

## EE/CprE/SE 492 WEEKLY REPORT 3

**Start Date – End Date:** 3/6-3/24

**Group number:** 27

**Project title:** 60 MW Solar Field and 34.5/115 kV Substation Design

**Client &/Advisor:** Black & Veatch advised by Ajarapu

**Team Members/Role:** Omer Karar, Madison Lakomek, Madissen Lawrence, Jacob Miller, Brooke Nelson, Ashton Randolph, Jenna Runge, Zachary Zimmerman

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### Weekly Summary

This week updates were made to the calculations that were started in the previous weeks. The bus calculation was slightly changed to show where the variables were taken from. The battery calculations were also finalized using the battery sizing website. The trench fill was also updated based on comments given by B&V last week. The key plan was also started based on the one line. For this, dimensions between the equipment was decided and all pieces were put into place.

### Past week accomplishments

- Bus Calculations - Zachary
  - Made adjustments to the calculations based on the comments provided by the clients and my understanding after going through them a second time. These calculations can be finalized after the key plan is completed.
- Battery Calculations - Madissen and Jenna
  - Made corrections to the battery calculations and used the battery sizing program from Enersys
  - Found a battery for our system and got the racking system layed out. Battery racking and sizing reports were generated and saved for our records.
  - The battery calculations are officially completed
- Key Plan - Madison & Jacob
  - Added all the components based on our one line to a blue beam plan
  - Researched distance between pieces to understand how far each component needs to be from each other
  - Placed components and distance labels in bluebeam
- ETAP
  - ETAP was having technical issues that did not get resolved until 03/20 therefore little simulation progress has been made.
- Trench Fill Calculations
  - Calculated Gause area and determined AWG cable standards for:
    - Transformer
      - AC Power
      - AC Test
      - DC Power
      - Control

- Fiber Optic
- CT
- Sump Pump
- Breakers
  - Control
  - AC power
  - PT
  - CT
- Yard Lighting
- Disconnect Switches
  - Power Cables
    - AC
    - DC
  - Control Cables
- Capacitor Banks
  - Power Cables
    - AC
    - DC
  - Control Cables
- CCVT
- Station Service Transformer

### Pending issues

We still need to finalize the distances between the pieces and how far the fencing should be around the components. We are waiting on B&V to review the key plan before more changes can be made to ensure the spacing and design looks correct. We also need to begin working on the battery calculations, grounding calculations, three line and grounding diagrams.

### Individual contributions

*\*this should be short and concise based on past week accomplishments. Instructions say do not include group meetings*

Name	Individual Contribution	Hours in the Past 2 Weeks	Hours Cumulative
Omer Karar	I didn't make any progress due to attending the NSBE regional convention outside the state.	0	13
Madison Lakomek	Made key plan	10	23
Madissen Lawrence	Led $\frac{3}{8}$ meeting,	6	20

	finished battery calculations		
Brooke Nelson	Worked on trench calculations	5	19
Jacob Miller	Researched multiple organization's documentation on component placement for the key plan. Updated one-line/CT diagram. Made rough key plan in AutoCad, took meeting minutes 3/22/23	10	28
Ashton Randolph	Finalized Trench Calculations	5	19
Jenna Runge	Completed battery calculations, took meeting minutes for 3/3/23 meeting.	5	19
Zachary Zimmerman	Worked on bus calculations/etap research	5	18

### Plans for the upcoming week

(Please describe duties for the upcoming week for each member. What is(are) the task(s), Who will contribute to it? Be as concise as possible.)

**Omer Karar-** I will be working on either the ETAP progress or the grounding calculations, whichever needs my help more.

**Madison Lakomek-** I plan on continuing working on the key plan by finalizing distances between all the components and adding any missing labels to the diagram.

**Madissen Lawrence-** I will continue to update our website with the biweekly reports, and I plan on beginning (and hopefully finishing) the grounding calculations.

**Brooke Nelson-** I plan on leading the team meeting, I also plan on taking the calculations and reformatting them into a report style.

**Jacob Miller-** Continue to add details to the key plan (PT, Cable trench, fence), then begin the ground calculations in order to progress.

**Ashton Randolph-** I plan on working on ETAP with Zach and trying to get the solar farm simulation completed

**Jenna Runge-** I plan to start work on grounding grid calculations.

**Zachary Zimmerman** - Now that ETAP is working in the senior design lab, I plan to begin working on our simulation of the solar farm and solar plant. The goal is to have the solar farm completed by the end of the week and begin working on the substation. Once the initial design is completed, I can begin conducting load flow, arch flash, and short circuit studies.

### **Summary of weekly advisor meeting**

The meeting on 03/08 we discussed the ETAP software as well as all of the progress we have made thus far this semester. We discussed how we could successfully portray our efforts to the industry panel by including key design decisions and calculations made by our group.

The meeting 03/23 we presented the key plan that Maddy has been working on. We also showed the PV solar design. We discussed creating an additional diagram that depicts how the inverters from the PV side connect into the three different feeders on the substation side. Creating this diagram will help illustrate how the solar farm and the substation are being connected more clearly. In addition we spent time discussing the importance of the load flow, arch flash, and short circuit studies that we will be performing during the ETAP simulation process.