

### Science Geeks - Group 3

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 two graphs—one to represent the intensity of sunlight hitting the ground on a clear sunny day and a second graph that represents the intensity of sunlight hitting the ground on a day that is sunny and clear in the morning, but rainy with thunderstorms in the afternoon. Sketch your hypothetical graphs with time (5:00am - 8:00pm) on the x-axis. Be prepared to share your graphs 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 June 9, 2013. Graph the data.

<b>Time</b>	<b>kW</b>
5:00 am	0.00
5:30	0.04
6:00	0.24
6:30	0.33

7:00	0.54
7:30	0.41
8:00	0.91
8:30	2.46
9:00	4.32
9:30	8.00
10:00	8.61
10:30	9.69
11:00	9.96
11:30	8.72
12:00 noon	9.85
12:30 pm	10.59
1:00	11.06
1:30	9.86
2:00	8.85
2:30	6.60
3:00	0.16
3:30	0.13
4:00	0.19
4:30	0.37
5:00	1.39
5:30	1.19
6:00	0.63
6:30	0.29
7:00	0.15
7:30	0.01
8:00	0.01

An archive of the weather for that day states “Sunny and clear in the morning hours with thunderstorms arriving by 3:00pm and lingering until evening”. How does your graph of DC electricity output compare to your sketch of a day that is rainy in the afternoon? 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  $1000 \text{ Wm}^2$ . Given that the Sun’s irradiance was  $912 \text{ Wm}^2$  at noon on June 9, 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 June 9, 2013? (Hint: kWh is kilowatt *hours*)