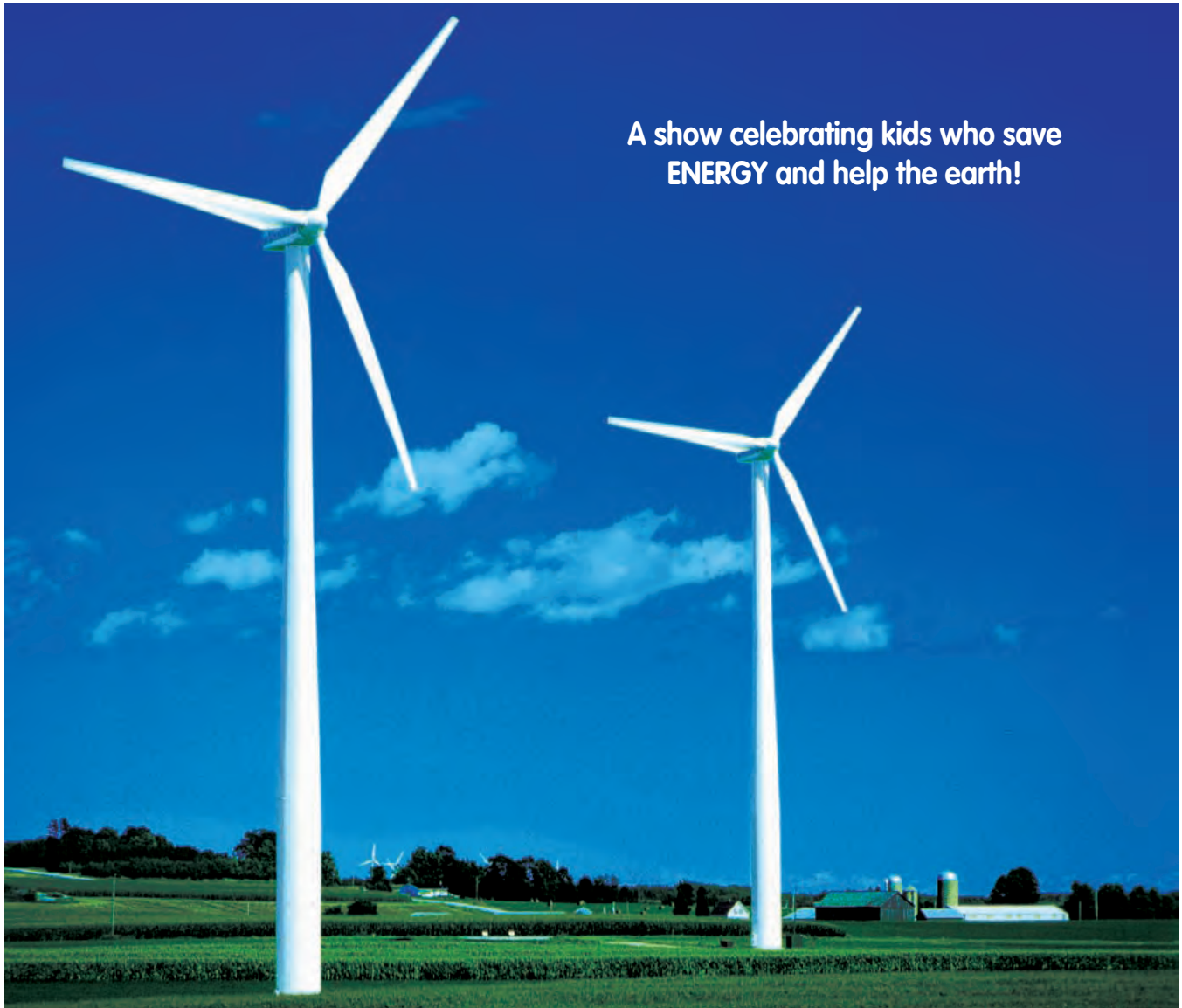


Madison Gas and Electric presents

MAGIC ENERGY



A show celebrating kids who save
ENERGY and help the earth!

Middle School Leader's Guide

Middle School Leaders Guide

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Background

MaGicEnergy is a live 30-minute energy/environmental education program for middle level students. The fast-paced program combines a strong environmental and energy message with magic, juggling, humor, storytelling, and audience participation.

MaGicEnergy was created in 2003 and revised in 2008 by Madison Gas and Electric in collaboration with performing artist, Dr. Bob Kann, a Madison-based educator and entertainer. *We Need Energy* is the major theme of the program with environmental subthemes woven throughout the program to demonstrate the relationship between the responsible use of energy and the quality of our environment.

The major themes of the program include:

1. We need energy to sustain our planet.
2. Energy use and the development of energy resources affect planet.
3. The energy decisions we make today will influence future generations.
4. Technology will play a significant role in energy resource development and environmental protection.
5. We can responsibly manage our personal energy use through energy conservation and lifestyle choices and thereby minimize the negative impacts our behaviors have on the environment.
6. Young people can influence decisions about energy and environmental policy in their communities and on a global scale.

Teachers can easily integrate MaGicEnergy program content into existing environmental/physical science, social studies, or general studies classes. Information is communicated in a fast-paced, live performance that incorporates learning styles identified in contemporary multiple learning theory. Feedback from host organizations since 2003 has confirmed that MaGicEnergy is a successful supplement to classroom instruction.

MaGicEnergy addresses key elements identified in market research for MGE: (1) conserve natural resources, (2) promote renewable energy resources, (3) plan for future energy needs by training the future adults and leaders of tomorrow's world, (4) improve the general environment, (5) focus on energy education, (6) focus on schools and students, and (7) individual actions can make a significant contribution to a healthy planet.

Program Synopsis

MaGicEnergy performer Bob Kann begins the show by "magically" removing a basketball from a briefcase while simultaneously promising to convince audience members that one person can make a difference to make the world a better place to live. A series of juggling tricks are used to demonstrate how frequently we use energy and yet take it for granted.

The concept of fossil fuels is introduced in the context of a magical transformation of a dinosaur into a piece of coal. Our reliance on fossil fuels presents us with two major challenges:

(1) dependence on and combustion of fossil fuels for energy leads to increased carbon dioxide levels and hence the threat of global warming threat and (2) fossil fuels are nonrenewable and eventually will not be available. The carbon footprint concept is presented here to demonstrate how personal behaviors have an impact on the environment in terms of the carbon dioxide individual actions can produce.

MaGicEnergy presents energy conservation and energy efficiency as partial solutions to reduce our growing reliance on fossil fuels. "Efficient" juggling routines with scarves and tennis balls illustrate the idea of stretching our resources and doing more with less.

Energy conservation means using less energy and reducing our demand for energy. For students, taking shorter showers, turning off unused appliances and lights, and recycling materials are introduced as effective personal energy management strategies. For students and/or parents, washing laundry in cold water, plugging leaks, caulking, turning the thermostat down in the winter and reducing air-conditioning in the summer also can be effective personal energy management strategies. A handcuff escape trick is used to introduce the idea that caulking, sealing leaks, and putting insulation in the walls of buildings can prevent heat from "escaping" and thereby reduce energy consumption.

Technology has brought us many new innovations in lighting technology and energy efficiency. Compact fluorescent lamps (CFLs) are more efficient than incandescent lamps, last longer, and produce less energy to operate. LED lights are even more efficient than compact fluorescent lamps. ENERGY STAR[®] is a government program to promote energy efficient products.

In Wisconsin, renewable energy is growing every year. Energy from the sun, wind, and water is being harnessed to produce clean renewable power. Wind power has great energy potential. To demonstrate wind energy, an indoor kite on a 20-foot string is flown gracefully over the audience as a symbol of wind energy potential. Students also are informed that their parents can purchase wind power from MGE.

Solar electric power is increasingly used throughout the world. In Madison, ten area high schools have photovoltaic solar electric systems installed on their school buildings thanks to a gift from MGE. A series of solar devices are demonstrated including an integrated solar radio/flashlight/alarm and a solar fan-cooled hat.

While we're developing renewable energy sources, we will continue to use fossil fuels. There are things kids can do to work for a clean environment. At Hamilton Middle School, kids and parents formed an Earth Club to investigate the possibility of providing their school with a cleaner energy source which can use less energy. On a personal basis, MGE has five specific suggestions for things kids and adults can do to help the environment and reduce their carbon footprint:

1. Turn off the juice when not in use
2. Switch to compact fluorescents
3. Control your thermostat
4. Wash your laundry in cold water
5. Look for the ENERGY STAR label when purchasing new appliances

It also is suggested that students generally educate themselves about the environment, pollution, and renewable energy and specifically consider checking out a portable energy meter from their local library to measure their home energy consumption.

In conclusion, MaGicEnergy is a call to environmental action guided by the notion that one person can make a difference. Gaylord Nelson, for example, was Wisconsin's governor and senator. His love for nature eventually led him to come up with the idea for Earth Day, which is a yearly event taking place around the world to educate people about the environmental dangers facing our planet. Gaylord Nelson embodies the idea of how one person can make a difference. Students are encouraged to make their own personal commitment to protect and improve the environment. A surprise "jumping stool" and cascading hat reinforces the idea that if students do make this commitment, they may be surprised by the result of their actions.

Name _____ Date _____

Suggested Key Word Self-Assessment Pretest

Next to each word, put an X in the box that show how you understand the word.

| Key Words | I know this word | I recognize this word but don't know what it means | I don't know this word |
|--------------------------------|-------------------------|---|-------------------------------|
| fossil fuel | | | |
| carbon dioxide | | | |
| global warming | | | |
| energy | | | |
| carbon footprint | | | |
| recycling | | | |
| insulation | | | |
| compact fluorescent bulb (CFL) | | | |
| light emitting diode | | | |
| renewable energy | | | |
| solar power | | | |
| wind power | | | |
| Earth Day | | | |

Name _____ Date _____

Suggested MaGicEnergy Pretest Questions

1. Kids only use energy to turn on electronic games and computers. True False
2. In Wisconsin, we mostly use the energy produced by burning coal, oil, and natural gas to provide us with heat and power. True False
3. The two major challenges represented by burning fossil fuels are (1) fossil fuels affect the environment and (2) they are nonrenewable resources. True False
4. Fossil fuels are formed from the remains of recycled steel and lead. True False
5. Global warming is partly caused by the buildup of carbon dioxide in the atmosphere. True False
6. Wisconsin produces many fossil fuels. True False
7. Global warming can lead to climate change. True False
8. A carbon footprint is a mark left by a dinosaur. True False
9. Energy efficiency means to use less energy to do more work. True False
10. Recycling is one way to conserve energy. True False
11. Insulation helps energy to escape from an environment more easily. True False
12. Technology can help us to produce more efficient, cleaner energy. True False
13. Light emitting diodes (LED lights) are less efficient than incandescent bulbs. True False
14. ENERGY STAR is a United States Government program to promote space exploration. True False
15. Renewable energy is energy that can be used again and again. True False
16. Wisconsin gets more than 50% of its energy from renewable energy sources. True False
17. Wind power was invented by Benjamin Franklin. True False
18. Solar power means turning sunlight into steam. True False
19. Wisconsin Senator Gaylord Nelson came up with the idea for Earth Day. True False
20. The idea behind Earth Day is to make sure there are cell phones available everywhere on the planet. True False

Pretest Answer Key

1. False
2. True
3. True
4. False
5. True
6. False
7. True
8. False
9. True
10. True
11. False
12. True
13. False
14. False
15. True
16. False
17. False
18. False
19. True
20. False

Suggested Classroom Activities

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Discussion Questions

- In MaGicEnergy, it is suggested that we use energy for just about everything we need or want to do. Developments of technology are increasingly making popular electronic gadgets like iphones and cell phones more appealing and cost less. How are we going to save energy in the future if we continue to invent new electronic gadgets which make us want to consume more energy?
- What kind of energy do you think people will be using in the future? Why?
- If you were to enter an energy conservation contest, what creative new idea for conserving energy could you try in the next 12 months and why? For example, a middle school student in China invented a Bike-Washing Machine. The boy bought a used washing machine from a local market and connected it to his bicycle. About an hour and a half later, he had completed both a great workout and washed a few loads of clean laundry.
- In MaGicEnergy, it is stated that technology can help us to produce cleaner, more efficient energy. Hybrid cars are a perfect example of this. However, some research suggests that owners of hybrid cars actually log more miles on their cars than SUV drivers because they pay so much less per mile for gasoline. How do you think we can convince drivers to drive less so that less energy is used?
- Recycling is one way to waste less energy. What creative suggestions can you make to increase the recycling which occurs in your classrooms and school? For example, can you write on both sides of paper instead of use only one side? Can paper towels in your classroom be recycled instead of tossed in the garbage? Can fruit and vegetable remnants from your lunches be composted instead of disposed of in the garbage? Can you identify lights that could be replaced with CFL's? Ask your custodian.
- Students at Hamilton Middle School formed an Earth Club to investigate ways to save energy in their school. If you were to form a similar club in your school, which people and organizations would be useful resources to help you achieve your goals (i.e. school, custodians, local utility companies, etc.)? Make a list of these resources.
- Electric hybrid plug-in cars can achieve up to 100 miles per gallon compared to the average mileage efficiency of about 27 mpg. What effect will having more plug-in cars have on the electric grid? In other words will electric cars increase electricity consumption? Will the electric transmission and distribution system be able to handle the increased demand? Will we need centralized plug-in stations in cities? Effect on air quality? Water resources?

Write an Envirogram

Background

Gaylord Nelson, Earth Day founder and former Wisconsin senator, was one individual who made a huge difference in raising the awareness of global environmental issues and the need for protecting our environment. Through his efforts, millions of people have made personal commitments to protect the environment and educate themselves about energy and environmental issues.

Nine-year-old Melissa Poe wrote a letter to President Bush in 1989 expressing her concerns about the environment. This letter resulted in the formation of Kids for a Clean Environment, the largest environmental activist organization of children in the world (www.kidsface.org) One person can make a difference.

When elected officials receive a letter from a concerned citizen expressing his or her views, he or she counts as if it came from ten citizens. Why? Research shows that out of ten people who might share an opinion about a particular topic, only one will take the time to actually write a letter.

Have your students write a letter or e-mail to their senator or representative in Washington to ask what he or she is doing to protect the environment in Wisconsin and on a national level. They can specifically ask about what he or she is doing to promote renewable energy and/or energy efficiency. They can use their library or the Internet to find out how to contact them.

Possible energy-related topics to investigate and find out the positions of your elected representatives:

- Government subsidies/incentive programs to encourage homeowners, businesses, and communities to invest in renewable energy systems including wind, solar, landfill gas, and bio-gas projects.
- Development of agriculture-based transportation fuels like ethanol.
- Local and national building codes that promote energy-efficient construction standards, building design, and mechanical equipment for new buildings.
- Local and national building codes that promote energy-efficient construction standards, building design, and mechanical equipment to retrofit existing buildings.
- Government subsidies to local municipalities that encourage responsible development of commercial wind farms.
- Greater tax incentives for individuals who purchase energy-efficient vehicles.
- Increased funding for research on zero-emission vehicles.

- National standards for installing renewable energy systems and minimum standards for training installers of renewable energy systems.
- Local, state, and federal initiatives to battle climate change and reduce greenhouse gas emissions.
- Local and state incentives to attract renewable energy manufacturing facilities.
- Requirements for fuel efficiency, hybrids, biofuels, or electric vehicles as part of the local or state government vehicle fleets.
- High speed train transportation connecting Madison, Milwaukee, Minneapolis, and Chicago.

Form an Energy Club at Your School

Kids throughout the United States are working together to protect and improve our planet.

Students and parents at Hamilton Middle School in Madison, WI formed an Earth Club to learn more about energy and investigate renewable energy options to save energy in their school.

Students at Cleveland Middle School in Albuquerque, NM formed an Energy Club that helps their school save electricity. Making school announcements and conducting energy patrols, the club keeps their school on a "green" track. They are featured on the PBS Kids Web site at: http://pbskids.org/dragonflytv/check_it_outs/energyclub.html

Students at West Branch Middle School in West Branch, IA saved their school nearly \$250 per month by installing energy-saving T8 fluorescent bulbs.

Students at Winston Middle School in Winston, OR made numerous recycling presentations to the school board and city council to encourage the community to expand its efforts to reduce waste. They also performed 20 waste audits in two years for interested companies. They examined trash, weighed recyclable materials, and suggested waste reduction opportunities. The students then presented their findings to the companies, which included waste loss assessments as well as current and potential savings.

Consider forming an Energy Club in your school. Invite interested students, teachers, and community members to learn more about energy together and figure out ways to save energy in your community. Invite your school district facilities director or head custodian to discuss the school district energy/environmental program.

Visit the MGE Web site at <http://www.mge.com/earthday/LightsOut.htm> and learn how local elementary, middle, and high schools are actively managing energy in their schools.

Hold a Debate about the Pros and Cons of Alternative Energies

Direct your students to research information for a debate about the pros and cons of renewable energy. Divide the class into two groups. Assign students to one side of the debate or the other (renewable energy vs. fossil fuel energy). Have them debate the advantages and disadvantages of energy production by use of fossil fuels or by use of renewable energy sources.

Family Home Energy Investigation

Background

Energy conservation in our homes is one strategy for managing our energy use and controlling energy costs. It avoids having to use unnecessary fossil fuels, which protect our precious land, water, and air resources. This investigation will help you to identify areas in your home where you can make improvements. Energy conservation is everyone's business. After you have completed the investigation, develop a plan and timetable to make improvements or changes. If you need additional energy conservation tips or have questions, contact MGE at 252-7117 or check the MGE Web site at www.mge.com to find helpful information.

Attic insulation. Use a ruler and measure how much insulation you have in the attic area. 12 inches or more is the recommended level. Inches of insulation: _____

Attic ventilation. Do you have air vents in the attic? Yes ____ No ____ . Attic vents help reduce moisture and excessive heat in the summer. MGE recommends one free square foot of attic vent per 100 square feet of attic area. If you have a vapor barrier installed, the recommendation is one square foot per 300 square feet of attic area.

Furnace filters. How often were your furnace filters changed in the last year? MGE recommends that you change your furnace filter at least once per month during the heating and air-conditioning seasons if you use a standard-type filter. If you use a media-type high efficiency filter, change your filter once every three months. Frequency of filter changes: Not at all ____, 1-3 times ____, 4 or more ____.

Lighting. How many compact fluorescent light bulbs do you have in your home? If you substitute one 20-watt compact fluorescent bulb for a 75-watt incandescent bulb, over the lifetime of the bulb you will save \$45 in energy costs and 400 pounds of goals. Number of bulbs: _____.

Water heater. Locate the EnergyGuide® label on the jacket of the water tank to determine how your water heater compares to other water heaters of similar size. Does yours: Use more energy? ____, Use the least? ____, Use an average amount? ____.

Water heater temperature. With an adult, run the hot water faucet in the kitchen and bathroom and check the temperature of your water. MGE recommends that you set your water heater to 120 degrees Fahrenheit. Kitchen ____°, Bathroom ____°.

Thermostat settings. Do you use a set-back thermostat? Yes ____ No ____ . Set-back thermostats allow you to save energy by programming your furnace to provide comfort settings when you are at home and when the home is unoccupied. MGE recommends a winter temperature setting of no higher than 68 degrees Fahrenheit in the winter and an air conditioner setting of no lower than 78 degrees Fahrenheit in the summer. What are your settings? Winter ____°, Summer ____°.

Windows. How many layers of glass do you have in your windows?

Single pane with no storm window ____

Single pane with storm window ____

Double-pane either gas-filled or with reflective low-emissivity coating (low-E) ____

Doors. Check the condition of your exterior doors. Do you have an insulated door? Yes ____ No _____. If not, do you have a storm door? Both? Can you see gaps around the edges? Do the doors shut tightly? What is the condition of the weather stripping around the perimeter? If it's an older style door, is it cracked or missing? Weather stripping around doors and windows should be in good condition to guard against heat loss and outside air infiltration.

Refrigerator. Check the inside temperature of your refrigerator. It should be set at 37 degrees Fahrenheit. Your refrigerator temperature ____°.

Bathroom. Do you use low-flow shower heads to conserve water and energy? Yes ____ No _____. Low-flow shower heads reduce the flow rate of your shower, which saves water and energy to heat the water. Standard shower heads use anywhere from 3 to 5 gallons of water per minute. Low-flow shower heads use about 1 to 2 gallons per minute and are a good investment. Low-flow faucet aerators also shave energy and water.

Furnace and air-conditioning systems. Do you have your furnace and air conditioner inspected annually by a qualified heating and air-conditioning professional? Yes ____ No _____. Having your furnace and air conditioner inspected and tuned up annually ensures that your systems are operating safely and efficiently. MGE recommends annual inspections.

Dehumidifiers. Do you use a dehumidifier in your house? Yes ____ No _____. If yes, do you operate it on a timer? Yes ____ No _____. MGE recommends that you operate your dehumidifier on a timer so that it runs at night instead of at high energy-use periods during the daytime.

Portable Energy Meter

Accurate and easy to use, these plug-in meters work on any standard 120-volt electric appliance. Use one to:

- Measure voltage, electricity cost and electric consumption.
- Find out the exact operating cost of various appliances, from refrigerators to lamps and computers.
- Identify the potential causes of high energy use.
- Predict your savings in reducing appliance use.
- Calculate the payback for replacing older equipment.
- Discover how much power some appliances draw even when switched "off;" i.e., "phantom power."

Borrow a portable energy meter at no cost from your local public library. MGE has donated many of these meters to area libraries. Usual checkout period is two to three weeks but varies with the host library. Because the meters are popular, you may want to reserve one ahead of time. Find and/or reserve a meter online by searching on "Portable Energy Meter" in your library system's online catalog. In the South Central Library System, you can also click on "Watts Up?" or "Portable Energy Meter" at the bottom of Madison Public Library's electronic booklist, connecting with LINKcat.

Energy Source Investigation

Background

Brainstorm a list of energy resources with students. Record these where students can see them. The list should include at least the following sources but may include others depending on the size of the class.

| | | | |
|------------|------------|---------------|--------------------|
| Biomass | Fusion | Natural gas | Solar photovoltaic |
| Coal | Geothermal | Nuclear power | Wind power |
| Fuel cells | Hydropower | Oil | |

Once students have had a chance to brainstorm their ideas, break students into groups of two to three. Assign each group one of the energy sources. Each group should be given a piece of flip chart paper to eventually record advantages and disadvantages of their energy source.

Students may use the Internet or other sources to research their energy source. Give students two to three days to complete their research and compile their responses on their flip chart paper. Each group will prepare a five-minute oral presentation noting advantages and disadvantages of their specific energy source. Each person in the group should present part of the presentation.

When preparing their papers, students should write large and legible so other students can read them from a distance.

Group names can be written on index cards and drawn out of a box to determine the presentation order. Each group is given five minutes to present their energy source and then respond to any questions the larger group may have.

Students should address the following areas in their presentation:

- Does the energy source produce electricity? In Wisconsin?
- Besides producing electricity, discuss other uses for the energy source?
- Is this a renewable or nonrenewable energy source?
- Is there potential to expand the use of this energy source? At what cost?
- What negative environmental effects are associated with developing and using this energy source?
- Do you think this energy source should be expanded to help solve our energy needs?

Wind Energy at Your School

Background

In this activity, students will measure the wind speed around the school grounds and determine the windiest spot using the Beaufort wind scale. Using a protractor and simple materials, students can build a device to measure the wind speed.

The Beaufort wind scale

The Beaufort scale was long in use as a system for estimating wind speeds. It was introduced in 1806 by Admiral Sir Francis Beaufort (1774 to 1857) of the British navy to describe wind effects on a fully rigged man-of-war sailing vessel. It was later extended to include descriptions of effects on land features as well. Today the accepted international practice is to report wind speed in knots (1 knot equals 1.85 kilometer or 1.15 miles per hour [mph]).

The Beaufort scale is divided into a series of values, from 0 for calm winds to 12 and above for hurricanes. Each value represents a specific range and classification of wind speeds with accompanying descriptions of the effects on surface features, as follows:

| Beaufort No. | Average mph | Knots | Surrounding |
|-------------------|-------------|----------|--|
| 0 calm | 0 | 0 to 1 | Smoke rises vertically |
| 1 light air | 1.2 to 3 | 1 to 3 | Smoke drifts slightly and shows wind direction |
| 2 light breeze | 3.7 to 7.7 | 4 to 6 | You can feel wind on your face and leaves rustle |
| 3 gentle breeze | 8 to 12.5 | 7 to 10 | Smoke will move horizontally, twigs move, flags extended |
| 4 moderate breeze | 13 to 18.6 | 11 to 16 | Branches move, dust and paper rise |
| 5 fresh breeze | 19.3 to 25 | 17 to 21 | Small tree sway |
| 6 strong breeze | 25.5 to 31 | 22 to 27 | Trees begin to sway, wires whistle |
| 7 moderate gale | 32 to 38 | 28 to 33 | Large trees bend |
| 8 fresh gale | 39 to 46 | 34 to 40 | Twigs break off trees |
| 9 strong gale | 47 to 55 | 41 to 47 | Branches break |
| 10 whole gale | 56 to 64 | 49 to 55 | Trees snap, damage evident |
| 11 storm | 65 to 74 | 56 to 63 | Widespread damage |
| 12 hurricane | 75+ | 64+ | Extreme damage |

Student questions

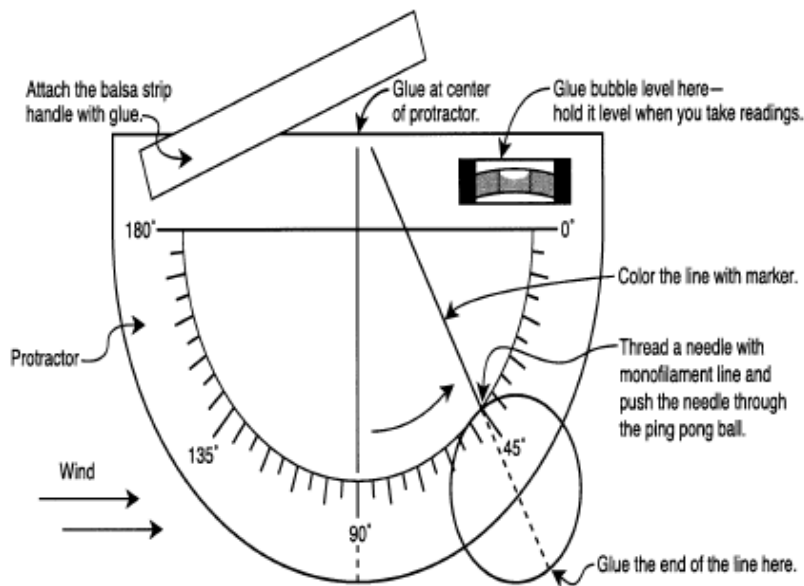
1. Measure the wind with the Beaufort scale (any wind greater than 8 mph can generate electricity).
2. Keep a record of the wind speeds at different times of the day.
3. At what time of day do the fastest winds usually occur?

Where is the windiest spot on your school grounds

Materials:

- 1 ping-pong ball
- 1 piece of monofilament fish line (1 to 2 pound test is good)
- Protractor: red magic marker
- 1 strip of balsa wood, about one-half centimeter (cm) square x about 18 cm (one-quarter inch thick) long
- 1 bubble level (the type with an air bubble inside; try a local hardware store)
- Glue
- Needle (long enough to go through the ping pong ball)

Build a device to measure the wind:



Using your wind device, calibrate the wind speed using the chart below.

| Angle | Miles per hour |
|-------|----------------|
| 90 | 0 |
| 85 | 5.8 |
| 80 | 8.2 |
| 75 | 10.1 |
| 70 | 11.8 |
| 65 | 13.4 |
| 60 | 14.9 |
| 55 | 16.4 |
| 50 | 18.0 |
| 45 | 19.6 |
| 40 | 21.4 |
| 35 | 23.4 |
| 30 | 25.8 |
| 25 | 28.7 |
| 20 | 32.5 |

Questions

Once you have constructed your wind measurement device, take at least three different readings at different locations on the school grounds. Remember to keep your wind device level when you take a reading. Note: Hold the device at eye level away from your body and find the prevailing wind direction. Now you are ready to take readings.

Where would you expect to have the greatest wind speeds?

Compare readings with other students

MGE Solar Web Site Investigation

Background

MGE has installed a variety of solar electric photovoltaic (PV) systems on area high schools and community sites. The program intended to create awareness of renewable energy systems, integrate solar technology into the educational curriculum of area high schools, and research various solar technologies. To support the installations, MGE has on its Web site a real-time data monitoring system for students to analyze and view performance data.

The monitoring equipment will display:

- Instantaneous power output.
- Cumulative energy output.
- Irradiance—with meter squared (how much light is hitting the array).
- Cell temperature and ambient temperature.

The *MGE Solar Web Site Investigation* is designed to familiarize the student with an Internet-based real-time solar data monitoring system.

The student will compare and contrast different solar electric system technologies, interpret daily and monthly energy production graphs, express and quantify environmental benefits of the solar PV systems.

Procedure

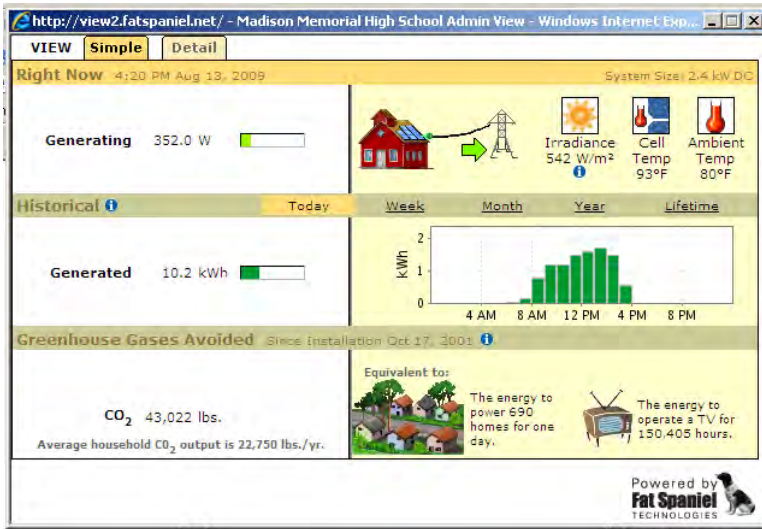
It is recommended that you use a high-speed Internet connection to complete the investigation. The preferred Web browser is Microsoft's Internet Explorer.

Go to the MGE Web site, www.mge.com/Environment/Green/Solar/Schools.htm, and click on the solar power section of the Home Page. Answer the following questions:

1. How many high schools currently have solar PV systems?
2. Choose any school and click on the Live Data Reporting link. An instrument panel view with gauges and dials should appear. Best time to view the data is late afternoon during daylight. This allows for sufficient data generation for the day. What three weather and/or solar energy measures does the system measure?
3. Record the following data in the table below:

Name of School: _____

Time of Day that you are recording the data: _____



4. Click on Today's Historical Energy tab. Describe the relationship between solar PV Output-kW and time. Full sunlight intensity is defined as 1,000 watts/m². Describe the shape of the curve.

5. At what time of the day was the most electricity produced? The least? Why?

6. All 10 high school PV systems can be described as "fixed arrays." In other words, the systems are positioned in a south-facing direction at a fixed angle, usually 25 or 45 degrees. However, MGE has several "dual-axis PV arrays" that actually track or move with the angle of the sun throughout the day. Find one of the dual-axis community sites (Lussier or MATC) and compare the daily energy production graphs. Which system, fixed or dual-axis, produces more power and why?

7. Click on the **Monthly Data** graph for Middleton High School and Middleton Alternative High School (MASH). Which system produces more electricity? Find the System Attributes for each system and compare the tilt angle of the array and estimated annual energy production of each system. The MASH PV solar shingle is considered a building-integrated system, where the PV material is manufactured into the shingle.

8. If the average MGE residential electric customer uses 700 kilowatt-hours (kWh) of electricity per month, estimate what percent of the annual electricity consumption would be provided for a home with a PV system similar to the one at West High School. Hint: Look for the estimated annual energy production in kWh in the System Attributes chart for any school listed and then do your calculation.

9. If a school's annual energy consumption is approximately 200,000 kWh per year and the PV system produces about 3,000 kWh per year, what percent of the building electric consumption can be produced with the PV system?

10. If it costs \$25,000 to install the PV system, how long will it take for the system to pay for itself? Hint: Each year the system generates about \$725 in electricity savings, plus the environmental benefits associated with avoiding burning fossil fuels and greenhouse gas emissions.

Answer Key to MGE Solar Web Site Investigation

1. Ten.
2. AC solar power, watts/sunlight (W/m^2), wind speed (mph), temperature (degrees Fahrenheit).
3. Varies.
4. Linear relationship. As solar intensity increases, electricity generation increases. Bell Curve.
5. Noon. Night. Solar intensity is greatest at noon.
6. Dual axis produces about 30% more because it tracks the sun directly.
7. Middleton High School produces more power.
 $25^\circ/18.5^\circ$
2,900 kWh/2,600 kWh
8. West High School's estimated annual production is 2,900 kWh.
 $700 \text{ kWh} \times 12 \text{ months} = 8,400 \text{ kWh/year}$ for residential customers.
2,900 kWh is 34.5% of 8,400 kWh annual load consumption.
9. 1.5% of the building total consumption.
10. About 34 years to pay for itself.

Phantom Energy

Many appliances and electronics in your home and school use energy even when they are turned off. This is called **phantom energy**. Look at the chart below to see how the Energy Vampire sucked more wattage when appliances were in "standby mode." You can test your family's home for the use of phantom energy. Use a portable energy meter, which you can borrow from your local public library.

| ITEM | WATTS |
|----------------------------|----------------------------|
| Television | 4 |
| VCR | 6 |
| DVD | 2 |
| Cable Box | 12 |
| Satellite Receiver | 15 |
| Component Stereo | 7 |
| Game Console | 1 |
| Cell Phone Charger | 2 |
| Desktop Computer | 4 |
| Notebook Computer | 1 |
| Computer Monitor | 1 |
| Modem | 5 |
| Wireless Router | 2 |
| Ink Jet Printer | 2 |
| Rechargeable Power Tool | 4 |
| Battery Charger | 2 |
| Total Standby Watts | 70 |
| 24 hours per day | 1,680 watt-hours |
| 365 days per year | 613,200 watt-hours |
| Divide by 1,000 | 613.1 kWh |
| Cost per kWh | \$79.72 |
| Divide by 12 | \$6.64 monthly cost |

What could you do with this money instead of having it sucked up by the Energy Vampire?

- Buy lunch for you and a friend
- Go to a movie
- Purchase a skateboard at a garage sale
- Put it in your piggy bank and save it to purchase a bicycle or materials to create a rain garden for your home.

How to prevent a Phantom Energy Attack: Unplug it! If you have a lot of cords and don't want to be going around your house unplugging each individual cord, use a power strip and turn off several phantom energy users in a single switch!

What is Your Carbon Footprint?

Take the Carbon Quiz and learn how You affect Global Warming! Circle which statements match up with your daily habits and add up your points.

1. How many lamps in your home have you changed to compact fluorescent bulbs?
 - a. 0-5 5 pts.
 - b. 6-10 10 pts.
 - c. 10-15 20 pts.
 - d. Every single one! 30 pts.
2. How did you travel today?
 - a. I drove in a car 0 pts.
 - b. I took the bus 5 pts.
 - c. I rode my bike 10 pts.
 - d. I walked 20 pts.
3. How much water did you use today?
 - a. I showered for 1-2 minutes 20 pts.
 - b. I showered for 3-6 minutes 10 pts.
 - c. I showered for 7-10 minutes 5 pts.
4. When I brush my teeth
 - a. I let the water run the whole time 0 pts.
 - b. I turn off the tap 5 pts.
5. I am wearing:
 - a. Only brand new clothes 0 pts.
 - b. Some second-hand or hand-me-down clothing 10 pts.
 - c. Almost all second-hand or hand-me-down clothing 20 pts.
6. In my lunch, this much food is wrapped in paper or plastic that I throw away:
 - a. All of it 0 pts.
 - b. Some of it 5 pts.
 - c. None of it 10 pts.
7. At home, my family recycles:
 - a. Nothing 0 pts.
 - b. Some paper and some cans and bottles 5 pts.
 - c. All of our paper, cans and bottles 10 pts.

How did you score?

0-30 points—You are a green apprentice! You are on the right path. You are still learning about ways to lessen your carbon footprint. You need to recognize negative habits and start changing. Pack a lunch with reusable materials, reduces energy use, carbon emissions and helps to keep the planet clean. Make sure to talk to your friends and family about making changes in their daily routines.

31-50 points—You are a Silver Energy Star! Your feet are pointed in the right direction! Your carbon footprint is small enough to make you an energy-saving and recycling pro! You may need to talk to your family about installing low-flow faucets and energy-efficient showerheads. Turn your positive habits into fun activities like making an old T-shirt into a decorative pillow.

51-100 points—You are an Eco Star! Congratulations! Saving energy, recycling and reusing materials fit in your life like a pair of worn-in sandals! You make choices that lessen your carbon footprint and help our planet stay clean by reducing carbon emissions! With this title, you can influence your friends and family. Think about starting a "bike-to-school" week at your school and people will listen!

Glossary of Terms

Carbon dioxide – A colorless, odorless gas that is the waste product of cell respiration and the combustion of fossil fuels. One of the main greenhouse gases.

Carbon footprint – The impact on the environment in terms of the carbon dioxide produced by an individual, organization, event, or product.

Climate change – Man-made and natural processes that result in slow gradual climactic and weather phenomenon.

Coal, oil, and natural gas – Fossil fuels extracted from the earth and used for electricity generation, transportation, space heating, and manufacturing/industrial processes.

Compact fluorescent lamp – A small fluorescent designed to fit in light fixtures that use standard incandescent lamps.

Earth Day – Annual observance on April 22 where individuals and organizations are involved with environmentally friendly activities and projects-beautification projects, construction projects, educational event, etc.

Electricity – The behavior of negative and positive charges (electrons and protons) due to their attraction and repulsion.

Energy conservation – Reduction in overall energy use.

Energy efficiency – The ratio or percentage of useful output to the total output in any system.

ENERGYSTAR label – A federal programming label put on products/appliances indicating it will save energy.

Environment – The sum total of all living and nonliving components in the entire natural world.

Fossil fuels – Carbon rich fuel formed from the remains of ancient animals and plants.

Gaylord Nelson – Former Wisconsin governor and senator credited with starting the first Earth Day.

Global warming – A warming of the earth's surface caused by an increase in human-generated gases resulting in more heat trapped by the atmosphere.

Hydropower – Electricity produced by the kinetic energy (movement) of water from an area of higher elevation to lower elevation.

Incandescent lamp – Traditional light bulb that produces light by passing sufficient electrical current through a thin wire resulting in production of light energy.

Insulation – Materials that slow down the movement of heat.

Light emitting diode (LED) – A light-emitting diode is an electronic light source. It emits light, usually colored, when an electric current passes through it and requires little power.

Madison Gas and Electric – Local investor-owned utility serving the gas and electricity needs for Madison, Wisconsin and outlying regions.

Photovoltaic (solar) system – A complete PV power system composed of the module (or array) and balance-of-system components including the array supports, electrical conductors/wiring, fuses, safety disconnects, electrical grounds, charge controllers, inverters, battery storage, etc.

Pollution – Any addition to man-made or natural systems that degrade or make it unhealthy for life processes.

Portable energy meter – A small device which measures voltage, electricity costs, and electric consumption.

Renewable energy – Energy derived from resources that are regenerative or, for all practical purposes, cannot be depleted. Types of renewable energy resources include moving water (hydro, tidal, and wave power), thermal gradients in ocean water, biomass, geothermal energy, solar energy, and wind energy.

Solar energy – Energy transmitted from the sun (solar radiation). The amount that reaches the earth is equal to one-billionth of total solar energy generated or the equivalent of about 420 trillion kilowatt-hours.

Sun – A yellow star around which the Earth and other planets of the solar system orbit. The sun provides nearly all the energy needed to sustain life on earth.

Technology – Modern day systems, devices, and processes that create efficiencies and improve overall quality of life.

Temperature – A relative measure of the amount of heat energy moving through matter.

Wind – The movement and circulation caused by uneven heating and cooling at the earth's surface.

MaGicEnergy Middle School Script

Welcome to MaGicEnergy. Today, I am going to try to change the way you think because I believe most of you don't believe that one person can make a difference to make the world a better place just like you don't believe I can remove a basketball from this thin briefcase.

Today's show is about energy- something we use all of the time and how the way we use energy affects our environment and our planet. You have power at your fingertips. With the flick of a finger you can turn on a light. Right now, I'm using energy from my sound system so that my voice can be heard by all of you. When I juggle these rings, it is human energy that's making these rings fly through the air, but ultimately was the energy from a factory that made those rings.

We all use energy to live and to have fun. We need energy so that our refrigerators keep our food cool so it won't turn fowl, energy to cook that food, and energy to power our computers. We need energy to heat water to take a shower, to wash our clothes and dishes, and to keep our homes cool in the summer and warm in the winter.

We need energy to power our cars, trains, and planes. We need energy for our factories to make all the stuff we use- the clothes we wear, the games we play, the books we read.

We don't always think about energy, but we use it for just about everything we need or want to do- by ourselves, with our friends, in our communities, around the world. You might say that energy makes the world go.

In Wisconsin, like most of the United States, we mostly use the energy produced by burning coal, oil, and natural gas to provide us with heat and power. These are called fossil fuels. They're what's left over from prehistoric animals like dinosaurs and plants that died millions of years ago and their remains slowly turned into oil, gas, and coal.

There are two major challenges burning fossil fuels present us. One is that fossil fuels affect the environment because when they are burned to give us energy, they release gases into the air including carbon dioxide. Too much carbon dioxide traps the heat of the sun. Much too much carbon dioxide may cause the planet to get warmer, which is what's called global warming and can lead to climate change.

The second challenge is that there's only a limited amount of fossil fuels in the world, and none of them are produced in Wisconsin. In Wisconsin, we have to bring in all of our coal, oil, and natural gas from out of state. Once the world's supplies of fossil fuels run out, they'll be gone forever, just like I'm going to make this water disappear. We are using fossil fuels at faster and faster rates because there's an increasing demand for more energy in Dane County, Wisconsin, throughout the world, and, of course, in Pennsylvania.

Just like a fever in your body makes you uncomfortable, temperature changes in the planet can cause problems like water shortages, tornados, human health problems, species extinction, and other problems for animals and plants.

Many things we human beings do like watching TV or using computers can release carbon dioxide. These activities contribute to your carbon footprint which is the impact you have on the environment in terms of the carbon dioxide your actions produce.

Fortunately, there are ways to reduce the harmful effects from global warming and to reduce your Carbon Footprint without running out of the energy we need, and that's by using energy wisely.

Using energy wisely means we stretch our current resources, protect the environment, and use the energy we're already using more efficiently. If, for example, I want to juggle six objects, I could do it by juggling like this, but a more efficient way to do it would be by juggling like this. I'm using less energy to achieve the same result.

We also can manage our energy supply wisely by - what do these words say? ("**USE LESS ENERGY**"). If we all use less energy, then we'd need to produce less energy and there would be less pollution. For you, this could mean taking shorter showers and therefore less water and energy is used to heat the water. In your home, reducing energy could mean washing the laundry in cold water instead of warm water. In winter, this could be turning the thermostat down a little bit and in the summer it could be using a little bit less air conditioning.

Not only can we use less energy, we all can – what do these words say? ("**WASTE LESS ENERGY**"). Wasting less energy means turn off the TV when it's not being used or turn off the lights when you leave a room. Or conserving energy, which means reduce, reuse and recycle. Collecting and reusing materials once considered trash like newspapers, aluminum cans and plastic bottles saves energy. Consider using reusable grocery shopping bags to replace plastic and paper grocery bags.

Wasting less energy means that in buildings like our schools, a lot of warm air in the winter leaks through the outside of the building just like trying to use this blanket to try to keep warm. So, if we want to be more efficient, we have to plug the leak to prevent the warm hot air from escaping, just like you're going to try to prevent me from escaping from these handcuffs. In a building like this, we could put insulation in the walls or weather stripping around the doors and windows to keep the heat inside. Insulating a building is like having a good thermos that keeps a hot drink hot or a cool drink cool.

Technology also can help us to produce cleaner, more efficient energy. Take this light bulb called the incandescent bulb. A better name for it might be heat bulb. Most of us still use these bulbs invented in 1879 and they're incredibly inefficient. 90% of the energy generated by these bulbs is wasted as heat, leaving only 10% to be used to give us light. All we have to do to save lots of energy is switch to these. These fluorescent bulbs use about ¼ as much electricity as the incandescent bulbs, produce about the same amount of light, and they last up to 10 times longer.

LED lights or light emitting diodes are even more efficient than fluorescent bulbs. Consider these for holiday lights. These bulbs last up to 100,000 hours- 10 times longer than fluorescent and much less electricity to operate them.

If you want to be sure something is energy efficient, look for this ENERGY STAR label on it. ENERGY STAR is a United States government program to promote energy efficient products. The label guarantees that products like refrigerators, TVs, and computers use less energy and help protect the environment.

No matter how much we improve our energy efficiency, we can only stretch our current resources so far. In the future, we're going to need sources of energy that can be used over and over again, sources that won't run out, and won't pollute. These are called renewable sources of energy.

Right now in Wisconsin we get about 4% of our energy from Renewable Energy Sources using power from the sun, wind, and water to make electricity.

The wind has great energy potential. For thousands of years, people have harnessed wind energy. Sailboats use wind energy to push their way through water, the sounds of wind chimes are created from the energy of the wind hitting the chimes, and now we're capturing the power of the wind to create electricity. Your parents can purchase wind power from MGE for as little as \$3 more per month on your electric bill. They can sign up by going to MGE.COM. This is a great way your family can reduce your carbon footprint.

Solar power, which means turning sunlight into electricity, is one of the cleanest sources of energy available and is being used in Dane County right now. Ten high schools in Dane County get some of their electricity from solar electric panels installed in their schools by MGE.

Solar power is being used throughout the world to provide power for a wide variety of uses. I've brought a few solar products today to show you. This multi-purpose-device has a solar panel to turn sunlight into energy and can be used as a flashlight, radio, or a siren. This helmet is a kind of solar air conditioner. The solar panel turns the sunlight into energy, you turn this switch on, and the fan blows to keep you cool.

So, on the one hand, we're still developing renewable energy sources. On the other hand, while we do, we're going to continue using fossil fuels. Since this planet is our home, it's important to keep our environment as healthy as possible, and there are things you kids can do to work for a clean environment.

At Hamilton Middle School in Madison, kids and parents formed an Earth Club. They're studying the energy used in their school building and looking at renewable energy options as ways to save energy in their school. Consider starting an Earth Club in your school and reduce your energy use.

Here are five things MGE suggests you and your family can do to help the environment and reduce your Carbon Footprint:

1. Turn off the juice when not in use
2. Switch to compact fluorescents
3. Control your thermostat
4. Wash your laundry in cold water
5. Look for the ENERGY STAR label when purchasing new appliances

Perhaps most important of all, educate yourselves. Learn more about the environment, about pollution, and about renewable energy. You can even check out a portable energy meter from your local library to measure how much electricity your plug-in appliances and equipment use.

One person can make a difference. Even if your families switch to only one of these bulbs, it can make a difference. Gaylord Nelson was a kid like you who grew up in Clear Lake, Wisconsin. He developed a love for nature, educated himself, and eventually became Wisconsin's governor and then senator. In 1970, Wisconsin Senator Gaylord Nelson came up with the idea of having a day of activities to teach people about the environmental dangers facing our planet. What do you think he called it? That's right-Earth Day. The idea behind Earth Day is that people like you and me should reach out to try to make a difference in the world. It means that improving the environment has to start with a personal commitment. So, I'm hoping that today you will make a personal commitment to protect and improve the environment. If you do, you may just be surprised by what can happen.

Energía Mágica

Bienvenidos a Energía Mágica. Hoy trataré de cambiar su manera de pensar porque creo que la mayoría de ustedes dudan que una persona pueda hacer una diferencia para mejorar el mundo, igual como dudan que yo no pueda sacar esta pelota de baloncesto de este delgado maletín.

La demostración de hoy trata de la energía— algo que usamos todo el tiempo, y como la manera que usamos la energía afecta a nuestro medio ambiente y planeta. Usted tiene el poder de la energía en la punta de los dedos. Con el movimiento de un dedo, ustedes pueden encender una luz. Ahora, estoy usando la energía de este sistema de sonido para que todos ustedes puedan oír mi voz. Cuando hago malabarismos con estos anillos, la energía humana causa que los anillos vuelen por el aire; pero últimamente, fue la energía de una fábrica que hizo esos anillos.

Todos usamos energía para vivir y divertirnos. Necesitamos energía para que nuestros refrigeradores mantengan nuestros alimentos fríos para que no se echen a perder, electricidad para cocinar esos alimentos, y electricidad para tener nuestras computadoras prendidas. Necesitamos energía para calentar el agua para ducharnos, para lavar nuestra ropa y nuestros trastes, y para mantener nuestras casas frescas en el verano y calientes en el invierno.

Necesitamos energía para nuestros carros, trenes, y aviones. Necesitamos energía para que nuestras fábricas fabriquen todas las cosas que usamos - la ropa que nos ponemos, los juegos que jugamos, y los libros que leemos.

Nosotros no pensamos en la energía todo el tiempo, pero la usamos en casi todo lo que necesitamos hacer o lo que queremos hacer - a solas, con nuestros amigos, en nuestras comunidades, en todo el mundo. Podrían decir que la energía hace que el mundo funciona.

En Wisconsin, igual a la mayoría de los Estados Unidos, usamos energía principalmente producida por carbón de combustión, petróleo, y gas natural para proveernos con energía y calefacción. Estos tipos de energía se llaman *combustibles fósiles*. Son los restos de animales prehistóricos como dinosaurios y plantas que murieron hace millones de años y sus restos se han transformado lentamente en petróleo, gas natural, y carbón.

La combustión de combustibles fósiles nos presenta dos importantes desafíos. Uno es que el combustible fósil afecta al medio ambiente porque cuando lo quema para darnos energía, emite un gas que se llama dióxido de carbono. Demasiado dióxido de carbono atrapa el calor del sol. La acumulación de dióxido de carbono puede causar que el planeta se caliente más; esto se llama calentamiento global y puede llevar a un cambio de clima.

El segundo desafío es que sólo hay una cantidad limitada de combustibles fósiles en el mundo, y ninguno de ellos son producidos en Wisconsin. En Wisconsin, tenemos que traer nuestro carbón, petróleo, y gas natural de otras partes fuera del estado. Una vez que se agote el abastecimiento mundial de estos combustibles fósiles, se irán para siempre, igual como haré desaparecer esta agua. Estamos usando combustibles fósiles a una velocidad cada vez más rápida porque la demanda de energía es mayor en el Condado de Dane, Wisconsin; en el mundo; y por supuesto, en Pennsylvania.

Igual como una fiebre en su cuerpo les hace sentirse incómodos, cambios de temperatura en el planeta pueden causar problemas tales como escasez de agua, tornados, problemas de salud en los seres humanos, extinción de especies, y otros problemas para animales y plantas.

Muchas cosas que nosotros seres humanos hacemos como mirar la tele o usar las computadoras puede soltar dióxido de carbono. Estas actividades contribuyen a su huella de carbono¹, lo cual es el impacto que usted tiene en el medio ambiente en términos del dióxido de carbono que sus acciones producen.

Afortunadamente, hay maneras de reducir los efectos dañinos del calentamiento global y reducir su huella de carbono sin agotar la energía que necesitamos, y eso se logra usando la energía inteligentemente.

Usar la energía inteligentemente significa estirar nuestros recursos actuales, proteger el medio ambiente, y usar la energía que estamos usando ahora en forma más eficiente. Por ejemplo, si quiero hacer malabarismo con seis objetos, yo puedo hacerlo de esta manera, pero una manera más eficiente de hacer malabarismo es así. Estoy usando menos energía para lograr el mismo resultado.

También podemos manejar nuestro abastecimiento de energía en forma inteligente - ¿Qué significan estas palabras? ("**USEN MENOS ENERGÍA**") Si todos usamos menos energía, entonces necesitaremos producir menos energía y habrá menos contaminación. Para ustedes, esto podría significar tomar duchas más cortas y así usarán menos agua y menos energía para calentar el agua. En invierno, esto podría ser bajando el termostato un poco, y en el verano, podría ser usando el aire acondicionado con menos frecuencia.

No solamente podemos usar menos energía, todos podemos - ¿Qué dicen estas palabras? ("**DESPERDICIA MENOS ENERGÍA**"). Desperdiciar menos energía significa apagar la tele cuando no la estén mirando o apagar las luces cuando sale de la habitación. O conservar energía, lo cual significa reducir, volver a usar las cosas, y reciclar. Juntar materiales que una vez se consideraba basura como periódicos, latas de aluminio, y botellas plásticas, y volver a usarlas, ahorra energía. Consideren usando bolsas del supermercado que se pueden usar una y otra vez para reemplazar bolsas plásticas y bolsas de papel.

Desperdiciar menos energía significa que en edificios como nuestras escuelas, una gran cantidad de aire caliente se fuga hacia el exterior del edificio en el invierno, justo como tratando de usar esta cobija para mantenerse caliente. Entonces si queremos ser más eficientes, tenemos que tapan la fuga para prevenir que el aire caliente se escape, igual como ustedes prevenirán mi escape de estas esposas. En un edificio como este, podríamos poner insulación en las paredes o cinta climática alrededor de las puertas y ventanas para mantener la calefacción adentro. Poner insulación en los edificios es como tener un buen termo que mantiene caliente una bebida caliente o fría una bebida fría.

¹ Huella de carbono - semejante al huella de un zapato en la tierra, nuestros acciones y decisiones sobre la energía tienen efectos en nuestro planeta.

La tecnología también puede ayudarnos a producir energía más limpia y eficiente. Tomen este foco llamado un foco de luz incandescente. Un nombre mejor para él podría ser foco de calor. Muchos de nosotros todavía usamos este tipo de focos que se inventaron en el año 1879 y que son increíblemente ineficientes. 90% de la energía generada por esos focos se desperdicia en forma de calor, dejando solo 10% para usar como fuente de luz. Todo lo que tenemos que hacer para ahorrar mucha energía es cambiarlos por estos otros. Estos focos fluorescentes usan más o menos $\frac{1}{4}$ de la electricidad usada por los focos incandescentes, producen la misma cantidad de luz, y duran diez veces más que los otros.

Luces LED o diodo emisor de luz, son aun más eficientes que los focos fluorescentes. Considera usando estos para Navidad o el Año Nuevo. Estos focos duran hasta 100,000 horas - duran diez veces más que los fluorescentes y usan mucho menos electricidad para operarlos.

Si quieren estar seguros que algo usa energía más eficiente, busque este sello de la ESTRELLA DE ENERGÍA. La ESTRELLA DE ENERGÍA es un programa del gobierno de los Estados Unidos que promueve productos que usan energía eficiente. El sello promete que aparatos como refrigeradores, televisiones, o computadoras usarán menos energía y ayudarán a proteger el medio ambiente.

Sea como sea la forma en que mejoramos nuestra energía, solo podemos extender nuestros recursos actuales hasta cierto límite. En el futuro, necesitaremos fuentes de energía que podamos usar repetidas veces, fuentes que no se agotarán y que no contaminarán. Estas se llaman fuentes de energía renovable.

En Wisconsin, nosotros obtenemos más o menos 40% de nuestra energía de fuentes de energía renovable como energía del sol, del viento, y del agua para producir la electricidad.

El viento tiene un gran poder de energía. Durante miles de años, la gente ha utilizado la energía del viento. Los veleros usan energía del viento para impulsar su avance en el agua, el sonido de las campanillas de viento lo crea la energía del viento cuando toca las campanillas y ahora nosotros estamos tratando de capturar la energía del viento para crear electricidad. Sus padres pueden comprar energía de viento de MGE por tan poco como \$3 más por mes en su factura de electricidad. Ellos pueden inscribirse por manera de la página de internet MGE.COM. Esta es una manera excelente en la que su familia puede reducir la cantidad de energía que desperdician, o lo que se llama su huella de carbono.

Energía solar, que significa transformar la energía del sol en electricidad, es la fuente de energía más limpia que tenemos disponible y la usa ahora mismo en el Condado de Dane. Diez escuelas secundarias del Condado de Dane obtienen su electricidad de paneles solares eléctricos instalados por MGE en sus escuelas.

La energía solar se usa en todo el mundo para proveer energía para una gran variedad de usos. Hoy traje algunos productos solares para mostrárselos a ustedes. Este dispositivo multifacético tiene un panel solar que transforma la energía del sol en electricidad y puede usarse como linterna, radio o sirena. Este casco es un tipo de acondicionador de aire solar. El panel solar transforma la energía del sol en electricidad; ustedes prenden este interruptor y el ventilador sopla para refrescarlos.

Por un lado, todavía estamos desarrollando fuentes de energía renovable. Por otro lado, mientras lo hacemos, seguiremos usando combustibles fósiles. Porque este planeta es nuestro hogar, es importante mantener nuestro medio ambiente lo más sano posible, y hay cosas que ustedes niños pueden hacer para luchar por un medio ambiente saludable.

En la escuela secundaria Hamilton, en Madison, niños y padres formaron un Club de la Tierra. Están estudiando la energía usada en el edificio de la escuela de ellos y mirando opciones de fuentes de energía renovables como maneras de ahorrar energía en la escuela de ellos.

Hay cinco cosas que MGE les sugiere que usted y su familia pueden hacer para ayudar al medio ambiente y reducir su huella de carbono:

1. Apaguen la electricidad cuando no la estén usando.
2. Cambien a focos fluorescentes.
3. Controlar su termostato.
4. Lavar su ropa en agua fría.
5. Busca el sello de la ESTRELLA DE ENERGÍA cuando comprando aparatos nuevos.

Tal vez lo más importante de todo es informarse y educarse. Aprendan más del medio ambiente, de la contaminación, de la energía renovable. Incluso puede usted rentar un medidor portátil de energía de su biblioteca local para medir cuanta energía usan sus aparatos que se enchufan y cuanta energía usa su equipo.

Una persona puede hacer una diferencia. Si sus familias sólo cambian un foco fluorescente, pueden hacer una diferencia. Gaylord Nelson era un niño igual a ustedes quien creció en Clear Lake, Wisconsin. Desarrolló un amor por la naturaleza, se educó, y con tiempo, se convirtió al gobernador de Wisconsin y entonces senador. En 1970, a Gaylord Nelson se le ocurrió la idea de tener un día de actividades para enseñar a la gente de los peligros ambientales con los cuales están enfrentando a nuestro planeta. ¿Qué piensan que él llamó a ese día? Eso es correcto, el Día de la Tierra. La idea detrás del Día de la Tierra es que la gente como ustedes y yo debemos tratar de alcanzar y de lograr un cambio en nuestro planeta. Significa que mejorando el medio ambiente tiene que comenzar con un compromiso personal. Por eso, espero que hoy día ustedes se comprometan personalmente a proteger y mejorar el medio ambiente. Si lo hacen, tal vez se sorprenderán de lo que puede pasar.

Additional Resources

Kids for a Clean Environment

www.kidsface.org

The impetus for the creation of Kids F.A.C.E. was driven by nine-year old Melissa Poe's correspondence to then-President Bush to help clean up the environment. Over 250 billboards with Melissa's letter to the president were placed across the United States in April, 1990. Melissa soon founded kids F.A.C.E. Among their many accomplishments since 1990, Kids F.A.C.E. members have distributed and planted over 1 million trees.

International Children's Rainforest

[www.rainforestweb.org/Rainforest Information/Sites for Kids/](http://www.rainforestweb.org/Rainforest_Information/Sites_for_Kids/)

A forest saved by children...The dream began in 1987 at a small, primary school in rural Sweden. It was the study of tropical forests and the rapidity of their destruction that prompted a teacher and a nine year old student to want to do something about it. Soon the children, guided by their teacher, launched a campaign to raise money to purchase threatened rain forest adjacent to the Monteverde preserve in Costa Rica. Within two years their initial 6 hectare purchase grew to 7,258 hectares. As the spirit swept across other lands, more groups formed and individual contributions arrived from the far corners of the globe. Teachers and students from all over the world use the facilities on ecology trips.

In 1994, a second Children's Rainforest was established in Amazonian Ecuador. 'The Jatun Sacha Bioreserve' covers 3,000 hectares, and has become an educational centre as well.

The Children's Rainforest is a Canadian charity whose mission is to help create bio-reserves in various tropical countries, through land purchases in ecologically rich areas. Funds raised by school-based environment clubs in Sweden, England, Germany, the U.S.A., and Canada, are used to purchase forests and set up educational programs.

Wisconsin Department of Natural Resources Environmental Education for Kids (EEK)

<http://www.dnr.state.wi.us/org/caer/ce/eeek/>

This electronic magazine is designed to help students' grades 4-8 to "learn more about the great outdoors."

It's Our World, Too! Community Service Projects for Young People to Make a Difference
www.wi-bpdd.org

Middle school students are capable of extraordinary accomplishments. The "It's Our World, Too!" curriculum provides numerous true stories of middle school students, occasionally high school students, and even elementary school students who have encountered problems which touched their hearts sufficiently to compel them to initiate service projects to attempt to rectify those problems. They've tackled problems in every imaginable area in which there is need: the environment, hunger, poverty, HIV/AIDS, cancer, discrimination, and issues related to helping everyone from babies and senior citizens. Some of their projects have benefited their local communities while others have helped children throughout the world.

With perseverance, resiliency, ingenuity, and compassion, they have formed organizations with their peers to tackle many of society's most pressing problems. They've successfully lobbied city governments, raised millions of dollars for countless worthy causes, and consistently proven that young people can help change the world.

The "It's Our World, Too" curriculum is unique in that it provides suggestions for service activities based upon projects successfully undertaken by youth. That is, the project ideas already have been proven to be worthy rather than simply sounding like "good things to do."

DoSomething.org
<http://www.dosomething.org>

Dosomething.org is a web based organization that believes teens have the power to make a difference. They "aim to inspire, support, and celebrate a generation of doers: people who see the need to do something, believe in their ability to get it done, and then take action." They provide the tools and resources to convert ideas and energy into positive action.

Global Youth Services Day Projects
<http://tools.ysa.org/map/gysdlist.shtml>

Global Youth Service Day (GYSD) is organized by Youth Service America with the Global Youth Action Network as its key partner and a consortium of international organizations and over 120 national coordinating committees in participating countries. GYSD is an annual global event that highlights and celebrates the contributions of youth to their communities through volunteer service. During Global Youth Service Day, youth around the world organize community service projects to address local needs. GYSD is held during a weekend every April.