Activity Overview

Grade Level: Varies
Activity: WOS-8

General Description

Students will read an electric meter, log their meter readings, and analyze the data collected.

Learning Outcome

Students will learn to read the electric meter attached to the solar energy system and will record their readings in a log book and on the Internet.

Subjects

Science, math

Process Skills

Observation, record keeping, computer skills

Duration

30 minutes

Key Vocabulary

Kilowatt-hours, journal, log, meter, odometer

Curriculum Standards

Texas (TEKS)
112.2.a.4
Louisiana (LSCS)
ESS-E-B5
Arkansas (ASCF)
3.1.4
National (AAAS Project 2061)
The Physical Setting – 2nd

Read the Solar Energy System's Electric Meter

Materials

- Electric meter attached to school's solar electric system
- Computer connected to the Internet
- Meter reading log sheets (attached)

Method

1. Teacher informs students of safety issues in working with electrical equipment of any kind.
2. Teacher then directs a student or team of students to read the electric meter attached to the school's solar electric system on a regular basis (hourly, daily, weekly, or monthly).
3. On a log sheet, students record the date and time of the reading, their name, and the meter reading itself.
4. Students or the teacher also can submit their meter readings on the Watts On Schools website (www.wattsonschools.com).
5. Meter data can be used to determine the amount of energy produced by the solar energy system between readings.

Discussion

The electric energy used by homes, schools, and businesses is typically metered by the electric company. The meter keeps a count of the amount of energy used by the building, kind of like how the odometer on a car counts the number of miles travelled. The electric meter enables the electric company to charge people the correct amount of money for the amount of energy used. In this way, people who use a lot of energy pay more than people who use less.

Each month, someone from the electric utility (the meter reader) reads all the electric meters to determine how much energy was used at each house, school, business, or other building. In this activity, students play the role of the meter reader, but instead of reading the meter to figure out how much energy was used, they read the solar energy system's meter to figure out how much energy was produced.

There are seasonal as well as daily variations in the amount of energy produced by solar energy systems. These variations result from different weather conditions at different times of the year (some months tend to be cloudier than others) or different times of the day (the sun doesn't shine on the solar panels at night, after all). Keeping a regular log of meter readings will enable teachers and students to recognize patterns in energy production, and to recognize problems when and if they arise.

Different frequencies of meter reading are appropriate for different purposes. If we want to see daily cycles in energy production, we probably need to take meter readings every hour or half hour for a day or two. If seasonal variations are of interest, weekly or even monthly meter readings may suffice. We recommend that classes submit weekly meter readings via the web site, but monthly readings may be acceptable in some circumstances.

There are two methods of recording data in this exercise. The first is to keep a running log of meter readings by using the meter reading log sheet (attached). This can be used by the school for all meter readings, and should be kept near the electric meter. These log sheets can be kept by the school as a written record of the solar system's energy production. Data in the log sheets can be used to create graphs and charts of energy production.

The second method is to record meter readings on the Watts On Schools website, where weekly or monthly meter readings can be recorded for each school. ***All schools are required to submit meter readings on at least a monthly basis via the web site***. This enables the project managers and sponsors to maintain accurate records of each system's performance.

If meter readings are made at some regular interval, the amount of energy produced between intervals can be calculated by subtracting the previous meter reading from the current one. For example, given the sample data below, we know that between 9:00 a.m. and 11:00 am on February 15, the system produced 41 kWh (1099 – 1058). Between January 1 and February 1, the system produced 384 kWh (932-548). If the meter readings are made on a regular basis, such as each morning at 9:00 a.m., the interval calculations are readily comparable.

Example 1. Solar System Meter Reading Log Book

Date and Time of Meter Reading	Name of Person Making Observation	Meter Reading (kWh)
January 1, 2000, 3:00 PM	Teacher A	00548
February 1, 2000, 9:00 AM	Student B	00932
February 15, 2000, 9:00 AM	Student C	01058
February 15, 2000, 11:00 PM	Janitor D	01099

If the meter readings are not made on a regular basis, then the interval calculations can be converted to units that are comparable, such as kWh/hour or kWh/day. For example, the amount of energy produced in the two hours between 9:00 and 11:00 a.m. on February 15 was 41 kWh. This can be converted to kWh/hour by dividing 41 kWh by 2 hours (41 kWh / 2 hours = 20.5 kWh per hour). The value is a rate of energy production. It can be compared to the rate of energy production between February 1 and February 15, during which 126 kWh were produced (1058 – 932 = 126) in a period of 336 hours (14 days x 24 hours per day = 336 hours). The rate of energy production during this time was therefore 0.375 kWh per hour—much less than 20.5 kWh per hour calculated before.

Assessment

Student performance on this activity can be assessed in a number of ways, depending on how the activity is implemented. Students can be evaluated on their ability to work with others in small groups. Students also can be evaluated on the accuracy of their journal entries.

Source: This activity created by CSGServices.

Solar Electric System Meter Reading Log Book

Date and Time of Meter Reading	Name of Person Making Observation	Meter Reading (kWh)

Copy this form as needed.