Dear Future SWEET City Team,

SWEET City is a fun, safe, interactive, and educational exhibit designed for National Grid and their customers. It educates customers on clean energy, energy efficiency, and the Smart Grid pilot program. The SWEET City exhibit includes four modules that generate power from solar and wind technologies, show power consumption with varying efficiencies, and explain the concept of the Smart Grid.

Each module has a fun and interactive component. In the solar module, a National Grid customer can turn a wheel of lighting films attached to the light source. The films, that simulate different weather patterns, allow the customer to see their direct effect on power generation. The wind module varies power generation based on wind turbine blade type. Customers can switch out blades to see the effects of blade style on power generation. In the energy efficiency module, the user is able to toggle between LEDs and incandescent light bulbs. Both bulbs are given the same voltage source. In the Smart Grid module, the user is able to trigger a blackout by disconnecting a transmission line.

The project also includes a road that runs through the city, connecting each module. Electric vehicle charging stations can be seen on the roadside. Although these charging stations will not be functioning, they are there to create a more realistic view of what National Grid offers to its customers.

Good luck with continuing this project and hopefully it is not too difficult. In order to make the process easier for you, here is some advice we have for the three major parts of our project.

Software:

When running a GUI at the same time as any program, make sure that you separate your code into multiple threads so that the GUI doesn’t stop while the Smart Grid code runs. This also makes it easier to add other modules to the code (i.e. Bluetooth for communicating between the different raspberry pis). It is much better to start with different threads than to try and create the threads later. The code is much neater and easier to combine functionality of all the modules.

For the 16x2 LCD screens, make sure to connect all of the LCD ground pins directly to the ground pins of the raspberry pi instead of using a ground bus. This will make it so the LCD does not display random characters from time to time.

Always have a backup just in case something goes wrong. The raspberry pi could malfunction or you might need to take a LCD for sizing purposes. There were many times when we were trying to figure out a way to mount the LCDs onto the board when we needed to take the LCD with all its connections to measure that the hole was the correct size or that the screws would fit. It would be much easier to just carry the LCD that isn’t connected to anything. Also, something might unexpectedly happen and having this backup is worth it.

Hardware:

It is always worth calling the PCB manufacturer to check on their required specs and files. We were set back because a drill file was missing and there was a lack of contact between the manufacturer and our team. Once you are ready to print your boards, make sure you double check all designs before and always order a backup PCB. The turnaround time for getting a new board isn’t worth the monetary savings. It is also worth ordering test boards to make sure everything works correctly before you actually order the real boards. This could have saved us a good amount of money.

Be sure to test your board as you solder and add solder to frayed wires. A board was fully soldered and functioning, but some frayed wires from our power supply broke. In the process of desoldering and removing the wires, a connection was broken and the board failed. Setting up the board more slowly and meticulously could have helped avoid the situation and saved us a lot of time.

If you happen to run into any trouble with circuit design or any hardware in general, speak with your professors. They want you to succeed and are willing to help when they’re available. Some problems that spent hours troubleshooting were fixed in minutes after speaking with ECE professors.

Mechanical Work:

Every dimension you make needs to be triple checked, and even after triple checking you should practice on a scrap material to make sure it works. Everything also needs to be very precise to +/- .001. If it is even slightly off, it needs to be completely redone. We had to remake many items because a dimension was slightly wrong.

Plan to make every item more than once. By doing multiple designs, you are able to see what works and what doesn’t. Start early and keep thinking of ideas to improve your designs. For example, we made our light filter twice. The first design was similar to that of a jewelers clip made of balsa wood. It encased the filters and also held up the lamp. Washers were used to separate the filters on the acrylic shaft and a spring was added for tension. Though this was not a bad design, the final product was not quite professional enough or aesthetically pleasing. The second light stand is made out of acrylic. This stand is much cleaner and significantly more professional looking. This design could be improved even more by making everything the same color and adding more supports so the filter holder can slide in and out. The stand could be more durable by adding more supports and filter casings.

Hopefully, this advice is helpful. Good luck!

Best,

SWEET City team 2017 (Jessica Cadreau, Jennifer Fong, Cameron Graves, Makenna Hart, Steven Li)