EE 491 Week 8 Report - sddec18-03

Design of a More Reliable Power Grid for Puerto Rico

3/19/18 - 3/26/18
Faculty Advisor: Vikram Dalal

Team Members

Logan Lillis - *Communications and Reports Lead*
Ricardo Rodriguez-Menas - *Webmaster and Project Plan Lead*
Heiqal Zamri - *Test Engineer Lead*

Weekly Summary

On Monday March 19th, we had our weekly meeting in the TLA. During this meeting, we discussed and combined much of the information we've collected into a presentation for Dr. Dalal, which we presented on Thursday, March 22nd. We also planned our third lightening talk and discussed new research findings.

Past Week Accomplishments

- Create Slides for Professor Dalal
  - Gas Turbines - Cal
  - Flywheels - Cal
  - Energy Storage and its applications - Ricardo
  - PREPA's interconnectivity - Ricardo
  - Natural Gas Deliquification Port - Logan
  - Economics and costs of oil imports - Logan
- E-mail slides to Professor Dalal for meeting - Ricardo
- Meet on Tuesday, 3/6 to work on group senior design reflection - codes of ethics.
- Begin thinking of a technical challenge for the lightning presentation after Spring Break.
- Begin looking into company connections between PREPA and USA
- Begin looking into cost comparisons between generating using natural gas and oil

Pending Issues

- Lack of research on costs associated with implementing and building components of grid
  - Will continue to look into
- Need to decide energy storage options
  - Ricardo will make decision based on research for Lightening Presentation on 3/27

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours

Logan Lillis	• Writing, Formatting, and Submission of weekly reports
	• Creation and formatting of Slides for 3/22 meeting
	• Natural Gas and Renewables:
	  ○ Solar Irradiance: Found files of all solar irradiance data in order to calculate longest periods w/o enough sun to make solar viable
	  ○ Con: this data is MASSIVE - 1 file per day for 2009-2018 with 408,000+ readings per day. To fix- choose specific latitude and increments to focus research on
	  ○ Average MJ/m^2/Day dependant on mainly latitude
	  ■ **18:** 20.5-22 MJ/m^2/day
	  ■ **18.2:** 18 MJ/m^2/day
	  ■ **18.5**: 19.5-20.25 MJ/m^2/day
	  ○ Looked into whether fixed, 1-axis tracking, or 2-axis tracking would be most beneficial and cost effective
	  ■ Contacted AES - their solar farm is a fixed axis. Their response:
	  ■ Our plant is a 23.7 MW solar plant, consisting of 100,800 polycrystalline modules, fixed on both axes. The plants needs a minimum level of 23 W/m^2 to start generating, and after that, the power level increases linearly with the solar irradiance up to 20 MW, which is the maximum power allowed under our Power
		8	37

	Purchase Agreement (PPA) with the Puerto Rico Electric Power Authority (PREPA). The generation hours will vary with the seasons (time of sunrise/sunset) and with cloudiness, but every day we have generation even if it is at a lower level. ■ They also sent November 2016 data, the lowest solar irradiance month since the site started, i.e “Worst Case” conditions ○ Natural Gas: Imports from Trinidad and Tobago ● Edited Project Plan ○ Formatting, Re-writing sections of all sections (1-4)		
Ricardo Rodriguez-Menas	● Project Plan Editing ● Studying Energy Storage ● Code of Ethics Outline (Standards)	5	30
Heiqal Zamri	● Project Plan Editing ● Including new ideas and research that we had done such as new information about natural gases in puerto rico ● Location, presence, function ● -Filling out empty topics that couldn’t be filled previously in the project plan such as the task approach and test plan ● Included gas turbines that we had presented to Dalal into the project plan such as the main manufacture of America being Siemens. ● Quick research on prices of natural gases ● Natural gases in America ranges throughout different states and from the article that was read, it was given the prices of natural gas for each state for specific time period.	4	24

Plan for Upcoming Week

- Create presentation for lightening talk on 3/27
  - Topic: Technical Challenge
  - Delegated Presenter: Ricardo
    - Will talk about energy storage
- Intensive research on Renewables, Energy Storage, and Natural Gas
  - Heiqal: energy storage
  - Logan: natural gas and renewables
  - Ricardo: Implementation
- Create Slides for Professor Dalal's meeting 3/22
  - Gas turbines - Heiqal
  - Flywheels - Heiqal
  - Energy Storage - Ricardo
  - PREPA's interconnectivity - Ricardo
  - Nat Gas Deliquification Port - Logan
  - Economics/cost of oil imports - Logan