Project

Building Communities

SKILLCHECK
- Interpreting Data
- Predicting
- Modelling
- Communicating

When a town is being built, a town council is formed to make decisions. One decision the council must make is how to provide the town with the most effective source of electricity. Experts survey the environment to determine which source of energy would give them the most electricity for the least cost. Models are built before the final decision is made so that the town council can make the best choice for the community.

Challenge

In a group, design a town and decide on a source of energy for this town.

Design Criteria

A. Imagine you are on the council for a new town.

B. Assume that three energy sources are available to your town: solar power, wind power, and hydro-electric power (hydro power).

C. Use information in your textbook as well as other sources (Internet, library books) to produce a list of advantages and disadvantages of each energy source.

D. Design your town with a population between 1500 and 5000 people.

E. Decide how many houses will be built in your town.Assume that four people live in each house.

F. Assume that you cannot store energy (that is, if you have extra energy in February, you cannot use it in May).

G. Assume that the energy usage by buildings (Table 1) does not change each month.

Materials
- drawing paper
- pens and pencils
- Bristol board

Apparatus
- 1 1.5 V D-cell batteries
- 3 1.5 V 10 watt light bulbs
- 10 copper wires with alligator clips

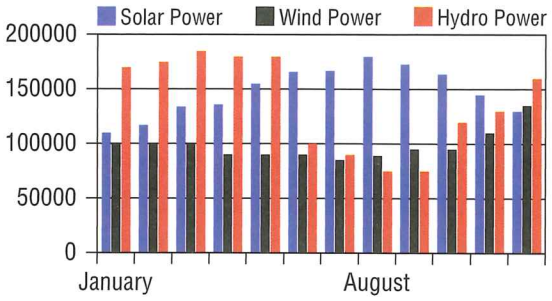

Figure 1 Energy sources available (measured in kilowatt-hours/month).

Table 1 Energy Usage for Buildings

Building	Energy Usage
House	360 kWh/month
School, Store or Office Building	800 kWh/month
Hospital or Airport	850 kWh/month
Recreational Facility	875 kWh/month
Factory or Industry	975 kWh/month

Plan and Construct

1. In your group, create a table to show the advantages and disadvantages of the three energy sources available to your town. Your table should also identify which of the sources is most reliable throughout the year (based on Figure 1).

2. Use the information in step 1 to decide as a group which power source you would prefer to use. Explain why.

3. (a) Decide on the population of your town.
   (b) Estimate the number of buildings (houses, stores, hospitals, facilities, etc.) that will be constructed in your town. Select the buildings you will need from those listed in Table 1.

4. Create a map of your town plan. Use pencil in case you have to make changes to your plan. (Don't try to include every house on your map. You can draw squares to representing groups of houses. Indicate the number of houses each square represents.) Include a power station.

5. Calculate the total amount of electricity required by your town in one month. Do this by adding together the energy usage of all the buildings in your town. Show your work. Table 1 provides the energy usage for different types of buildings in kilowatt-hours/month.

6. Predict whether your chosen energy source will be able to supply electricity for your town throughout the year. Which months, if any, do you think could be a problem?

7. Determine whether your chosen energy source will be able to supply electricity for your town throughout the entire year.
   (a) From Figure 1, use the bars of the graph to estimate how much of your chosen energy source (in kilowatt-hours/month) is available each month of the year.
   (b) Compare these numbers to the total amount of electricity required by your town in one month (step 5).
   (c) Are there any months in which the energy source will not provide enough electricity for your town?

8. If the energy source will not provide enough electricity, you will have to either:
   (a) choose another energy source (repeat step 7 to ensure that enough electricity is available), or
   (b) remove some of the buildings from your town plan until enough electricity is available.

9. Draw a final map of your town on Bristol board. Show each building wired into the power plant. Each building should be labeled with its name and amount of energy usage.

10. Present your model.

Evaluate

1. How would you change the design of your town if you repeated this project?

2. What was the most important information your group used for choosing the source of energy?

3. Were you able to use the source of energy you chose, or did the amount of electricity needed by your town change the decision?

4. Compare your results to those of other groups. How did the size of the towns affect the choices of energy source?

Extend Your Skills

5. Which energy source would you choose if you needed a second one?

6. Imagine you are on the council for a city with 10 000 homes:
   (a) What other ways could you provide electricity to your city?
   (b) Which of these choices is least harmful to the environment?