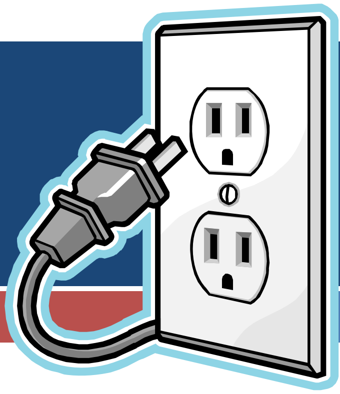

GO GREEN PROJECT:

ENERGY USE

Leaders Guide

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Grade level

7-12. This is a basic lesson plan that can be expanded for high school grades or simplified for elementary students.

Subjects(s)

Science
Math

Duration

One and a half 50-minute class periods

Description

Most people have little idea of the cost to power the electronic appliances in their homes. This lesson gives students a brief history of energy and helps them develop tools to make better decisions in relation to home energy use.

Objectives

1. Students will understand that life on Earth is affected by a series of interconnected cycles and that those cycles are affected by the way we use Earth's natural resources.
2. Students will use exploration and mathematical calculations to determine their home energy consumption.

NDSU
Extension Service
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Materials

- EnergyUse PowerPoint
- Electrical appliances (one for every two students)
- Kill-A-watt™ home electricity monitor (optional)
- Home Energy Use worksheet

Procedure

Day 1:

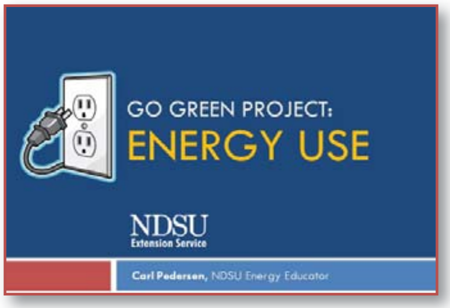
1. Begin with the PowerPoint provided on energy and the history of energy use on Earth. (25 minutes)
2. Demonstrate the use of the Home Energy Use evaluation worksheet (procedure included in PowerPoint)
3. Pass out one electrical appliance for every two students and have them determine the energy requirements of that appliance. Have students exchange appliances and determine the electricity requirements for at least five different ones.
4. Homework: Have students go home and determine the energy use of five more appliances in their home.

Day 2:

1. Revisit information from the previous day.

   Discussion questions: What is energy? What are some ways to reduce energy use? What is standby power? What appliances have standby power draws? What appliances in your home use the most electricity? How can people determine energy use of electronics and appliances when making purchases?

Slide 1



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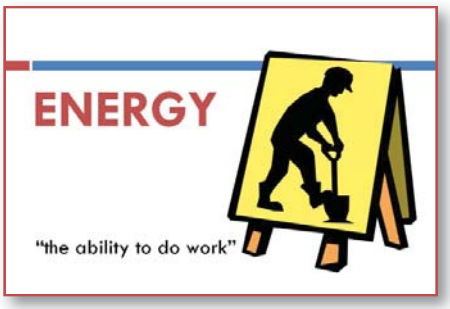
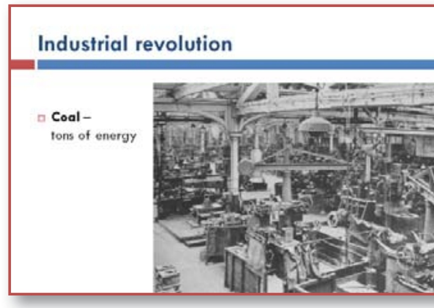
Slide 2



Energy simply defined is "the ability to do work." Heating a home, dribbling a basket ball or digging a hole all takes energy. The sources of that energy and the ways that energy is converted are extremely varied. You need to take an energy source and convert it so work can be done.

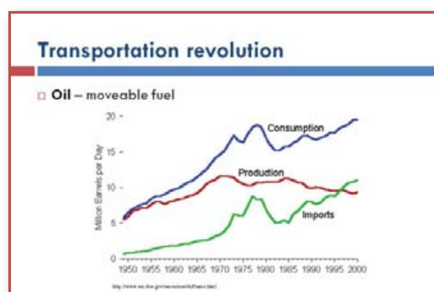
Slide 3



The industrial revolution occurred as a result of the discovery of the amount of energy in coal. The amounts of energy released when coal is burned gave inventors the ability to operate larger and more productive steam engines. Previously, wood was used and did not have enough energy released to power steam engines and other machines. Once the energy in coal began being used, it changed the course of history.

This was the first time in history that people stopped paying attention to the organic cycles of the Earth and instead they began working against them. Before the industrial revolution, they had to grow crops when weather was good and store enough food and fuel sources to last through the winters. This was a dramatic shift in the way the resources on our planet were utilized; it was a switch from renewable to nonrenewable resource utilization, a switch from organic to inorganic economy, and a switch from resource use to resource depletion economy.

Slide 4



The discovery of the process to refine oil into usable sources of energy fueled the transportation revolution, another explosion in the use of nonrenewable energy sources. In 1859, the first North American oil well was drilled in Titusville, Pa. The increased use of oil further changed the landscape from using natural sources of energy to working against the processes of the Earth.

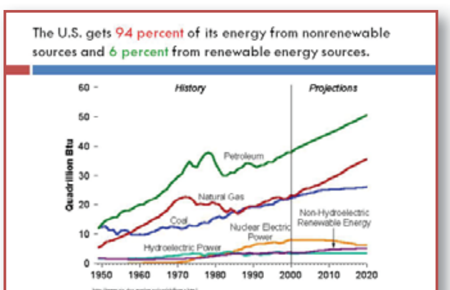
Slide 5

The materials economy: extraction, manufacturing, distribution, consumption, disposal.

Our economy is based on a system of using things and then throwing them away. We produce, grow or mine things that then are processed. These materials are sent to a distribution center, where consumers purchase them and bring them home. After using them, they are discarded and either burned or enter a landfill. The vast majority of things we use are not returned to the environment to enter the ecosystem again. Our system of supply and demand is based on a linear system.

The Earth is not linear. It is an interconnected group of cycles: water cycle, carbon cycle, nitrogen cycle, etc. This system we are using is not sustainable. Eventually the ecosystem will be damaged past the point of where it can recover naturally.

For more information, visit www.storyofstuff.com



Slide 6

According to the U.S. Department of Energy's Energy Information Administration, the U.S. gets 94 percent of the energy it uses from nonrenewable resources and only 6 percent from renewable sources. Nonrenewable resources are ones that once used are no longer available for reuse. Examples are coal, oil and natural gas. Examples of renewable energy use are wind turbines, hydroelectricity generation and energy from solar radiation.

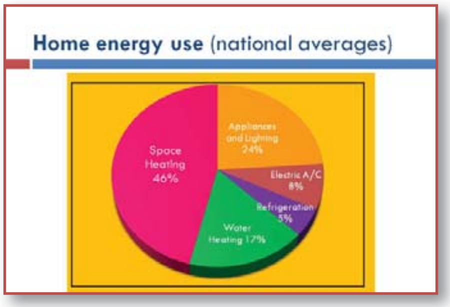
Slide 7

Interest in the use of renewable energy sources is increasing. While these are not new ideas for energy use, interest in utilizing them is rekindled.

Slide 8

The most important source of energy that needs to be promoted is energy efficiency. Americans simply are using too much energy and until energy use is reduced, we will continue to experience the same problems. While energy efficiency is not actually a source of energy, many utility companies and industries are looking at increasing the amount of work done for the amount of energy consumed, or getting more bang for the buck.

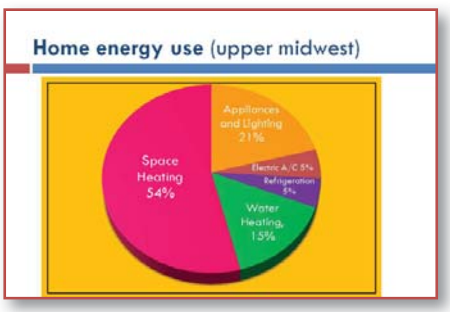
Slide 9



When trying to become more efficient with energy, looking at the largest energy users makes sense. In homes, that is heating and appliances.

According to the U.S. Department of Energy, Energy Information Administration, 2001 census data, 46 percent of home energy use in the U. S. is for heating and another 24 percent is for lighting and appliances. In North Dakota and the upper midwest, a much larger portion of energy use is for home heating. Home heating accounts for closer to 50 percent of energy use (See next slide).

Slide 10



Data from for the Upper Midwest home energy consumption

Table CE1-10c. Total Energy Consumption in U.S. Households by Midwest Census Region, 2001

Data accessed at www.eia.doe.gov/emeu/recs/recs2001_ce/ce1-10c_mw_region2001.html June 20, 2009.

Slide 11

If heat is created in a home and it leaks out, the homeowner is paying to heat the outside air, which is a waste of energy and money.

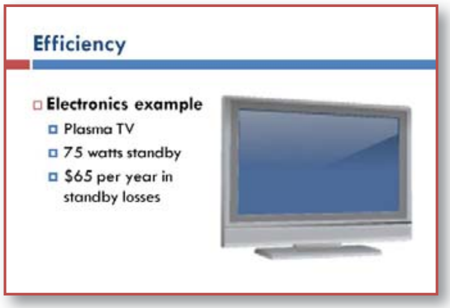
When trying to determine the greatest areas of heat loss in a building, start with these areas:

- Check insulation levels in the attic and walls if possible. Do not forget to check to see if foundation walls are insulated.
- Look to see if plumbing and heating pipes that leave the building are allowing heat to escape into the attic or outside.
- Interior walls often also are a serious culprit of heat loss. They can act as a funnel for heat losses. Heat passes into uninsulated interior walls. Heat rises as a result of convective processes. If those walls do not have insulation plugging the top of them, that heat could be lost to the attic and the surrounding area.
- Check for cracked seals around windows and doors.

Slide 12

This image shows where the majority of heating leaks are in a home.

Slide 13



Home electronics and lighting account for 24 percent of home energy use nationwide. The problem with most appliances is that you cannot determine easily how much they cost you to use. One of the best things to do is purchase ENERGY STAR electronics and appliances. The ENERGY STAR label ensures you the appliance is more energy efficient than government standards require.

ENERGY STAR appliances also have very low standby power losses. Standby power losses occur when an appliance still will draw electricity even when turned off. If they have a clock, a soft-touch keypad or remote control, they use what is called standby power. The amount of electricity they use depends on the appliance and the efficiency of that appliance. The average house has an estimated 20 appliances that use standby power. If you want to check, walk through the house at night with all the lights off and look for clocks or the little lights that tell you appliances still are using electricity. The cost of energy consumed by standby power in the United States is estimated at $4 billion per year or the amount of electricity generated by seven power plants. What can you do? Put appliances such as computers on power strips that have an on/off switch. When you buy appliances, educate yourself about how much they cost to operate, including in standby mode.

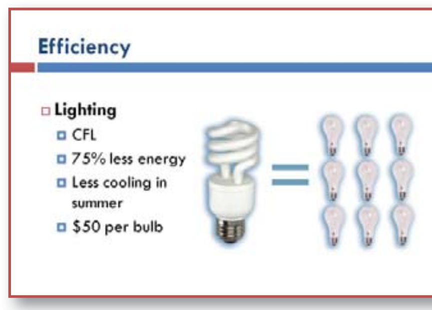
For example, plasma televisions are generally huge energy wasters. Some can use as much as 500 watts of electricity when in use and as much as 75 watts when turned off. An appliance that uses 75 watts of standby power will cost $65 per year at 10 cents per kilowatt-hour.

Slide 14

Other appliances, such as video games, can be large consumers of electricity. According to the Natural Resources Defense Council, the Nintendo Wii uses only 16 watts of electricity when being played compared with 150 watts used by the Sony Playstation 3. In addition, many gaming systems do not come from the manufacturer with auto-sleep functions enabled. This means the game continues to draw maximum power until the user shuts the game off.

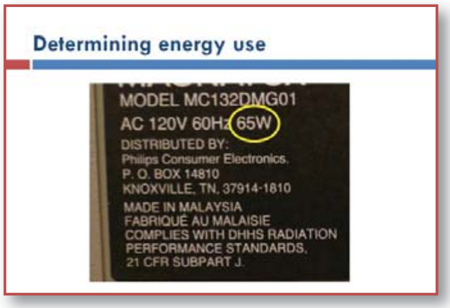
Natural Resources Defense Council. 2008. Lowering the Cost of Play, Improving the Energy Efficiency of Video Game Councils. Report accessed 20 June 2009 at www.nrdc.org/energy/consoles/files/consoles.pdf

Slide 15



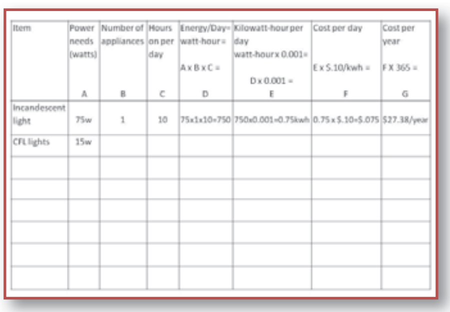
Switching from incandescent to compact fluorescent light (CFL) bulbs is a guaranteed money and energy saver. The bulbs consume around 75 percent less energy than an incandescent bulb and produce less heat. The majority of the energy used by incandescent light bulbs is used to produce heat, not light. Less heat produced from each bulb means less energy to cool your house in the summer. In the winter, incandescent bulbs will provide heat to the home. You would need to do a fuel cost savings analysis to determine if electric heat is less expensive than the heat source you have in your house. You can save an average of about $50 per incandescent bulb you replace with a CFL during the life of the CFL bulb.

Slide 16



Electronic appliances come with energy labels to inform consumers about how much electricity they require. The cost to use that appliance can be determined from this label. In the example on this slide, the piece of electronics is rated at using 65 watts of electricity. If you used this appliance for one hour, it would use 65 watt-hours of electricity. Electricity is sold by kilowatt hour, so you would need to convert watts to kilowatts to determine the cost. If you used this appliance for two hours, it would use 130 watts of electricity (2 hours x 65 watts).

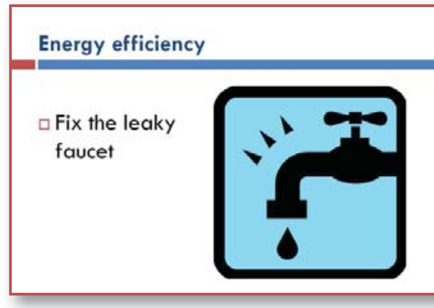
Slide 17



Item	Power needs (watts) A	Number of appliances B	Hours on per day C	Energy/Day= watt-hour = A x B x C = D	Kilowatt-hour per day watt-hour x 0.001= D x 0.001 = E	Cost per day E x $.10/kwh = F	Cost per year F X 365 = G
Incandescent light	75w	1	10	75x1x10=750	750x0.001=0.75kwh	0.75 x $.10=$.075	$27.38/year
CFL lights	15w						

Use this worksheet to determine how much an appliance or piece of electronics will cost to use in a year. Start on the left side of the worksheet and fill in the blanks as you work across. The first example is done showing the cost of a 75-watt light bulb. One light bulb (A) on for 10 hours a day (C) uses 750 watt-hours (D) of electricity in a day. Since electricity is sold in kilowatt-hours, you need to multiply watt-hours by 0.001 to convert it to kilowatt-hours (E). Then to get the daily cost, multiply the kWh by the cost of electricity. The national average cost of electricity is 10 cents per kilowatt-hour, so that is the number used (F). Finally, multiply the daily use by 365 to determine how much that electronic device is costing per year. Complete the second row (the CFL light bulb) to determine the cost to use a comparable CFL for a year. Then use the rest of the columns on the worksheet to determine how much energy appliances use.

Slide 18



Using energy more efficiently is like stopping a leaky faucet. We would not let a faucet continually run or drip in our homes, but we allow energy to be wasted. The way we use energy is like the analogy of trying to get a drink of water from a firehouse. Sure, you will be able to get a drink, but a lot of water will be wasted. We use a lot more energy than we need to simply because we do not try to utilize the most efficient means to accomplish each task.

For more information on this and other topics, see: www.ag.ndsu.edu