

Design - Part 1

Derek Elkins, Patrick Musoy, Mackenzie Ray,
Nathan Tegeler, Matthew Wells

Client: Burns and McDonnell
Advisor: Hugo Villegas
Team: SDDec-24-02





What is a substation?

A substation acts as a middleman in the electricity supply chain.

It takes voltage from one level to another.

- Step up - low to high
- Step down - high to low

A Bus is system of uninsulated conductors that carry electricity from one point to another



Project Overview-Ames Substation

- Our main goal is to connect a 69kV, 2 MW solar farm into an existing substation
- Station already has 3 input lines, the solar farm would make four
- Each lines requires a different pilot/relaying (communication of system) scheme
- Design a bus configuration system with a high level of reliability and a low level of complexity
- End goal is to have a dynamic simulation with an event analysis report



Ideation - Lotus Blossom

CAD drawings

- Recruit K-12 students interested in AutoCAD and/or substations
- Have AI attempt to make our drawings
- Recruit an out of work engineer to do them for us

Relaying

- Research relaying on SEL (manufacturer) website to get a better understanding of I/O assignments and needed protection



Potential Solution

The solution we choose was to complete the project ourselves

- Bus configuration design document
- Relaying design document
- Needed drawings
- PSCAD simulation
- Research the I/O assignments and needed relaying for our chosen bus configuration



Market Research

We researched different manufacturing companies for the relaying system

- SEL
 - Used commonly across industry
 - Highest customer service and product performance reviews
 - Higher cost
- ABB
 - Offer a wide range of services - their relaying systems are subpar
 - Have a poor reputation for customer service and product quality
- General Electric
 - Been around for a long time but they do not focus on automation
 - Short warranties and subpar products



Conclusions

For our project we have decided to use SEL (Schweitzer Engineering Laboratories) for our relaying. They offer the best customer service and highest quality of products. Alongside this they also have superior documentation and data sheets for their relays. To us, the added cost is worth all of these benefits.