

4910 Lightning Talk: **Prototyping**

Ames Microgrid Evaluation & Substation Consulting

Team: sdmay25-02

Team Members: Sean Carver, Bethany Danley, Thomas Edwards, Nathan Kallal, Mina Khalil, MacKenzie Woods

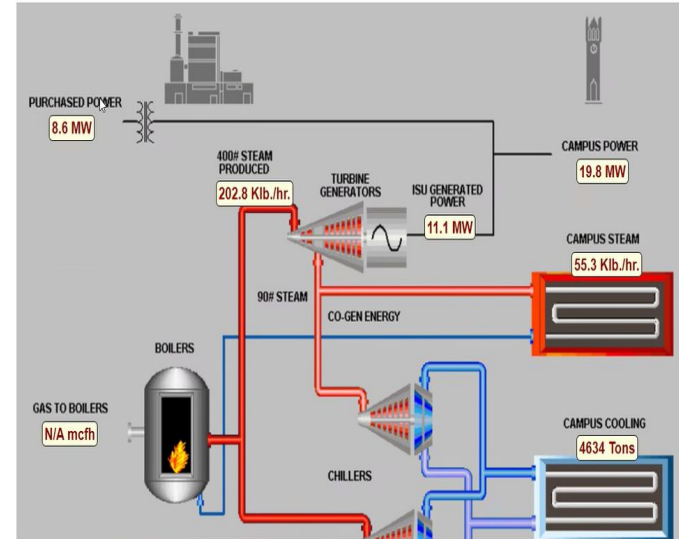
Client: Burns & McDonnell

Faulty: Zhaoyu Wang



Project Overview

- Project Goals:
 - Improve campus microgrid and substation infrastructure
 - Create scalable models for distribution and transmission
- Objectives:
 - Design a one-line diagram for a safe, reliable substation
 - Build a microgrid model for load management and energy distribution
 - Support growth and resilience with renewables



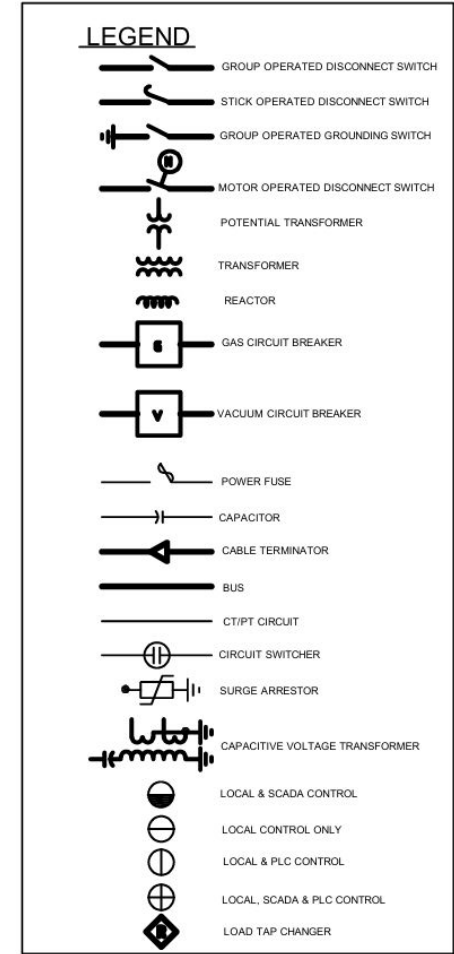
Prototypes Overview

- Microgrid Prototype:
 - Platform: OpenDSS model for campus distribution network
 - Purpose: Simulate campus load distribution and reduce load
 - Goal: Test load feasibility without GIS

10/2/24 at 2:55 PM real time	BTU/hr	kW	Tons/hr	Gal of Gasoline/hr	\$/hr	Cost per kW
Electricity	72,014,301	21,100	6,001	626	\$2,142	\$0.10
Heating	55,078,500	16,138	4,590	479	\$964	\$0.06
Cooling	89,598,000	26,252	7,467	779	\$1,520	\$0.06
Total	216,690,801	63,490	18,058	1884	\$4,626	\$0.07

Prototypes Overview

- Transmission Prototype:
 - One-Line Diagram: Substation design for reliable power flow and battery integration
 - Diagram Goals:
 - Visualize power flow from high-voltage sources
 - Identify protection, breakers, and switchgears
 - Allow flexibility for future renewable expansion
 - Map structure and identify equipment



IOWA STATE UNIVERSITY



Learning and Challenges

- Microgrid Learnings: Manual mapping and OpenDSS model adaptation
 - Worked: Google Maps workaround
 - Didn't Work: GIS absence and load profile limitations
- Transmission Learnings: Diagram complexity, balancing clarity and detail
 - Worked: Initial one-line success
 - Didn't Work: Access specific equipment information



Conclusion

- Key Takeaways:
 - Prototypes support campus energy needs and scalability
 - Microgrid model provides insights into load management
 - One-line diagram enhances substation safety and flexibility
- Next Steps:
 - Refine load profiles and integrate renewable sources
 - Begin Relaying Single Line Diagram and General Arrangement for new substation

