

Utility Scale Lithium-ion Battery Energy Storage System

Team: sddec24-18

Client: Burns & McDonnell

Faculty: Zhaoyu Wang



Project Overview

- Work with Burns and McDonnell to build a 25 MW/ 100 MWh battery energy storage system
- Build this system hypothetically design this on an “unoccupied” plot of land about 15 acres
- Determine which battery containers we want to use
- Determine which inverter technology and how many inverters we want to use
- Calculate various values for apparent power, reactive power, and current
- Calculate the cable sizings needed for the design
- Create a one-line diagram that will be used as a map showing where the equipment is interconnected



Mike from MidAmerican

"Archetype"

- Age: 47
- Lives in Iowa
- Busy work schedule
- Team leader for his group

About them

works on a team with engineers and technicians

Has calluses on hand from doing hard work

Leads the team working with the group of students working on the storage project



Artifact: journey map

Comparison

Unique Value Proposition
What makes this company unique?

Company Advantages
What are the things that provide a leg up?

Company disadvantages
Where might drawbacks exist?



Tesla also has their own set of solar panels that are directly tied to their BESS systems for fast, easy, and efficient production.

Tesla's systems have advanced software and connectivity. Usage can be monitored as an app on iOS or other devices.

Well established leader in renewable energy market.

Tesla has vertical integration and large manufacturing facilities.

Products are expensive per kWh.

Tesla has trouble filling orders in some markets and often has long lead times on projects.



Has the largest operational BESS in the world.

Are aggressively looking for growth opportunities and looking for more markets.

Know how to find revenue and scale operations.

Good relationships with utilities.

Does not have a presence in every state.

Reliance on third parties for long-term contracts.



Strong track record of reliability.

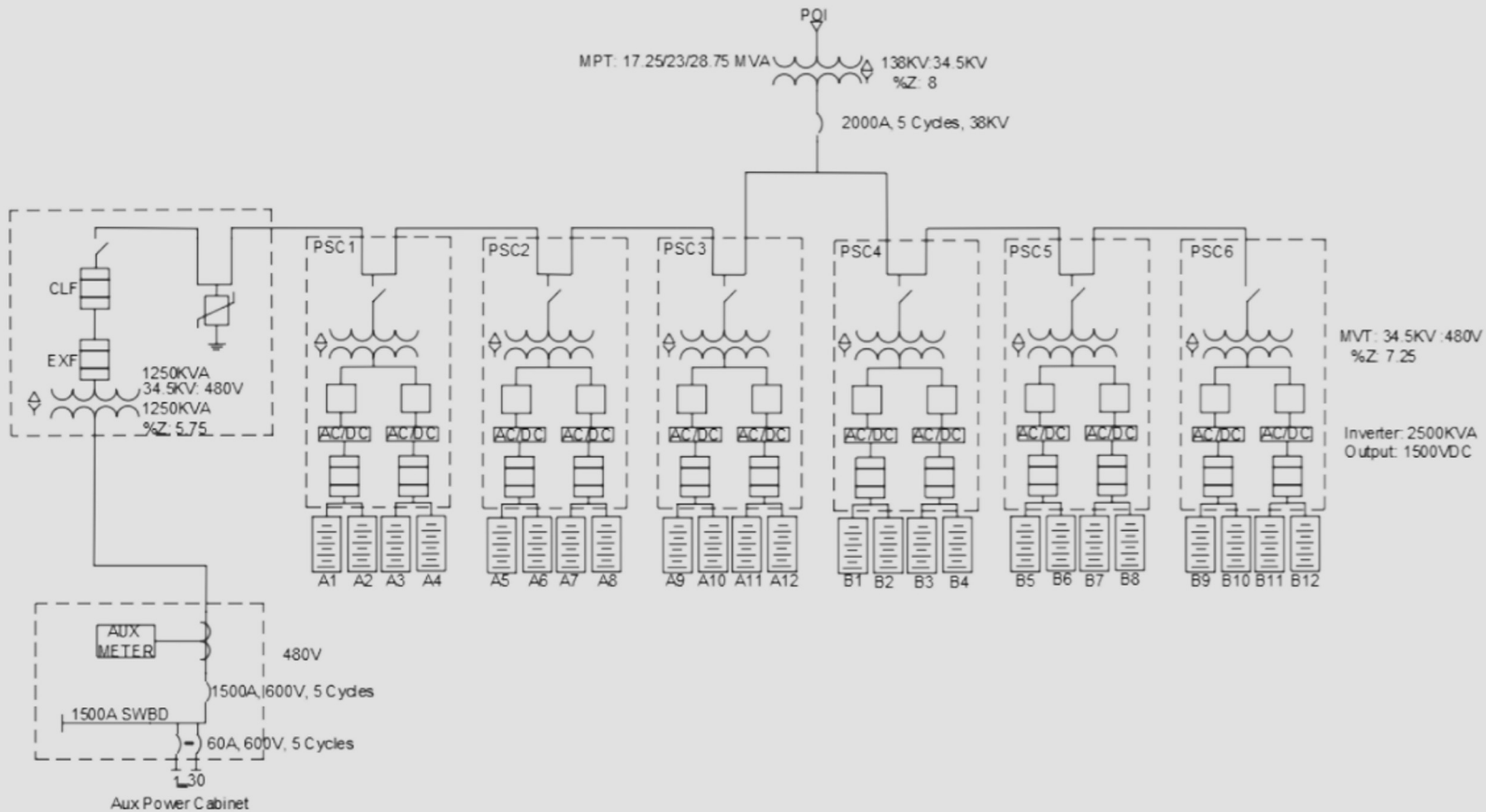
They select the best solution for each project knowing that they are not being allowed to enter the market until they have the technology that they can use consistently under given ambient weather.

Systems are very robust and customizable.

Fluence has a good track record of high safety and reliability standards.

Initial cost investment is very high.

Fluence is well known in the energy sector but does not have much of a reputation in other sectors. Their technology requires a significant amount of time to be proven, meaning they have to invest in research for each project which makes for slow and costly production.



Artifact: Technical Complexity Analysis

Sustainability of Design

Human

- Allow energy production to become more reliant on renewable energy sources
- Manage peak energy demands discharging as demand peak
- Making the system more modular would futureproof



Economic

Advantages

- Make renewable energy sources more economical
- Solution for medium-sized cities

Disadvantages

- Batteries are very expensive
- Limited effective lifespan



Technical

The one-line diagram we created uses multiple types of new technologies.

Contains several connections to and from batteries, inverters, and transformers.

make the already available energy production more efficient.

