

□ Activity 2: Solar Power For Your Home

In this activity, you will consider how to use solar panels to harness the power of the Sun, a renewable energy source, for your home. Begin by reading a few basics about solar power:

- Solar panels work by using photons from the Sun to push electrons so that they begin to move in one direction, thus generating a flow of electricity. (Photons are the packets of energy in visible light and other electromagnetic waves.)
- Solar panels generate DC (direct current) power. In DC current, the electrons move in the same direction. However, homes use AC (alternating current) power. The electrons in AC current switch directions periodically. Therefore, solar panel installations also include an inverter that converts the DC power to AC power.
- Solar panel technology is not as efficient as it could be. Solar panels convert solar energy to electricity at about 15-20% efficiency; however, scientists are working to bring that percentage up significantly by using different materials.

Most people's lives are centered around electricity. Have you ever thought about the number of things in your house that are powered by electricity? The chart on the following website shows the energy usage of common household appliances while they are running. Which appliances use the most electricity? The least?

Household Appliances

www.movingbeyondthepage.com/link/7089/

This website will give you information about different household appliances and the power they consume.

In the rest of this activity you will learn more about solar power and decide whether it could be an option for your home. The "Using Solar Power" activity pages are divided into five parts. Complete the activity by using the following detailed instructions for each part.

Part 1: Solar Power Pros and Cons

The high demand for electricity in the average home has sparked interest in using solar power as an alternative form of energy. There are several benefits to solar power, but there are concerns associated with it as well. Explore the information presented on the following website to learn about these advantages and disadvantages. When you have finished reading, complete the advantages and disadvantages chart in Part 1 of the first "Using Solar Power" activity page.

Solar Energy: Pros and Cons

www.movingbeyondthepage.com/link/11381/

This website lists and explains the advantages and disadvantages of solar power and what those mean to the average consumer. Be sure to read the explanations of each advantage/disadvantage. They are found below the chart.

Part 2: Evaluate Your Home's Solar Power Potential

Next, you'll analyze the potential opportunity of solar power for your home. Follow these steps to complete Part 2 on the activity page:

1. Open the Project Sunroof website. Enter your address into the "Check My Roof" box. Click the orange button to search for your house.

(Note: If your address isn't in an area covered by the website, or if you live in an apartment, you can use the address of a friend or family member for this activity, even if they live in another town.)

Project Sunroof

www.movingbeyondthepage.com/link/11382/

This website uses Google Maps to analyze the average amount of usable sunlight your home gets each year and the number of square feet available on your roof for solar panels.

2. Record the amount of usable sunlight your home receives each year. Divide this number by 365 to find the average number of hours per day.

3. Record the amount of space on your roof that is available for solar panel placements. The website automatically calculates this number based on how much sunshine your roof gets in different places.
4. On the activity page, write down your household's average monthly electric bill. You can find this information on your utility bills, either in paper form or online. You may ask a parent to help you find this number.
5. Enter this number into the website. (Scroll down below the map.) Use the drop-down menu to select the amount that is closest to your monthly average.
6. Find the box to the right: "Your Recommended Solar Installation Size." Click on the lowercase "i" in the corner of that box and read about how this number is calculated.
7. Record the recommended solar installation size on your activity page, in both kilowatts (kW) and square feet.
8. Solar panel effectiveness depends on the amount of sunlight that can reach the panels. This is determined by weather, geographic location, and surrounding trees. Look at the image of your roof on the map. The areas of your roof that receive the most sun will appear in bright yellow. On the activity page, sketch your roof and color the sunniest areas yellow.

Part 3: Design Your Solar Panel Installation

In Part 3, you will choose the best location for a solar panel installation and decide on a design. Follow these steps:

1. Open the following solar power calculator.

Solar Power Calculator

www.movingbeyondthepage.com/link/11383/

This calculator allows you to see how a solar power installation would look on your roof and helps you calculate the number of modules you would need if you used this particular company.

(Note: Solar panel size and efficiency varies depending on the brand, but this calculator gives you an idea of what you might expect.)

2. Zoom in and center your house in the middle of the screen. Then click "Next."
3. Now you will choose where to install solar panels. You can only select one roof spot on this calculator, so find the largest, sunniest area on the roof. Refer to your drawing from Part 2 or look at the Project Sunroof map.
4. To mark your selection, click on all four corners of the section of roof you have chosen. Note that you can only use one side of a slanted roof. You can deselect a pin by double-clicking on it, or move a pin by clicking on it and dragging it. Click "Next."
5. Tell the calculator which edge of the roof is lowest by clicking on that edge. Click "Next."
6. Now you should see rows of solar panels in the section of roof you selected. Check how much power the installation can provide by looking at the bottom of the "Place solar modules" text box. It is measured in kWp, which means the amount of kilowatts produce at peak sunshine.
7. This number should match the number of kW you recorded in Part 2. If it is higher, reduce the number of panels. If this number is too low, try choosing a larger section of roof. **NOTE:** Click on the "Back" button to reset the calculator and choose a new roof section. You can add and remove panels by clicking on them or on the light gray square outlines.

8. Now that you know the number of modules you will need, rearrange them as you please on the roof. Also try clicking the "Place modules in landscape" option. Draw your favorite layout in the box on the activity page.
9. To answer the question, consider what factors (shape of roof, nearby trees, etc.) may limit the number of solar panels that can be installed on your roof. Also compare these two numbers:
 - a. the amount of power your solar installation would need to produce in order to cover your family's electricity usage (the number of kilowatts you recorded in Part 2)
 - b. the amount of power a solar installation on the sunniest part of your roof would be capable of producing (the kWp shown on the solar energy calculator).

Part 4: Potential Savings

How much could an average homeowner save by installing a solar power installation? Complete the calculations on the activity page to find out.

Part 5: Your Recommendations

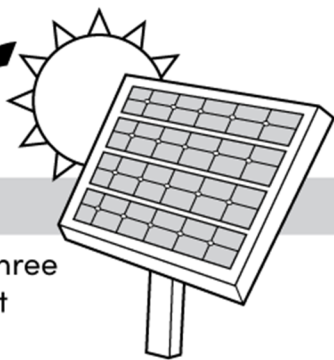
Is solar power a good option for your home? There are many factors to consider:

- Does your home receive enough sunshine for a solar power system to generate a useful amount of electricity? Less efficient systems can still be worthwhile, but it may take a few extra years to earn back the initial investment amount.
- Check your local utility company's website. Do they offer to purchase any extra solar power you might generate?
- What about the cost of installing a system? Would your family be willing to commit to it? Are there any rebates or tax credits available through your local utility company or your local/state government?
- Will a solar installation add value to your home?
- Does your family value sustainable energy? Would investing in a solar power installation be important to your family?

Think about these questions and take into consideration everything you learned during this activity. Summarize your final recommendations on the activity page. Be sure to explain your reasoning.

When you are finished, share your findings and final recommendations with a parent. Discuss what you have learned about the advantages and disadvantages of using solar power in the average home.

Using Solar Power



Part 1: Solar Power Pros and Cons

Read about solar power on the website shown in the lesson. Decide which three advantages and disadvantages of solar power you think are most important and list them below.

Solar Power	
Advantages	Disadvantages

Part 2: Evaluate Your Home's Solar Power Potential

Follow the steps in the lesson and record your data below.

How many hours of usable sunlight does your home get per year?	
On average, how many hours per day is this? (divide by 365)	
How much roof space is available for solar panels?	_____ ft ²
What is your average monthly electric bill?	
What size solar panel installation would you need in order to cover most of your home's electrical needs?	_____ kW (_____ ft ²)

Using the map, draw a small sketch of your home's roof and color the sunniest areas yellow. These are the best areas for solar panels.

Part 3: Design Your Solar Panel Installation

Follow the steps in the lesson.

Sketch a possible solar panel placement for your roof.

Is your home's roof able to support a solar installation large enough to cover your family's electricity? Explain.

Part 4: Potential Savings

Assuming an average monthly savings of \$120 off the monthly electric bill and an average solar panel usability of 25 years, find the potential savings over time with solar panels. This is an estimate. Actual savings may be greater or less depending on the cost of electricity in the future.

Monthly savings	\$120
Annual savings (monthly savings x 12)	
Savings over 25 years (annual savings x 25)	
Average initial cost of solar panel installation	\$15,000
Net long-term savings (25 year savings - initial cost)	

Part 5: Your Recommendations

Review the data you have collected. Do you recommend a solar panel system for your home? Explain why or why not.

Activity 2: Solar Power For Your Home

Your child will explore the potential benefit of using solar power for your home. She will first read information online about the advantages and disadvantages of solar power. Next, she will research how well solar panels might work for your home and calculate the possible costs and savings of a solar panel system. After she has completed her investigation, discuss the results. Be sure she can accurately explain why she does or does not recommend the use of solar power for the home.

Note: If the solar panel websites do not cover your location, or if you live in an apartment or condo with a shared roof area, your child can do the investigation using the address of a friend or family member in another location.