

BI-WEEKLY REPORT 4

MARCH 1, 2021 - MARCH 15, 2021

SDMAY21-37

115/34.5KV SOLAR POWER PLANT & SUBSTATION DESIGN

CLIENT: BLACK & VEATCH

FACULTY ADVISOR: DR. VENAKATARAMANA AJJARAPU

GROUP MEMBERS:

CHRISTOF BARRIER

LOGAN HINKLE

KEVE HUGHES

BRIAN LEMKE

CORTLAND POLFLIET

NOLAN ROGERS

ERIC SCHULTZ

SUMMARY

The objective for this report period was to use the notes provided by our mentors to update and revise our initial One-Line Diagram and Bus Plan Diagram designs. We properly named various components in both diagrams and added numerous components to the Bus Plan Diagram. In addition, we properly spaced the Bus Plan Diagram based on clearance guidelines given to us by our mentors. We still have some work to do on the One-Line Diagram, specifically regarding relaying and re-spacing. However, after consulting our mentors, we have decided to put it on hold for now until it becomes more of a priority. We also completed a considerable amount of work on our Trench Fill Tool, which we will continue to work on in the coming weeks. At the request of our clients, we created a basic model for an Overview Drawing of our entire project, combining the solar farm and the substation in one document that is properly scaled. Finally, we received some information from our mentors regarding the Grounding Calculation that we need to have completed by the next meeting on March 22nd. Attached with this report will be the PDFs of our One-Line, Bus Plan, and Overview Drawing diagrams.

ACCOMPLISHMENTS

- Trench Fill Tool – Nolan, Brian, Logan, Keve, Christof, and Cortland
 - Added a calculation sheet for equations
 - Calculates various values such as gauge size and cross-sectional area.
 - Pulls data from input pages of respective trench models.
 - Populated tables for various values of interest
 - Included data from two different trench companies – Trenwa and Old Castle
 - Created functions to determine the most space efficient trench (preliminary).
 - Included cut sheets for components that we could find.
 - Listed specific component requirements from Black & Veatch to prepare for population.

- One-Line Diagram – Eric, Christof, Brian, and Cortland
 - Rotated layout by 90 degrees to better align with our purposes.
 - Added space between each component to prepare for relaying.
 - Renamed all circuit breakers and disconnect switches as well as the voltage transformer.
 - Gave proper current ratings to circuit transformers.
 - Removed unnecessary disconnect switch near voltage transformer.
- Bus Plan Diagram – Eric, Christof, and Nolan
 - Properly named all components according to notes from Black & Veatch.
 - Properly spaced all components based on clearance guidelines given by Black & Veatch.
 - Added fence, control enclosure, and cable trench with proper spacing.
 - Added termination and takeoff structures for input/output of substation.
 - Added various distance measurements
 - Center-to-center distance between components (X and Y).
 - Total footprint of components.
 - Total footprint of substation including fence.
 - Other niche measurements of interest.
 - Removed unnecessary disconnect switch near voltage transformer.
 - Changed cable color from red to black.
- Overview Drawing – Eric, Keve, and Logan
 - Created first revision of diagram.
 - Combines the solar farm from last semester with the substation that we are currently designing.
 - Properly scaled substation based on dimensions of our solar farm (2520 x 2684 ft)
 - Connected inverters from each row of arrays to their respective connection on the substation.

Group Member	Bi-Weekly Hours	Cumulative Hours
Christof	16	43
Logan	13	35
Keve	14	36
Brian	15	40
Cortland	12	34
Nolan	15	41
Eric	28	50

PENDING ISSUES

- Trench Fill Tool –
 - Awaiting cut sheets for various components from Black & Veatch to continue building the tool.
 - Need to work on formatting and appearance.
- One-Line Diagram –
 - We are in discussion with our mentors regarding the specifics of relaying, more info to come.
 - Will have to adjust the spacing of this once we decide how we are going to model relaying.
- Bus Plan Diagram –
 - There may be some components added in the future that may impact spacing, but for now we received confirmation to use these dimensions for the upcoming calculations.

PLANS FOR UPCOMING WEEKS

- Trench Fill Tool –
 - Continue to work on tool once we receive required information from mentors.
- One-Line Diagram –
 - Figure out how to model relaying and adjust spacing accordingly.
- Bus Plan Diagram –
 - Use dimensions to create a model for the upcoming calculations.
- Grounding Calculation –
 - Create grounding grid according to IEEE 80-2000 guidelines.
 - Find uniform soil resistivity and minimum conductor size for grounding conductors.
 - Various other calculations.
 - Provide short report.

SUMMARY OF MEETINGS

We received many new resources and very helpful feedback from Black & Veatch over the past two weeks, which has helped fast-track the completion of our Bus Plan Diagram. We received the go-ahead to begin work on the Grounding Calculation based on the dimensions of our current Bus Plan Diagram. We are still awaiting a few action items from Black & Veatch including component cut sheets and information on relay modeling. We plan on having the Grounding Calculation completed by our next meeting on March 22nd.