CLEAN ENERGY INSTITUTE
UNIVERSITY of WASHINGTON

Solar from Scratch Student Worksheet

I. Introduction:

1. In your own words, describe how solar cells produce electricity.

2. If you have two solar cells that output 1 A and 5V, what would your current and voltage be for these cells wired in parallel? What if they were wired in series?

3. If you have four cells that output 3V and 0.6A, can you sketch a way to connect them so you can get a total voltage of 6V and 1.2A?

II. Experiment:

4. Based on your ideas from the last question, wire a solar panel charger yourself! Sketch your final design below. Hint: check that your voltage and current are what you want before connecting to your buck converter (see question 5).

5. Test your solar cell array using alligator clips and a multimeter. Note your values of DC voltage and current from each different configuration you try. Check in bright sunlight vs regular classroom lighting. Are your voltage and/or current values different?

6. What problems did you run into while trying to build your charger? What did you try to solve them? What worked and what didn't? How were you creative?

7. Design a carrying case of your portal charger! Sketch your thoughts or write notes here.

III. Discussion:

8. You need to generate at least 1900 W of power for your home, which would be true if your household uses about 200 kWh per month (typical for a smaller home without lots of air conditioning and heating needs) and you live in Washington, which gets 3.57 peak sun hours in a day on a fixed solar panel. If you have solar cells that generate 5V and 1A during these peak sun hours, how many cells would you need? How would you wire them together? If the cells are about 10 in^2, how much roof area do you need?

9. Do you think a household or business building could get all of their electricity needs supplied by solar? Why or why not? Are there other things we could add to a system with solar panels to better provide electricity when it's needed? How would you design a building to run completely off of clean energy sources?