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EE 491 Weekly Report 5

2/20/2018 – 2/27/2018

Group 11

High-Level Design of a Distribution Microgrid

Client: Alliant Energy

Advisor: James McCalley

Nick Stitzell – Communications Engineer

Minoru Fernando – Economics Engineer

Joe Thurin – Power Engineer

Taylor Murphy – Research 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.

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### Weekly Summary:

This week we finalized our first version of the prototype. This prototype was brought into our client meeting and discussed down to the letter. During the meeting, our team concluded that the simulation of the system is increasing in importance. Whereas we were focusing on the design of the physical system, we are now shifting at least some of our focus towards modeling the conditions of our system. In a typical grid connected system there isn't quite as much need for 100% confidence in the system as there is in an island system. This system needs to be confident, so we will focus on simulating the environment as well.

### Past Week Accomplishments:

Last week we began compiling our research into a spreadsheet to begin our prototype. We started with creating our input and output parameters and then started modeling a simulation that

takes all the effects of the environment on the system and interacts with the demand curve given to us by Alliant.

**Pending Issues:**

The only issue we encountered this week is a small number of data points. Because our current demand curve is only based on one day, we don't have a confident way to extrapolate this information to a 30 day demand. We hope to receive more specific information down to the hourly demand.

**Individual Contributions:**

<b>Team Member</b>	<b>Contribution</b>	<b>Weekly Hours</b>	<b>Total Hours</b>
Nick Stitzell	Created a Design Document for the project team and its accomplishments up until this point, updated project website, created weekly status report, communicated with Alliant Energy corresponding to receiving more information about the demands of the system	7	21.5
Minoru Fernando	Looked into creating more solar categories and regression equations to apply to the simulation	6	13
Joe Thurin	Began creating the spreadsheet and began research on the load and solar day for future prototypes	7	17
Taylor Murphy	Researched battery options for the simulation and found calculations for the quantity of batteries needed for the system	6	14
Remo Panella	Worked on final product research and input/output design for	7	13.5

	the simulation and prototype		
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#### Plans for the Coming Week (2/27/2018 – 3/6/2018):

- Nick
  - Finalize Design Document V1
- Remo
  - Continue updating the prototype and designing the simulation for hours
- Joe
  - Assist with Design Document V1
- Taylor
  - Apply a solar radiation profile into the simulation
- Minoru
  - Research further environmental effects on the system and data on solar radiation charts
- Alliant Energy

#### Summary of Client Meeting (2/27/2018):

- Battery efficiency
  - Add a description with where the information comes from
  - Possibly look into battery power leakage over periods of non-use
- Load shape (hourly) will come from Alliant
  - Varying load profile for days of the week?
  - Varying load profile for months of the year?
- Solar Generation graph from Alliant
  - 24 hour?
- Medium = 60% generation
- Low = 10-20% generation
- High, medium, and low solar day quantities for simulation will be looked into by Alliant
- Nichols is almost entirely residential as far as consumers go
- Create simulation for all scenarios. Certainty of system must be more confident.