



ENERGY

Merit Badge Requirements

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 1a. 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, light bulb, 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. Keep a 14 day log that records what you and your family did to reduce energy use. 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. 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 system produce more useable 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
- * Wind turbines
- * Tidal energy, wave energy, or ocean thermal energy conversion devices

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.

Requirement 1

Find an article on the use or conservation of energy.

What in the article was interesting to you? _____

What question(s) does the article raise? _____

What ideas are addressed in the article that you do not understand? _____

After you have completed requirements 2 through 8, revisit the article you found for requirement 1a.

Explain what you have learned in completing the requirements that helps you better understand the article: _____

Requirement 2

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

Toaster: _____

Greenhouse: _____

Lightbulb: _____

Bow Drill: _____

Nuclear Reactor: _____

Sweat Lodge: _____

Scout Name: _____ Unit #: _____ Date: _____

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

What system did you construct? _____

Give a brief explanation: _____

Requirement 3

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

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

Name the systems primary source of energy: _____

Identify the useful outcomes of the system: _____

Identify the energy losses of the system: _____

Requirement 4

Conduct an energy audit of your home. You may choose to use the Energy Audit on the last page of this worksheet if you wish.

Keep a 14 day log that records what you and your family did to reduce energy use. Use the following spaces to help you keep track of the day-to-day items.

Day 1: _____

Day 2: _____

Day 3: _____

Day 4: _____

Day 5: _____

Day 6: _____

Day 7: _____

Day 8: _____

Day 9: _____

Day 10: _____

Day 11: _____

Day 12: _____

Day 13: _____

Day 14: _____

You have 2 options for this next part. Read through each of the following options very carefully. Select and complete one of them

OPTION 1

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.

Scout Name: _____ Unit #: _____ Date: _____

Type of energy used: _____
How is it delivered? _____
How is it measured? _____
What is the current cost per measured unit? _____

Type of energy used: _____
How is it delivered? _____
How is it measured? _____
What is the current cost per measured unit? _____

Type of energy used: _____
How is it delivered? _____
How is it measured? _____
What is the current cost per measured unit? _____

Type of energy used: _____
How is it delivered? _____
How is it measured? _____
What is the current cost per measured unit? _____

OPTION 2

Record the transportation fuel used, miles driven, miles per gallon, and trips using your family car or another vehicle.

Trip: _____
Fuel Used: _____ Gallons MPG: _____ Miles Driven: _____

Trip: _____
Fuel Used: _____ Gallons MPG: _____ Miles Driven: _____

Trip: _____
Fuel Used: _____ Gallons MPG: _____ Miles Driven: _____

Trip: _____
Fuel Used: _____ Gallons MPG: _____ Miles Driven: _____

Trip: _____
Fuel Used: _____ Gallons MPG: _____ Miles Driven: _____

Trip: _____
Fuel Used: _____ Gallons MPG: _____ Miles Driven: _____

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, and using the computer). Explain how you can change your energy use through reuse and recycling: _____

Requirement 5

Identify and describe five examples of energy waste in your school or community. Suggest in each case possible ways to reduce this waste

Example 1: _____

Suggestion to reduce this type of waste: _____

Example 2: _____

Suggestion to reduce this type of waste: _____

Example 3: _____

Suggestion to reduce this type of waste: _____

Example 4: _____

Suggestion to reduce this type of waste: _____

Example 5: _____

Suggestion to reduce this type of waste: _____

Describe the idea of trade offs in energy use: _____

Explain how the changes you suggested would lower costs, reduce pollution, or otherwise improve your community: _____

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

Scout Name: _____ Unit #: _____ Date: _____

Tell why people might resist the changes you suggest: _____

Requirement 6

You have been asked to create 5 pie-charts. Using separate pieces of paper create the pie-charts and include the required information on each. When complete, attach the charts to this worksheet and turn them in to your merit badge counselor.

Pie Chart 1

- A) Show the energy resources that supply the United States with most of its energy.
- B) Tell where you got your information

Pie Chart 2

- A) Show the share of energy resources used by the United States that comes from other countries.
- B) Tell where you got your information

Pie Chart 3

- A) Show the proportion of energy resources used by homes, businesses, industry, and transportation.
- B) Tell where you got your information

Pie Chart 4

- A) Show the fuels used to generate America's electricity.
- B) Tell where you got your information

Pie Chart 5

- A) Show the world's known and estimated primary energy resource reserves.
- B) Tell where you got your information

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

Requirement 7

Tell what is being done to make any FIVE of the following energy systems produce more useable 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: _____

Scout Name: _____ Unit #: _____ Date: _____

Fuel Cells: _____

Geothermal Power Plants: _____

Nuclear Power Plants: _____

Solar Power Systems: _____

Tidal Energy, Wave Energy, or Ocean Thermal Energy Conversion Devices: _____

Wind Turbines: _____

Requirement 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.

Position: _____

Education Required: _____

Training Required: _____

Home Energy Audit

In The Attic:

__ Insulation - Use a ruler to measure the depth of insulation between ceiling joists. Make sure the level you measure meets or exceeds the recommended amount of insulation for your area.

__ Vents - Adequate venting reduces buildup of moisture in winter, of heat in summer. This minimizes temperature transfer into living areas and allows insulation to work better. About 1 sq. ft. of venting is recommended for every 150 sq. ft. of attic. Consider installing a thermostat-controlled attic fan to exhaust air.

In The Living Areas

__ Air Leakage - Cracks allow heat to escape in winter, enter in summer. To test, hold lit candle by window and door frames, window air-conditioning units, attic door. If flame flickers, you need weather-stripping, caulking and perhaps storm windows. Refer to the "Outside" section of this checklist.

__ Wall Insulation - To test, put a thermometer on outside wall of room, another at room center. Check after 4 hours. If wall reading is 5 degrees below room center reading, you need wall insulation. Consult an insulation contractor.

__ Fireplace - Close damper when fireplace is not in use. Otherwise, heating and cooling are lost up the chimney.

__ Thermostat - Set at 68 degrees in winter (turn down 5 degrees more when sleeping), 78 in summer. Turning thermostat on and off throughout the day uses more energy.

__ Drapes - During winter, open drapes and shades to let sunlight in. During the summer, close drapes and use opaque, light-colored ones to keep sun out.

__ Unused Rooms - Close heating and cooling vents, doors in areas seldom used.

In The Kitchen

__ Seals - To test, close a dollar bill in the door of the freezer, refrigerator, and oven. If the bill removes with little resistance, the appliance is leaking energy...replace the seal.

__ Appliances - Major appliances use major energy. Use washers and dryers during the morning and later evening hours, and on weekends, when energy requirements are not at their peak.

__ Lights - Install fluorescent light bulbs whenever possible...they use less energy.

In The Basement

__ Heating/Cooling System - Clean or replace furnace and air-conditioner filters once a month. Dirty filters make equipment work harder, use more energy. Have unit serviced once a year.

__ Water Heater - This is the #2 energy user in the home. Set temperatures between 140 & 160 degrees...drain sediments 3-4 times a year.

__ Ducts/Pipes - Insulate hot water pipes plus heating and cooling ducts, particularly if your basement is unheated.

__ Floors - Heat is lost through poorly insulated floors. If you have a crawl space under your house, install batt-type fiberglass insulation under floors...6" (R-19) is good.

__ Venting - Washer & dryer units should be vented directly to the outside to prevent heat and moisture buildup. In an air conditioned home, close off laundry and kitchen areas when they are in use...cool with a fan only.

On The Outside

__ Windows - Storm windows and double-paned glass can reduce energy usage up to 15%. Keep direct sunlight out during summer, but let in as much as possible in winter. This can be done with drapes, shutters, awnings, and shade trees that lose their leaves.

__ Weather Stripping & Caulking - As discussed under "Air Leakage", caulk the cracks around windows, weather-strip around doors. These improvements can lower your energy consumption by as much as 10%.