EE 491 Weekly Report 8

3/27/18 – 4/3/18

Group 11

High-Level Design of a Distribution Microgrid

Client: Alliant Energy

Advisor: James McCalley

Nick Stitzell – Communications Engineer

Minoru Fernando – Research Engineer

Joe Thurin – Power Engineer

Taylor Murphy – Power Engineer

Remo Panella – Data Engineer

Project Objective:

Create an excel document that estimates the cost of incorporating distributive generation and storage into a microgrid system at Nichols, IA.

Weekly Summary:

This week we touched up the V2 prototype, since Alliant was unable to meet last week, and presented it to Alliant on March 27th. We also began our V3 prototype this week which will continue improving the accuracy in which we simulate and environment and calculate the solar generation and storage needed. This prototype will also begin designing a Matlab version of the prototype which will make calculations quicker and allow us to have a much larger simulation that goes for long periods of days rather than one week.

Past Week Accomplishments:

Last week we finalized the second version of the microgrid design prototype to change the daily load and demands to hourly load and demands. The prototype and further summarized and made clear the different solar generation and storage distributions for the simulated environment.

Pending Issues:

One issue is that we haven't been able to find accurate information on solar radiation storage and generation from the solar panels we are using. The technical specs that we received from Alliant give us the KWh from the panels, but not enough information about how varying solar radiation affects the panel generation.

A second issue is that we're not sure how we will model the simulation in Matlab, being that we have limited experience. We would like to have a chart with a list of inputs that can be edited, which when ran, will output a chart of similar nature to the excel prototype.

Individual Contributions:

Team Member	Contribution	Weekly Hours	Total Hours
Nick Stitzell	Continued improving the Project Plan, began preparing a tutorial for the prototype in the form of a PDF	4	33.5
Minoru Fernando	Began research and development of a solar radiation distribution chart on an hourly basis for different day models	6	29
Joe Thurin	Finished V2 prototype, Extended simulation to 7 days on an hourly basis, created a summary of each day's simulation	9	43
Taylor Murphy	Continued modeling solar radiation and generation in Nichols, IA, assisted with Matlab prototype	4	29
Remo Panella	Began implementing excel simulation calculations into a Matlab prototype, research coding tools and language to create simulation	5	29.5

Plans for the Coming Week (3/27/18 – 4/3/18**):**

- Nick
    - Continue working on the tutorial
    - Begin a powerpoint or some other presentation for the panel

- Remo
  - Continue creating a Matlab chart with inputs that model the same simulation as excel
- Joe
  - Assist with Matlab simulation model
  - Begin Nichols calculations for variable supply (80%, 90%, 100%)
- Taylor
  - Begin Nichols calculations for variable supply (80%, 90%, 100%)
  - Add solar and load profiles to daily models
- Minoru
  - Assist with Matlab simulation model
- Alliant Energy

Summary of Client Meeting (3/27/18):

- Happy with the direction of the excel prototype.
- Matlab will be used to check that our calculations are accurately representing quantities of panels and batteries
- Create charts that attach visuals to the outputs for easier interpretation of the data
  - be able to be understood by a client
  - Geographical illustration of the town?
  - Include as many illustrations as possible to increase understanding
- Use peak day loads for Nichols
- 4 months of load data available for Nichols in 15 minute samples
- Winter, summer, and spring profiles available for us in the fall semester
- For presenting to panel at end of semester
  - Solar panels are becoming a testable option for providing power to small towns
    - Is this more cost effective than current methods?
    - What makes it more or less cost effective?
    - To what capacity of the load do you supply power for the town?
    - What sort of days/conditions are troublesome for the microgrid powered by solar panels?
      - Not necessarily peak and low generation/load days since this is how the microgrid is being designed
        - Possibly a string of medium days?
- Currently using arbitrarily generated simulation days due to a lack of extensive data, which will be provided next semester
  - This semester is being used to create a model which works for Nichols once we receive the data and will be able to use for future projects.