



Community Energy Use

Students survey local residents and businesses to learn how their community uses energy.

Grade Level: 5–8 (9–12)

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

Setting: Classroom and community

Time:

Preparation time: 50 minutes

Activity time: Up to one week

Vocabulary: Economic sector, End use

Major Concept Areas:

- Energy flow in ecosystems including human societies
- Consumption of energy resources
- Quality of life

Objectives

Students will be able to:

- identify representative energy users from each economic sector in their community; and
- summarize the various end uses of energy in their community.

Rationale

Students become aware of the different ways in which energy resources are used in the community and appreciate the important role energy plays in sustaining today's society.

Materials

- Copies of the Yellow Pages (optional)
- Copies of the following pages:
 - *Survey of Energy Use in the Community*
 - *Wisconsin Resource Energy Consumption by Economic Sector (2012)*
 - *Wisconsin Commercial Energy Use by Type of Fuel (1970-2012)*
- Find additional resources related to this activity on keepprogram.org > Curriculum & Resources

Background

On a typical day, many different activities are taking place in the cities, towns, and rural areas of Wisconsin. In the early morning, dairy farmers are milking cows. Throughout the day, customers are shopping for food, clothes, household goods, and gifts at stores and malls. Appliances, tools, paper products, and automobiles are being produced in factories and mills. Theaters are showing the latest movies during the afternoon and evening. What do all of these activities have in common? They are all using energy to produce goods and provide services.

Taken together, businesses and community institutions use about half of all the energy used in Wisconsin. The energy they use comes from coal, fuel oil, natural gas, and electricity generated by fossil and nuclear fuels, and renewable energy resources such as wood, hydroelectric power, biomass fuels, solar, and wind. Some businesses and industries even produce energy for their own needs. Other industries, like electric and natural gas utilities, provide energy resources.

The ways businesses and institutions use energy seem so different. After

all, what end uses might a dairy farm, a paper mill, and a movie theater have in common? Nearly all buildings require air conditioning, lighting, space heating, and water heating. Another common end use is office equipment; these days nearly every business and institution has a computer, printer, and scanner to organize and communicate information.

Some end uses, although common to many businesses, vary in terms of their importance. For instance, cooking and refrigeration are major end uses in restaurants, but are minor end uses in offices that have a coffee maker, microwave oven, and refrigerator in their break rooms. Certain end uses in industry (like process heating and motor-driven machinery for manufacturing) and in agriculture (crop drying and irrigation) are only found within these sectors. The types of equipment listed under the miscellaneous equipment end use category are also specific to a particular business and institution. Examples range from drills used by dentists to video games at arcades. (See **Economic Sectors and End Uses** for further explanations and examples of energy end uses found in commercial businesses, industries, farms, and other institutions.)

Procedure

Orientation

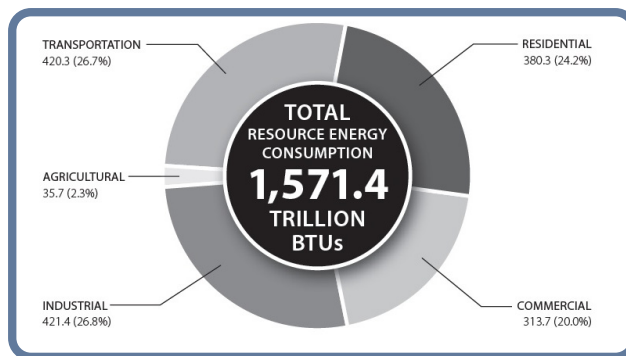
Ask students to describe their community. Have them list representative businesses or organizations in their town or city. Students can refer to their parents' careers or perhaps their own part-time work. An alternative is to have students look through the Yellow Pages and find examples that fit in each sector. Challenge students to place their listed items within the following categories (economic sectors):

- Transportation
- Agriculture
- Industrial
- Commercial
- Residential

Have students continue to provide examples until there is at least one representative within each sector (schools fit within the commercial sector).

Steps

1. Discuss how businesses or organizations use energy. How does industry or business energy use compare to how students use energy in the home? What type of equipment is unique to a certain business? (See **Economic Sectors and End Uses**)
2. Ask students to guess which of the sectors use the most energy. Have students assign the percentage of total energy they think each economic sector uses in Wisconsin. Encourage educated guesses. The total should add up to 100 percent.
3. Show students the **Wisconsin Resource Energy Consumption by Economic Sector (2012)** page. Have students compare the percentages they listed to the sector percentages on the pie chart and comment on what they see.
4. Ask students if they think their community's energy use is comparable to the whole state of Wisconsin. For example, if students live in a farming community, they may think that agriculture should be represented by a larger percentage.
5. Discuss ways students can get a better picture of how their community uses energy. They might contact a local utility or perhaps their chamber of commerce might have some insights.
6. Inform students that through surveys they can gain an understanding of their community's energy use.
7. In general students will need to do the following:
 - Develop a survey. Have students brainstorm what information they would like to acquire about their community's energy use. Based on the needed information and questions, have students develop a community energy use survey or use or adapt the one provided with this activity (see **Survey of Energy Use in the Community**). The class should develop the survey together so all students are asking the same questions.
 - Decide whom to survey. Have the class generate a list of organizations or agencies they could survey to gain insight into their community's energy use. Encourage students to identify representatives from the commercial industrial, and agricultural economic



sectors. Suggest students begin by contacting people they know such as businesses where they or adult family members work. Students should check with you before they make their decisions.

- Plan the survey strategy. Students may want to mail the survey, conduct phone surveys, or visit the sites and conduct interviews. Encourage students to obtain the name and contact information for the person within the business or institution who knows the most about energy use. It may be the owner or students might be referred to the custodian, superintendent, or maintenance manager for additional information about energy use. A large facility may employ production engineers who know how energy is used in certain production processes.
- Conduct the survey. To conduct the survey, students can work in teams (if surveys are being mailed, this can be done as a class with specific tasks—such as identifying addresses, labeling, and tallying the results—assigned to different groups). It may take about a week for the students to develop and conduct their surveys (more time will be needed if they mail their surveys).



Closure

Have students report highlights of their survey findings after they have been conducted. This report may either be a short written summary or a brief oral presentation.

NOTE: Ask students to re-examine the percentage of energy they guessed that each sector in their community used. Would they want to make any adjustments based on their surveys?

Assessment

Formative

- Did questions in students' surveys effectively solicit information about community energy use?
- How effective were students' surveying strategies?
- Did the class identify and survey a variety of community members?
- Did student presentations indicate that they had successfully surveyed community members about their energy use?
- Can students summarize how each economic sector in their community uses energy?

Summative

- Have students create a profile of energy use in their community based on their survey findings. The profile can be a written report, a video documentary, a travel brochure, or a short story. One suggestion is to create a mural or large community map on one of the classroom walls. The mural should depict the various economic sectors of their community and how they use energy. Perhaps the local utility would want to display the mural or map as well.
- If possible, invite an actual community planner or someone from the local utility to discuss the community's resource management policies. Based on their surveys, can students see how this plan is working? Is there evidence that energy is being used efficiently? What recommendations do students have for revising the plan?

Extensions

Find out what the businesses and the community have done to improve energy efficiency. Below are some questions students can ask.

- Does the business or community institution consider energy efficiency important?
- Has the business or community institution made any energy efficiency improvements over the past two years?
- If "yes," describe the energy efficiency improvements.
- Is the business or community institution planning to undertake energy efficiency improvements?
- If "yes," describe the energy efficiency improvements being planned and indicate when they are expected to be completed. If "no," why not?

Students can suggest ways that the business or community institution they surveyed could improve energy efficiency (if it has not already done so) and how it could solve problems that prevented it from improving energy efficiency in the past.

Adapt the community survey to ask business owners what energy source is used to power their equipment and operations. For example, see *Wisconsin Commercial Energy Use by Type of Fuel (1970-2012)*. Some industries, such as paper companies, generate their own electricity. Students can also investigate how energy sources have changed over time. For example, according to the graph electricity use has increased while petroleum has decreased.

Related KEEP Activities

Students can use other surveys, such as the one in “At Watt Rate?” to measure their home energy use. In the activity “Why Use Renewable Energy,” students interview home and business owners about their alternative energy choices. With the activity “Energy Futures” students can investigate possible future scenarios for their community.

© 2020 Wisconsin Center for Environmental Education

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



Economic Sectors and End Uses

Energy consumption in Wisconsin is divided among five economic categories called sectors. Examples and typical energy end uses found within each economic sector are listed in the following table.

| Economic Sector | Examples | End Uses |
|-------------------------------|--|--|
| Residential | Apartments, Single Family Homes, Multi-Family Homes, Mobile Homes, Vacation Homes | Air Conditioning, Clothes Washing and Drying, Cooking, Entertainment, Home Office Equipment, Lighting, Outdoor Equipment, Refrigeration, Space heating, Water Heating, Workshop Equipment, Miscellaneous Appliances ¹ |
| Commercial | Offices, Retail Stores, Grocery Stores, Restaurants, Warehouses, Theaters, Government Buildings, Schools, Places of Worship, Hotels and Motels | Air Conditioning, Clothes Washing and Drying, Cooking, Lighting, Office Equipment, Refrigeration, Space heating, Water Heating, Workshop Equipment, Miscellaneous Equipment ² |
| Industrial | Factories and assembly plants that make finished products. Industries that contract or produce raw materials and energy resources such as minerals, lumber, fishing, coal, oil, natural gas, and electricity. | Air Conditioning, Cooking, Lighting, Miscellaneous Appliances, Office Equipment, Motor-Driven Machinery ³ , Process Heating, Refrigeration, Space Heating ⁴ , Ventilation, Water Heating |
| Agricultural (Farming) | Dairy, Fruits and Vegetables, Grain (corn, wheat), Livestock (beef, hogs, poultry), Other | Air Conditioning, Crop Drying, Irrigation, Lighting, Motor-Driven Machinery, Refrigeration, Space Heating, Ventilation, Water Heating, Water Pumping, Miscellaneous Equipment ² |
| Transportation | Passenger, Commercial, Government | Airplanes, Automobiles, Boats, Buses, Ships, Trains, Trucks |

Definitions of Less Common Energy End Uses

¹Miscellaneous appliances are home appliances that are not categorized under other end uses. Examples include electric toothbrushes, vacuum cleaners, and electric foot massagers.

²Miscellaneous equipment is equipment used in the commercial, industrial, and agricultural sectors that is not categorized under other end uses. Examples include floor polishing equipment used in offices, X-ray machines used in a doctor's office, and film projectors used in theaters.

³Motor-driven machinery is machinery used in manufacturing processes that is driven by motors. Drills used to make holes in metal and saws used to cut wood in a lumber mill are examples.

⁴Process heating is heating used in manufacturing and other industrial processes. Heating iron ore in a blast furnace to make steel is an example of process heating.

⁵Insulation and air infiltration—drafts and air leakage through windows, doors, and other cracks—in homes and buildings are not listed in the table because they are not considered to be end uses. However, they directly influence the effectiveness with which energy is used for space heating in homes and other buildings, and are therefore important.

Survey of Energy Use in the Community

Name and address or location of business:

Type of business or community institution:

- Commercial business
- Industry
- Farm or agricultural business
- Government institution
- Nonprofit organization
- Other (describe)

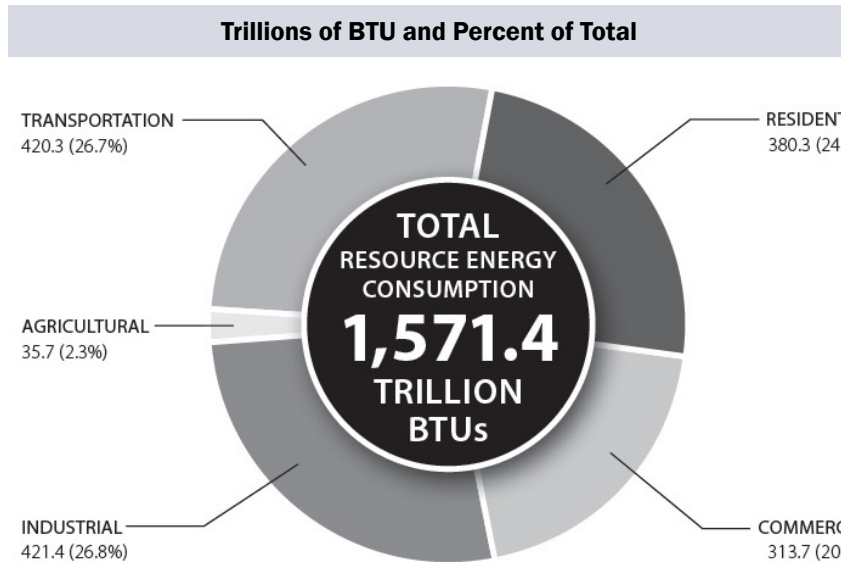
Name and job title of person(s) being interviewed:

Briefly describe what the business does.

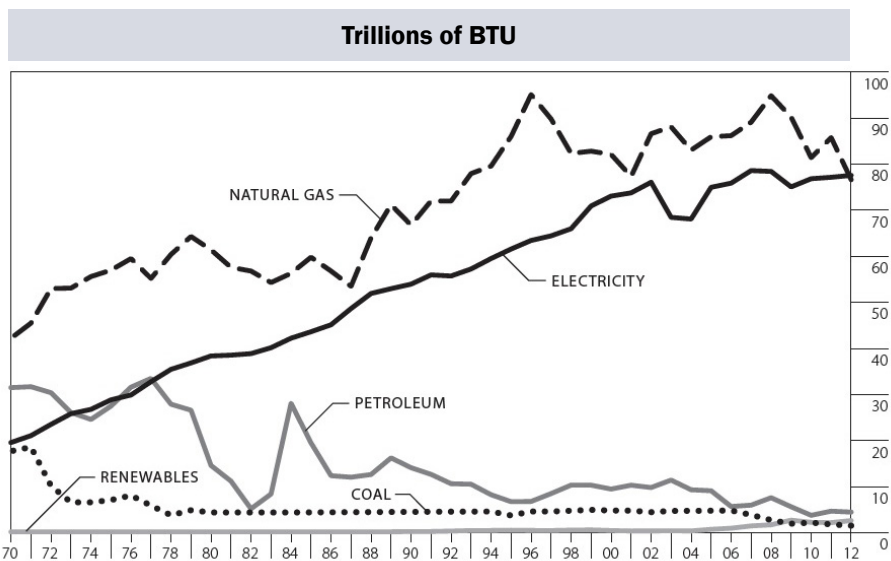
What are the main ways that this business or community institution uses energy?

What special equipment, machinery, or manufacturing processes does the business use, what is its purpose, and is it a major or minor user of energy?

Wisconsin Resource Energy Consumption by Economic Sector (2012)



Wisconsin Commercial Energy Use by Type of Fuel (1970-2012)



Source: 2013 Wisconsin Energy Statistics