



Energy Action Plan

Students develop an action plan that addresses an issue related to energy resource management. The plan can be used as the performance standard for the theme Managing Energy Resource Use.

This project can be assigned at the beginning, middle, or end of a unit related to managing energy resource use. It can also be the energy unit; by developing the plan, students teach themselves and the class about energy resource management practices. Students can be given class time to develop and implement the plan, or do this on their own. Students can gain knowledge and skills about management practices through other activities in this guide.

Grade Level: (6–8) 9–12

Subject Areas: Agriculture Education, Art, English Language Arts, Family and Consumer Science, Health, Mathematics, Science, Social Studies, Technology Education

Setting: Classroom and community

Time:

The time frame depends on when and how project is implemented. The following is a possible timeline for the project.

Week One

Introduce assignment and have students select their project (**Orientation** and **Steps 1–3**).

Weeks Two and Three

Students plan their project (in and outside of class) and participate in class activities related to effects of energy use and development (**Step 4**).

Objectives

Students will be able to

- contrast possible solutions to an energy-related issue;
- develop an energy action plan;
- implement the energy action plan to promote positive behavior regarding energy use, to help resolve an energy-related issue, or both; and
- judge the effectiveness of their action plan.

Rationale

Developing and implementing an energy action plan allows students to gain first-hand experience in energy resource use management.

Materials

- Copies of the following:
 - [Project Action Planning Form](#)
 - [Project Action Selection Guide](#)
 - [Decision-Making Grid for Action Ideas](#)
 - [Self-Assessment Questionnaire](#)
 - [Evaluation Criteria](#)
 - [School Case Studies](#) (see **Getting Ready**)

Week Four

Students complete project. Meet with students to discuss progress reports. Students prepare and turn in assessments of results (**Step 5** and **Closure**).

Getting Ready:

Review the resources and examples of [School Case Studies](#) on keepprogram.org > Curriculum & Resources > Energy & Your School > Additional Resources. You may choose to direct students here for research purposes.

Background

Through media and education, students are introduced to a variety of topics related to energy resource development and use. Some of these topics or effects are positive (sanitary living conditions, convenient lifestyles) while some are negative (air pollution, resource depletion). Sometimes negative effects seem overwhelming and many students think there is nothing they can do to lessen them. Students become empowered when they learn strategies that enable them to make positive contributions. As a result of investigating a school's energy use, students may identify strategies or actions they can take to make their school more efficient.

People have a variety of reasons for deciding to take action regarding effects of energy resource development and use. Beliefs, values, and attitudes are strong motivators. Seeing that other people are doing something to make positive contributions or knowing that they will benefit after taking action also promotes people to become involved. Students and teachers gain positive experiences from participating in action projects as well (see **Benefits for Students and Teachers**).

Action projects can be designed to promote positive effects of energy resource development or use or to help improve negative effects. People can become involved in managing energy resources or taking actions in a variety of ways. Six common citizen action strategies include education, persuasion, economic action, political action, ecomanagement, and legal action (see **Action Strategies**). Student projects can utilize one or a combination of these approaches.

When students are contemplating a project, they should establish a goal and determine objectives. The goal is the purpose or intent of the project. Objectives are specific and achievable tasks related to accomplishing the goal. The specific steps to accomplishing the objectives are the methods. An example of a goal is: "To educate people about energy-related air pollution issues." One objective is to survey people to find out their current attitudes and beliefs. Setting timelines and formulating a budget are intrinsic components of a project.

After thoroughly researching their school's energy use and deciding on an action strategy, students will still need to consider several factors before beginning a project. An action analysis criterion can be organized into a checklist to determine if action is warranted and appropriate (see

Decision-Making Grid for Action Ideas).

Educators should be aware of considerations and needs unique to their school and community and include these criteria in the checklist.

- Is the project relevant to the objectives of the class?
- Does the project comply with policies of the school system or organization?
- How does the project fit into the curriculum?
- What are the interdisciplinary connections?
- Will student motivation and ownership be generated?
- Will the project include a diversity of learning techniques?

When action projects are conducted in a school setting, purposeful learning must occur. The decision to become involved should come from the students. They may need guidance to determine if the project is within their capabilities (see **Some Tips to Keep in Mind**).

Through action projects, students gain firsthand experiences and learn they can make contributions to energy resource management. Even if the outcome of the project is not successful, meaningful learning occurs. Throughout the planning and implementation of an action project, people learn about themselves, their colleagues, the environment, society, and how all these elements work together to create change and form our futures. Having students participate in energy action projects provides them with the opportunity to secure energy resources for their own needs today as well as for tomorrow.

Procedure

Orientation

Prior to this activity students may want to investigate an effect related to energy resource development and use (see the activity "Energy Investigations for School Buildings").

Share one of the **School Case Studies** from the KEEP Website (see **Getting Ready**). The following questions can be used to orient students to the elements involved in conducting an action project.

- What type of actions did they undertake?
- What motivated the individual or group to take these actions?
- What barriers and challenges did they face?
- How did they overcome these barriers?
- Do you know stories about people who faced a similar challenge?

Steps

1. **Divide the class into cooperative working groups of three or four.** Ascertain their interest in taking action relating to an effect of energy resource development and use.

Share the rationale behind taking action (see **Background**). Inform students that actions can be taken to support positive effects or try to improve negative effects. NOTE: This project can be done individually or by the whole class.

2. **Have each group identify an issue related to school energy use.** By conducting a school energy audit, other problems or issues may arise (see the activity “Energy Investigations for School Buildings”).

It is very important that student interest drive this project. Student concern and involvement in managing an effect of energy resource development and use can be enhanced through research and investigation. If necessary, allow students to change groups to join one that is working on a project that is more interesting to them.

3. **Involve students in a discussion of what can be done.** Have students use the **Project Action Selection Guide** to identify a mode of action they'd like to take. See **Action Ideas: Energy Efficiency Measures** for a list of projects that can be undertaken to address many of the energy issues discussed throughout this guide.

4. **Provide students with the student activity sheet, Project Action Planning Form.** Discuss the information on this form. Review the procedures required for students to complete their project. Have students outline a list of responsibilities and assign members of their group to complete each task. It may be helpful to classify tasks under different group role titles. Following are several possibilities:

- **Leader or facilitator:** directs the group and makes sure tasks are completed
- **Researcher:** locates and organizes information needed to complete the project
- **Planner or engineer:** develops strategies for completing the project
- **Construction worker:** builds, conducts, or takes necessary actions to complete the project
- **Recorder:** takes notes or videotapes the group's progress
- **Public relations:** communicates with the public,

secures permission to conduct project, presents results of project

Encourage students to contact organizations and local community groups that have information about their intended action project. See the KEEP Website for lists of agencies, organizations, and other resources.

Students should also begin considering how they will monitor the progress of their endeavors. An energy learning log or some other method of documentation is an ideal way for students to record what they have learned and to reflect on their learning (see **Ideas for Monitoring Progress**).

5. **Have students implement their plan. Conduct group meetings and discussions to help students execute the forms, initiate action, and complete their projects.** For long-term projects, arrange for students to submit written or verbal progress reports regularly.

Closure

When students have completed their projects or taken some kind of action, have them discuss their feelings and experiences. Review the processes students used to monitor their progress. They can fill out the **Self-Assessment Questionnaire** to evaluate their success.

Encourage students to prepare a presentation about their project. They can present results at fairs and civic events. They may also want to develop a videotaped program to share with various community groups.

Assessment

Formative

- Were students able to identify action strategies that addressed an effect of energy resource development and use?
- Did they develop effective criteria that helped them select a feasible strategy of action?
- Did students carefully document their progress, reflecting on the effectiveness of each of their steps?

Summative

- Review and discuss students' responses to the **Self-Assessment Questionnaire** or other means they used for evaluation.
- Have students use an **Energy Learning Log** or some

other method to document their progress (see **Ideas for Monitoring Progress**). Refer to **Evaluation Criteria** to identify ways to assess student work.

- Monitor how successfully students educated others about their project. You may want to develop or have students develop a simple survey for people to record what they think they learned.

Credits

Activity adapted from The Watercourse and Western Regional Environmental Education Council (WREEC). "Water Actions" pp. 12–15 in *Project WET*. Bozeman, Mont.: The Watercourse and Western Regional Environmental Education Council (WREEC), 1995. Used with permission. All rights reserved.

Some Tips to Keep in Mind, Ideas for Monitoring Progress, and Self-Assessment Questionnaire adapted

from Western Regional Environmental Education Council. *Project WILD: Taking Action! An Educator's Guide to Involving Students in Environmental Action Projects*. Houston, Tex.: Western Regional Environmental Education Council, 1995.

Action Strategies based on Hungerford, Harold R., Ralph A. Litherland, R. Ben Peyton, John M. Ramsey, and Trudi L. Volk, p. 168 in *Investigating and Evaluating Environmental Issues and Actions: Skill Development Program*. Champaign, Ill.: Stipes Publishing, 1996.

Project Action Planning Form for Teachers and Students adapted from Lane, Jennie, and Catherine Rossow. "Sources and Ideas for Special Projects" pp. 225–260 in R. Wilke, editor, *Environmental Education: Teacher Resource Handbook*. Thousand Oaks, Calif.: Corwin Press, Inc. 1997.

Ideas for Monitoring Progress

- Keep a video or photo log of project highlights. After the project is completed, use the video or photo scrapbook as a springboard for discussions in which students share their feelings about the experience and what they learned.
- Collect memorabilia (articles about the project, newspaper photos, students' own photos, planning schedules, and so on) to create an action project scrapbook that students can sign and write comments in.
- Ask students whether they've changed their thinking or behaviors as a result of the project. Have them write essays describing those changes and what they think prompted them.
- Have students keep a journal to record feelings about the project, its progress, and its setbacks and to keep notes about working with others. After the project, have students share parts of their journals with the group and discuss their feelings.
- Have students evaluate other members of their group, as well as themselves. Before they do, give students pointers on positive, constructive feedback and focus the session on specific points, such as contribution to the project, effort, conflict resolution approach, and so on.
- Have community members who were involved in the project assess student performances. You can develop an assessment form or have students conduct short interviews.

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The Wisconsin K-12 Energy Education Program is supported through funding from



Wisconsin K-12 Energy Education Program (KEEP)
College of Natural Resources
University of Wisconsin - Stevens Point



Action Strategies

Education involves teaching or informing others about a topic or issue related to energy resource use and development. Approaches include the following:

- Developing an energy education unit and presenting it to another class
- Producing a play that presents information about the topic [for a community group or the school]
- Writing and printing a newspaper about energy issues, problems, and benefits

Persuasion is employed when a person or a group tries to convince people to support a certain course of action. Examples of persuasion action projects include the following:

- Writing and presenting speeches about energy issues during a school event, such as Earth Day
- Creating and performing a play intended to encourage people to conserve energy
- Designing posters and fliers that urge local businesses to start a recycling program in the office
- Conducting a debate in school about the school's heating fuel choice
- Writing a letter to the editor of a newspaper promoting renewable energy resources

Economic Action involves trying to have an impact on an issue through the marketplace by making a point of purchasing or boycotting a product. Students can also raise money and make a financial contribution to support the resolution of issues. Examples of this approach to citizen action include the following:

- Conducting a fundraiser that involves designing and selling energy efficient products, such as crafts from recycled materials
- Refusing to buy products that are overpackaged or have nonrecyclable containers
- Raising money and donating it to a nonprofit organization that promotes wise energy use
- Writing a grant or contacting a funding source to support an energy management project

Political Action involves encouraging or pressuring elected officials to address an issue. Examples in this category include the following:

- Phoning or writing a letter about an energy issue to an elected official
- Conducting a “get out and vote” campaign to support a candidate who promotes wise energy use
- Speaking about an energy issue at a public hearing

Ecomanagement consists of taking physical action to protect or to improve the environment. Examples include the following:

- Turning off lights when not in use
- Using alternative means of transportation
- Reusing paper
- Reducing the amount of food wasted during meals

Legal Action pertains to promoting change in agencies, the government, and organizations through legislation or the judicial system. Generally, students will not utilize this approach because it involves activities such as bill writing or civil action suits. However, through the education action strategies, students can learn how legal actions helped form many of the laws and regulations governing use of our energy resources.

Some Tips to Keep in Mind

Encourage Student Ownership and Initiative

The more your students are involved in the project, the more they'll get out of it. To the extent possible, allow them to make their own decisions (which issue to focus on, how to conduct the project, and how to share results). Of course, you will be involved in decisions by (among other things) helping students evaluate the pros and cons of each choice. You can gauge how much direction makes the most sense, but, ultimately, the students should feel as though they're charting their own course.

Encourage Parents and Other Community Members to Become Involved with the Project

Conflict can sometimes surface when students interact with community members and parents who don't agree with a specific activity or who don't feel that action projects are an appropriate educational approach. In many cases, you can diffuse this response by discussing projects with parents and community members beforehand and by explaining how action projects enhance educational goals.

Keep Your Opinions in Perspective

We all have our own ideas, beliefs, and opinions about issues. Part of being an effective educator is allowing everyone to openly express opinions, no matter how different they may be from our own. Many educators recommend that teachers hold back on sharing their opinions so students have a chance to discuss the issues, to research material, and to form their own ideas about how they feel. It is also critical for educators to keep students on track and focused on the facts. Emotionally charged debate and hotly contested points of view can obscure the real facts and divert students' attention from the issue under scrutiny.

Encourage Student Cooperation, Compromise, and Understanding

Have your students work in small groups as much as possible. Besides the well-documented educational benefits of cooperative learning, group work offers a taste of real-life problem solving. Point out that finding solutions to issues is rarely a solitary endeavor. Teams of people—scientists, politicians, concerned citizens—often arrive at a plan of action together. Ideally, each person brings his or her own perspectives and talents to the process, and the results reflect the strengths of those human resources. Multiple perspectives encourage thoughtful debate, boost critical thinking skills, and allow students to make informed choices—especially if opinions are accompanied by reliable information.

Help Students Evaluate Their Methods and Change Their Plans If Necessary

Being able to adapt—or even totally change directions if something isn't working—is a plus when it comes to solving problems. From time to time over the course of a project, have the students step back, assess the overall scheme, and evaluate their methods. Ask if they think things are running as smoothly as they expected. If they think there's room for improvement, ask what might be done to adjust the situation. In some cases, problem-solving teams can brainstorm ways to deal with the snags and setbacks encountered along the way. Encourage specific methods for evaluating success as the project develops. Students might keep journals and record what they think is going well and what seems to need change. They can also survey community members to get reactions to the project's plan and progress. Likewise, periodic checkups for reactions from colleagues, teachers, or other students can be valuable.

Help Students Appreciate the Value of Their Work

It's important for students to know that their project, no matter how small, is significant. Too often all of us feel that there's nothing we can do to solve a problem, or that whatever we can do isn't enough. Assure youngsters that every action counts. Even if the students' actions don't seem to have much effect right away, the long-term results can be very important. For example, if a project designed to help consumers choose environmentally friendly products fails to make big changes in consumer purchases, students will have learned a lot about the issue and raised public attention—perhaps they will have inspired others to take up the cause.

Benefits for Students and Teachers

What are the reasons for conducting action projects in the classroom? When teachers are given time to consider this question, they have a lot to say. Here is what one group of teachers came up with during a workshop on teaching environmental issues.

Benefits for Students

- Young people have concerns about their community, and it is important to respond to their concerns and support them. Investigating actual problems and making an effort to improve those situations engages students and motivates them. The process makes learning relevant to their lives.
- Going through a process of investigation and action can instill optimism, rather than despair about the future. Students should understand the seriousness of energy-related problems but also develop a sense of hope and commitment to change.
- Considering energy-related issues and their solutions requires students to practice and improve skills such as decision making, critical reflection, and problem solving. These skills are particularly important in the context of imperfect or incomplete information. They learn how to apply their skills and knowledge and reconsider their opinions as they build their own world.
- Studying energy-related issues can empower young people by connecting their daily lives and local community with their classroom studies. Their actions may help them save money, enhance the health and well-being of community members, conserve energy resources, etc.

Benefits for Teachers

- Energy issues are making headlines. They can attract and hold students' interest because they are current, relevant, critical issues of the times.
- Addressing energy issues involves a variety of activities and learning experiences, thus improving the quality of teaching.
- Involvement in energy action projects develops cooperation and a sense of community among students.
- Effects of energy resource development and use provide a context for interdisciplinary learning.
- A systematic approach to exploring, analyzing, and solving problems addresses learning objectives that are central to education reform.
- The urgency of environmental deterioration demands that we incorporate environmental issues into the classroom experience.

Energy Learning Log

Energy Learning Logs are similar to portfolios and are used for projects within the performance standard activities. Use an Energy Learning Log throughout the entire developmental process of students' learning about energy. An Energy Learning Log can be of any type, such as an accordion folder, a spiral or loose-leaf notebook, etc. Invite students to personalize the outside of their logs with drawn or cut-and-pasted illustrations relating to energy.

Energy Learning Logs Can Be Used...

...as a Vehicle for Pre-assessment

Prior to any instruction on energy, invite students to write about energy for 15 minutes or so. Emphasize that this is not a formal writing task. They should write down anything that comes to mind, keeping their pen or pencil to the paper at all times. If their mind is blank, suggest they write the word energy over and over again until they think of something related to energy, or they can write about why they can't think of anything related to energy. After students are done writing, ask them to summarize what they wrote by writing down three statements that they think they know about energy, and three questions that they have about energy. These questions can be discussed as a class, shared with the teacher on an individual basis, or kept private. At the end of the energy unit, have students revisit these questions and statements and answer or rewrite them as needed.

...to Help Organize and Plan a Project

After students have been introduced to the purpose of a project, encourage them to use the Energy Learning Log as a planning and organizing tool. They can outline their objectives and identify what they need to acquire. The log can be used to collect background information and reference materials such as journal articles and interview results. This is one reason why a large three-ring binder or accordion folder serves as a good log.

The system students use to organize the information they collect provides insights into their thought processes. Have students construct outlines or concept maps that diagram their arrangements. This allows you a good opportunity to evaluate their work in progress. Assist them by identifying new categories or suggesting ways they can narrow their scope.

...as a Reflective Tool and to Monitor Progress

Use the Energy Learning Log to link different energy concepts students have learned. When students are learning new concepts, encourage them to refer to previous information.

Allow time at the end of each energy education activity for students to summarize and interpret what they experienced. They should view these writing opportunities as a means to express their personal insights. They are striving to make the energy activity meaningful and to apply it to their own lives. By relating what they have observed in their own words, students will discover gaps that need to be filled, make connections among existing thoughts, and raise questions that require further exploration.

Students may wish to use parts of the log as a diary. They can record their personal reflections, wishes, and frustrations in a special section of the log, in code, or in a separate journal. In some

Energy Learning Log

cases, this section will be designated as writing not to be viewed by the teacher.

...to Report and Evaluate Results

An Energy Learning Log can be used to document the results of a project or activity, or it can be the project. Actual samples of student work can be part of the log. Samples include artwork, videos, poetry, draft writings, calculations, and test results. One strategy involves having students use the log to show what they think is their best work. Reflective questions should accompany this presentation. For example, students can be asked to explain why they think this is their best work, what they did to make the project successful, what they would do differently, and how this applies to their overall development as a current and future energy consumer.

If the log itself is graded, one or more of the following criteria can be used: accuracy of content, creativity, originality, evidence of increased knowledge about energy, thorough expression of attitudes toward energy, completeness, etc. It is best to present these criteria to students before they initiate their log work; then they will know what they should achieve. These criteria can be adapted into a rubric evaluation form (see Converting KEEP's Assessment Ideas into Rubrics).

Resources

Barrow, Lloyd. "A Portfolio of Learning." *Science and Children* 31, no. 3 (1993):38-39.

Belanoff, Pat, and Marcia Dickson, editors. *Portfolios: Process and Product*. Portsmouth, N.H.: Boynton/Cook Publishers, Inc., 1991.

Benjamin, Carol Lea. *Writing for Kids*. New York: T. Y. Crowell, 1985.

Cole, Donna J., Charles W. Ryan, and Fran Kick. *Portfolios across the Curriculum and Beyond*. Thousand Oaks, Calif.: Corwin Press, Inc., 1995.

The Watercourse and Western Regional Environmental Education Council. "Water Log" pp. 19–22 in *Project WET Curriculum and Activity Guide*. Bozeman, Mont.: The Watercourse and the Western Regional Environmental Education Council (WREEC), 1995.

Project Action Planning Form

Title of Project _____

Group Members' Names	Responsibility
_____	_____
_____	_____
_____	_____
_____	_____

Briefly describe your project, its goal, and why it is important.

Project Objectives

Develop a set of objectives for your project. These objectives should encompass the expected results and accomplishments, what you hope to learn, and any other considerations provided by your teacher.

Research and Background Information

Has your project been done before? If so, how was it done? What approach worked best?

Make a list of information and/or data you need to gather in order to complete your project. Identify possible sources of information relevant to your project and where you might find them.

Identify any community, state, or national organizations that might provide you with information, materials, or services.

Identify other people such as teachers, administrators, parents, or community members who might help you with your project. Describe how they can help.

Project Action Planning Form

Planning

On a separate sheet of paper, create a workable project outline.

- a) Begin by listing all the tasks you will need to do in order to finish your project.
- b) For each task, assign responsibility to someone on your team.
- c) Assign a date by which that task will need to be completed.

Make a list of all the materials and resources you will need to complete your project. Use the project outline to identify materials and resources you will need to accomplish each task.

Determine the costs (if any) of doing your special project. Make a list of ways you can minimize your costs.

Identify any obstacles you may encounter when conducting your project and describe possible ways to resolve them.

Educating Others

How will you inform others about what you have accomplished? You could write a feature article for a local newspaper or gain attention from a television news program. You may also present a summary of your efforts to another class or at a town or school meeting.

Other Considerations

What special equipment or arrangements will you need in order to complete your project? How will you obtain them (permissions, transportation, use of computers or telephone, special field equipment, etc.)?

When will you work on your project (during school, after school, in the evening, on weekends)?
Are you willing to spend the time you need to complete the project?

How will you keep track of your progress (a journal, photographs, videotape, portfolio, etc.)?

Will your project require long-term follow-up? If so, who will continue your project after you are finished?
What long-term maintenance costs are associated with your project?

Project Action Selection Guide

1. What effect of energy resource development and use will your project address?
NOTE: It is best that you conduct an investigation of this topic or issue before doing an action project. An investigation involves researching and analyzing the history and causes of the effect and how it influences our lives and the environment.

2. Do you plan to support (enhance, promote) or correct (improve, change) the effect?

3. What evidence is there that action is needed?

4. Do you have a good understanding of the beliefs and values of people who will be affected by this project? Summarize their viewpoints.

5. Once you have decided on an effect of energy resource development or use, brainstorm action ideas for conducting a project that addresses this topic or issue. In addition, write down the desired result.

Action Idea	Intended Outcome
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

6. Use the **Decision-Making Grid for Action Ideas** to evaluate each of the action ideas you listed. Some decision-making criteria are listed, but you may have others you'd like to include. Rule out projects that are unmanageable. Decide which is the most feasible in terms of time, cost, and/or participant support. Which one will most likely be successful?

Decision-Making Grid for Action Ideas

Criteria	Action Ideas (List alternative ideas below.)				
It is safe (it will not endanger the life or health of people involved).					
It is legal.					
Your values support this action.					
You have the skills to conduct this idea.					
The time needed to conduct this project is reasonable.					
There are available resources to help complete this project.					
The cost is worth the benefit					
Which action idea are you going to choose as a project, and why?					

Self-Assessment Questionnaire

1. Decide how effectively you met each of your objectives. For objectives you achieved, describe what you learned from the experience. For those you haven't accomplished, will you still try to achieve them? If yes, how? If no, why not?
2. What was the most successful part of your project? What was the least successful part?
3. Who was influenced or motivated by your actions? Who might those people now influence?
4. If you repeated the project, what, if anything, would you do differently and why?
5. How do you feel about your involvement in the project?
6. Have your feelings and opinions about the issue you worked on changed since you began the project? If so, how? If not, why not?
7. What did you learn during this project that you'll be able to apply to other energy use situations that you'd like to change?
8. Would you get involved in another energy action project? Why or why not?
9. What advice would you give to other students planning an action project?
10. Do you think it's important for citizens to volunteer for community service? Why or why not?

Evaluation Criteria

Investigation and Report Title _____

Group Members' Names

Responsibility

_____	_____
_____	_____
_____	_____
_____	_____

Selection of the Action Strategy

The group considered a variety of alternative action ideas.	Strongly Agree	Agree	Disagree	Strongly Disagree
The group evaluated and selected the most plausible action idea for their project.	Strongly Agree	Agree	Disagree	Strongly Disagree

Planning the Project

The group established realistic goals (criteria) for the project.	Strongly Agree	Agree	Disagree	Strongly Disagree
The group used a systematic approach to research information needed to complete the project.	Strongly Agree	Agree	Disagree	Strongly Disagree
The group developed a workable project outline and timeline.	Strongly Agree	Agree	Disagree	Strongly Disagree
The group worked efficiently together to complete tasks.	Strongly Agree	Agree	Disagree	Strongly Disagree

Project Completion

The group carefully documented the progress of the project.	Strongly Agree	Agree	Disagree	Strongly Disagree
The results of the group's project positively addressed the energy effect studied.	Strongly Agree	Agree	Disagree	Strongly Disagree
The group accomplished the goal and objectives of their project.	Strongly Agree	Agree	Disagree	Strongly Disagree

Action Ideas: Energy Efficiency Measures

Below is a list of action ideas that can improve energy efficiency at home, at school, and in the community. Students can perform many of these measures themselves, or they can work with their peers, family, school personnel, and community members to improve energy efficiency.

Energy efficiency measures that correspond to the **Appliance Survey** from “At Watt Rate?” (available at keepprogram.org) are listed under each end use category. Teachers may want to have students do these surveys first. If students discover other energy efficiency measures not listed here, they should be encouraged to undertake them if possible.

The cost of implementing energy efficiency measures varies widely. Measures listed under Basic Action Ideas for each end use are free. Many other measures only cost a few dollars. A few require a major investment, such as purchasing a large appliance, buying a new vehicle, or adding insulation as part of a home improvement project. Each energy efficiency measure is ranked from the least costly to the most costly within a specific energy end use category. The rankings are symbolized as follows:

No cost: Ø

Low cost: ¢ - \$ (less than \$1 to \$25)

Medium cost: \$ - \$\$ (\$25 to \$200)

High cost: \$\$\$ (Greater than \$200)

Broader cost ranges are shown using two cost symbols separated by a dash. For example, a cost range shown as “Ø - \$” means that the cost to implement this measure ranges from no cost to a low cost. All costs are initial investment costs that save energy (and money) over time. Even those that cost little or no money may yield noticeable energy savings. The energy efficiency measures listed here represent only some of the many possible measures that can be taken.

Lighting

Implement Basic Action Ideas Ø

- Remember to turn off lights that are not in use.
- Do not turn on more lights than you need for specific tasks such as reading or writing.
- Clean light bulbs and fixtures by removing dust and dirt that have accumulated on them.

Caution: Never use water to clean light bulbs while they are turned on. The water’s cooling effect could shatter hot bulbs.

Delamp and Relamp Fixtures

- Reduce light levels that are too bright by removing unnecessary bulbs from fixtures (delamping). Ø
- Replace high wattage bulbs with lower wattage bulbs of the same type (relamping). ¢ - \$
- Combine delamping and relamping to get the desired amount of light from a fixture. For example, replacing two 60-watt incandescent bulbs (120 watts and 1,730 lumens total) with one 100-watt, 1,710 lumen incandescent bulb will save 20 watts and provide the same amount of light. NOTE: Be sure to delamp and relamp first those fixtures that are used most often (4 hours or more per day).

Action Ideas: Energy Efficiency Measures

Replace Incandescent Light Bulbs with More Efficient Bulbs

- Replace incandescent bulbs with light emitting diodes (LEDs) or compact fluorescent lamps (CFLs). Be sure to install LEDs/CFLs first in fixtures that are used most often (4 hours or more per day). \$ - \$\$ (depending on the number of bulbs being replaced)

Use Daylight

- Rearrange living and work spaces to take advantage of daylight. Ø
- Open curtains and blinds during the day to reduce the use of indoor lighting. Ø
- Consider repainting walls and ceilings with light colors to reflect more light. \$ - \$\$
- Consider investing in skylights or extra windows to allow more daylight to enter the room. \$\$\$

Use Other Lighting Energy Efficiency Measures

- Connect a timer or a light sensor to outdoor lights so that they automatically turn off during the daytime and turn on at night. \$ - \$\$

Insulation and Air Infiltration

Implement Basic Action Ideas—Air Infiltration Ø

- Close drapes and window shades during the winter and the summer.
- Close doors when going in and out.
- Make sure that all interior windows and storm windows are closed during the heating season.
- If your home has a fireplace, make sure that the damper is tightly closed when you don't have a fire burning.

Add Insulation

- Add insulation to the attic, walls, and basement as needed. Contact a building supply dealer, a home builder, an energy professional, the Wisconsin Energy Bureau, or the Wisconsin Department of Industry, Labor, and Human Relations (the state agency that oversees building codes) to find out recommended R-values for the areas where insulation is to be added. \$\$ - \$\$\$

Reduce Air Infiltration in Windows

- Place clear plastic barriers over windows during the heating season to prevent drafts. Many department and hardware stores sell window plastic kits for this purpose. ¢ - \$
- Replace cracked and broken windowpanes. ¢ - \$
- Caulk and weatherstrip air leaks around the exterior and interior of window frames. ¢ - \$
- Install new storm windows or repair old ones. \$ - \$\$

Action Ideas: Energy Efficiency Measures

Add Window Coverings

- Install drapes, shades, or insulating coverings that can be rolled down and closed into place. \$ - \$\$\$ (depending on the type of window coverings installed and the number of windows covered)

Reduce Air Infiltration in Doors

- Install door sweeps or make fabric “snakes” and place them at the bottom of doors to prevent drafts. ¢ - \$
- Caulk and weatherstrip air leaks around doors. ¢ - \$
- Repair door closing mechanisms so that doors close automatically. ¢ - \$
- Install storm doors on exterior doors if none are present. \$ - \$\$

Reduce Air Infiltration in Walls, Foundations, and Other Openings

- Install foam rubber gaskets behind electrical outlet cover plates. ¢ - \$
Caution: Make sure that the electricity to the outlet is turned off before removing a cover plate.
- Caulk or seal cracks in the foundation and gaps or openings where wires and vents enter exterior walls of homes and buildings. ¢ - \$\$
- If your fireplace damper doesn't work, either have it repaired, install a chimney-top damper, or install a door on the fireplace. \$ - \$\$

Space Heating, Water Heating, and Air Conditioning

Implement Basic Action Ideas—Space Heating Ø

- During the heating season, set your thermostat to 68 degrees F (20 °C) during the day (or when you are home) and to 58-60 degrees F (13 °C) when you go to bed (or when you are away).
- Close heating vents, radiators, etc. in rooms and other interior spaces that do not need to be heated. Also, clean the dust and cobwebs from heating vents (registers).
- Bleed the air out of hot water radiators.
- Close off rooms that do not need to be heated.

Implement Basic Action Ideas—Water Heating Ø

- Turn down the water heater thermostat to 120 degrees F (49 °C). Turn it down even further when your family goes on vacation. Some water heaters have a vacation setting specifically for this purpose.
- Do not let the water run while washing your hands, brushing your teeth, shaving, or washing dishes.
- Do not let the shower run for more than a few seconds before stepping into it.

Action Ideas: Energy Efficiency Measures

Implement Basic Action Ideas—Air Conditioning ∅

- During the cooling season, set the air conditioner at 78 degrees F (26 °C). Set it higher if your home has ceiling fans.
- Turn off the air conditioner if you leave your home for more than an hour.
- Close off rooms that do not need to be cooled.

Implement Space Heating Energy Efficiency Measures

- Clean or change the air filter of your furnace monthly. ¢ - \$
- Build reflectors out of aluminum foil and place them between the radiator and the wall. This will help reflect heat from the radiators into a room. ¢ - \$
- Install a programmable thermostat. \$ - \$\$\$
- Have your boiler or furnace serviced every one or two years. \$ - \$\$
- Seal and insulate warm-air heating ducts that come out of your furnace. \$ - \$\$
- Consider installing a high-efficiency furnace or boiler if replacing an old furnace or boiler. \$\$\$

Implement Water Heating Energy Efficiency Measures

- Install a low-flow shower head in your shower. ¢ - \$
- Install water-efficient faucet aerators (faucet heads) in your kitchen and bathroom sinks. ¢ - \$
- Fix leaky faucets. ¢ - \$
- Install an insulating blanket around your water heater. ¢ - \$
Caution: Do not cover thermostats, burners, water heater controls, or air inlets of water heaters with insulating blankets. Do not cover the tops of natural gas water heaters. Make sure that blankets are taped securely to water heaters to prevent them from slipping down. Ask an adult for help when adding blankets to water heaters. Note that installing insulating blankets on certain high-efficiency water heaters may reduce efficiency. Follow directions and manufacturer's recommendations.
- Insulate the first three feet (90 cm) of the hot water pipe coming out of the water heater. ¢ - \$
- Insulate all hot water pipes in unheated basements and crawlspaces. \$ - \$\$
Caution: Do not replace or cover older pipe insulation on your own. It may contain asbestos and should not be touched or disturbed except by a professional.
- Consider installing a high-efficiency water heater, if replacing an old water heater. \$\$\$

Implement Air Conditioning Energy Efficiency Measures

- Place window air conditioners on the shaded sides of the house. ∅ - \$, depending on whether you have to buy mounting brackets
- Clean or change your air conditioner's air filter every one or two months. ¢ - \$
- Build an awning over the air conditioner so that it is not exposed to the sun. \$\$ - \$\$\$
- Consider installing a high-efficiency air conditioner, if replacing an old air conditioner. \$\$\$.

Action Ideas: Energy Efficiency Measures

Major Home Appliances

Implement Basic Action Ideas—Refrigerators and Freezers Ø

- Set your refrigerator's temperature between 38 and 42 degrees F (3 and 6 °C), and your freezer between 10 and 15 degrees F (-12 and -9 °C). Use a thermometer to check these temperatures, since refrigerator or freezer dials usually do not show temperatures.
- Do not open the refrigerator or freezer door longer than necessary.
- Decide what you want to get from the refrigerator or freezer before you open the door.
- Stock your refrigerator with food and fill any remaining large spaces with jugs of water. However, do not overfill your refrigerator to the point where you reduce air circulation and cooling effectiveness.
- Clean the coils behind your refrigerator and freezer at least once a year.
- Make sure the refrigerator door seal is tight when closed.
- Move refrigerators and freezers away from direct sunlight, stoves, dishwashers, and other heat sources.
- Make sure that the refrigerator is not pushed tightly against the wall; air must circulate through the coils.
- Use energy-saving settings on your refrigerator and freezer if they have them.

Implement Basic Action Ideas—Clothes Washers, Clothes Dryers, and Dishwashers Ø

- Use energy-saving settings on your clothes washer, clothes dryer, and dishwasher if they have them.
- Run clothes washers, clothes dryers, and dishwashers with full loads when possible.
- Wash clothes in cold or warm water when possible.
- Hang washed clothes on a clothesline to dry.
- Wash dishes by hand, especially if there aren't enough to fill a dishwasher. Use water-conserving habits (for example, don't let the water run unnecessarily) when washing.
- If your dishwasher doesn't have a no-heat air dry feature, turn off the dishwasher after the final rinse cycle and open its door to let dishes air dry.

Implement Basic Action Ideas—Stoves (Ranges) Ø

- Use microwave ovens and toaster ovens in place of electric ranges and ovens when possible.
- Cover pots when cooking food or boiling water, except when cooking food that may boil over (like pasta).
- Place small pots or pans on small burners when cooking.
- Make sure that the metal reflectors under burners are kept clean so they can reflect heat to pots and pans during cooking.
- Avoid opening the oven to look at food while it is cooking. Turn on the oven light and look through the window instead.
- Reduce cooking time by defrosting foods in the refrigerator before cooking.

Action Ideas: Energy Efficiency Measures

Implement Refrigerator and Freezer Energy Efficiency Measures

- Consider purchasing a high-efficiency refrigerator if replacing an old refrigerator. \$\$\$

Small- and Medium-Sized Electrical Appliances & Equipment

Implement Basic Action Ideas Ø

- Turn off appliances and equipment if they are not being used.
- Substitute manual effort (labor) for using an appliance when possible. Think of it as a way of getting exercise.

Implement Electrical Appliance and Equipment Energy Efficiency Measures

- Buy energy-efficient appliances and equipment whenever possible. ¢ - \$\$\$

Transportation

Use Transportation Alternatives

- Walk or bike to destinations whenever possible. Ø
- Start or join a carpool to commute to school or work. Ø - \$ (depending on how the cost of carpooling compares to the cost of using your own vehicle)
- Use mass transit (buses, trains) for commuting purposes, when possible. Ø - \$\$ (depending on how the cost of using mass transit compares to the cost of using your own vehicle)

Maintain Vehicles for Greater Fuel Efficiency

- Keep the tires of your vehicle inflated to the manufacturer's recommended maximum pressure. Ø
- Change engine oil and the oil filter according to the manufacturer's recommended schedule. ¢ - \$
- Have your vehicle's engine tuned up regularly. \$ - \$\$
- Have the wheels of your vehicle aligned regularly. \$ - \$\$

Practice Driving Habits That Increase Fuel Efficiency Ø

- Combine several errands into one trip.
- Reduce any unnecessary weight carried by the vehicle. Extra weight reduces fuel efficiency.
- If you stop for more than one minute, it is more efficient to turn off the engine than to let it idle.
- Avoid revving up the engine.

Action Ideas: Energy Efficiency Measures

- Avoid rapid acceleration and braking. Drive smoothly and anticipate traffic stops.
- Obey speed limits. Most vehicles reach their optimum fuel efficiency at speeds between 40 and 55 miles per hour (mph) (64.4 and 88.5 km/hr). As speed increases over 55 mph (88.5 km/hr), fuel efficiency drops quickly. Speeds of 65 mph (104.6 km/hr) use from 10 to 15 percent more fuel than 55 mph (88.5 km/hr). Losses at 75 mph (120.7 km/hr) compared to 65 mph (104.6 km/hr) are even greater.
- Use cruise control when driving on level highway roads.

Consider Buying a More Fuel Efficient Vehicle \$\$\$

- If you or a member of your family plans to buy a new or used vehicle, consider choosing one with the highest possible fuel efficiency (miles per gallon, or mpg) rating. Small vehicles with four-cylinder engines and manual transmissions generally have the highest fuel efficiency ratings. However, fuel efficiency ratings also vary for different classes of vehicles (cars, minivans, station wagons, light trucks, etc.), so make sure to consider the most efficient vehicle within a certain class.

Trip Planning

- Design a travel brochure of Wisconsin that identifies energy-efficient ways of getting to various destinations and points of interest within the state.

Energy Efficient Landscaping

Plant Trees

- It's much cooler to sit under a densely leafed, spreading tree that blocks the sun's rays than under one that only filters rays. The Arbor Day Foundation suggests planting trees with round or horizontal-oval crowns. Trees rated highest for shade are maple, horse chestnut, beech, green ash, walnut, poplar, and sycamore.
- Consider the plant's adaptability and hardiness. For the north side of a building, choose a shade-tolerant plant that's extremely winter hardy. For the south and west sides, use plants that are adaptable to drought, excessive sun, and hot winds.
- To prevent foundation damage, a tree planted within 10 feet (300 cm) of a building should be selected from those species that have a taproot instead of a lateral root system.
- Plant trees with strong wood. However, for quick shade, interplant fast-growing weaker trees such as willows. When the slower, stronger trees reach a desirable height, remove the weaker ones.
- When deciding where to plant your trees, observe summer shadows on your property and plant trees where they will shade hot spots during the hottest days of summer. Locate large deciduous shade trees on the south, southwest, and west sides of the building about 15 to 25 feet (45-75 m) apart and 10 to 15 feet (30-45 m) from the building. Deciduous trees block the summer sun but let winter's warming rays filter through after the leaves fall. Plant trees with strong wood, such as oaks, lindens, or ashes. (Weaker trees can cause damage if branches break off during high winds.)

Action Ideas: Energy Efficiency Measures

Plant Dwarf Shrubs near Building Foundations

- Dwarf shrubs are suitable for energy-efficient landscaping because they remain small at maturity (2 to 3 feet high [60-90 cm]) and can be planted near buildings. Also, since they stay small, they require little maintenance. Small plantings near your building can save energy year-round. In the winter, dwarf shrubs, especially evergreens, can block the force of cold winter winds against the foundation. This reduces both heat loss through the walls and cold air leaks. In the summer, dwarf shrubs can cool the air near your building by a process called transpiration. As plants give off moisture to the air, the air cools, similar to the way perspiring cools humans. The air temperature can be as much as 10 degrees cooler by shrubs. Evergreen dwarf shrubs are especially effective for cutting heat loss in the winter. Many of the conifers (needle types) are very hardy and form an effective foundation wind barrier year-round. Locate these shrubs on the north and northwest sides of your building.