EE 491 WEEKLY REPORT 5   *Date: 3-Oct. 2016*

Group number: May1727-28

Project title: Stand-alone Hybrid Solar/Wind Power Plant

Advisor: Dr. Ajjarapu

Team Members/Role:

Eric Cole - WebMaster
Brian Gronseth - Solar Tech lead
Mike Trischan - Key Concept Holder
Nathaniel Byrne - Group Leader
Jeffrey Szostak - Wind Tech Lead
Matthew Lee - Communications Lead

o   **Weekly Summary (Short summary about what you did this week)**

>We have been working to finish our simulations of our wind and solar systems. The existing solar files are not working properly and if they cannot be fixed this week will need to be scraped. Wind simulations are progressing but have hit a roadblock because we do not have a turbine we intend to purchase yet so we cannot accurately model it.

o   **Past week accomplishments (please describe as what was done, by whom, when)**

Met with Matt Post to talk about regulations for setting up a turbine around Coover hall. He still needs to talk with people at FPM, but it sounds like our best bet will be either Coover courtyard or Northwest corner of Coover. We still need to wait on him to move forward with this. Started a spreadsheet to analyze and compare wind speeds in the courtyard and NW corner to see which location will be viable for our project. Scheduled a meeting with Nick David to learn more about wind turbine simulation. Worked on a Simulink model for our system and made some good progress.
I was able to find a built in feature of Matlab that automatically calculates and plots the IV/PV curves of its solar panel blocks.
The wind team talked to the Coover Hall building manager about setting up a wind turbine in the courtyard of Coover. Started recordings of average wind speed in the courtyard and continued working on the simulink model.
"Everyone Tasks: Get access to 1102 Coover & 1301 Coover (power lab & senior design room) https://keys.ece.iastate.edu/rooms/index.php?page=login

Wind Team's Tasks:
1. Understand what Generator Speed is, if we can control it, and its relationship with Output Voltage.
2. Be able to draw a block diagram of the Wind Turbine system.
3. Email Nick David about a tour of the Wind Lab.
4. Establish communication with Matt Post about placing a Wind Turbine on the roof of Coover.
Solar Team Tasks:
1. Finish lab manual and understand its operation
2. Find where Isc and Iph are within model and analyze which is greater
3. Research temperature dependence of solar panels and why
4. Determine how MPPT is affected by battery connections, analyze how voltage fluctuates without MPPT, gain deeper understanding of MPPT
Once again, we will be meeting in 3043 Coover next Thursday (6 October) at 3p."

We met with Matt Post and discussed placing the Wind Turbine on Coover's roof. Matt Post was out of town for a week which was why we didn't meet up with him right away. We decided that would be too expensive and are now going to purchase a pole and place it either in Coover's courtyard or the NorthWest corner of Coover. We acquired an anemometer and began measuring the wind in those two locations. We created a spreadsheet for the data which we will refer to when deciding where to place the Wind Turbine and Pole.
We finished two portions of the Wind Simulink model (the input and output models), and are now attempting to combine the two models together.
We also did further research into Wind Turbines and poles which we can mount them onto.
We made progress in the Solar Simulink model and realized the cause to its current problem.

We set a date to meet with Nick David to discuss our Wind Simulink model and see how we might improve it. That will take place Tuesday, 11 October.

The two teams met with Professor Ajjarapu and Ankit Singhal Thursday and discussed our progress.

Solar team Simulated different scenarios in simulink to verify vi curves and tried to debug the battery model.

- ## **Pending issues (if applicable)**

All is well

We're running into issues on placing our wind turbine in the right location, red tape /policies from the University regarding university wide architectural design is completely interfering with our ability to put our wind turbine in a ideal location.

Simulink Block specifics

Getting approval for a wind turbine may well be impossible.

We can calculate the Wind at ground level around Coover, but we can't calculate the wind 20 or 30 feet up in the air.

- o **Individual contributions**

Name	Hours this week	Total	Contribution
Nathaniel Byrne, Group Leader	3.5	14.5	Matt doing a very good role with communication and administration.
Mike Trischan- Key Concept holder	5	15	Met with Matt Post to talk about regulations for setting up a turbine around Coover hall. He still needs to talk with people at FPM, but it sounds like our best bet will be either Coover courtyard or Northwest corner of Coover. We still need to wait on him to move forward with this. Started a spreadsheet to analyze and compare wind speeds in the courtyard and NW corner to see which location will be viable for our project. Scheduled a meeting with Nick David to learn more about wind turbine simulation. Worked on a Simulink model for our system and made some good progress.
Matthew Lee & Communications Lead	4.2	14.7	Worked on simulation of solar system and completing lab manual. Simulink project was not working and therefore could not finish. Need to finish lab manual again. Researched MPPT and how that works with our solar cells. Created weekly report.
Jeffrey Szostak, Tech Lead	5	18	I scheduled the meetings with Matt Post and Nick David. I also did research on Wind Turbines and poles which we can mount them onto. I also took wind datapoints around Coover.
Brian Gronseth Tech Lead	2	8	Simulated with and without mppt at different temperature and irradianice and recorded results to compare to the equations given by documentation
Eric Cole	4.5	16.5	Updated Simulink model to include the wind turbine equation that we hope to model.

- o **Comments and extended discussion**

NA
We are running into problems regarding the placement of our wind turbine. I think we could make the whole wind turbine system mobile along with the rest of the project. The only thing that isn't already on a cart is the solar panel. By having the entire system being mobile, we can avoid policies that regard the safety and architectural policies interfering with our design.
none
NA
None.
It is hard to move forward and produce results when the battery diagram decides to randomly work and not work. Hopefully we can resolve these issues to move on to hardware soon.

- o **Plan for coming week (please describe as what, who, when)**

Meet with Nick David, work on Simulink model, hopefully hear back from Matt Post, measure wind speeds.
Solar will continue to work on full simulations of our system, I will focus on building on the Working versions of the previous group's simulations. Wind will also do simulations and collaborate with a professional in the field.
Continue work on the Simulink model, hear back from the Coover building manager about approval for a wind turbine and then hopefully order a turbine.
All: Need to begin writing Project Plan V1.0 Request room access Solar Generate IV curves from simulated data Troubleshooting program Begin modeling a new battery circuit Finish lab manual (come up with improvements) Finish simulations Wind Meet with Matt Post (Tuesday) Talk to Mani about a budget Select a wind turbine Finish simulations Next steps, Finish simulation, get approval to install a turbine, combine models to make a hybrid system.
Meet with Nick David and hear his input as well as ask him several questions we have. Research different types of Wind Turbines. Specifically, we want Turbines which we can view its outputs electronically so it can be used for educational purposes. Determine which Pole we would like to use. Continue, and hopefully finish, the Wind and Solar Simulink models. Continue taking wind datapoints around Coover.
Make graphs of data after simulation and have a working model in simulink that includes battery storage component

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

Presented the progress mentioned above.
Presentation of our current progress.
Finally met with Ajjarapu, eager to get us to move to hardware. Worried that if we can't get a wind turbine approved we will have to focus more on the hybridization via simulation.
The two teams met with Professor Ajjarapu and Ankit Singhal Thursday and discussed our progress for a little over an hour. We shared what we've learned from Matt Post and why we should purchase a pole for mounting the Turbine. We discussed expenses pertaining to this decision. We discussed what type of pole and Turbine we should purchase. The type of Turbine changed a little bit

due to it being mounted on a pole versus on Coover's roof.
We showed them our Simulink models and received feedback pertaining to how the models could be improved.

Presented our data and received our new assignment for the upcoming week. Also verified our timeline.