

## EE/CprE/SE 492 GROUP PROGRESS REPORT

Group number: 01

Project title: Hybrid solar/battery for electronic derailleur

Client: Dr. Raj Raman

Advisor: Dr. Raj Raman

Team Members: Aydin Bashich, Elba Estarellas, Jack Waskow, Mohamed Mohammad, Rachel Vallier, Seth Pierre, and Connor Davison

○ **Project Summary:** *Our client requested a solar battery to charge an electronic derailleur. The derailleur is currently charged with a battery that is charged through a wall outlet. The benefit of having the solar battery is that the battery will never need to be taken off the derailleur to charge, and therefore, will hypothetically never die because the sun will be able to charge the battery since the bike is outside. For our project, we determined the components we needed to accomplish a set of criteria the client provided. An example of one constraint is that the battery must have a run time of 10 hours.*

○ **Accomplishments**

*This week was the first week that we had all the components together. We split up into two groups. The first group focused on measuring the individual components to determine if they worked correctly. Additionally, this group was figuring out exactly how the components were working. The people in this group were: Jack, Elba, and Rachel. The other group focused first on figuring out how to charge the battery that came with the derailleur. This group determined how to charge the battery with the voltage source and allowed it to charge for a little bit, and then measured the voltage. This was all good because we determined that the battery was able to be charged and that the battery measured 7.36V, which was close to what we expected. Then this group also calculated the resistance we needed to discharge the battery we have for the solar-powered battery. This battery came fully charged, so we want to discharge it so that we can verify the battery is able to charge. We determined that we are going to use a 74-ohm resistor to cause the battery to die in approximately 3 hours. The people in this group were: Aydin, Seth, Connor, and Mohamed.*

**Group 1: Rachel, Jack, and Elba**

1. Measured the voltage across the following components:
  - a. DC converter
    - i. Worked as expected, but will purchase an additional DC converter to step the voltage up an additional 3 V.

- b. Solar Cell
    - i. Worked as expected without load, but once the load was added the output was not as expected
  - c. Solar Controller
    - i. Did not work as anticipated, but will adjust the issue with the additional DC converter
2. Numbered 10 solar cells and measured voltage and current in full direct sunlight to calculate power. The table below shows the voltage without any load
- a. Used 150-ohm resistor
    - i. Should get closer to 3.5 V without the load, but with the load 3.1 V.
    - ii. With the 150-ohm load, we received 19 mA, but we found that we should have received 6 times larger current.
  - b. Used 47-ohm resistor
    - i. Should get closer to 3.5 V without the load, but with the load 1.24 V.
    - ii. With the 150-ohm load, we received 28 mA, but we found that we should have received 4 times larger current.
    - iii. Will not meet the charge time with these values

Cell	1	2	3	4	5	6	7	8	9	10
V (V)	3.3	3.37	3.4	3.4	3.45	3.42	3.4	3.4	3.4	3.35

- c. After putting 2 solar panels in parallel, we received the same power out, and realized we were current limiting it with too high of a resistance.
  - i. In parallel the current doubled, which is good because that is what we wanted.
  - ii. We picked parallel to increase current.
- d. We will be able to charge in the appropriate time when using multiple solar panels in parallel.
- e. Individually put out 20 mA and 3 V.

**Group 2: Connor, Seth, Aydin, and Mohamed**

- 1. Charged that battery that came with derailleur
  - a. Measured at 7.36V, it says it is a 7.4V battery, so worked as anticipated
  - b. Created a secure connection to the battery to test
- 2. Calculated resistance required to discharge battery
  - a. Determined approximately 5 mA draw per hour

<b>Resistance</b>	1.48 kohms	148 ohms	74 ohms
<b>Time</b>	60 hours	6 hours	3 hours

- b. Will use 74 ohms to discharge in 3 hours
- 3. Sent an email to Sram to inquire about the power dissipated during each shift of the derailleur

- o **Pending issues** *The issue we had is that the solar controller did not work as anticipated, but we will fix this with the additional DC converter.*

- o **Advisor Input/Signature:**

Please select one of the options below and sign.

    DRR I am pleased with the progress the team is making.

    The team's progress could use some minor improvements, which I will discuss with them.

    The team's progress has some major concerns that I will discuss directly with Dr. Bigelow, bigelow@iastate.edu , 515-294-4177

Signature: D. Raj Raman

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- o **Client Input/Signature:**

Please select one of the options below and sign.

    DRR I am pleased with the progress the team is making.

    The team's progress could use some minor improvements which I will discuss with them.

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