

Science Geeks - Group 1

As a group, discuss how the intensity of the Sun (as measured in a specific spot on the surface of the Earth) changes throughout the day and is influenced by the weather. Sketch below a graph that represents the intensity of sunlight hitting the ground on a clear sunny day from 5:00am to 8:00pm (put time on the x-axis). Be prepared to share your graph with the class.

Endeavour Elementary has a solar/photovoltaic array at the school that utilizes energy from the Sun to produce electricity. You obtained the data below. It is the DC electrical output of the array for May 14, 2013. Graph the data.

Time	kW
5:00 am	0.00
5:30	0.02
6:00	0.15
6:30	0.32
7:00	0.97
7:30	3.09
8:00	4.01
8:30	5.69
9:00	6.91
9:30	7.95
10:00	8.93
10:30	9.71
11:00	10.31
11:30	10.78
12:00 (noon)	10.94
12:30 pm	10.98
1:00	10.80
1:30	10.56

2:00	9.95
2:30	9.18
3:00	8.29
3:30	7.23
4:00	6.11
4:30	4.59
5:00	3.57
5:30	2.06
6:00	0.70
6:30	0.37
7:00	0.16
7:30	0.02
8:00	0.00

An archive of the weather for that day states “Clear, warm, no precipitation”. How does your graph of DC electricity output compare to your sketch of a sunny day? How would you characterize the relationship between the intensity of sunlight and electrical output of a photovoltaic/solar device?

Photovoltaic devices (cells, panels and arrays) are tested and rated at a sunlight intensity measurement (irradiance) of 1000 Wm^2 . Given that the Sun’s irradiance was 1013 Wm^2 at noon on May 14, 2013, what size in kW is the array at Endeavour Elementary?

Challenge!

The electricity that the solar array produces is used by the school, saving them money. If the school saves 12 cents for every kWh that is produced by the array, how much money did the school save on May 14, 2013? (Hint: kWh is kilowatt *hours*)