

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

Advisor: Dr. Ajjarapu

Week 6 Report

October 12 - October 17

Team Members

Daniel Tott - Team Leader

Nathan McGlaughlin - Webmaster

Jasleen Grover - Key Concept Holder 1

Minsung Jang - Key Concept Holder 2

Summary of Progress this Report

This week we corrected our code for IEEE's 4 node test feeder in GridLab-D. The transmission lines for the system were updated so that the power flow could be run correctly. There were also commands added to extract the voltages and the currents of the system, so that the values could be compared to IEEE's values, which were matching. The work with IEEE's 4 node system by hand was wrapped up, as we correctly were able to add the voltage regulator to our computations, and run the power flow.

Past Week Accomplishments

Daniel:

- Updated GridLab-D Code for 4node.glm to include transmission lines
 - Previous version of the GridLab code for IEEE's 4 node test feeder did not have properly set up transmission lines. Researched how to fix this problem, and wrote code for two objects for the two transmission lines along with the line configuration. With properly defined transmission lines, our code for 4node.glm was able to run the power flow for the 4 node system.
- Added commands to 4node.glm to extract voltages and currents
 - Code for 4node.glm had no commands to extract the needed voltage and current data. Added lines for voltdump and currdump to get the voltages for the 4 nodes, and currents of the 2 lines.
- Solved the IEEE 4 node test Feeder with voltage regulator in MATLAB
 - Corrected the input information for the voltage regulator to account for the correct position of the regulator being between the transformer and node 3 instead of between node 3 and 4. With the correct position, the impedance of the transmission line between nodes 3 and 4 did not affect the voltage regulator, and the power flow was able to be solved accurately.

Nathan:

- Solved IEEE 4 node test feeder with voltage regulator in Matlab
 - Solved the system using the forwards backwards method. Started by hand and then transitioned to Matlab.

Jasleen:

- Solved the 4 node problem using matlab.
 - I was assigned to solve the 4 bus IEEE system and was asked to find the voltages at every bus using iteration method. After doing the hand calculation I coded the related equations in matlab so that I could do the same calculations using my program.
- Started coding for 4 bus system without regulator in GridLab D
 - After completing the 4 bus problem our advisor asked us to add a regulator in the middle of the 2 buses in order to understand the working and the function of a regulator. We started using the GridLab D after we were done solving the 4 bus IEEE problem with a regulator by hand, I am in the process of learning how to code in GridLab and put together the bus configuration.

Minsung:

- Studied IEEE 4 node test feeder with voltage regulator
 - Downloaded IEEE 4 node test feeder with regulator file on IEEE website, and understood how it works as a coding. Compared the matlab file with the hand calculation that we did.
 - Change test feeder file as our 4 node feeder system and run GridLab D
 - We need to fix the code as our version. After it run the code on GridLab D to check it work properly, and compare data with our hand calculation data.
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Pending Issues**Nathan:**

- Getting access to GridLab

Jasleen:

- Get access to GridLab on my laptop. I was not able to download GridLab D on my laptop due to some IOS limitations. After consulting with ETG, my group member and I were finally able to get access of the software on our computers.
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Plans for Upcoming Reporting Period**Everyone:**

- Research capacitors, regulators, and switches in GridLab-D
 - Over the next week we will begin work on IEEE's 13 node test feeder, and implementing it in GridLab-D. The 13 node system will contain three new components in capacitors, regulators, and switches. We need to gain an understanding of how to define these three components in GridLab-D.

Daniel:

- Create skeleton for IEEE's 13 node test feeder in GridLab-D
 - Over the next two weeks, we are planning to complete IEEE's 13 node test feeder in GridLab-D. For the next week, I will create a skeleton of our code by accounting for all the objects that need to be defined to make the 13 node test feeder work correctly. The objects will then be

assigned to group members, and they will study how to define them, which will be done the week after.

Nathan:

- Figure out how to access GridLab on Mac
 - Two of our members need to be able to use GridLab in order to have a successful project

Jasleen:

We have started looking into the 13 bus IEEE system and are understanding its working and learning how to implement that on the Grid Lab D software.

Minsung:

- Figure out how works 13 Node bus system
 - We got new assignment that to understand 13 node bus system. It is hard to calculate with hand, so using 13 node file on IEEE website and understand how to implement.

Individual Contributions

| Team Member | Contributions | Weekly Hours | Total Hours |
|--------------------|---|--------------|-------------|
| Daniel Tott | -Updated GridLAB-D Code for 4node.glm to Include Transmission Lines -Added Commands to 4node.glm to Extract Voltages and Currents -Solved the IEEE 4 Node Test Feeder in MATLAB | 7 | 49 |
| Nathan McGlaughlin | -Researched how to code in GridLab D -Reviewed 4 bus regulator problem in MatLab | 7 | 45 |
| Jasleen Grover | -Researched and learned how to code in GridLab D. -Did GridLab D coding for a 4 bus system. -Reviewed the 4 bus problem with regulator and did suitable corrections. | 7 | 44 |
| Minsung Jang | - Reviewed 4 bus with regulator system by hand and Matlab code - Learned the code to simulate 4 bus system and how to run GridLab D program. | 7 | 38 |

Note:

-We ALL are given the same task by our advisor professor Dr. Ajarapu and hence our contributions towards the project are similar and not unique to every individual group member . So for instance we all

were told to solve a 4 bus system problem so that in future when we simulate data on GridLab D we know how things are actually working. So we ALL solved the SAME EXACT PROBLEM TOGETHER. In future weeks we will start having different individual contributions as we work on different parts of the project in GridLab D.

Gitlab Activity Summary

Gitlab Report

- Updated 4node.glm - Daniel
 - Added two objects for the transmission lines, and one object the line configuration.
 - Added voltDump and currDump commands to extract voltages and currents for the 4 nodes and two lines.