



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. _____

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 _____

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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 _____

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

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

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: [BSA Troop 780](#) -or- 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](#) - [PowerSmart-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](#) convert 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](#) convert electrical 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 walls 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