
EE/CprE/Se 492 WEEKLY REPORT 3

February 11, 2019- February 17, 2019

Group Number : sdmay19-17

Project Title: Substation Design

Client: Burns & McDonnell

Advisor: Manimaran Govindarasu

Team Members:

Jacob Heiller- Controls Engineer

Rebecca Franzen- Studies Engineer

Connor Mislivec- Quality Control Specialist

Riley O'Donnell- Administrator

Tom Kelly- Project Manager

Wilson Pietruszewski- AutoCAD Engineer

Nicolaus Cory- AutoCAD Engineer

Weekly Summary:

This week, we began sizing the 125V DC battery for our substation. After the conversation with Burns & Mac, we were able to begin the initial proceedings for determining the size for the battery. Upon completion of this study, we will begin to size the AC battery for the substation. As for protection & controls (P&C), we submitted an initial one-line drawing for customer review. After minor changes, our team was able to obtain an approved drawing for the one-line. This approved drawing allowed our team to begin drafting the three-line, both the 69kV and 138kV breakers and the transformer schematics. Using the Protection Requirements document that was provided to us by our client, we began placing the components into CAD drawings and correcting the contact assignments.

Past Week Accomplishments:

- Began calculations on AC/DC Studies and Battery Sizing - Nic and Becca
 - Classified DC Loads and determined amperage of devices
 - Calculated the worst case scenario to correctly determine the necessary amperage rating of battery sets.
 - Calculate Amp-hour rating of battery set based off of DC loads
 - Determine type, vendor, and size of battery cells
 - Determine AC Loads and Classifications in order to continue with AC station service transformer design.
- Drafted the one-line diagram - Jake & Tom

- Obtained a sketch from the client as an example for the preliminary one-line sketch
- Created the initial design in Microsoft Visio to quickly represent the relays and control schemes based off of the specifications document given to us by the client
- Had to determine how to implement the protection given in the specifications and make sure that the breakers and transformers would be properly protected given a fault condition and the fault condition would be detected and protect the proper equipment
- Submitted preliminary sketch to the client and received feedback and the protection scheme for the 69kV bus was changed from bus monitoring to directional relaying
- Picked up all of the feedback from the client and resubmitted the initial design two more times until the one-line was approved by the client
- Started drafting the design in AutoCAD, using the preliminary design made in Visio
- Began drafting on transformer schematics - Wilson & Riley
 - Determined the number of drawings needed to satisfy all components of the transformer
 - Began to assign contact initial contact assignments to each relay based from the Protection Requirement document
 - Reviewed the protection document and ran a point-to-point test
 - The point-to-point test is to ensure that every output assignment has an input assignment somewhere within the breakers or the transformer
 - Upon completion of point-to-point we were able to affirm each contact assignment for the relays in needed in the transformer schematic
- Continued research on communication network - Jake & Connor
 - Made a preliminary sketch showing the high-level connection between the Fiber Distribution Panels, router and RTU

Pending Issues:

- Need the contact assignments for the added SEL relays to the one-line diagram so we can reflect the changes in the schematic drawings
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Individual Contributions:

| Name / Role | Individual Contribution | Hours this week | Cumulative Hours |
|-----------------|--------------------------------------------|-----------------|------------------|
| Rebecca Franzen | Continued work on DC battery sizing | 8 | 104 |
| Jacob Heiller | Assisted in completion of one-line diagram | 12 | 103 |

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|----------------------|---------------------------------------------|---|-------|
| Tom Kelly | Assisted in completion of one-line diagram | 5 | 101 |
| Connor Mislivec | Continued research of communication network | 5 | 99.5 |
| Riley O'Donnell | Began drafting transformer schematic | 5 | 102 |
| Wilson Pietruszewski | Began drafting transformer schematic | 5 | 103.5 |
| Nicolaus Cory | Continued work on DC Battery sizing | 8 | 18.5 |

Comments and extended discussion:

Plan for the coming week:

- 125V DC Battery Design - Nic & Becca
 - Begin DC Battery sizing report
 - Once report has been approved, begin to size the AC battery and then complete the AC Battery Sizing report
- Continue work on one-line relay schematic and transformer schematic - Wilson & Riley
 - Finalize contact assignments for all relays reacting with the transformer
 - Work with Jake and Tom to understand the one-line drawing so we can start the relay schematic
 - Continue work in AutoCAD to submit an initial draft of the transformer schematic
- Continue work on P&C one-line diagram, three-line diagram and breaker schematics - Tom, Jake & Connor
 - Work with Wilson & Riley to affirm that all contact assignments are correct
 - Determine all relays needed to complete the 4 breaker schematics
 - Develop the three-line diagram based off the approved one-line drawing
 - Continue work in AutoCAD to submit a finalized version for the one-line diagram

Weekly Advisor Meeting Summary:

- Prepared presentation including the following
 - List of all tasks to be completed for this project
 - Delegation of all tasks

- Flowchart to visualize the progression of the project
- After the presentation was concluded, we were tasked with two more presentations
- The first presentation includes all IEEE standards used during the design components of our first semester accomplishments
- The second presentation is the Project Status Review which includes
 - Project plan concept sketch
 - Project plan summary
 - Design concept sketch
 - Implementation diagram
 - Task status
 - Delegation of the tasks