

EE 491 Weekly Report 10

Start Date: April 10

End Date: April 16

Group number: 18

Project title: Utility Scale Lithium-Ion Energy Storage Project

Client: Burns and McDonnell

Faculty Advisor: Zhaoyu Wang

Team Members/Role:

- ❖ Oksana: Leader—responsible for keeping the team on track; cable sizing and cable schedule report.
- ❖ Sarah: Organizer—responsible for revising, editing, and helping keep track of all our reports; one-line diagram design and one-line diagram report
- ❖ James: Document Report—responsible for the submission of our reports; Inverter quantity; one-line diagram design and one-line diagram report
- ❖ Cole: Point of Contact/Communicator—responsible for meeting and contacting the clients and faculty advisor; AutoCAD site layout design and site layout/ technology justification report.

Weekly Summary:

This week, we worked on creating reports for the client so we can keep track of all the progress we have completed so far. We worked on creating a cable schedule, a one-line diagram report, an equipment selection and justification report, and a site layout report. We also finalized the one-line diagram and the cable sizing calculations.

Past Week Accomplishment:

As a group:

- Worked on one-line diagram report
- Continued calculating cable sizing
- Technical documentation for the client
- Add legend and notes to one-line

Individually:

- James: one-line diagram in AutoCAD and equipment and justification report
- Cole: Worked on AutoCAD file to include the location of the cables
- Oksana: Cable sizing calculations and cable schedule
- Sarah: Technical documentation for the client, one-line diagram report, and updating the team website

Pending Issues:

We need to set up a final meeting with our faculty advisor.

Individual Contributions:

Name	Individual Contribution	Hours this reporting period break down	Total hours for the week	Total Hours
Oksana Grudanov	<ul style="list-style-type: none"> - Calculate cable sizing - Cable Schedule - Weekly Report 	2.5 (Cable sizing math and cable schedule report) 2.5 (Weekly meetings) 1.0 (Weekly report)	6.0	56.0
Sarah Ebert	<ul style="list-style-type: none"> - Technical documentation for our client 	2.5 (Weekly meetings) 2.0 (Documentation)	4.5	48.0
CJ Dustin	<ul style="list-style-type: none"> - AutoCAD Cable routing - Cable length 	2.5 (Weekly meetings) 1.5 (Cable routing)	4.0	49.5
James Mendenhall	<ul style="list-style-type: none"> - One-line Diagram - Client Final Documentation 	2.5 (Weekly meetings) 2.0 (Client Final Documentation)	4.5	49.5

Plans for the upcoming week:

- Continue to work on the technical documents for the client, including the cable schedule, one-line diagram report, equipment selection and justification report, and the site layout report.
- Work on sizing cable lengths for the conduit in AutoCAD based on the NEC code 2020 table 300.5 and 300.50

Individual Assignments for the upcoming week:

Oksana: Finalize cable schedule report.

Sarah: Compile our work in a technical report for our client. I will also work on our team presentation.

Cole: Adding the vertical offset for the cable length for all of the electrical components

James: Work on the design documentation for Burns & Mac

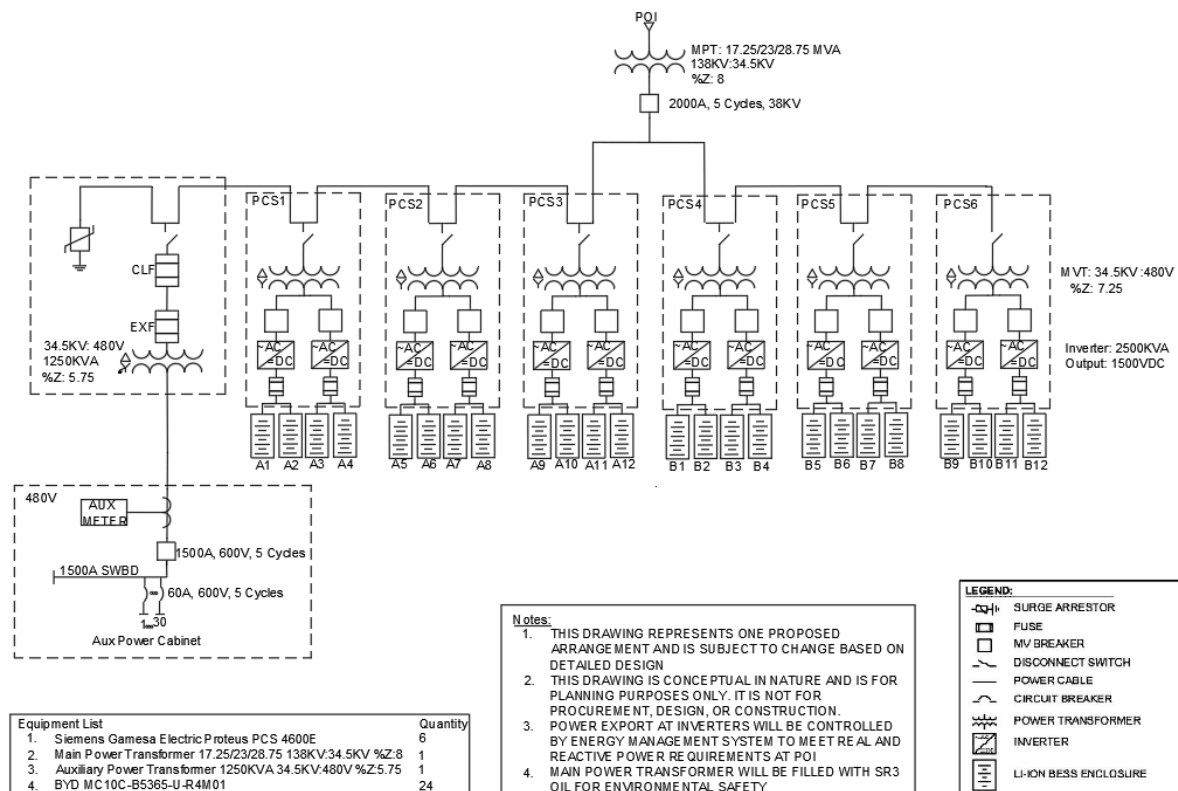
Summary of weekly advisor meeting:

We will not be meeting with our advisor this week as he has been pretty busy. We will set up a meeting for next week to talk about the project and the final presentation for this project.

Summary of weekly client meeting:

In this week's meeting, we talked about the cable schedule report we created. We highlighted a few more areas we could add to make the cable schedule more professional and by the standard for electrical engineers. We discussed the few cables we have not mentioned in the diagram, such as communication wires, and discussed where the aux power cabinet cables would go. We also discussed how to measure the cables' lengths in a conduit (underground) and how we are expected to size their lengths according to the NEC code tables 300.5 and 300.50. Finally, we discussed the one-line diagram report we created and our final meetings for the semester. After our final presentation, we will schedule a brief meeting with the client to discuss how it went and where we will start when next semester rolls around.

One-line Diagram:



Cable sizing calculations:

$$P = \sqrt{3} \times V \times I \times PF$$

$$\rightarrow I = \frac{P}{\sqrt{3} \times V \times PF}$$

Assumptions:

- Aluminum lines
- PF = 1.0 (worst case scenario)
- Low V side - use min V to Calc. max Amps in line
- Directly buried in Earth
- Using ambient temp of 40°C for low-voltage lines

References from NEC code 2020 version

Medium voltage : Table 311.60(C)(86) - Pg. 180

- MV105
- two circuits
- Triplexed - directly buried in Earth

Low voltage : Table 310.16 - Pg. 164

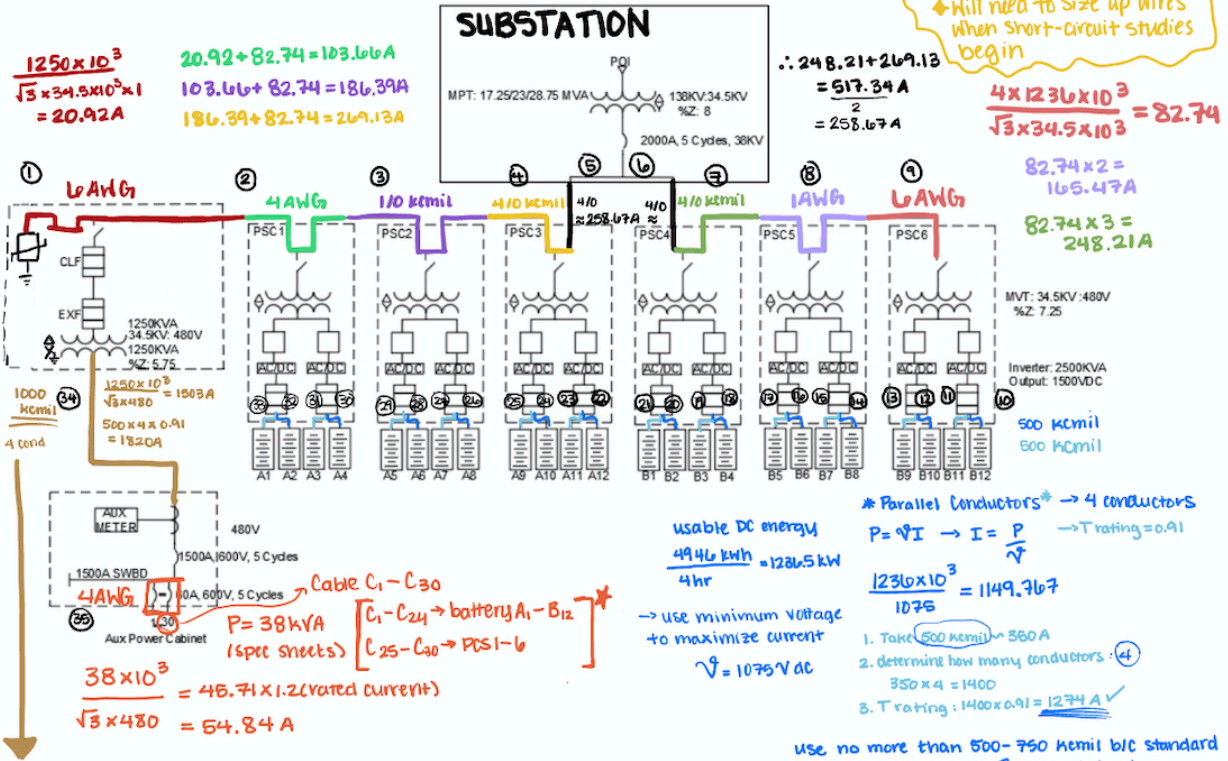
- Aluminum
- 90°C rated temp

Ampacity correction factors

- Table 310.15(B)(1) - Pg. 162
- Correction factor = 0.91

NOTES:

- Communication cables not included
- Will need to size up wires when short-circuit studies begin



- * 1503A → doesn't go up that high; need more conductors/phase
- 1. Choose conductor size - 1000 kcmil ~ 500A
- 2. multiply ampacity by # of conductors - 4/phase
- 3. multiply by T rating - 0.91
- 4. size up; NOT too much ~ 1820A ✓

* Parallel Conductors → 4 conductors
 $P = \sqrt{3} I \rightarrow I = \frac{P}{\sqrt{3}}$ → T rating = 0.91
 $\frac{1236 \times 10^3}{1075} = 1149.767$
 1. Take 500 kcmil ~ 500A
 2. determine how many conductors: 4
 $350 \times 4 = 1400$
 3. T rating: $1400 \times 0.91 = 1274A$ ✓
 use no more than 500-750 kcmil b/c standard wiring for DC batteries. Battery window has max size of cables that will fit.