

## ***EE/CprE/SE 492 STATUS REPORT 6***

***4/4–4/17***

***Group number: sdmay25-02***

***Project title: Ames Microgrid Evaluation and Substation Consulting***

***Client &/Advisor: Adam Arnold (Burns & McDonnell) and Dr. Zhaoyu Wang***

### ***Team Members/Role:***

- **Sean Carver - Transmission Team (Substation)**
- **Bethany Danley - Distribution Planning Team**
- **Thomas Edwards - Distribution Planning Team**
- **Nathan Kallal - Distribution Planning Team**
- **Mina Khalil - Transmission Team (Substation)**
- **MacKenzie Woods - Transmission Team (Substation)**

### **o Weekly Summary**

Over the past two weeks, both the Transmission and Distribution teams made significant progress on the Ames Microgrid Evaluation and Substation Consulting project. The Transmission Team met with the client to review project progress, updated their Semester 2 schedule, and advanced key deliverables, including completing multiple revisions of elevation drawings and integrating clearance information using IEEE standards. The General Arrangement drawing was updated and converted to Bluebeam, and the team finalized the first revision of the grounding plan while awaiting fault current data from Distribution. Meanwhile, the Distribution Planning Team successfully completed and tested their campus grid model, performed a load flow analysis, and began evaluating solar panel options for compliance with industry standards. Plans were also made for modeling peak load effects and preparing final deliverables such as the design document, IRP presentation, and project poster. Both teams continue to communicate effectively and are on track to meet project deadlines.

### **o Past week accomplishments**

- **Transmission Team:**
  - **Client Meeting & Progress Review**
    - Met with the client to discuss project progress.
    - Reviewed completed deliverables and incorporated revisions.
    - Updated the Semester 2 schedule accordingly.
  - **Elevation Drawings & Clearance Checks**
    - Elevation A-A: Revision 4
    - Elevation B-B: Revision 3
    - Elevation C-C: Revision 3

- Elevation D-D: Revision 2
  - General Arrangement (GA) Drawing
    - GA Drawing: Revision 2
    - Converted from AutoCAD Electrical (ACADE) to Bluebeam.
    - Addressed comments from Revision 1 and implemented necessary updates.
  - Grounding Plan
    - Grounding Plan: Revision 1 completed.
    - Sean reached out to the Distribution Team for ground fault current values — currently awaiting their response.
    - Plan to overlay the grounding plan directly onto the GA for simplicity and better visual alignment.
- Distribution Planning Team:
  - Completed Open DSS Model
  - Presented and got approval from client
  - Working on continued research of solar and batteries.

○ **Pending issues**

- Transmission Team:
  - Continuing to create custom blocks within ACADE
  - In the process of converting remaining drawings from ACADE to Bluebeam
  - Team members are building familiarity with clearance and grounding plan requirements, as this is a new area of experience for all involved in the transmission team
- Distribution Planning Team: The distribution team has no pending issues.

○ **Individual contributions**

<u>NAME</u>	<u>Individual Contributions</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Sean	Worked on the grounding plan. I received comments and I am addressing them.	6	62
Bethany	Wrapped up and presented the completed OpenDSS model to Adam. Continuing to research on battery storage.	4	71
Thomas	I looked at the finalized model, ran the simulation, and started looking at the power flow results and how solar could impact the load curve.	4	87
Nathan	Finished research into the different solar panel options. Created a spreadsheet with technical specifications and numbers to work with for cost estimates	8	70

Mina	I worked on transforming the GA to Bluebeam and picking up comments that were sent by the client.	6	73
MacKenzie	Completed all four elevation drawings (A-A, B-B, C-C, and D-D), incorporating clearance information based on IEEE standards provided by the client. Created custom A-Frame blocks to improve consistency across the drawings. Additionally, I documented detailed meeting minutes during the substation team meeting.	10	85

o **Comments and extended discussion** *(Optional)*

Regarding non-technical concerns, there are currently no issues. Our team is collaborating effectively, and communication has been smooth across meetings and tasks. We feel confident in our ability to continue working together successfully as we move forward with the project.

o **Plans for the upcoming week**

- Sean: Finish the grounding plan. Get the fault current and make adjustments to the grounding plan. Help Mina with the GA.
- Bethany: Over the next weeks I plan on finishing the battery research and adding in the solar and battery representation into OpenDSS.
- Thomas: I plan on looking forward and start seeing what progress needs to be done for us to complete the Design Document updates, the poster, and the Industry presentation.
- Nathan: Moving forward, I plan on using my findings for the solar panels to generate a final report on cost and power generation available. My next steps will be to confirm my data with our client and produce graphs and data to show how adding solar generation could help curb load needs on campus.
- Mina: I will be picking up any comments that will be sent by the client.
- MacKenzie: Pick-up comments on the Elevation Drawings as well as the Clearance Plan.

o **Summary of weekly advisor meeting**

Monday, 4/7 Distribution Team Meeting With Adam Arnold (Client):

On 4/7, the Distribution team met with the client to discuss their progress and final deliverables. Since the last meeting on 3/23, the team has gotten the model to closely match the campus grid and also run a load flow analysis using the given voltage values. There has been some progress as

well with modeling solar panels, but the team is waiting for Adam to confirm whether the panel types Nathan found are up to the Burns & McDonnell industry standards. Since the model is now working, Adam told us that a good goal would be to be able to model the peak load at the feeder, and show what effects adding solar and/or battery storage would have on calming the duck curve. Once this is done for the peak load, it would be a stretch goal to model this for the off-peak seasons.

Looking forward at the deliverables for the course, the team discussed what work needed to be done for each item. The design document is where most of the effort will probably go as it is the most technical, but ample time will also be needed to create a presentation for the IRP and the accompanying poster. Together, a deadline of 4/21 for technical work was set so that 2 weeks could be left for the team members to solely focus on making sure that each deliverable was up to standard for the IRP and professor grade.

#### Monday 4/7 Transmission (Substation) Team Meeting with Client:

**Attendees:** Jenalee, Sean, MacKenzie, Mina

**Absent:** Emily (due to trainings)

##### 1. Introductions & Technical Issues

- Brief introductions were made at the start of the meeting.
- Sean experienced minor audio issues initially but was able to participate once resolved.

##### 2. Safety Moment

- **Topic:** UV Exposure
- Reminder to wear sunscreen when outdoors, even on cooler or overcast days.
- UV index can be checked via weather apps; protection is important even if it doesn't feel hot.

##### 3. Schedule & Assignments

- **Status:** Partially updated; more work to be done.
- **Clearance Checks:**
  - Elevations are starting to look good.
  - Clearances for live components (phase-to-phase, etc.) need to be highlighted.
  - Reference: 18' and 9' were given as examples.
  - Jenalee will send the clearance chart for 150kV (e.g., 5 ft clearance).

- MacKenzie will be responsible for drawing the clearance arcs and completing the clearance check diagrams.
- **Due:** April 14
- **Grounding Plan (GA):**
  - Sean is assigned to complete the grounding plan.
  - He will need to add fencing and a grounding grid:
    - Grid should be 3 ft inside and outside the fence line.
    - Avoid foundations; go around them.
    - Add evenly spaced stingers throughout the layout.
  - Equipment grounding (e.g., breakers: 19 #9 cables, transformers: 6 stingers).
  - It's okay if stingers aren't done in the first revision—focus on the grid.
  - Jenalee will send IEEE standards and go-by documents for typical grounding (e.g., 45M00 to Breaker 1).
  - **Due:** April 14

#### 4. Elevations

- Emily sent elevation-related updates via email.
- Sync internally before sending anything to the client (Burns & McDonnell).
- Notes on A-frames and insulators:
  - Use insulators for A, B, and C phases.
  - Transitioning to a 13.8kV line; jumper connects at the bottom.
  - Rigid bus must be moved further out—1.5 ft off the equipment before the jumper.
  - Indicate where the jumper connects from the line side.
  - Dimensioning must be accurate and consistent between equipment, switches, and bus.
  - Fact-check each other's work before submitting to ensure accuracy.
  - Reminder: Distribution is always shown on the low bus.

## 5. General Arrangement (GA)

- Ensure the bus does not abruptly end—indicate its destination.
- Include reasoning behind design decisions for clarity.
- If fault current data is available, include it to inform conductor sizing.

## 6. Communication

- If there are upcoming meetings with the full group, notify Jenalee and Emily in advance so they can prepare and attend.

### Monday, 4/14 Distribution Team Meeting with Adam Arnold (Client):

Adam had to cancel at the last minute due to scheduling conflicts. We will meet instead on 4/21, where we will wrap up project work and pivot to the final deliverables.