**Memo**

To: Professor Pisano

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Team: Sweet City: Team 20

Date: 11/15/16

Subject: Sweet City First Deliverable Test Plan



1. **Solar Module**

**Description and Goal:**

To complete the Solar Module, two solar panels are powered using a 60W light. As the light from the bulb is blocked (as the sun would be by clouds or night,) an LED light strip will dim accordingly. The LED strip is attached to a small scale model of the “Rainbow Swash” liquid natural gas tower in Dorchester.

The overall goal is to display solar power generation to National Grid customers and allow them to actively vary a visual load. Varying the output voltage is done by covering the 60W light using provided films. Different lighting films will allow varying amounts of light through. This simulates different weather patterns or a setting sun.

Completion of the solar module is a major milestone in the overall project. It will mark the finishing of more than 1/4 of the total project. One of the four modules are completed and it also shows the feasibility of voltage measurements using the MSP430 microcontroller.

**Procedure:**

To achieve the desired source voltage of between 9 and 10V, the solar panels must be wired in series. To do this, attach the positive terminal of solar panel 1 to the negative terminal of solar panel 2. The negative terminal of solar panel 1 is then connected to the negative terminal of the LED strip. The positive terminal of panel 2 connects to the positive terminal of the LED strip. With standard room lighting, the panels only supply ~7V, which is not enough to power the load. The module includes a 60 watt light to fully power the panels and drive the LED display.

**Verifiable Result:**

By supplying over 8V using the 60W light, the LEDs are lit. Placing lighting films over the light varies the supply voltage. This, in turn, actively changes LED brightness. This achieves the “interactive” requirement for the module while also using a visual load to show National Grid customers the effects of light on solar panel output.

**2.0 Data Acquisition Software**

**Description and Goal:**

Almost every module of this project requires the power that is either generated or consumed to be displayed on an LCD screen. Once figuring out how to measure and display the data for solar power, it is easy to apply this to obtaining data for the wind and energy efficiency modules. This program could also be used as a template for creating the program for the Smart Grid module in which a display showing how the entire system works together is used. The overall goal is to take the power generated by the solar panel and display the number, scaled to be similar to that of a real city, on the computer. Since an MSP430 is going to be used to display the voltage (and the maximum input to the pins on an MSP430 is 3V), a voltage divider must be used in order to take the voltage from a high output to the low input to the pins.

**Procedure:**

When the light is on, the desired output of the solar panels is 9 to 10V. Since the maximum voltage of the pins on the MSP is 3V, the MSP430 is connected in parallel to a voltage divider and in series with the solar panels. This steps down the voltage going into the MSP. It then takes the stepped down analog input and converts it to a digital value using an ADC. The program converts the number back to the original input voltage and displays that number on the screen.

**Verifiable Result:**

The voltage value of both the original input and scaled down value should be displayed on screen. This value should also change based on the films being placed over the light shining on the solar panel.