, basement and crawl spaces.
8. Insulate heating-and-cooling ducts.
9. Install storm windows or sheets of plastic to single-paned windows during the winter to decrease heat loss through the windows.
10. Add insulation and a radiant heat barrier in the attic.
11. Install a programmable thermostat.
12. **Can you think of more energy-saving actions?**

STUDENT PAGE

KILOWATT OURS CHALLENGE

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 6

Name_____ **Date**_____

Kilowatt Ours Action Pledge

1. Talk with your family and circle the numbers by the things from either the no-cost or the low-cost list that you already do at home. Then pick at least five new actions that you and your family agree to take at home to save energy and money.

2. Write the actions on the Kilowatt Ours Action Pledge page. The pledge is your household's plan to save 25% in energy use.

3. Next to each action write when you and your family will do the actions. For example, you may decide to do them right away, in one or two weeks, or in one month.

4. Ask everyone in your household to sign the pledge.

5. Post the pledge on the refrigerator or another visible place as a reminder for everyone to do the actions. Remember that your goal is to reduce your household's energy use by 25%. Choose actions that you and your family can all do and that will help you reach your goal!

6. Look at your last electric bill or history usage from your local utility to find out how many kilowatt-hours your family uses in one month. Use the equation below to calculate your 25% reduction goal.

25% Reduction Goal = average kWh used in one month × 0.25

6. Finally, report your energy-saving actions and savings to the Kilowatt Counter. Just go to: www.CountYourKilowatts.org.

Ultimate Kilowatt Ours Challenge: Become a Net-Zero Home!

Those students and families who are super-motivated and are already meeting the Kilowatt Ours 25% reduction goal can try the Ultimate Challenge! The challenge is to reduce energy consumption as much as possible in the home. Then, with the resulting dollars saved, buy blocks of green power through your local electricity distributor. Aim to have all of your household's electricity consumption originating from green power sources, and you and your family can work towards the goal of becoming a **Net-Zero Home!**

How would you build a net-zero-energy community?

STUDENT PAGE

KILOWATT OURS ACTION PLEDGE

Name_____ **Date**_____

We understand that consuming energy in buildings impacts finances, human health, the environment, and our community. Therefore, we pledge to take the following steps in an effort to reduce our energy consumption at home:

Our goal is to save _____ kilowatt-hours by _____, _____.
Number Date Year

We will:

1.

When:

2.

When:

3.

When:

4.

When:

5.

When:

****

Family Member's Name (print)	Signature	Date
1) _____	_____	_____
2) _____	_____	_____
3) _____	_____	_____
4) _____	_____	_____
5) _____	_____	_____

HOME ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 7

Overview
This home energy assessment uses the Home Energy Saver online-audit tool developed by the Environmental Energy Technologies Division at Lawrence Berkeley National Laboratory. The Home Energy Saver is a professional-level tool that is used in predicting building performance, guiding design, and assisting policymakers around the world. Students will be able to enter their data into the interactive web-based energy calculator to receive customized results and upgrade recommendations for the home. This is a great team or class project, and can be extended into a community outreach project. Additional online energy calculators are listed on page 39.

Objectives
1. To recognize the factors that affect energy efficiency in residential buildings
2. To assess a home's energy consumption and efficiency
3. To make and record observations and measurements
4. To use an Internet tool to enter data and produce results
5. To make recommendations for energy-efficiency upgrades and actions to a homeowner

Skills
Critical Thinking
Observation
Measurement
Math
Internet
Presentation and Interviewing

Time
Preparation: 1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)
Procedure: 1 hour

Materials
Kilowatt Ours National Edition DVD (2007)
Electric and gas bills
Internet access
After-you-watch *Kilowatt Ours* Activity 7 Student Pages (pages 40-43)
Class Tally Sheet (page 44)
Other helpful items: compass, flashlight, yardstick or tape measure

HOME ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 7

Preparation

- Have students complete Before-you-watch *Kilowatt Ours* Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
- Ask students to bring in electric and gas bills from home. If they are unable to bring their bills, you may bring in example bills from your residence, with your personal information blacked out. They will use the bills to find the cost of each type of energy.
- Have students review the Home Energy Saver website: **http://hes.lbl.gov/ .**

Procedure

1. Ask the students if they know what an energy assessment is. An energy assessment, or energy audit, is a technical examination and review of energy consumption in a building or on a campus. Why would a home energy assessment be a good thing to do? It is an important first step to becoming more energy efficient.
2. With the students, review the 19 questions on the assessment sheets, and the steps the students will need to take to complete the process.
3. The students will take the following steps:

   a) Complete the first 19 questions of the assessment and record all of the information they collect on the assessment sheets.
   b) Go to the Home Energy Saver website at **http://hes.lbl.gov/.**
   c) Enter the zip code of the home they evaluated and click "Go!"
   d) Enter their answers to the 19 questions and click "Save Answers."
   e) The website will generate a session number, which they record in the space provided after question 19.
   f) Click "Calculate" and print the resulting page.
   g) In the "Potential Annual Savings" box, click "More detail on energy and CO_2 emissions."
   h) Print Detail Page and bring to class with the assessment sheets with the 19 questions.
   i) Enter their information on the Class Tally Sheet. Write their name and Session ID on a new line. Then, using the "Whole House" Savings section from the Detail Page, record the "$" and "Energy" savings, and calculate the emissions reductions for this session, using the values provided.
   j) As students and families make changes in their homes, they will report the energy-savings information to the "Kilowatt Counter" (**www.CountYourKilowatts.org**). They can also use the same session ID number to enter new data, or make changes to the data, in the Home Energy Saver, and produce updated results for the home.
   k) For additional activity ideas and information, visit **http://energizedlearning.lbl.gov/.**

Extensions

After assessing their own homes, students may assess the home of a friend or neighbor, and present the results and recommendations to the homeowner.

This activity may also be extended by continuing with a more detailed assessment. Once students click "Calculate," the website will allow them to further assess each area of energy use in their homes, gathering more detailed information to produce a more accurate report. The areas they may investigate are: heating and cooling, water heating, lighting, and major and minor appliances. Using the same session ID number, they just click on the particular area they would like to further assess. For example, they may click on "heating and cooling" to gather and add more detailed data into the calculator about the heating and cooling systems in that home. As they enter more data, the calculator will produce more accurate results.

Additional online calculators

- ✓ **Kilowatt Ours Kilowatt Counter: www.CountYourKilowatts.org**
- ✓ Alliance to Save Energy: http://www.ase.org/content/article/detail/971
- ✓ BP Carbon Footprint Calculator: http://www.bp.com/extendedsectiongenericarticle.do?categoryId=9015627&contentId=7029058
- ✓ Carbon Footprint Calculator: www.carbonfootprint.com/calculator.html
- ✓ Earth Team: http://www.earthteam.net/action_month/index.html
- ✓ Ecological Footprint Quiz: www.ecofoot.org
- ✓ Green Mountain Energy: http://www.begreennow.com/calculator
- ✓ Safe Climate Calculator: http://www.safeclimate.net/calculator/
- ✓ TVA Energy Right: http://www.energydepot.com/energyright/appcalc/pg1.asp?ID=0
- ✓ U.S. Environmental Protection Agency Personal Greenhouse Gas Calculator: http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterToolsGHGCalculator.html

This activity was adapted from the Home Energy Saver by the Community Home Energy Audit Program, a project of the Truth and Reconciliation Project.

STUDENT PAGE

HOME ENERGY ASSESSMENT

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 7

Name_____ **Date**_____

To complete this energy assessment, visit with the homeowner, ask the questions, make your own observations, and record the answers. After completion, follow the instructions after question 19.

1. Upgrade calculation:
   Payback Period: *Leave at "10 years".*
   Efficiency Level: *Leave at "Energy Star".*

2. City: _____ *Enter your city or town, or the one closest to you.*

3. Year house was built: _____ *If you don't know, ask the homeowner.*

4. Conditioned square feet: _____ *This is the amount of square feet that is heated and cooled in the home. For example, an attached garage is usually not heated or cooled and therefore would not be included in the conditioned square feet. Measure the conditioned square feet, or ask the homeowner.*

5. Stories above ground level: _____ *For houses built into a hillside (for example, one floor above ground level on one side, two floors above ground level on the other side), treat your house as if it had one floor above ground level and a conditioned basement.*

6. Direction the front of the house faces: _____ *Use a compass.*

7. What type of foundation does your house have? _____ *Circle one:*
   Slab-on-grade Unconditioned Basement Conditioned Basement
   Unvented Crawlspace Vented Crawlspace

   If different parts of your home have different foundation types, select the type that underlies the largest floor area. If your home is a split-level or tri-level, select the type for the part of your home that is at ground level.

8. How much attic floor or roof insulation do you have? _____ inches *Try to measure the insulation only if you can see into the attic. Do this by measuring the insulation depth near the opening in the ceiling.*
   Do NOT try to climb into the attic.

STUDENT PAGE

HOME ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 7

Name_____ **Date**_____

9. Does your house have wall insulation? YES NO/DON'T KNOW *Only circle "Yes" if you are certain that the walls are insulated. Otherwise, circle "No/Don't know".*

10. Does your house have foundation or floor insulation? YES NO/DON'T KNOW *Circle one.* **CAUTION: Identify this without crawling under the house.**

11. Do you have a clothes washer? HAVE DON'T HAVE *Circle one.*

12. How many refrigerators do you have? _____

13. How many stand-alone freezers do you have? _____

14. What is your water heater fuel? *Choose one from list below.*
Electricity Piped Natural Gas Fuel Oil Liquid Propane Gas

15. What kind of heating equipment do you have? *Choose one below that you use the most.*
None Room/Wall Central Gas/Electric Baseboard Electric Heat Pump
Electric Furnace Gas/Oil Boiler Oil Furnace

16. What kind of cooling equipment do you have? *Choose one below that you use the most.*
None Room/Window Central Air
Room Unit with thermostat Electric Heat Pump

17. Starting with the front of your house, how many windows are on each side?
Front: _____ Left: _____ Back: _____ Right: _____

18. What price do you pay for your energy? *Consult your utility bills for the types of energy used.*
Electricity: _____$/kWh Piped Natural Gas: _____$/therm or $/100 cubic foot
Liquid Propane Gas: _____$/gallon Fuel Oil: _____$/gallon

19. How many people living in your house fall into the following groups?
0–5 years _____ 6–13 years _____ 14–64 years _____ 65 yrs and older ____

Session ID: _____ from http://hes.lbl.gov/

STUDENT PAGE

HOME ENERGY ASSESSMENT

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 7

Name_____ **Date**_____

When you complete the 19 questions, go to the Home Energy Saver calculator at **http://hes.lbl.gov/** . Follow these steps:

1. Enter the zip code of the home you assessed and click "Go!"

2. Enter answers to the 19 questions and click "Save Answers".

3. The website will create a session number for the assessment. Record the session number in the space after question 19.

4. Click "Calculate" and print the resulting page, which now contains the session ID number.

5. In the "Potential Annual Savings" box, click "More detail on energy and CO_2 emissions".

6. Print the Detail Page and bring to class with the 19-question assessment sheets.

7. In your classroom, find the Tally Sheet. Write your name and Session ID on a new line. Then, using the "Whole House" Savings section from the Detail page, record the "$" and "Energy" Savings and calculate the emissions reductions for this session. The conversions you will need are listed below.

8. As your family makes changes in your home, you can report the energy-savings information to the "Kilowatt Counter" (www.CountYourKilowatts.org). You can also use the same session ID number to enter new data, or make changes to the data, in the Home Energy Saver and produce updated results for your home.

9. Conduct a follow-up interview and review the Detail Page with the homeowner.

Conversions

Convert kWh saved into pounds of coal, carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitrogen oxides (NO_x) saved.

kWh saved = pounds of coal saved (1 pound coal required for 1 kWh)

pounds of CO_2 saved = lb of saved coal × 1.4 lb CO_2/1 lb coal

pounds of SO_2 saved = lb of saved coal × 0.006 lb SO_2/1 lb coal

pounds of NO_x saved = lb of saved coal × 0.003 lb NO_x/1 lb coal

HOME ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 7

Name_____ **Date**_____

Follow-up Interview with Homeowner

1. Have you ever had an energy assessment conducted in your home?

2. Were you able to provide the information necessary to complete the assessment?

3. What new information or knowledge did you gain as a result of the energy assessment?

4. What changes do you think you can make to save energy at home?

5. When do you think you will make these changes?

6. Do you think you can save money by saving energy at home?

7. How was this home energy assessment interesting or useful to you?

8. How can we improve the home energy assessment and provide better assistance to help you save energy and money?

9. Are you willing to report your energy- and money-savings to us so we can track the impact we are having conducting home energy assessments?

To report your savings to Kilowatt Ours, go to: www.CountYourKilowatts.org

For information about financing and incentives for home upgrades, visit:

http://www.eere.energy.gov/weatherization/

STUDENT PAGE

HOME ENERGY ASSESSMENT

AFTER-YOU-WATCH *KILOWATT OURS*

ACTIVITY 7

CLASS TALLY SHEET

Student Name	HES Session ID Number	Potential Annual Savings					
		kWh	Coal (lbs)	$	CO_2 (lbs)	SO_2 (lbs)	NO_x (lbs)
Buster Kilowatt	*123456*	*10,098*	*10,098*	*572*	*14,137*	*60.6*	*30.3*
Class Totals	**n/a**						

SCHOOL ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 8

Overview
In this activity, students will take a tour of your school with a facilities or maintenance person to investigate your school's energy use. They will create a list of energy-saving recommendations to present to the school administrators or school board. You may choose one or two sections of the assessment to complete if time does not allow for the entire activity.

Objectives
1. To recognize the factors that effect energy efficiency in buildings
2. To conduct an energy assessment of the school facilities
3. To make observations and record data
4. To conduct an interview with an administrator or facilities manager at the school
5. To identify areas of improvement for environmental, economic and social habits that can be implemented in the school
6. To make recommendations for energy-efficiency upgrades and actions to school administrators

Skills
Critical Thinking
Observation
Investigation and Research
Presentation and Interviewing
Data Collection and Recordkeeping

Time
Preparation: 1.5 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)
Activity: Two 60-minute class periods plus additional time for follow-up, if desired

Materials
Kilowatt Ours National Edition DVD (2007)
School's utility bills
After-you-watch *Kilowatt Ours* Activity 8 Student Pages (pages 49-52)
Optional Student Page (page 53)

Preparation
- Have students complete Pre-viewing Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
- Ask students to think about what uses energy in the school and what the source of this energy is. Do they think the school can save energy? They should record their ideas.
- If necessary, ask your principal for permission to conduct a school assessment. The principal may be able to answer some of the questions in the "General Information" section of the assessment questions. This will save more time during the school tour.

- Arrange for the school facilities or building manager to lead your class on a tour of the school buildings and energy-using areas. **Make an appointment and set a date and time!** Plan on two hours for a full tour.
- Request copies of your school's electric and gas bills, if possible, for the most recent 24 months. For a more detailed assessment, you may request other utility bills, including water and sewage, deliveries, and garbage disposal. Students can write a letter to the principal and facilities manager to explain the project and to request permission and utility bills.
- If possible, arrange a screening of *Kilowatt Ours* at your school and invite your principal, facilities manager, school staff, and PTA members. Another option is to invite them to your classroom to watch selected parts of the film, such as the section showing examples of school success stories.

Procedure

1. Review the assessment questions, and as a class, decide who might best be able to answer the questions. **The students may be able to find some answers on their own!** Each student needs to fill out the assessment forms. One idea is to form teams to work on different parts of the assessment questions. Decide if they will complete the entire assessment.

2. At a scheduled day and time, take a tour of the buildings and school campus with a facilities or maintenance person. Begin with your classroom. Make sure to view both the heating and cooling systems! Ask your tour leader to answer the remaining questions on the assessment. Be sure to ask the questions geared toward the area you are visiting. (That is, ask the cafeteria and lunchroom questions when in that area.) You will find the responses lead to other questions. Listen carefully and record as much accurate information as possible!

3. Draw or obtain a map of the school, and label the areas of energy use, being specific about what is using energy in each area. Label the hours of operation for each area to identify when settings can be adjusted or turned off. Indicate when different areas are not in use.

4. Discuss your discoveries as a class and brainstorm a list of ways to conserve energy at school. Try to answer the questions: What have you learned about energy use in your school? Which systems or equipment use the most energy in your school? Which use the least energy? Which system is most energy efficient? Which system is least efficient? Which systems require the most maintenance or time for replacements? What are the most costly maintenance systems? Which equipment or systems run or are turned on when the buildings are vacant and there is no one around? How can you use the information you gathered to make changes?

5. Create a list of reasonable recommendations for saving energy at school, then prioritize the list, from easy, low-cost recommendations to recommendations that require more time and money. Include ideas for ways to spend the money saved!

6. Present the list of recommendations to the principal, the facilities manager, the PTA, and even the school board. You can take this a step further and develop an energy management plan for the school. Some resources to help you are included below.

Further Action Steps

- Write an article for the school paper or other school media, highlighting your most interesting findings and listing energy conservation tips for students.
- Encourage everyone at your school to view *Kilowatt Ours,* then organize a large public screening for parents and community members.
- Start an energy efficiency campaign at your school.
- Present your findings and recommendations to the parent-teacher group at your school to gain more support for implementing energy conservation measures at your school.
- Visit other schools in your district to talk about energy efficiency efforts at your school.
- Contact your local electric utility to request information and ask if they offer an energy evaluation of any sort.
- Review professional energy audits that have been completed at your school in the last two years. If no audits were carried out, arrange for the building-plan drawings and utility bills to be gathered for cost estimates of an energy audit. Determine what recommended action items from the audit were taken, if the action items need to be updated, and what action items were not taken and why. Ask questions about energy-audit requirements. Determine if your state requires licensed professional engineers to perform an energy audit. Refer to the School Audit Checklist if your school is interested in arranging a professional walk-through of the campus.

Professional School-Audit Checklist

If your school administrators are interested in investigating the possibility of a professional school audit, certain pieces of information are necessary even for the initial walk-through assessment. If the school or district already has a performance contract, then an audit may not be legally possible. The administrators will need to verify this point. The walk-through provides the professional an opportunity to gather enough information about the school facilities to offer an estimate for the full campus audit. A full audit can include energy and water consumption, waste production and disposal, air quality, fire suppression, and third-party energy consumption.

Source: Energy Services Coalition

The following information should be provided for the auditor if possible:

1. Copies of the utility bills for 24 months – water and sewage, electric, gas
2. Copies (or arrangements for borrowing) the building drawings (hard copy or electronic) – architectural, electrical, and mechanical
3. Copies of garbage and trash disposal bills (these should show how many containers, size of containers, and frequency of disposal)
4. Description of how the building is used – hours of operation, including normal hours, extracurricular periods of use, space-leasing (or free use), how many days per year
5. Description of perceived or actual energy-saving measures in place already
6. Description of the building – the square footage; year(s) the facility was built; any significant improvements; types of windows, roofing, insulation; building structure (one-story, two-story, etc.)

For more information about a professional school audit, contact:

Environmental Services Coalition
www.energyservicescoalition.org
Green Building Council
www.usgbc.org

More Great Ideas and Resources
School energy-audit ideas: Ecokids
http://www.ecokids.ca/pub/fun_n_games/printables/activities/assets/energy/school_energy_audit.pdf#search=%22school%20energy%20audit%22

Sample High School Energy Audit Curriculum Unit: Bonneville Power Administration
http://www.bpa.gov/corporate/KR/ed/energyaudit/homepage.shtml

Technical training program: STEM (Savings Through Energy Management)
http://www.wilsoned.com/STEM.html

Energy-saving tips for schools: Alliance to Save Energy
http://www.ase.org/content/article/detail/625

School energy-efficiency links: Alliance to Save Energy
http://www.ase.org/content/article/detail/646

More great resources and tips for schools: Flex Your Power
http://www.fypower.org/

Clean energy challenge for students: http://www.climatechallenge.org/

SCHOOL ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 8

Name of student interviewer_____ Date_____
Name of person interviewed_____
Position/title _____

General Information

1. What year was the school built?

2. What additions or renovations have been made to the school? When were they completed?

3. What facilities use energy on the school grounds? Some examples are outdoor lighting, scoreboards, snack bars, or the gymnasium.

4. What types of fuels are used to provide energy to the school for heating, cooling, lighting, water heating and other energy needs?

5. What are the total annual energy costs for the school, including electricity and gas? How much is spent on heating, cooling, and water heating?

6. Does the school pay any additional energy costs, such as transportation costs? How much are those annually?

7. How many hours is the school in use on weekdays, weekends, in the summer, and on holidays? Describe extracurricular periods of use and space-leasing (or free use), including how many days per year. Describe when different areas are vacant.

8. Who is in charge of energy use in the school? Who has access to the controls? What type of system is in place for monitoring the control of energy use at the school?

9. Who is in charge of maintaining equipment that uses energy? Do the energy-using systems have maintenance schedules that are followed?

10. What type of energy conservation is already in use?

Building Envelope

1. What is the square footage of each building?

2. How many stories high is each building?

3. Have there been any building improvements or major repairs since each building was constructed? Include discussions about types of windows, roofing, and insulation.

SCHOOL ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 8

Name of student interviewer_____ Date_____

4. What types of materials were used to construct each building on campus? In what sort of condition are the buildings?

5. What are the roofing materials? In what condition are the roofs? Do any of the buildings leak when it rains?

6. Are the buildings designed to use passive solar heat and light?

7. In which direction do the buildings face?

8. How many windows are on each side of each building? Approximately what percentage of outside wall space do the windows cover?

9. Are the windows single- or double-paned? Can they be opened? Do they have adjustable blinds or shades of any sort that work? Are any windows cracked or broken?

10. Do the windows have awnings or overhangs over them to provide shade from direct sun in summer, and still allow the slanted sunlight in winter to enter? How wide are the overhangs?

11. How many outside doors are there on each building? Of what type material are the doors constructed? Some examples are insulated steel or aluminum, solid wood, or hollow wood.

12. How many windows do the doors have? Are they single- or double-paned and are they cracked or broken?

13. Do windows and doors seal tightly or do they leak air? Are the exterior doors self-closing?

14. How many tall, shade-providing trees are on each side of each building? Are they evergreen or deciduous?

15. Do the buildings have wall, ceiling, roof or floor insulation? If so, what R-rating does it have?

16. Are interior stairwells open or enclosed?

SCHOOL ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 8

Name of student interviewer_____ Date_____

Heating and Cooling Systems

1. What type of heating system is used in the school? What type of energy does it use?

2. When was the heating system installed?

3. What is the AFUE (Annual Fuel Utilization Efficiency) of the system?

4. Does the heating system have a programmable thermostat to control temperature? What are the settings? If not, how is temperature regulated in the buildings?

5. What type of cooling system is used in the school?

6. When was the cooling system installed?

7. What is the SEER (Seasonal Energy Efficiency Rating) of the cooling system?

8. Does the cooling system have a programmable thermostat to control temperature? What are the settings? If not, how is temperature regulated in the buildings?

9. Do the buildings have an air exchange system when neither the heating nor the cooling system is running?

10. Is there a maintenance schedule for the heating/cooling systems that is followed?

11. Are the boilers, ducts and pipes insulated?

12. Does the school use passive solar heating?

13. Are the heating/cooling systems able to economize? Do the economizers work?

14. Is fresh air controlled by occupancy or the need for fresh air, or is maximum fresh air provided all of the time?

STUDENT PAGE

SCHOOL ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 8

Name of student interviewer_____ Date_____

Lighting

1. What type of lighting is used in the various areas inside the school? What type of lighting is used outside the school?

2. Are lights and fixtures cleaned?

3. Can any lights be controlled with dimmer switches? Where are these lights located?

4. Does the school use skylights or daylighting techniques?

5. Do any of the lights have automatic timers, photocells, or photo sensors?

6. Are lights turned off when not needed?

Water Heating

1. What type of energy is used to heat water in the school?

2. How many water heaters are used in the school?

3. When were the water heaters installed?

4. What is the EER (Energy Efficiency Rating) for each water heater?

5. Do the water heaters have timers? What are the settings for each heater?

6. What is the temperature setting for each heater?

7. Are the water heaters and water pipes insulated?

8. Are flow restrictors used?

9. Does the water system leak?

Electrical Appliances

1. How many computers does your school have? Are they turned off at night? Are they turned off when not in use?

2. How many photocopiers does your school have? Are they turned off at the end of the day?

3. What other electrical appliances does your school use? Are they all turned off when not in use?

Sources: The NEED Project and Energy Services Coalition

STUDENT PAGE

OPTIONAL
SCHOOL ENERGY ASSESSMENT
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 8

Name of student interviewer_____ Date_____

Cafeteria or Lunchroom

1. Are meals prepared at the school?
2. What kind of dishes and utensils are used?
3. How are foods kept warm or cool for serving? Are warming lights turned off when not needed? Are steam trays compartmentalized so individual ones can be turned off when not in use?
4. How is dish washing handled? How is the water heated for the dishwashers?
5. What types of deliveries are made for the kitchen? Is there enough storage space so fewer deliveries can be made? What are the refrigeration and freezer capacities?
6. How can waste be reduced?
7. Are items purchased in large quantity, thereby decreasing packaging waste?
8. Are any of the packaging materials recyclable? Is there a recycling program in place? Are recyclables separated? Are recycling compactors used?
9. What size containers are used for disposal of trash? How often do the containers need to be emptied?
10. Is a trash compactor used?
11. Are wastes separated for composting?
12. Are oils and grease recycled?
13. Does the routine in the kitchen call for energy-using devices to be turned on at a scheduled time in case they might be used? For example, does the routine call for the baking ovens to be turned on, even though there are no baked items on the menu for that day?

Water Consumption

1. Are waterless urinals used?
2. Have toilets been updated to use less than 2 gallons per flush?
3. Are all of the toilets and urinals working properly, or does water continue to run between uses?
4. Are restroom sink faucets dripping? Have automatic sensors been installed to activate water flow on and off?
5. Have rainwater storage tanks been installed and used for “grey” water needs?

Fire Suppression

1. Is the fire-suppression system a wet or dry system?
2. Do all areas of the school have to maintain a minimum temperature to protect pipes from freezing?

Third-Party Energy Consumption

1. What types of deliveries and pickups are made? What is the frequency of trips?
2. How can the need for deliveries be reduced?
3. How can the need for pickups be reduced?
4. What size containers are used?
5. What type of packaging is used?

Source: Energy Services Coalition

KILOWATT OURS QUIZ SHOW
CLASH OF THE ENERGY SAVERS!
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 9

Overview

The game show is a simple follow-up classroom activity that can be used as a review, a method of assessment, a discussion after viewing the film, or an introduction to another activity. The questions and answers all come directly from the *Kilowatt Ours National Edition* DVD (2007).

Objectives

1. To review and assess new knowledge about energy production, its related problems, and the solutions
2. To engage in a discussion about *Kilowatt Ours* and the ideas it presents
3. To work as a team to reach consensus and present ideas

Skills

Critical Thinking
Comprehension
Group Cooperation

Time

Preparation: 1 hour (including viewing of 25-minute *Kilowatt Ours National Edition*)
Activity: 30 minutes to 1 hour

Materials

Kilowatt Ours National Edition DVD (2007)
Board to keep score
After-you-watch *Kilowatt Ours* Activity 9 questions and answers (pages 56-62)
Optional: PowerPoint Quiz Show (available at www.KilowattOurs.org/curriculum)
Prizes

Preparation

- Have students complete Before-you-watch *Kilowatt Ours* Activity 1 if they have not already done so.
- Show *Kilowatt Ours: A Plan to Re-Energize America* to your students.
- Decide which game-show format to use. You can simply create two teams, ask the questions, and give points for correct answers. Or for more fun, easy, Power Point game-show templates, go to: http://www.glc.k12.ga.us/trc/cluster.asp?mode=browse&intPathID=5128
- A fun idea is to have compact fluorescent light bulbs as prizes.

KILOWATT OURS QUIZ SHOW
CLASH OF THE ENERGY SAVERS!
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 9

Procedure

1. After viewing *Kilowatt Ours,* divide the class into two teams and create team names.
2. Ask each team to select a spokesperson/team captain.
3. Teams may discuss quietly and decide on answer together. The answer that the spokesperson gives is the only valid answer. NO SHOUTING OUT. Answers that are shouted out by team members are not valid.
4. Correct answers are worth one point. Use your best judgment to determine if an answer is correct. If the answer given is incorrect, the other team gets a chance to steal the point.
5. To give each team a fair chance, you can switch back and forth between teams for each question.
6. Feel free to add questions, or use the questions as a starting point for further discussion or activities.

Extension

Students can also create their own questions for each category from *Kilowatt Ours* to ask the other team.

KILOWATT OURS QUIZ SHOW
CLASH OF THE ENERGY SAVERS!
AFTER-YOU-WATCH *KILOWATT OURS*
ACTIVITY 9

QUESTIONS AND ANSWERS

CATEGORY 1 – WHERE DOES YOUR ELECTRICITY COME FROM?

1. How do coal-mining companies get coal out of the mountains of Appalachia?
   They use 2,500 tons of explosives each day to remove the earth and extract the coal.

2. How much earth has to be removed from the Appalachian Mountains to extract 4 million tons of coal?
   24 million tons of earth must be removed to extract 4 million tons of coal. (Do you think that is feasible?)

3. What has happened to streams in Appalachia as a result of the mountaintop-removal process?
   More than 1,500 miles of streams have been buried or filled with silt in Appalachia. The natural landscape has been altered beyond repair, leading to severe floods, such as the one in the town of Dorothy, West Virginia, in July 2001.

4. Why is flooding a resulting problem of coal mining?
   Flooding is a problem because millions of tons of debris are dumped into the valleys below the coal mines, filling streams with silt.

5. How much of America's electricity is generated by coal-fired power plants?
   About 52% of America's electricity is produced by burning coal in power plants.

6. How much of America's energy is generated in nuclear power plants?
   About 20% of America's energy is generated by nuclear fission in power plants.

7. What type of raw material is mined and used in nuclear power generation?
   Uranium ore is mined and used in the process of nuclear power generation. As long as it stays in the ground in its natural state, uranium is not toxic to humans.

8. Where are the largest uranium reserves in the US?
   The largest reserves of uranium in the United States are in New Mexico.

9. What type of waste does nuclear power generation produce?
   Nuclear power generation produces radioactive waste, including uranium mill tailings, reactor fuels and weapons-grade plutonium waste, and plutonium waste. The waste is extremely toxic and we still do not know how to dispose of it!

10. Why is demand for electricity rising?
    Demand for electricity is rising because people have many more appliances and electronic devices than ever before, and are consuming much more electricity as a result. Population increase is also a major factor contributing to increased demand.

CATEGORY 2 – DIRTY COAL

1. What type of waste is produced as a result of coal mining?
   Processing coal leaves behind massive amounts of toxic slurry waste which is stored in giant sludge ponds throughout Appalachia. In the fall of 2000 one of these lakes failed, sending an estimated 300 million gallons of sludge into the Big Sandy River in Martin County, Kentucky.

2. What has happened in Great Smoky Mountains National Park as a result of burning coal in power plants?
   Visibility in the Great Smoky Mountains has declined 60% over the last 60 years. Air pollution is the biggest problem that the national park is dealing with. The pollution affects trees, alters soils, and harms fish in the streams. One of the by-products of coal-fired power plants is ground-level ozone pollution, which damages living tissue in plants. Air pollution is also occurring in Mount Rainier, Everglades, Yosemite, Rocky Mountain, Yellowstone, and Grand Canyon National Parks, as well as almost all other national parks around the nation.

3. What causes 83% of the visibility-reducing haze in Great Smoky Mountains National Park?
   Sulfate particulates emitted by coal-burning power plants cause the haze.

4. How does burning coal (a fossil fuel) affect global climate?
   Burning coal in power plants produces extra greenhouse gases such as carbon dioxide and methane which causes the "heat blanket" around the earth to become thicker, keeping more heat from escaping into space, and warming the planet. America's largest single source of greenhouse emissions is coal-fired power plants.

5. What evidence are we already seeing of a warming planet?
   We are seeing more intense hurricanes, hotter and longer summers, the disappearance of the Spruce-Fir ecosystem, more mosquitoes and the vector-born diseases that they bring, rising oceans, and the coral reefs off of Florida being damaged by warming oceans.

6. How many people in the United States live in bad air areas?
   According to the EPA, 33 million people, over 10% of the population, live in bad air areas around the United States.

7. Why do 45 out of 50 states warn that fish are unsafe to eat?
   These states post advisories or warnings because of the high levels of methylmercury in the water, which ends up in the fish and then in humans who eat the fish. Methylmercury is toxic to humans, especially children and unborn fetuses.

8. According to the Centers for Disease Control, what do 1 in 10 women of childbearing age carry in their tissues that is unsafe?
   They carry unsafe levels of mercury in their tissues, which is passed on to the mother's unborn child, causing damage to the baby's brain and nervous system during a fragile state of development in the womb.

9. What are some of the consequences from exposure to methylmercury on a child's development as they grow and mature?
   A child can have neurological deficits that they never recover from, causing them to not do as well in school, not be able to recognize geometrical patterns as well as other children, and not understand what they are reading as well as other children.

10. Name two things of which asthma is the number one cause.
    Asthma is the number one cause of hospitalization of children, chronic illness in children, health-care expenditures for chronic illnesses in children, school absences, and lost revenue in school systems.

CATEGORY 3 – OUR KILOWATTS

1. How much coal needs to be burned in a power plant to produce one kilowatt-hour of electricity?
   For each kilowatt-hour we use, about one pound of coal is burned.

2. For how long can one pound of coal power ten 100-watt light bulbs?
   One pound of coal can power ten 100-watt light bulbs for one hour.

3. For about how long can one pound of coal run an air conditioner or water heater?
   One pound of coal can run an air conditioner or water heater for about 15 minutes.

4. The average home in the United States uses how many kilowatt-hours per month?
   The average home in the Unites States uses over 900 kilowatt-hours per month.

5. Approximately how much coal must be burned in a typical year to power the average home in the United States?
   More than 5 tons of coal must be burned in a typical year to power the average home in the United States.

6. How much coal does the United States mine and burn every year in power plants?
   The United States mines and burns approximately 1.1 billion tons of coal every year.

7. Recycling _____ saves enough energy to power a television for three hours.
   *Recycling **ONE aluminum can** saves enough energy to power a television for more than three hours!*

8. How much energy does Austin Energy save through its conservation programs in the City of Austin? How many megawatts of power would a coal-fired power plant produce?
   Austin Energy saves over 600 megawatts of power every day in the City of Austin; a power plant would provide only 500 megawatts of power for twice the price.

9. In the summer of 2000, how did the state of California avert an energy crisis?
   Through an energy-efficiency education program, California was able to cut peak energy demand by 14%, saving 55 megawatts of power, avoiding the need to build ten new power plants, and avoiding blackouts that summer.

10. How much energy does the air cooling and heating system use in the average home, and how much money does it cost to run per year?
    The typical residential cooling and heating system uses about half the energy in the average home, costing about $1000 per year.

CATEGORY 4 – STEP 1: ENERGY EFFICIENCY

1. How much more efficient are compact fluorescent light bulbs (CFLs) than incandescent bulbs?
   CFLs are up to 75% more efficient. They use 25% as much electricity as incandescent bulbs.

2. Why are CFLs more efficient than incandescent bulbs?
   Incandescent bulbs use 90% of the energy they require on producing heat, and only 10% on producing light. CFLs use 80% of the energy to produce light. So to produce the same amount of light, CFLs require less energy, and they also last years longer than incandescent bulbs.

3. What is Energy Star?
   Energy Star is a federal government program run by the US Environmental Protection Agency and US Department of Energy that certifies and identifies energy-efficient products. Just a few examples of products that can have the Energy Star label are lights, windows, refrigerators, clothes washers and dryers, dishwashers, ceiling fans, televisions, and home electronics.

4. What would result if every household in America changed just one bulb to an Energy Star compact fluorescent?
   The change would save enough energy to light 2.5 million homes and remove the amount of greenhouse gas emissions from 800,000 cars.

5. What has Toyota done in their headquarters to create an energy-efficient building?
   Toyota uses a technique called indirect lighting which bounces the light off the ceiling, dispersing it across the workstations. In addition, they have motion control sensors so only sections of the building which are occupied are using lights and energy. As a result the building is 60% more efficient than the most rigorous energy code in the US, and saves money every year.

6. America only recycles about how many of its aluminum cans?
   America only recycles about half of its aluminum cans. (Why don't we recycle more?)

7. What can be done to traffic signals and exit signs to save energy and money?
   Traffic signals and exit signs can be upgraded to LED bulbs, which are very energy efficient. They use 90% less energy than incandescent bulbs.

8. Schools in America spend more on _____ than on computers and textbooks combined.
   *Schools in America spend more on **energy bills** than on computers and textbooks combined.*

9. What are some benefits of daylighting?
   Some benefits of daylighting are: saving energy and money, and improved student performance, test scores and behavior.

10. Name some actions that can be taken at school to save energy and money.
    At school, we can turn off the lights and computers when they are not in use, we can adjust the temperature of the room, we can use daylighting, we can conduct a school energy audit and present recommendations for change to the administration and school board, we can show "Kilowatt Ours" *to the entire school, or we can start an energy efficiency campaign on campus. Are there other ideas?*

11. Name some actions that can be taken at home to save energy and money.
    At home, we can do all of the actions listed in the "Kilowatt Ours Challenge" activity and the "Top Ten Steps to Save Energy" guide.

CATEGORY 5 – STEP 2: USE GREEN POWER

1. Name three green power sources.
   Examples of green power sources are solar, wind, geothermal, and methane gas. "Kilowatt Ours" *does not include nuclear power as a green energy source because of the extremely toxic waste it produces.*

2. Why are solar, wind, geothermal, and methane gas energy sources called "green"?
   They are clean and renewable energy sources. They emit no pollutants or waste, and are constantly produced, or renewed, by the earth and sun.

3. Name one way you can support green power at home.
   I can call my local electricity provider and sign up to participate in its green power program, if it has one. If my family can afford to, we can install solar panels on our roof, or install a geothermal heat-pump system.

4. What can be done to flat rooftop space to save half the power needs of a city?
   Flat rooftop space can be covered with solar collectors to gather energy from the sun and produce electricity.

5. Explain the basic concept of a geothermal heat-pump system.
   Geothermal heat pumps are very efficient because they use the constant temperature of the earth, which is an average 59 degrees, as the heat- exchange medium instead of the outside air temperature. They use a ground heat-exchanger to heat and cool buildings and heat water.

6. How does TVA's Green Power Switch Program work?
   Any resident in the TVA region can call their local utility to find out if they can participate in the Green Power Switch program. The customer voluntarily purchases blocks of green power (150 kWh) for $4 each, which displace that amount of energy from the power mix produced by TVA at coal-, hydro-, and nuclear power plants.

7. What can schools do to take action on Step 2?
   Schools can also sign up to buy green power through the local utility. Schools can invest in installing their own green power sources as well, such as a geothermal pump system, solar collectors, or wind turbines, which will save them thousands of dollars on power bills.

8. What is the potential for wind energy in the Midwestern and Rocky Mountain states alone?
   Using only wind power, the Midwestern and Rocky Mountain states could produce 2.5 times the entire amount of electricity generated in America today.

9. How is methane gas produced?
   Methane gas is produced naturally from the decay of organic matter. It can be harnessed from waste-water treatment plants, landfills, and livestock farms, and used to produce energy.

10. What does "net-zero" mean?
    "Net-zero" means that a building produces as much energy as it consumes because of energy efficiency and the use of green power.

11. Why do we need to do both Step 1 and Step 2 to become an energy-efficient nation?
    We need to lower our energy demands now, before green power sources such as solar, wind, and methane gas become practical, affordable, and effective.

BONUS CATEGORY – KILOWATT QUOTABLES

Explain the idea behind the following quotes:

1. "How can we possibly afford to build all these new power plants? There's got to be a better way."

2. "We can't afford not to afford it."

3. "The old saying is, 'You can't get something for nothing,' but in this case, you are getting something for nothing…"

4. "We are poisoning our grandchildren."

5. "Why should you take a picture of a mountain?"

6. "We are conducting an unplanned, uncontrolled experiment on the only atmosphere we have."

7. "We have, after all, mastered one form of technology that causes zero emissions of greenhouse gases: nuclear power."

8. "Energy conservation is a wise investment."

9. "You can't smell it, you can't taste it, you can't even feel it going through your body."

10. "It's our responsibility to leave a cleaner future for our children and our children's children, because if we don't do it, who **will** do it?"

    The answers to these questions will vary. Use your best judgment to give points for thoughtful responses.

GLOSSARY
APPENDIX A

Active solar – A term describing technologies that convert solar energy into usable heat, cause air-movement for ventilation or cooling, or store heat for future use, using electrical or mechanical equipment, such as pumps and fans, to increase the usable heat in a system.

Building envelope - The structural elements, or building shell, including the walls, roof, floor and foundation of a building that enclose the conditioned space.

Carbon footprint - A measure of the impact human activities have on the environment and climate change, in terms of the amount of greenhouse gases emitted through burning fossil fuels, measured in units of carbon dioxide equivalent.

Carbon offset - A financial instrument representing a reduction in greenhouse gas emissions, which includes carbon credits.

Coal - A fossil fuel created from the remains of plants that lived and died about 100 million to 400 million years ago, were buried under water and dirt, and transformed under heat and pressure into rich hydrocarbon deposits. Coal is considered a nonrenewable energy source because it takes millions of years to form.

Compact fluorescent lights (CFLs) - New lighting technology that is four times as efficient as incandescent bulbs and lasts up to ten times as long.

Consumption - The act of using energy.

Daylighting - The use of direct, diffuse, or reflected sunlight to provide supplemental lighting for building interiors.

Ducts - Pipes or tubes through which warm or cool air is transported in a building.

Economize - To use resources efficiently and frugally.

Electricity - A secondary source of energy that is produced from a primary source of renewable or nonrenewable energy, such as coal, natural gas, solar energy, or wind energy. The electrical energy that an appliance or device uses is determined by knowing how long it consumes electrical power at a specific rate. It is commonly measured in kilowatt-hours.

Electric power - The amount of electric current flowing due to an applied voltage. It is the amount of electricity required to start or operate a load for one second and is measured in watts or kilowatts.

Emissions - Substances discharged into the air as a result of burning fossil fuels to produce energy. Emissions that result from burning coal are carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and methylmercury.

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APPENDIX A

Energy - The ability to produce change or do work. For example, energy can produce light, heat, motion, sound and growth.

Energy audit (assessment) - A technical examination and review of energy consumption in a building or on a campus. A professional audit is conducted by a trained expert such as an engineer, and includes a report with recommendations for upgrades and improvements to increase energy efficiency.

Energy conservation - Any behavior that results in the use of less energy.

Energy efficiency - The use of less energy to accomplish the same task, such as heating a home or washing clothes.

Energy-efficiency upgrade - An improvement made to a building that results in increased energy efficiency.

Energy Star - A government program that certifies energy-efficient products. Products with the Energy Star label have been identified by the US Environmental Protection Agency and the Department of Energy as the most efficient products in their classes.

Flow Restrictor - A water- and energy-conserving device that limits the amount of water that a faucet or showerhead can deliver.

Fossil fuel - A type of nonrenewable energy source that was created from the remains of plants that lived and died about 100 million to 400 million years ago when parts of the earth were covered with huge swampy forests. Coal, petroleum, and natural gas are examples of fossil fuels.

Geothermal heat pump - A very efficient closed-loop system that uses the constant temperature of the earth (an average 59 degrees) as the heat-exchange medium instead of the outside air temperature. It uses a ground heat-exchanger, such as water or Freon, to heat and cool buildings and heat water.

Global warming - A term that refers to the rise in the earth's temperature resulting from an increase in heat-trapping gases (mainly carbon dioxide and methane) in the atmosphere, causing changes in climate around the globe.

Greenhouse effect - A naturally occurring process that the earth experiences because certain gases trap energy from the sun, keeping the earth's temperature 60 degrees warmer than it would otherwise. As a result, life on earth can be sustained.

Green power - A term used to describe energy sources that do not produce waste or emissions and are renewable. Wind, solar, and geothermal energy are examples of green power.

GLOSSARY
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Green Power Switch - A program developed by the Tennessee Valley Authority and local public power companies as a way to bring green power to consumers. Consumers sign up and choose to purchase $4 blocks of green power; the cost is added to their monthly bills.

Grid - A term used to describe the network of power generation sites, transformers, wires, and cables that transport electricity from a power plant to homes. People are considered to live off-the-grid when they are living self-sufficiently without relying on any public or private energy provider or utility.

Hydropower - A renewable energy source created by the force of moving water. People can capture the energy and convert it into electricity by building dams and hydroelectric power plants.

Incandescent light bulbs - The lighting technology that Thomas Edison is famous for developing in 1879, which is still commonly used today. These bulbs convert up to 90% of the electricity they use into heat rather than light.

Insulation - A material that provides resistance to heat flow in homes, lowering heating-and-cooling costs. Insulation varies by material, thickness, and density, and is rated in terms of its thermal resistance, or R-value. The higher the heat resistance of the insulation, the higher the R-value.

Kilowatt-hour (kWh) - The kilowatt-hour is a measure of electrical energy**.** It is the product of power in watts and time interval in hours. For example, electricity used at a rate of one watt for 1000 hours , or 10 watts for 100 hours, or 1000 watts for one hour, is equal to one kilowatt-hour of energy (1000 watt-hours = 1 kilowatt-hour).

LED (light-emitting diode) - A form of lighting technology that is 90% more energy-efficient than incandescent lighting.

Mercury - A naturally occurring element found in air, water, soil and rocks, including coal. When coal is burned, mercury is released into the air, eventually ending up in the earth and water and changing into methylmercury, which is highly toxic.

Meter - The gauge that measures electricity or gas consumption in buildings. Each month, employees from the local utility read the numbers on the meter to determine how much energy was used in the building for that month. Meters can have dials or digital displays.

Methane - A gas that is naturally produced when organic matter decomposes. The gas can be collected from sources such as landfills, waste-water treatment plants, and livestock farms, and then used as an energy source. Methane gas collection is considered a green power source.

GLOSSARY
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Mountaintop removal - The process of removing tons of earth from mountains with the use of large amounts of explosives in order to extract coal for energy production. This practice drastically alters the landscape and is common in the Appalachian region.

Natural gas - A type of fossil fuel consisting mainly of methane gas. Natural gas is a common energy source used to produce heat and electricity.

Net-zero energy - A net-zero-energy home produces as much energy as it consumes each year due to energy-efficiency practices and the use of green power. Net-zero can also be accomplished by purchasing green power from a utility or earning energy credits.

Nonrenewable energy - Energy sources that cannot be replaced once they are used. Fossil fuels are considered nonrenewable because they take millions of years to form. Coal, petroleum, natural gas, propane and uranium are nonrenewable energy sources. In the United States, we use these types of energy most.

Nuclear energy - Energy in the nucleus of an atom that is released when atoms are split apart to form smaller atoms in the process of nuclear fission. Power plants use nuclear fission and most commonly use enriched uranium ore as the fuel in the process to produce electricity.

Oil - A fossil fuel, also called petroleum, created from the remains of sea plants and animals that died 300 million to 400 million years ago, were buried by layers of dirt and rock, and transformed into deposits under enormous heat and pressure. Oil is called a nonrenewable energy source because it takes millions of years to form.

Passive solar - A term describing a method of building design that uses structural elements to heat and cool a building without the use of mechanical or electrical equipment. For example, the windows, walls and floors are designed so that they collect, store, and distribute solar energy in the form of heat in winter and reject solar heat in the summer.

Performance contracting - The practice of using energy savings resulting from building upgrades to pay for the upgrades on the building.

Phantom load - A term that refers to the electricity used by electronic appliances and devices while they are turned off or in standby mode. Appliances with remote controls or digital clocks are common “electricity phantoms”. Also called vampire power, standby power, or leaking electricity.

Power - A measure of the rate of doing work or the rate at which energy is converted. Electrical power is the rate at which electricity is produced or consumed, and is measured in watts.

Power distributor - A company (also commonly called a *utility)* that sells energy, such as electricity or gas, to consumers in a city or region. Power distributors often do not produce the energy, but purchase it from a company that does.

Power supplier - A company (also called a *power producer*) that generates energy from a primary energy source, such as coal or natural gas, and sells it to the local power distributors.

Production - The process of making electricity from a primary energy source, to be used by consumers.

Programmable thermostat - A thermostat that can be adjusted, according to a pre-set schedule, to control run times for air-conditioning and heating. As a result, the equipment is not operated as much when people are asleep or the building is not occupied, saving about 10% in heating and cooling costs per year.

Renewable energy - Energy sources whose supplies are replenished again after they are used. Geothermal, hydropower, biomass, solar and wind are examples of renewable energy.

Solar energy - Radiant energy that is produced by the sun and is a renewable energy source. People can use solar energy in different ways, including heating passively or actively, generating electricity, heating water, and lighting buildings.

Sustainable - Being capable of using a resource or maintaining a process, such as energy production, without depleting or permanently damaging the resource or environment.

Thermostat - An automatic device which regulates the temperature of a building by controlling the supply of gas or electricity to a heating unit, by adjusting the temperature at which the thermostat is set.

Uranium - A nonrenewable metal which is the most widely used fuel in nuclear power plants because its atoms are easily split apart. Uranium ore is harmless in its natural state in the ground, but is extremely toxic when it is mined and processed.

Utility - A company that provides energy for customers and is also called an energy provider.

Wind energy - A renewable energy source produced by the uneven heating of land and water on the earth's surface by the sun. People can harness the energy using turbines to generate electricity.

GLOSSARY
APPENDIX A

Add more glossary terms:

Definitions for the terms in the glossary are derived from various sources, including:

1. Green-E: http://www.green-e.org/dictionary.shtml
2. *Kilowatt Ours: A Plan to Re-Energize America*: www.KilowattOurs.org
3. Merriam-Webster Online: http://www.m-w.com/
4. The NEED Project's Secondary Energy Infobook: www.need.org
5. U.S. Department of Energy: http://www.eere.energy.gov/consumer/
6. Wikipedia: http://en.wikipedia.org/wiki/Main_Page

ADDITIONAL ONLINE RESOURCES
APPENDIX B

General Websites

Alliance to Save Energy
www.ase.org/section/_audience/educators
Green School Program, lesson plans, great links to audits and other resources for schools

American Wind Energy Association
http://www.awea.org/
The go-to site for anything about wind energy

an-inconvenient-truth.com
www.an-inconvenient-truth.com
Many links, resources, curriculum materials, and a great Personal Impact Audit Checklist

Appalachian Voices
http://www.appalachianvoices.org/
Tools and strategies for successful grassroots campaigns to defend Appalachian region

APS Power Posse
http://powerposse.aps.com/
Great classroom activities

Austin Energy
http://www.austinenergy.com/
A community-owned electric utility that has one of the most comprehensive energy efficiency programs

Big Frog Mountain
www.bigfrogmountain.com
Information about alternative energy sources

Bullfrog Films
www.bullfrogfilms.com
Catalog of independently produced environmental videos

Carbon Conscious Consumer
http://c3.newdream.org/
Challenges individuals to establish climate-friendly daily habits and inspire their friends to do the same

The Clean Air Campaign
http://www.cleanaircampaign.com/Kids-Schools
Lesson plans about air quality

Co-op America: Climate Action
http://www.coopamerica.org/programs/climate/
Provides tools to take economic action to stop global warming

Earth 911
www.earth911.org
An environmental clearinghouse, providing resources and links for many environmental topics

Earth Day Network
http://www.earthday.net/
Up-to-date news and resources relating to the environment and a great teacher network

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General Websites

Edutopia: Go Green Database
http://www.edutopia.org/go-green
A directory that can be searched by topic, grade level, cost, or location

Efficiency Vermont
http://www.efficiencyvermont.com/pages/
A great example of a progressive electric utility with excellent resources to help reduce energy use

Energy Action Coalition
http://energyactioncoalition.org/
A movement of youth uniting to take action for clean and just energy

Energy and Environmental Alliance
www.eea.freac.fsu.edu
Good facts and links

Energy Hog
www.energyhog.org
Great site for just about everything

Energy Justice Network
http://www.energyjustice.net/
The grassroots energy agenda, supporting communities threatened by polluting energy and waste technologies

Energy Star
www.energystar.gov
Everything you want to know about energy efficiency

Florida Solar Energy Center
http://www.fsec.ucf.edu/en/
Information on research in alternative energy, and teacher resources

The Green Earth Project
www.greenearthproject.com
Energy and environmental education for schools; great information and links

Green Market Fundraising
www.greenmarketfundraising.com
Helps students and schools fundraise through the sale of energy-saving products

I Love Mountains
http://www.ilovemountains.org/
Action and resource center to end mountain top removal

Imagining Tomorrow: Alternate Energy Futures
http://www.itomorrow.theforesightproject.org/
A creative writing and video contest about clean energy for all high school students in the United States

Lowe's Energy Solutions Guide
http://images.lowes.com/animate/ENERGYSTAR_Solutions_Guide.pdf
Comprehensive and user-friendly guide to saving energy

ADDITIONAL ONLINE RESOURCES
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General Websites

National Environmental Education Week
http://www.eeweek.org/energycurricula.html
A great list of energy-related curricula, tools, and resources

National Oceanic and Atmospheric Administration
Climate Program Office
http://www.climate.noaa.gov/education/index.jsp

National Wildlife Federation
http://online.nwf.org/site/PageNavigator/ClimateClassroom/cc_teachers_slideshow
Global warming slideshow and presenter's guide

Nebraska State Energy Office
www.neo.ne.gov
Energy codes, statistics, energy-saving tips, and glossary

The NEED Project
National Energy Education Development
PO Box 10101
Manassas, VA 20108
800-875-5029
www.need.org
Energy education programs and curriculum materials

One billion bulbs: "Changing the world one bulb at a time"
http://www.onebillionbulbs.com/
Fun, interactive site promoting compact fluorescent light bulbs

Pacific Gas and Electric Company
http://www.pge.com/education_training/energenius/index.html
Free classroom materials on energy efficiency and safety

The Power Is in Your Hands
www.powerisinyourhands.org
Home audits, tax credit information, energy-saving tips

Project Learning Tree
www.plt.org
Award-winning environmental education program designed for educators, parents, and community leaders working with youth, from preschool through grade 12

Southern Alliance for Clean Energy
www.cleanenergy.org
Great resource with a focus on the southeastern region

Southface
www.southface.org
Training and workshop opportunities focusing on energy and water conservation, technical assistance and sustainability resources

Tennessee Valley Authority
www.tvakids.com
Energy sourcebooks and curriculum materials

Unscrew America
http://unscrewamerica.org/
Wacky site that is very appealing to young people

U.S. Department of Energy, Energy Efficiency and Renewable Energy
www.eere.energy.gov
Thorough and reliable research and information

U.S. Department of Energy, Energy Information Administration
Energy Kid's Page
www.eia.doe.gov/kids
Energy education resources, classroom activities, games, glossary, and links

U.S. Environmental Protection Agency
Climate Change Kids Site
www.epa.gov/globalwarming/kids
Great information, games and resources for educators

U.S. Green Building Council
http://www.usgbc.org/
Professional information on building sustainable and efficient structures

Watts on Schools
www.wattsonschools.com
Great activities

Calculators and Carbon Credits/Offsets

Kilowatt Counter
www.CountYourKilowatts.org
Track and report your energy-saving actions directly to Kilowatt Ours and see your impact!

Alliance to Save Energy
Home Energy Checkup
http://www.ase.org/content/article/detail/971

American Forests
http://www.americanforests.org/resources/ccc/
The Personal Climate Change Calculator will measure your climate-affecting CO_2 emissions

BP Carbon Footprint Calculator
http://www.bp.com/extendedsectiongenericarticle.do?categoryId=9015627&contentId=7029058
A tool that helps you to estimate your household carbon footprint

Carbon Footprint Calculator
www.carbonfootprint.com/calculator.html
Quickly determine your primary carbon footprint, based on your household fuel bills and your annual travel

ADDITIONAL ONLINE RESOURCES
APPENDIX B

Calculators and Carbon Credits/Offsets

Carbonfund
http://www.carbonfund.org/
This website says “Reduce what you can, Offset what you can’t”

Choose Renewables
http://www.chooserenewables.com/
Determine your impact and then create and implement your personal MyEnergy Makeover

ClimateCare
http://www.climatecare.org/
Helps you reduce your CO_2 emissions and carbon footprint

Earth Team
http://www.earthteam.net/action_month/index.html
A school carbon calculator developed by a high school senior

Ecological Footprint Quiz
www.ecofoot.org
A quick-and-easy quiz to find out how much productive land and water you need to support what you use and discard

Green Mountain Energy
http://www.begreennow.com/calculator
This calculator will let you calculate your CO_2 emissions in different areas of your life and offset them

Home Energy Saver
http://hes.lbl.gov/
A thorough energy audit tool that calculates a home’s energy use and potential savings

LiveNeutral
http://www.liveneutral.org/
Calculate, reduce, and neutralize your footprint

Native Energy
http://www.nativeenergy.com/
This website offers unique “help build” carbon offsets

Renewable Choice Energy
http://www.renewablechoice.com/
A leading national provider of renewable energy and carbon offsets for homes and businesses

Safe Climate Calculator
http://www.safeclimate.net/calculator/
A calculator that allows you to determine carbon dioxide emissions from major sources, homes, and transportation

Sustainable Travel International
http://www.sustainabletravelinternational.org/
Promotes responsible travel, ecotourism, and sustainable development

TerraPass
http://www.terrapass.com/
Very comprehensive site to help reduce emissions

TVA Energy Right
http://www.energydepot.com/energyright/appcalc/pg1.asp?ID=0
A program that encourages, communicates, and supports the wise and efficient use of electricity in homes

U.S. Environmental Protection Agency Personal Greenhouse Gas Calculator
http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterToolsGHGCalculator.html

Zerofootprint Kids Calculator
http://us.zerofootprintkids.com/kids_home.aspx
Super-kid friendly, customizable calculator tool

In Tennessee

Conservation Education Now for Tennessee Students (CENTS)
Tennessee Department of Education
http://www.state.tn.us/education/projectcents/
Tami Coleman
615-741-6055
Tamara.coleman@state.tn.us

Energy Division of Tennessee Department of Economic and Community Development
Local government and small business energy loan programs
www.tnecd.gov
615-741-1888, Energy Hotline: (800) 342-1340

Energy Services Coalition
www.energyservicescoalition.org
Green Building Council
www.usgbc.org
Deb Faust, LEED AP
615-391-5278
debfaust@comcast.net

Environmental Education in Tennessee
www.eeintennessee.org

Green Schools Program
Tennessee Department of Environment and Conservation
http://www.tennessee.gov/environment/ea/tp3/tp3_grschools.shtml
Cynthia Rohrbach
615-532-0077
Cynthia.rohrbach@state.tn.us

Tennessee Energy Education Network (TEEN)
Tennessee Department of Economic and Community Development
http://www.state.tn.us/ecd/energy_teen.htm
Ramona Nelson
731-426-0536, Energy Hotline: (800) 342-1340
Ramona.nelson@state.tn.us

Tennessee Environmental Education Association (TEEA)
www.teea.info
Vera Vollbrecht
615-352-6299
Vera.vollbrecht@nashville.gov

COAL MINING

- The process of mountaintop-removal takes place 24 hours a day, every day.
- Five million pounds of explosives a day are used by the coal-mining companies in Appalachia.
- More than 1,500 miles of streams in Appalachia have been buried as a result of the mountaintop-removal process.
- In the fall of 2000, over 300 million gallons of coal slurry were spilled into the Big Sandy River in Martin County, Kentucky. Although this ecological disaster was 30 times greater than the 1989 Exxon *Valdez* oil spill in Alaska, very few people outside of Kentucky heard about it.
- In the past 30 years, mountaintop-removal has claimed more than 450 mountains in central and southern Appalachia and there are dozens of permits for new mines in the works.
- 52% of America's electricity is generated from burning coal.
- America mines and burns 1.1 billion tons of coal every year, enough coal to fill a train extending from the west coast to east coast and back, and then around the world 3 times. We burn this much **every year**.

COAL BURNING

- America's largest single source of global warming emissions is coal-fired power plants.
- Visibility in the Great Smoky Mountains National Park has declined 60% over the last 60 years.
- Every single national park in the United States has haze pollution including Mt. Rainier, Everglades, Yosemite, Rocky Mountain, Yellowstone, and Grand Canyon National Parks.
- On average, 83% of the visibility-reducing haze in Smoky Mountains National Park is from sulfate particulates produced by coal-burning power plants.
- One of the by-products of burning coal is ground-level ozone pollution, which affects living plant tissue and breathing in people.
- According to the EPA, 33 million people, over 10% of the population, live in bad air areas around the United States.
- More than 45 states now post statewide mercury advisories warning that fish are unsafe to eat.
- According to the Centers for Disease Control, nearly 1 in 10 women of childbearing age in America carry unsafe levels of mercury in their bodies
- The largest source of mercury pollution today is coal-fired power plants.
- Asthma is the number one cause of:
    - Hospitalization of children
    - Chronic illness in children
    - Health-care expenditures for chronic illnesses in children
    - School absences
    - Lost revenue to school systems

FACTS AND STATS FROM *KILOWATT OURS*
APPENDIX C

NUCLEAR POWER

- Grants, New Mexico is America's largest source of uranium, the raw material used for nuclear fuel.
- As long as uranium remains in its natural state in the ground, it is harmless. But when it is mined and processed, its radioactivity becomes toxic to humans.
- A typical 1000-megawatt nuclear reactor creates large amounts of radioactive waste, including 179,000 tons of uranium mill tailings; 159 tons of reactor fuels and weapons-grade plutonium; and 0.2 tons of plutonium waste EVERY YEAR.
- Currently more than 50,000 tons of spent fuel and other radioactive wastes are being stored at nuclear facilities across America, and this amount grows each year.
- The proposed solution to disposal of radioactive waste in the US is to move all of the waste to Nevada and bury it in Yucca Mountain. The projected cost of the repository is more than 60 billion dollars.
- Nuclear power generation is the most expensive way of making electricity when you look at construction costs, waste costs, and operating costs, and it is paid for by taxpayers through federal government subsidies.
- 20% of America's electricity is generated by nuclear power plants.

OUR ELECTRICITY USE

- In the United States, one kilowatt-hour of electricity requires approximately one pound of coal to be burned in a power plant.
- One kilowatt-hour or one pound of coal can run…
    - Ten 100-watt light bulbs for one hour
    - Air conditioner or water heater for 15 minutes
    - Refrigerator for 30 minutes
- The average home in the US uses 30 kWh of electricity per day. That's more than 900 kWh per month, and more than 5 tons of coal per year.
- In all, the United States burns 1.1 billion tons of coal every year.
- Lights account for 40% of electricity usage in many homes. In the United States, that's 360 pounds of coal per house per month that must be burned in order to keep the lights on.
- **Schools in America spend more on energy bills then they do on computers and textbooks combined!**

ENERGY EFFICIENCY

- Compact fluorescent light bulbs use 20% as much electricity as incandescent bulbs and last years longer too.
- New refrigerators are 40% more efficient than they were just a few years ago.
- Energy Star programmable thermostats, if used properly, can save $150 per year.
- If every American household changed just one bulb to an Energy Star compact fluorescent, we'd save enough energy to light two and a half million homes, and remove the amount of greenhouse gases from 800,000 cars.
- A typical washing machine uses 500 kWh per year of electricity. An energy-efficient front-loading washer uses only 167 kWh.

- The typical home wastes about 20% of the warm and cool air that comes through the ducts of the heating and cooling system because of leaks.
- The three steps to becoming an Energy Star home are: 1.Seal 2.Insulate 3.Buy Energy Star
- A geothermal system is up to 70% more efficient than the standard air conditioner or heater.
- Schools that use daylighting have been shown to improve student performance, test scores, and behavior.
- LEDs are super-efficient light bulbs which run for seven years or more and are 90% more efficient than incandescents.
- Recycling one aluminum can saves enough energy to power a television for three hours. (America only recycles about half of its aluminum cans.)
- Energy conservation is the quickest and cheapest way to save money, cut air pollution, and save entire mountains of coal.

GREEN POWER

- As we lower our demand for electricity, wind and solar become more affordable and effective.
- The potential of wind energy alone in the Midwestern states and Rocky Mountain states is equal to 2.5 times the entire electricity generation in this country today.
- A methane digester collects animal manure and captures the released methane gas, which can be burned to produce electricity.
- Solar hot water is one of the most affordable but under-utilized renewable technologies in America and is one of the best energy investments that can be made. If just half the homes in America were using this technology, our nation would replace the need for 20 power plants.
- Half the power needs of a city could be met if all the flat rooftop space were covered with solar collectors.
- Today only a very small percentage of America's electricity is produced from the wind and the sun, but this is changing.
- More than 20 states have adopted renewable portfolio standards. Within two decades these states will generate a large portion of their power from clean energy sources.
- A net-zero home produces as much energy as it consumes, hopefully offsetting the need to generate that power in a power plant.
- TVA's Green Power Switch program produces electricity using solar, wind, and methane gas.

QUOTES FROM *KILOWATT OURS*
APPENDIX D

Quotes from the film can be used as discussion points or writing prompts.

"What if, every time we flipped a light switch at home, a mountain exploded in West Virginia; or every time we turned on the air conditioner in summer, a child suffered an asthma attack; or when we turned up the heat, the entire planet was warming… and what if, instead of all that, we had a choice of something better? What choice would you make?"
— Jeff Barrie, Filmmaker

"And then there's the energy we all take most for granted, electricity. Over the next twenty years, just meeting projected demand will require between 1,300 and 1,900 new power plants. That averages out to more than one new power plant per week, every week, for the next 20 years."
—Vice President Dick Cheney

"I've heard it said that when you do things the way you always have, you'll get what you've always gotten. Today we've got global warming, air pollution, and all sorts of human health problems that are tied to the way we generate electricity… how can we possibly afford to build all these new power plants? There's got to be a better way."
— Jeff Barrie, Filmmaker

"This is our heritage, our culture, this is our lives; we're connected to this land."
— Judy Bonds, community member, Whitesville, West Virginia

"People—a lot of people ask me if I have a picture of the mountains when they were still here. For one, you can't take a picture of a mountain when you're on it. But two, Lord have mercy, why should you take a picture of a mountain? It's gonna be there forever. Or at least I thought."
— Larry Gibson, community member, Kayford Mountain, West Virginia

"We are conducting an unregulated, unplanned experiment with the only atmosphere we have—not a very smart thing to be doing."
— Christopher Flavin, President, Worldwatch Institute, Washington, DC

"The reality is: The planet is warming and we can either do something about it or not."
— Michael Shore, Southeast Air Quality Manager, Environmental Defense

"We have after all mastered one form of technology that causes zero emissions of greenhouse gases: nuclear power."
— Vice-President Dick Cheney

"It's an expensive way of generating electricity, it's a risky way of generating electricity, and in the 21st century we have better options available today that we didn't have in the 1960's when most of the nuclear power plants were built."
--- David Lochbaum, Union of Concerned Scientists

QUOTES FROM *KILOWATT OURS*
APPENDIX D

"Is nuclear power the answer to our energy needs?"
--- Jeff Barrie, Filmmaker

"We know that ozone is a pollutant that affects breathing in people, and if you see ozone damaging living tissue here on this plant, it kind of makes you wonder what it's doing to your lungs."
— Jim Renfro, Air Quality Specialist, Great Smoky Mountains National Park

"We are poisoning our grandchildren. We've gotta stop."
— Reverend Woody Bartlett, Interfaith Power and Light, Atlanta, Georgia

"If every American household changed one bulb to an Energy Star compact fluorescent, we'd save enough energy to light 2.5 million homes and remove the amount of greenhouse gasses from 800 thousand cars."
— Danny Orlando, Energy Star Specialist, US EPA, Atlanta, Georgia

"I can only wonder why more people aren't taking advantage of energy efficiency…. Energy conservation is a wise investment."
— Jeff Barrie, Filmmaker

"Did you know that schools in America spend more money on energy bills than they spend on computers and textbooks combined? Saving energy translates to better education."
— Jeff Barrie, Filmmaker

"All the money you save can go back to your teachers…can go back to your operating costs of schools… so you can't afford not to afford it."
— Robert McAllister, Energy Manager, Sumner County Schools, Portland, Tennessee

"The old saying is, you can't get something for nothing, but in this case you are getting something for nothing…"
— Joe Mike Akard, Sullivan County Department of Education, Blountville, Tennessee

"…Look at it this way, and saving energy becomes one of our most abundant and clean sources of new energy. It's the quickest and cheapest way to save money, cut air pollution, and save entire mountains of coal."
— Jeff Barrie, Filmmaker

"We simply must do everything that we can in our power to slow down global warming before it is too late.… This is something that we owe our children and that we owe our grandchildren because nothing is more important than protecting our planet. "
--- Arnold Schwarzenegger, Governor, State of California

"Converting America into a clean-energy nation begins with each of us."
— Jeff Barrie, Filmmaker

ACTION IDEAS
APPENDIX E

Here are a few more ideas to involve your entire school and your community!

1. Involve the PTA by showing *Kilowatt Ours*: "Come to the PTA meeting and learn how to save money on your energy bills!"

2. Learn more by signing up for the Kilowatt Ours Net-zero Network and receive energy-saving tips each month.

3. Support and get involved with groups and efforts that are working to solve our energy problems.

4. Organize an energy essay-writing contest at your school.

5. Organize a light bulb fundraiser and exchange.

6. Write an article for the school paper or other school media highlighting your most interesting findings and listing energy conservation tips for students.

7. Encourage everyone at your school to view *Kilowatt Ours* and organize a large public screening for parents and community members.

8. Start an Energy Efficiency Campaign at your school.

9. Present your findings and recommendations to the parent-teacher group at your school to gain more support for energy efficiency at your school.

10. Visit other schools in your district to talk about efforts at your school.

11. Contact your local electric utility to request information and ask if they offer an energy evaluation of any sort.

12. Review energy audits that have been completed at your school in the last two years. If no audits were completed, arrange for the building drawings and utility bills to be gathered for cost estimates of an energy audit. Determine what action items from the audit were taken, if the action items need to be updated, and what action items were not taken and why. Ask questions about energy audit requirements. Determine if your state require licensed professional engineers to perform an energy audit. Refer to the "Professional School-Audit Checklist" in Activity 8 of the *Kilowatt Ours* Companion Curriculum if your school is interested in arranging a professional walk-through of the campus.

HOW TO BUILD AN ENERGY CONSERVATION POWER PLANT AND SAVE $1000 PER YEAR
APPENDIX F

Every kilowatt you save "fuels" the creation of a conservation power plant.*

Keep in mind...	Annual Savings	
1 Kilowatt-hour = 1 Pound of Coal	**Lbs. Coal**	**$$$**
1 Assess your current energy usage and pledge to reduce.	---	---
2 Replace the 5 most used light bulbs with compact fluorescent bulbs.	662	$90
3 Plug into power strips and turn them off when not in use.	720	$95
4 Line-dry your clothes.	500	$75
5 Set hot water heater at 120° and use low-flow showerhead.	225‡	$40
6 Adjust the thermostat to 68° in winter and 78° in summer.	864	$115
7 Upgrade refrigerator and clothes washer to Energy Star model.	942	$125
8 Improve insulation of your attic, exterior walls and floors.	1,518	$200
9 Weatherize and seal windows, doors, air ducts, etc.	1,872	$260
10 Use a portion of your savings to pay for green power.	1,800†	---

SAVINGS TOTALS*

The average home can save this many pounds of coal per year: 9,103

The average home can save this much money per year on energy: $1000

* Visit **KilowattOurs.org** for more information, to receive free energy saving tips, network with other energy savers and use the Kilowatt Counter energy tracking system!

‡ 2550 kwh/year reduction of 10% from 120 degrees and low flow = 255 kwh/year
† Coal savings based on purchase of 1 block of TVA Green Power per month- $4 per month for 150KWH/month of green power.
*All potential savings are estimates based on U.S. EPA, DOE and EIA data. Estimates are based on the national average of $1900 as the annual household energy bill amount. Actual savings may vary. Up-front costs not included. Typical payback on energy-efficient upgrades listed ranges between 1 and 5 years.

Standards connections are listed at
www.KilowattOurs.org/Educators

Thank you!