EE 491 WEEKLY REPORT 4 ***Date: 2/20/2017***

Group number: 1706

Project title: Renewable Energies Lab

Client &/Advisor: Prof. Ajjarapu

Team Members/Role:
Leader: Travis Merrifield
Webmaster: Elika Korhonen
Communications: Noah Chartouni
Idea Holder: Josh Pachl & Steve Ukpan

- **Weekly Summary**

  There were three primary tasks to accomplish this week. First we needed to create and model the IV characteristics of a PV cell. This was completed, but not to Prof. Ajjarapu's liking. We will try again next week with data collected through changing resistor values and adding a load line. Second was to find L and C values that will generate continuous current on a booster. This was completed, despite a small hick-up with changing inductor values when they should have remained constant. Prof Ajjarapu was still pleased with the work and we don't need to redo the calculations. However, it may be useful to have the correct information in the future. Third was to get started on modeling a MPPT. Elika did great work on starting the MPPT model. We believe that we have it working however, more tests need to be conducted to come to that conclusion. Overall we got a lot accomplished this week and have started to lay a good foundation of knowledge.

- **Past week accomplishments**
  - **Elika:** Established a model for the Max Power Point Tracking and PV design with Travis. This involved extensive simulink work and persistence since the PV model wouldn't behave as expected. They were very successful and exhibited the proper behaviors. The MPPT model was more difficult, but I spent a many hours studying the design and operation.
  - **Josh:** I worked on calculations regarding power electronics. Specifically observing how the different L and C values affected things such as the output voltage , voltage ripple, and continuous current. I put varied different parameters for the booster and made different calculations as well as graphs for each set of parameters. I also helped other group members formulate ideas on how to generate a PV curve for the solar panel using the proper equations.
  - **Noah:** Did some duty cycle calculations to see if our values from last week's booster circuit was matching what the equations say.
  - **Travis:** Created a PV model that could easily sweep from an open to a short on the output terminal. This produced a nice VI curve and with that data I could also make P/V curves. I made plots for five different irradiance levels.
  - **Steve:** Helped develop the simulink p-v model. Researched and provided documentation for the current used to determine the I-V curve. Tested and analyzed block diagram models

- **Individual contributions**

NAME	Hours this week	HOURS cumulative
Elika	13	30
Josh	12	27
Noah		
Travis	10	24
Steve	9	21

  - **Elika:** Spend quite a bit of time getting the MPPT model to work and helping Travis with the I/V and P/V curves. The MPPT is almost done but needs to be understood further. I designed a Matlab function that monitors the I and V values and adjusts them to make sure they're at the most efficient value possible.
  - **Josh:** Spent a fair amount of time getting together L and C calculations with various plots for the Boost converter. As well as helping Travis and Elika with some concepts on the I/V and P/V curves.
  - **Noah:** Did calculations on the booster circuit to see if what we were expecting was what we got in simulation. I also helped Elika finish up the MPPT model.
  - **Travis:** Most of my time was spent working on the I/V and P/V curves in the PV model.

What took the longest amount of time was trying to simulate all resistor values from open circuit to short circuit. I also spent an hour or so helping Elika get started on the code for the MMPT.

- **Steve:** Explored different options we can use to model an I-V curve with a simulink diagram. Attained an expression used to determine current flowing through the terminal of a solar cell

- **Plan for coming week**
  - **Elika:** Continue learning about the MPPT method and concepts. A large amount of understanding is absent on my part and this needs to be learned. Completing this task will show us the importance and need of maximizing our power potential.
  - **Josh:** I will spend a small amount of time adjusting some of the L and C calculations. Most of the time will be spent understanding the MPPT as well as getting an MPPT that can function in junction with a booster and chopper for the DC to DC conversion. This along with the understanding of the PV curves will be a large accomplishment.
  - **Noah:** Learn more about MPPT and what it changes in order to get maximum power. Work on the model and make sure it's performing as it should. Also help with the VI curves.
  - **Travis:** Remake the IV curves with resistor values rather than the ramp method I used. I need to plot those at different irradiance levels and with load lines. With this information I need to make the conclusion as to why MPPT is important and what it needs to do in order to generate the maximum power. I will also help with the MPPT model and try to clean up the file system we have on google docs.
  - **Steve**: Develop a solidified understanding of MPPT and its relationship to PV & IV curves. Update and improve the current simulink MPPT model then test and analyze the model. Spend time understanding DC-DC converter and the L and C calculations used to minimize the ripple effect

- **Summary of weekly advisor meeting (if applicable/optional)**

  This weeks meeting was very similar to previous weeks where we did not have the exact information that prof. Ajjarapu wanted. Everyone on the team feels that we have a good understanding of most of the material, we just need to present/show that to him. We briefly discussed our VI curves and spent most of the meeting discussing our circuit model. He spend some time talking about the model and defining what values are constant and what values can change. This is important because our MPPT has a limited amount of variables it can change in order to get maximum power. Next week will have better IV curves to learn why MPPT is important. We also discussed the minimum L and C values. The execution was slightly off, but the calculations and understanding was there so Ajjarapu was pleased. Last we talked about the MPPT model we started. Ajjarapu was less interested in how we implemented this because he doesn't feel we have a good enough understanding as to why we need MPPT, as well as what I needs to do. Next week we will clean up and present that VI curves and the MPPT.