Weekly Progress Report and Planning Sheet

Solar Powered Charging Dock for eScooters

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<u>Activities Completed This Week:</u>

- Researched Battery Ah equations

  - $$T = H * (AhM / (I * H)^n)$$
  - T is time that the battery will output at a certain V and I.
  - H is the amount of hours the manufacturer tested the battery over
    - Sometimes C-Rate = 1/H
  - AhM is the Modern AmpHour measurement.
  - I is the current that you want to output.
  - n is the Peukert number that accounts for the loss at different current values.
  - C. Platt, *Encyclopedia of Electronic Components*, vol. 1. Sebastopol, CA: Maker Media, 95472.
- Researched the data sheet for the battery that is going to be used.
  - Power Sonic 121000-U Battery
    - Found a sheet for PS-121000S, but picture on front is of the U.
    - 10-12 Year life
    - Includes Dimensions
    - It doesn't show the C-Rate that I could find. But C is just the inverse rate of the time that a battery is tested for.
  - Battery is rated at nominal capacity to supply 5 amps at 10.5 Volts for 20 Hours
    - We want it to last at 2.5 amps at 42 Volts.
    - Need to find out how the DC-DC converter will modify the voltage and current.
  - Might need to use alternate performance specifications, these show lower timespans at higher amperage.
    - Need to look up the daylight characteristics at different times of the year. This would determine if we need to have more than one battery in parallel to get a higher amperage necessary.
- Met with Professor Adel ,

- ○ Went over battery choice and datasheet for battery. Discussed how for the battery voltage controller it would be best to use a premade voltage controller instead of one used ourselves. This would be much more efficient power wise.
  - ○ As for the battery, Adel suggested that either the battery should be 12 Volt with a DC DC Boost converter, or 48 volt with a DC DC Buck converter to get the voltage down to the level that we need for the charging. 42 Volts 2 Amps.
  - ○ Discussed charging time for the battery depends on the current. Charging at 1 amp would double the time to charge the battery, while charging at a higher amperage would decrease the charging time. This is why the professor recommended a battery with a high voltage, and then using the buck converter to decrease the voltage, but increase the amperage.
- ● After going to the lab and looking for the 48V battery hooked up to the Salt Filtering Project, it was found to be the same battery as earlier researched. So the system with the boost converter is probably what is going to be used. But, this also means that a system that uses an inverter might be better since it is simpler.
- ● The Solar Panels come equipped with a charge controller built in, so including a charge controller won't be necessary.
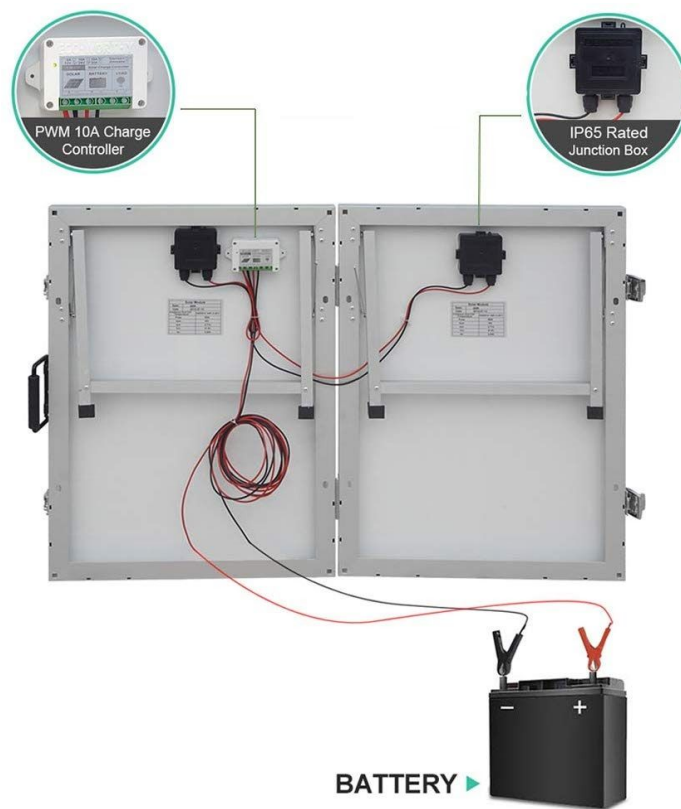
  - ○
- ● RFID scanner operational on Arduino Uno. Will work on prototype for locking mechanism next.
  - ○ Arduino Mega 2560 swapped out for Arduino Uno because more libraries and available pinouts.

- ○ Will program RFID to scan student ID, store most recent scan, and then release locking mechanism when met with original scan. Will also throw LEDs on it to indicate correct or incorrect ID.
- Researched ethical and standards for the Ethics Analysis. Found out that grounding has a lot more involved standards for a Solar powered system. Grounding will be needed for all of the components in the system. This is paramount for keeping the user/equipment safe from electrocution, lightning strikes, and fires.
  - ○ https://www.solarpowerworldonline.com/2012/04/installation-practices-keep-your-pv-system-well-grounded/

Activities in Progress:

- Samu is sourcing the components that will be used to create a prototype in adels lab, and is also modeling the station in solid works and lock. He is also working on the inclusion of RFID technology into the unlocking mechanism.
- Zach is working on building the circuit in simulink proof of concept solar charging. Also, there is a possibility that a local company might allow us to use their electric scooters as a base for the setup. Also working on a better schematic for the circuit. Working on the sun tracking of the system, and the motor necessary for this to work.
- Nate is working on the prototype for the locking mechanism.

Activities to be Started Next Week:

- More research.
- Working 3D modeling

Issues for Immediate Action and Attention:

- Should the charging be hard wired into the circuit, or should an inverter be used in conjunction with the charging cable that comes with the scooter? Maybe the cable can be added in a way that is impossible to steal?

Key Team Interdependencies and Resolution:

- Relying on Nate for all the website production/upkeep.