



Energy

Merit Badge Workbook

This workbook can help you but you still need to read the merit badge pamphlet.

The work space provided for each requirement should be used by the Scout to make notes for discussing the item with his counselor, not for providing the full and complete answers. Each Scout must do each requirement.

No one may add or subtract from the official requirements found in **Boy Scout Requirements** (Pub. 33216 – SKU 34765).

The requirements were last issued or revised in 2006 • This workbook was updated in April 2012.

Scout's Name: _____ Unit: _____

Counselor's Name: _____ Counselor's Phone No.: _____

<http://www.USScouts.Org> • <http://www.MeritBadge.Org>

Please submit errors, omissions, comments or suggestions about improving this workbook to: Workbooks@USScouts.org

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.

What was interesting? _____

What questions does it raise? _____

What ideas does it address 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, _____

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. (See the Sample Home Energy Audit at the end of this workbook.)

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.

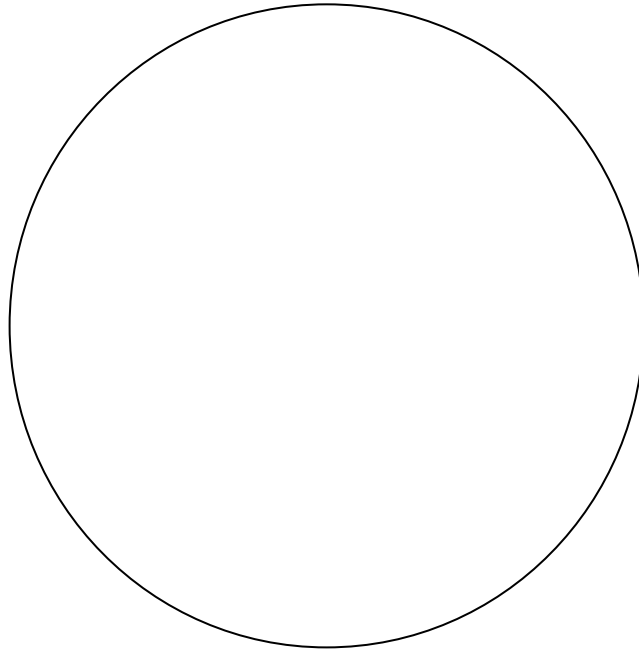
b. Explain what changes to routines, habits, or convenience are necessary to reduce energy waste. _____

Tell why people might resist the changes you suggest. _____

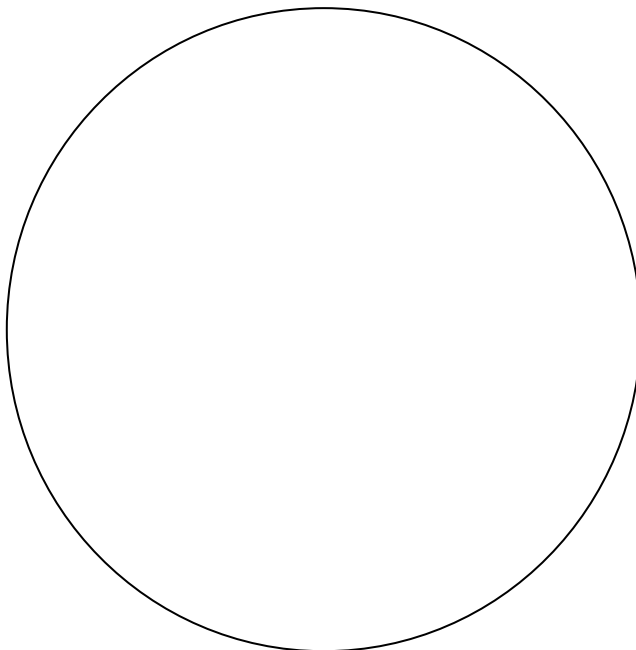
6. Prepare pie charts showing the following information, and explain to your counselor the important ideas each chart reveals. Tell where you got your information. _____

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

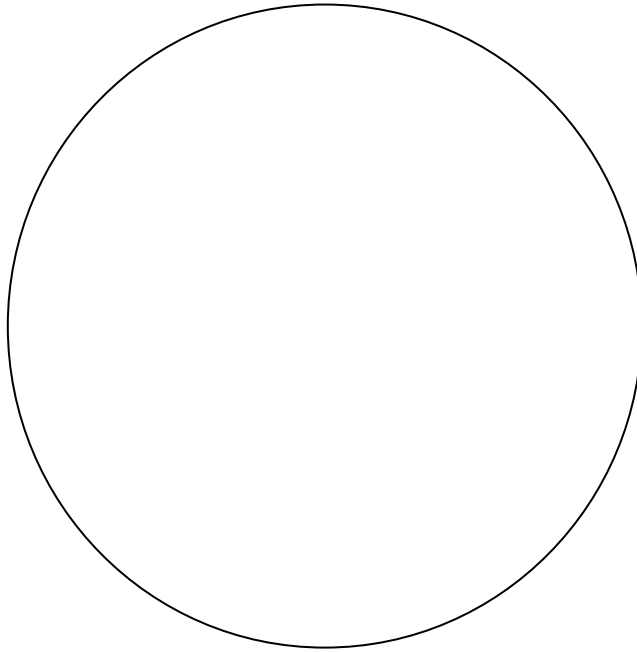
a. The energy resources that supply the United States with most of its energy



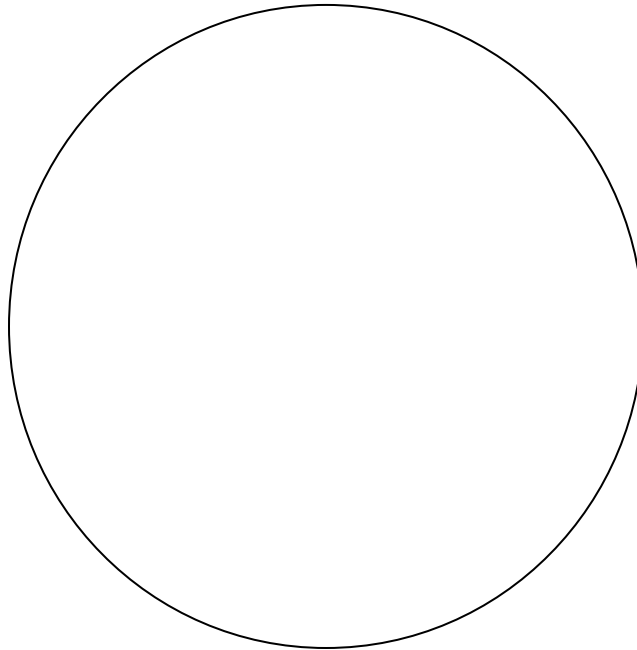
b. The share of energy resources used by the United States that comes from other countries



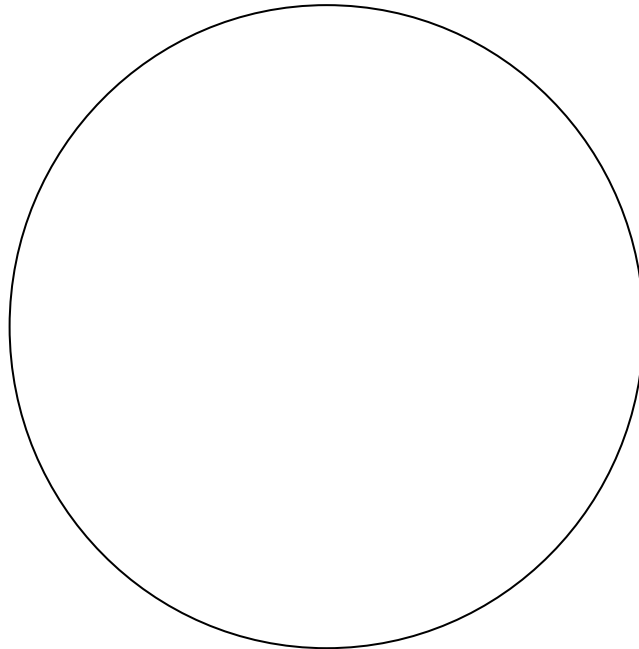
- c. The proportion of energy resources used by homes, businesses, industry, and transportation



- 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 1: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

Safety concerns _____

Energy System 2: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

Safety concerns _____

Energy System 3: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

Safety concerns _____

Energy System 4: _____

What is being done to produce more usable energy? _____

Technology _____

Cost _____

Environmental impacts _____

Safety concerns _____

Energy System 5: _____

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.

Position: _____

Education: _____

Training: _____

Requirement resources can be found here:
http://www.meritbadge.org/wiki/index.php/Energy#Requirement_resources

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

Important excerpts from the [‘Guide To Advancement’](#), No. 33088:

Effective January 1, 2012, the *‘Guide to Advancement’* (which replaced the publication *‘Advancement Committee Policies and Procedures’*) is now the *official* Boy Scouts of America source on advancement policies and procedures.

- **[Inside front cover, and 5.0.1.4] — Unauthorized Changes to Advancement Program**
No council, committee, district, unit, or individual has the authority to add to, or subtract from, advancement requirements.
(There are limited exceptions relating only to youth members with disabilities. For details see section 10, “Advancement for Members With Special Needs”.)
- **[Inside front cover, and 7.0.1.1] — The [‘Guide to Safe Scouting’](#) Applies**
Policies and procedures outlined in the *‘Guide to Safe Scouting’*, No. 34416, apply to all BSA activities, including those related to advancement and Eagle Scout service projects. [Note: Always reference the online version, which is updated quarterly.]
- **[7.0.3.1] — The Buddy System and Certifying Completion**
Youth members must not meet one-on-one with adults. Sessions with counselors must take place where others can view the interaction, or the Scout must have a buddy: a friend, parent, guardian, brother, sister, or other relative —or better yet, another Scout working on the same badge— along with him attending the session. When the Scout meets with the counselor, he should bring any required projects. If these cannot be transported, he should present evidence, such as photographs or adult certification. His unit leader, for example, might state that a satisfactory bridge or tower has been built for the Pioneering merit badge, or that meals were prepared for Cooking. If there are questions that requirements were met, a counselor may confirm with adults involved. Once satisfied, the counselor signs the blue card using the date upon which the Scout completed the requirements, or in the case of partials, initials the individual requirements passed.
- **[7.0.3.2] — Group Instruction**
It is acceptable—and sometimes desirable—for merit badges to be taught in group settings. This often occurs at camp and merit badge midways or similar events. Interactive group discussions can support learning. The method can also be attractive to “guest experts” assisting registered and approved counselors. Slide shows, skits, demonstrations, panels, and various other techniques can also be employed, but as any teacher can attest, not everyone will learn all the material.

There must be attention to each individual’s projects and his fulfillment of *all* requirements. We must know that every Scout — actually and *personally*— completed them. If, for example, a requirement uses words like “show,” “demonstrate,” or “discuss,” then every Scout must do that. It is unacceptable to award badges on the basis of sitting in classrooms *watching* demonstrations, or remaining silent during discussions. Because of the importance of individual attention in the merit badge plan, group instruction should be limited to those scenarios where the benefits are compelling.

- **[7.0.3.3] — Partial Completions**
Scouts need not pass all requirements with one counselor. The Application for Merit Badge has a place to record what has been finished — a “partial.” In the center section on the reverse of the blue card, the counselor initials for each requirement passed. In the case of a partial completion, he or she does not retain the counselor’s portion of the card. A subsequent counselor may choose not to accept partial work, but this should be rare. A Scout, if he believes he is being treated unfairly, may work with his Scoutmaster to find another counselor. An example for the use of a signed partial would be to take it to camp as proof of prerequisites. Partials have no expiration except the 18th birthday.