



# Understanding Energy

## Lesson 5: Solar Energy Basics

**AUTHOR:** Eric Gronseth

**DESCRIPTION:** Students will learn the basics of solar power and the difference between photovoltaic solar power and passive solar power. They will also learn the pros and cons of solar power and be able to describe the advantages and disadvantages of using solar power in various settings. This will be accomplished through the usage of data from a real solar array and discussing what exactly this project is generating and what the numbers are that are pulled from the project.

**GRADE LEVEL(S):** 4<sup>th</sup>, 5<sup>th</sup>

**SUBJECT AREA(S):** Energy, solar energy generation, renewable and nonrenewable energy, electricity, light, energy transformation, electricity, photovoltaic

**ACTIVITY LENGTH:** 40 minutes

**LEARNING GOAL(S):** Students will be able to describe the basic principles of solar power and list advantages and disadvantages of using solar power. Students will be able to distinguish between passive solar and photovoltaic solar power. Students will be able to determine what data from a solar array represents. Students will be able to determine the cause of energy generation trends when observed over longer periods of time.

**NEXT GENERATION SCIENCE STANDARDS:**

- 4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

**UNIT CONTENT:**

- Lesson 1: Energy Sort
- Lesson 2: Brainstorm Energy Sources
- Lesson 3: Energy Basics
- Lesson 4: Home Energy Survey
- **Lesson 5: Solar Energy Basics**
- Lesson 6: Home Energy Use
- Lesson 7: How to Observe and Keep Records
- Lesson 8: Setting Up an Experiment

- Lesson 9: Collecting and Reporting Data, Making Recommendations
  - Ongoing Activities: Daily Observations and Record Keeping
- 

## Materials List

- Solar energy spiral notebook (1 per student)
- Computer(s) to access Solar4RSchools.org website - <http://www.solar4rschools.org/explore-data> (We will use Solar Data from Elmonica Elementary for this project)

## Vocabulary

- Solar
- Solar panels
- Photovoltaic solar (PV)
- Passive solar energy

## Student Background

- Students will have previous knowledge of the different types of energy and the pros and cons of each type of energy (previous lesson).
- Students will have basic understanding of sources of energy and the fact that solar energy is a renewable source of energy.

## Educator Background

- Teacher will need to have knowledge of and access to up-to-date information regarding solar energy including current uses and the advantages and disadvantages of using solar energy.
  - The Solar4RSchools web site has current information and history regarding solar energy production at various sites. Because our school is one of those sites, we will be able to utilize local information from our own school.  
<http://www.solar4rschools.org/schools/elmonica-elementary-school>
- 

## Lesson Details

### Activity – Photovoltaic Energy Monitoring

- Class will observe the Solar4RSchools kiosk in the school lobby looking for current and historical energy production through the Elmonica solar project. Note: For schools without a kiosk, find the same display of our school at <http://www.solar4rschools.org/kiosk-elmonica-elementary-school>. If you have classroom access to iPads or other computing devices, consider allowing students to explore this

Solar 4R Schools™ is a program of BEF.

**BONNEVILLE** : 240 SW 1st Avenue  
**ENVIRONMENTAL** : Portland OR 97204  
**FOUNDATION** : 503-248-1905  
: [www.b-e-f.org](http://www.b-e-f.org)

information on their own or in small groups. Otherwise, a classroom projector will work well. Many projects on [solar4rschools.org](http://solar4rschools.org) have live data displays. If you are struggling to find the information that you want, email their program manager at [Solar4RSchools@b-e-f.org](mailto:Solar4RSchools@b-e-f.org) and they will help you.

- Students will monitor the kiosk or website on a daily basis for one week to determine differences in energy output and usage. Energy output of our solar system can be seen on a daily, weekly, monthly, or yearly basis. We visited and recorded the output daily and made our own line graph. The kiosk shows a weekly line graph so we were able to compare our hand made graphs to the one produced by the kiosk or on the web site.
- Additionally, students can be asked to make notes in their journal about weather patterns throughout the monitoring period.
- We receive monthly reports from the school district regard energy usage. We used those reports and compared them to the output of the solar system on our roof.
- Students will create a hand drawn line graph of one week's energy output and usage of the Elmonica solar panels in their graph paper spiral notebook. *Note: This energy data can be downloaded via the Solar4RSchools.org energy exploration tab. In an add-on lesson, students can download this data for your monitoring period (or another, such as when the sun is lower/higher in the sky!) to create graphs on the computer as well.*
- Students will share ideas about the impact the Elmonica solar production has on energy usage in our school and community with a partner.
- Teacher will lead a discussion on ways that solar energy is used in the community including building placement and other passive solar energy options.

Solar 4R Schools™ is a program of BEF.

**BONNEVILLE** : 240 SW 1st Avenue  
**ENVIRONMENTAL** : Portland OR 97204  
**FOUNDATION** : 503-248-1905  
: [www.b-e-f.org](http://www.b-e-f.org)