

EE/CprE/SE 492 BI-WEEKLY REPORT 2

2/11/24 – 2/24/24

Group number: sdmay24-18

Project title: 115/34.5 kV Solar Substation & Design

Client &/Advisor: Black&Veatch/Dr. Ajarapu

Team Members/Role:

Eli Schaffer / Team Leader

Baylor Clark / Team Organizer

Liam Gossman / Client Correspondent

Eduardo Jimenez-Tzompaxtle / Submission, Research and Testing Leader

Chicheng Tang / Research and Testing Leader

Siti Mohd Ratzi (Bell) / Recorder and Testing

○ **Weekly Summary**

The group mainly continued on our tasks from last week. The main objectives for this week were to finalize main equipment selection, update the substation one-line, and verify ETAP calculations. The group finalized most of the substation equipment selections, while also looking into protection relays that would best fit with our setup. We initially encountered issues when trying to access ETAP, however we were able to get it working by the end of the week and verify its computational accuracy with a simple power flow scenario. Our industry client, Black and Veatch, also provided us with several calculation templates to fill out for various substation requirements. We were able to make good progress with these calculations and will continue to work on them for the next few weeks.

○ **Past week accomplishments**

- Eli: Worked on finding cut sheets and datasheets for one-line components, updating the one-line and other AutoCAD drawings. Spent a few hours working on finding these datasheets.
- Baylor: Took time to think about what the next steps are on the autocad drawings. Looking into the most crucial tasks in the upcoming weeks.
- Liam: Found remaining substation equipment including low-side metering transformers, lightning arresters, and station power transformers. Continued research on protection relays.
- Eduardo: Justified ring bus configuration and drew up AutoCad drawings of the plan view
- Bell: Working on starting on calculations : grounding, ac load, dc load, bus and some cost analysis calculations.
- Chicheng: Do the basic research about the Grounding type, and also try to verify the ETAP.

○ **Pending issues**

- Eli: Wanting to set up preliminary deadlines for drawing sets and other tasks we are looking to complete this semester.
- Baylor: ETAP onboarding and list of simulations needed to be run by the end of the semester.
- Liam: Need to research protection relays from other vendors. Need to find appropriate pricing estimates for substation equipment.
- Eduardo: Adding the rest of the ring bus plan view components for transformer, switchgear, circuit breaker, and conduits. Draw up a side view of the plan view in AutoCad
- Bell: Incomplete parameters and data to start on the calculations. Working on estimating the outer dimension of the substation fence to start on grounding calculations.
- Chicheng: Make sure ETAP runs properly.

○ **Individual contributions**

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours these weeks</u>	<u>HOURS Cumulative This Semester</u>
Eli	Presentation set-up, ACAD updates, Equipment Datasheets	9	31
Baylor	ACAD Updates, ETAP Onboarding, Calculation Research	6	27
Liam	Substation equipment and relay research/selection	6	30
Eduardo	AUTOCAD top plan view, ring bus research and justification	7	30
Bell	Working on the calculation sheets for grounding, bus, ac, and dc load calculation, setting up parameters and putting up the equations	7	36
Chicheng	ETAP	3	27

○ **Plans for the upcoming week**

- Eli: Working on creating equipment schedules for both the PV equipment and substation equipment.
- Baylor: ETAP power flow model for our PV farm. Calculation documents research and implementation.
- Liam: Search for realistic pricing on substation equipment and look into relays from alternative vendors.
- Eduardo: Add more components to the 115 kV bus line in the plan view, and draw the side view of the plan view for more details
- Bell: Further progress on calculations, providing substation fence outer dimensions to start on grounding calculations, setting up more parameters, equipments data and ratings, and equations for the calculations: AC load, DC load, Grounding and bus calculations.
- Chicheng: Modeling our project into etap.

○ **Summary of weekly advisor meeting**

This week the team met with our faculty advisor, and we summarized our AutoCAD drawings and updates as well as talked about if we were getting comments back from our industry professionals. We explained that we got feedback from them every week and then also sent our industry professionals a “sheet set” every few weeks to keep them updated. We tried to work in ETAP and were having issues with it. We told him this and that we were able to meet with ETG to resolve this issue. He also mentioned that we should be aware of our actions and the reasoning behind them.

Broader Context

1. Have we identified or become aware of new effects?
 - i. Disposal of PV cells and how they are dealt with. The US recycles both the glass and metal frames from old solar panels that have reached the end of their life cycle.
2. How can we argue for or provide evidence of positive effects?
 - i. One of the positive effects for our solar farm and substation is the mutual understanding of renewable energy between nations and states so that we can contribute to each other for a better future. One example of this is that the US imports most of its solar cells from Southeast Asia which leads to us being diplomatic with each other ([1](#)).
3. How can we address or justify negative effects?
 - i. The negative effects considered by the group are minimal when considering the broader context of power production. A very prevalent political topic is climate change and the amount of clean energy consumed. While there are downsides to the production of PV Cells the technology is improving and also the total negative impact on the environment is minute compared to non-renewable energy production.
4. Meet with your client and advisor to discuss your updates:
 - i. B&V said: Looks good but add more on the global impact and to consider making a comparison between solar and other forms of energy generation.