

Ames Substation



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Client: Burns and McDonnell
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Team: SDDec-24-02



Project Overview

Assist Burns and McDonnell with the design of building an Ames Substation so a 69kV, 2 MW solar farm is able to be connected to existing infrastructure. The substation will accommodate 138kV transmission lines from Ankeny, Boone, and Nevada substations. To complete the construction of the substation our team will need to detail the bus configuration selection, draw the site layout, detail the pilot scheme selection, and specify relaying requirements and I/O assignments. We will also deliver a one-line diagram of the protection system, a dynamic simulation with simplified relay models, and an event analysis report that compares inverter-based and synchronous generation. This project will involve addressing the differences that renewable energy sources create in substation design. These differences involve dealing with inverters and other power electronics which require different protection schemes from conventional synchronous generators.



Problem statement

Our substation design will ensure safe, fast, and reliable power to Ames and the surrounding communities.





List and description of users (e.g., personas)

Jack Black

- Average American consumer
- Famous for several fun movies
- Likes to be cool during hot summer

User needs

- Jack Black needs a way to work during the day using electricity because he has to make money to support his family so they are not angry at him.
- Jack Black needs to run his AC during the summer because the extreme heat makes him uncomfortable.
- Jack Black needs to cook food because he must feed his family.



Mani Mina

- Iranian man who has a PhD in Electrical Engineering with a research focus in electromagnetic wave propagation and a PhD in Physics
- Uses electricity in his day to day life

User needs

- Mani needs this reliable power source to ensure he always has access to his research because he wants to make new advances in electromagnetism.
- Mani needs electricity to teach his students (through games) because teaching brings him joy.
- Mani needs the solar farm tapped into the station to ensure his electricity works in the winter.



Gideon Kauffman

- Amish fellow
- Opposed to public infrastructure

User needs

- Gideon needs to be informed about the new substation to address his skepticism towards public infrastructure.
- Gideon needs to appreciate the substation because it provides efficient power to his community with minimal consequences to the local environment.



Conclusions

Our users desperately need to have reliable power from our substation

Our project will include only high level design such as simulations, relaying requirements and layouts.