

## sdmay19-46: Impact of High Photovoltaic Penetration on Distribution Systems

Advisor: Dr. Ajjarapu

Week 7 Report

October 17 - October 24

### Team Members

Daniel Tott - Team Leader

Nathan McGlaughlin - Webmaster

Jasleen Grover - Key Concept Holder 1

Minsung Jang - Key Concept Holder 2

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### Summary of Progress this Report

Began working on implementing IEEE's 13 node test feeder in GridLab in our file 13node.glm. Everybody researched more into working with GridLab to account for the addition of components in more realistic systems such as voltage regulators and capacitors. Also learned how to work with larger distribution systems in GridLab with multiple line spacings and configurations to account for. Created a skeleton of the code for 13node.glm to account for all the components that would need to be included in the code in order to run a power flow in GridLab.

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### Past Week Accomplishments

#### Daniel:

- Researched implementation of capacitors, voltage regulators, and switches in GridLab-D
  - In order to include capacitors, voltage regulators, and switches in our implementation of IEEE's 13 node test feeder in GridLab-D, I learned how these components were defined in GridLab-D. The capacitors need to be defined as part of the object loads, and are simple three phase impedances. The voltage regulators are similar to defining transformers as the configuration needs to be defined first, and includes the time the regulator runs, and the position of the taps, among other things. The object definition for the regulator itself simply states the position of the regulator, and which load it is sensing. The switch is a simple object that defines which nodes/loads it is between, and can either be defined as "OPEN" or "CLOSED".
- Created a skeleton of the code for IEEE's 13 node test feeder "13node.glm"
  - Accounted for all the objects that would need to be included in order to have a successfully running system in GridLab-D. In all, 54 objects need to be defined, which I placed in order according to a coding format that we agreed upon. The distribution system has 13 nodes, a switch, a transformer, and a voltage regulator, along with the line configurations, line spacings, conductor definitions, and definitions of the lines themselves. There are also capacitors to be accounted for in two of the nodes, both of which are loads. Two objects were also accounted for at the end to extract the voltages and the currents.

#### Nathan:

- Figured out how to access GridLab on my laptop
  - With the help of the ETG team I got a virtual machine for our group that I used to download GridLab onto.

- Researched implementation of 13 node test feeder in GridLab
  - Studied how regulators and capacitors work in GridLab.

**Jasleen:**

- Got access of the software.
- Learned how to code on the new software (Grid Lab D)
- Researched different site that can help learn the software.
  
- Started to work and understand Grid Lab D and learned how to implement the 4 bus problem on the software.

**Minsung:**

- Learn how to implement 13 node bus system on GridLab D
    - I could get 13 node bus system file on IEEE website. Learn how the 13 node bus system with transformer, regulator and switch are consisted as a code and consider how to apply our version of 13 node on the file.
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**Pending Issues**

None

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**Plans for Upcoming Reporting Period****Daniel:**

- Assign the objects for 13node.glm to the group members
  - Will evenly distribute the objects that need to be defined amongst the group members
- Add a voltage regulator to the 4 node distribution system in GridLab-D
  - A GridLab-D version of the voltage regulator that was previously added to IEEE's 4 node test feeder will be added to our code for 4node.glm. The voltage regulator will need to run autonomously, and match up with the adjustments that were made by hand in MATLAB.

**Nathan:**

- Prepare to implement 13 node system
  - Study GridLab code structure and code the 13 node system

**Jasleen:**

- Prepare for the presentation for the advisor and the client.
  - Learn more about the Grid Lab D software and improve on my coding skills.

**Minsung:**

- Make sure 4 node with regulator and 13 node bus system works
    - Restudy how to calculate 4 node system by hand, and check the MathLab code and GridLab D. Also check how 13 node bus works, and its GridLab D code.
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## Individual Contributions

Team Member	Contributions	Weekly Hours	Total Hours
Daniel Tott	-Researched implementation of capacitors, voltage regulators, and switches in GridLab-D -Created a skeleton of the code for IEEE's 13 node test feeder "13node.glm"	6	55
Nathan McGlaughlin	-Access GridLab on Laptop -Research GridLab coding for 13 node test feeder	6	51
Jasleen Grover	-Got access of Grid Lab D on MAC book - Did coding in matlab to get the bigger bus systems to GridLab	7	51
Minsung Jang	-Learned how 13 node with regulator, switch, transformer works on the bus system, and how they represent on the code.	6	44

## Gitlab Activity Summary

### Gitlab Report

- Created 13node.glm, and made a skeleton of the code - Daniel