Energy

Merit Badge Notebook

This workbook can help you but you still need to read the merit badge pamphlet (book). No one can add or subtract from the Boy Scout Requirements #33215. Merit Badge Workbooks and much more are below: Online Resources.
Workbook developer: craig@craiglincoln.com. Requirements revised: 2006, Workbook updated: November 2008.

Scout's Name: _____ Unit: _____

Counselor's Name: _____ Counselor's Ph #: _____

1. Do the following:

a. Find an article on the use or conservation of energy. _____

Discuss with your counselor what in the article was interesting to you, _____

_____

the questions it raises, _____

_____

and what ideas it addresses that you do not understand. _____

_____

b. After you have completed requirements 2 through 8, revisit the article you found for requirement 1 a. Explain to your counselor what you have learned in completing the requirements that helps you better understand the article. _____

_____

_____

_____

2. Show you understand energy forms and conversions by doing the following:

a. Explain how THREE of the following devices use energy, and explain their energy conversions:

toaster, _____

_____

greenhouse, _____

_____

lightbulb, _____

_____

bow drill, _____

_____

nuclear reactor, _____

_____

sweat lodge. _____

_____

b. Construct a system that makes at least two energy conversions and explain this to your counselor. _____

3. Show you understand energy efficiency by explaining to your counselor a common example of a situation where energy moves through a system to produce a useful result. _____

Do the following:

a. Identify the parts of the system that are affected by the energy movement. _____

b. Name the system's primary source of energy. _____

c. Identify the useful outcomes of the system. _____

d. Identify the energy losses of the system. _____

4. Conduct an energy audit of ***your home***. (*Sample Home Energy Audit*) _____

Keep a 14 day log that records what you and your family did to reduce energy use.

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____
11 _____
12 _____
13 _____
14 _____

Include the following in your report and, after the 14 day period, discuss what you have learned with your counselor.

a. List the types of energy used in your home such as electricity, wood, oil, liquid petroleum, and natural gas, and tell how each is delivered and measured, and the current cost; OR record the transportation fuel used, miles driven, miles per gallon, and trips using your family car or another vehicle. _____

b. Describe ways you and your family can use energy resources more wisely. In preparing your discussion, consider the energy required for the things you do and use on a daily basis (cooking, showering, using lights, driving, watching TV, using the computer). Explain how you can change your energy use through reuse and recycling. _____

5. In a notebook, identify and describe five examples of energy waste in your school or community. Suggest in each case possible ways to reduce this waste.

Describe the idea of trade offs in energy use. _____

In your response, do the following:

a. Explain how the changes you suggest would lower costs, reduce pollution, or otherwise improve your community.

b. Explain what changes to routines, habits, or convenience are necessary to reduce energy waste. _____

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_____

Tell why people might resist the changes you suggest. _____

_____

_____

_____

_____

6. Prepare pie charts showing the following information, and explain to your counselor the important ideas each chart reveals. Tell where you got your information. _____

   Explain how cost affects the use of a nonrenewable energy resource and makes alternatives practical. _____

   _____

   _____

a. The energy resources that supply the United States with most of its energy

b. The share of energy resources used by the United States that comes from other countries

c. The proportion of energy resources used by homes, businesses, industry, and transportation

d. The fuels used to generate America's electricity

e. The world's known and estimated primary energy resource reserves

7. Tell what is being done to make FIVE of the following energy systems produce more usable energy. In your explanation, describe the technology, cost, environmental impacts, and safety concerns.

- Biomass digesters or waste to energy plants
- Cogeneration plants
- Fossil fuel power plants
- Fuel cells
- Geothermal power plants
- Nuclear power plants
- Solar power systems
- Tidal energy, wave energy, or ocean thermal energy conversion devices
- Wind turbines

Energy System: _____

What is being done to produce more usable energy? _____

_____

Technology_____

_____

Cost _____

_____

Environmental impacts _____

_____

Safety concerns _____

Energy System: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

Safety concerns _____

Energy System: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

Safety concerns _____

Energy System: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

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Energy System: _____

What is being done to produce more usable energy? _____

Technology_____

_____

Cost _____

_____

Environmental impacts _____

_____

Safety concerns _____

_____

8. Find out what opportunities are available for a career in energy.

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Choose one position that interests you and describe the education and training required. _____

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_____

Online Resources *(Use any Internet resource with caution and only with your parent's or guardian's permission.)*

Boy Scouts of America: ► scouting.org ► Guide to Safe Scouting ► Age-Appropriate Guidelines ► Safe Swim Defense ► Scout ► Tenderfoot ► Second Class ► First Class Rank Videos ► Safety Afloat

Boy Scout Merit Badge Workbooks: usscouts.org -or- meritbadge.org **Merit Badge Books:** www.scoutstuff.org

Guide to Safe Scouting Safe Swim Defense Safety Afloat Blood Borne Pathogens Youth Protection Training

Requirement Resources

See: http://meritbadge.org/wiki/index.php/Energy for these links and much more

1: Energy Conservation and Efficiency - Energy Conservation - Top 5 Green Myths - Energy Conservation Myths - Power$mart-Alliance to Save Energy - Energy Hog Busters

2: Classroom Energy! Energy: The Quick Tour

a: How Stuff Works: Toasters - Greenhouses - Light Bulbs - Bow Drill - Nuclear Reactors

b: A BSA Crystal Radio Kit or BSA AM/FM Radio Kit converts radio energy to electrical energy and then electrical energy to sound energy.

A BSA Door Alarm Kit converts mechanical energy to electrical energy and then electrical energy to sound energy.

Fans covert electrical energy to mechanical energy and then mechanical energy to wind energy.

3: Car Engines convert heat to mechanical energy. Brakes convert mechanical energy to heat.

Speakers convert electrical energy to sound. Microphones convert sound energy to electricity.

Light Bulbs & LCD's convert electricity to light. Solar Cells convert light to electricity.
Fans covert electical energy to mechanical energy and then mechanical energy to wind energy.
Wind Turbines convert wind energy to mechanical energy and then mechanical energy to electrical energy.
Also see: Toasters - Microwave Ovens - Refrigerators - Batteries

4: **Energy Audit:** The BSA Home Energy Audit is in the Energy Workbook
Other audits: Energy Star - Alliance to Save Energy - Home Energy Saver - Dept of Energy

5: Dept. of Energy Garbage to Energy - Converting Waste to Energy - Energy Efficiency - Electric Buses - Public Transportation - School Energy Audit - Alliance to Save Energy

6: The Future of Energy
a. The energy resources that supply the United States
b. The share of energy resources used by the United States that comes from other countries
c. Energy used by homes, businesses, industry, and transportation
d. The fuels used to generate America's electricity
e. The world's known and estimated primary energy resource reserves

7: Biomass digesters or Dept. of Energy Garbage to Energy - Converting Waste to Energy
Cogeneration plants - Fossil fuel power plants
Fuel cells
Geothermal power plants
Nuclear power plants - 25 Largest in the US
Solar power systems
Tidal energy, wave energy, or ocean thermal energy conversion devices
Wind turbines - American Wind Energy Association

8: Careers in Energy

General Resources

National Geographic Society: http://www.nationalgeographic.com/
Energy Information Administration: http://www.eia.doe.gov/kids/
Energy Star - US EPA: http://www.energystar.gov
Nuclear Energy Institute: http://www.nei.org
U.S. Department of Energy: http://www.eere.energy.gov/
EarthTrends: http://earthtrends.wri.org/
National Hydropower Association: http://www.hydro.org
National Renewable Energy Laboratory: http://www.nrel.gov

Sample Home Energy Audit

Attic

- ☐ Insulation - Is there enough insulation between ceiling joists?
- ☐ Vents - Sufficient and unobstructed?

Living Areas

- ☐ Air Leakage - Tape a foot of toilet paper to a pencil with paper hanging free. Hold near windows and doorframes, window air-conditioning units, and electrical covers. If paper moves, you may need weather-stripping, caulking, or storm windows.
- ☐ Wall Insulation - Are the wall too cool to the touch on a cold day or too warm on a hot day?
- ☐ Thermostat - Set at 68 degrees in winter (turn down 5 degrees more when sleeping), 78 in summer.
- ☐ Drapes - During winter, open drapes and shades to let sunlight in. Close at night. During the summer, close drapes.
- ☐ Unused Rooms - Close heating and cooling vents, doors in areas seldom used.
- ☐ Use fans instead of air conditioning when possible. Fans can also help circulate air when the air conditioning is on.

Fireplace

- ☐ Close the damper when fireplace is not in use.
- ☐ Glass doors keep heat from escaping up the chimney.

Kitchen

- ☐ Refrigerator/Oven Seal - To test, close a dollar bill in the door. If the bill moves with little resistance, the seal is bad.
- ☐ Appliances - Use washers and dryers in the morning and late evening hours when energy requirements are lower.
- ☐ Lights - Turn off lights when not used. Install lower wattage and fluorescent light bulbs whenever possible.
- ☐ Faucets do not drip.

Basement/Crawl Space

- ☐ Heating/Cooling System - Clean or replace filters monthly. Have unit serviced once a year.
- ☐ Water Heater - Set temperatures no higher than 160 degrees. Drain sediments 3-4 times a year.
- ☐ Ducts/Pipes - Insulate hot water pipes as well as heating and cooling ducts.
- ☐ Floors - If you have a crawl space under your house, install batt-type fiberglass insulation under floors.
- ☐ Venting - Washer & dryer units should be vented directly to the outside.

Outside

- ☐ Weather Stripping & Caulking - Caulk the cracks around windows, weather-strip around doors.
- ☐ Windows - Storm windows and double-paned glass can reduce energy usage up to 15%.
- ☐ Doors - Keep doors tightly closed on hot or cold days.
- ☐ Storm Doors - Help insulate doors