Smart Grid Innovation with AI

Jomarion

Names of team members: Josiah Friday, Mason Thatcher, Aaron Botwinik

Mentor: Michael Roberts

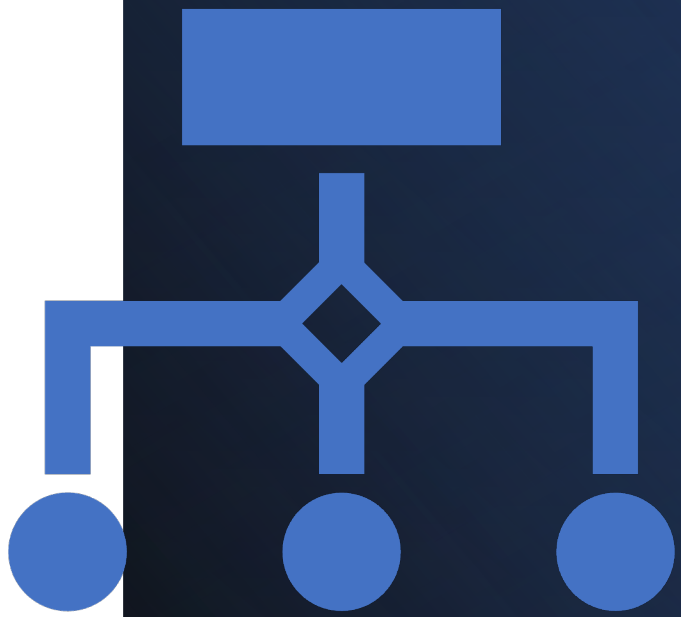
Background Information

- We are a team of 3 high schools students (2 freshman, and 1 sophomore)

- Smart grids are based off of traditional power grids, but made more effective by better connections and the usage of Artificial Intelligence to detect power failure and restore electricity across the grid quickly.
- Micro grids are smaller grids that are able to work independently from other large scale grids.

Design Process

- To develop the design, we used maps to locate areas that were then used in the smart grid.
- We also used activity resources and other outside resources to figure out certain statistics of what the power usage levels of each area were.
- To create a priority list, we found out which places have the highest value to the surrounding area, and then ordered appropriately.



The Priorities

We came up with this priority list because:

- Hospitals need power to support human life
- Emergency services need power to keep everything under control
- Gas stations can provide gas for vehicles and generators
- The places where people live require some levels of power
- Grocery stores need only enough power to keep food products fresh and to allow people to have access to food during a lack of power.

1. Hospitals
2. Fire Stations
3. Police Stations
4. Gas Stations
5. Senior living centers
6. Residential Areas
7. Hotels
8. Grocery Stores
9. Schools
10. Other Stores

The Design

- Our design includes distribution of power during optimal times and sensors to know whether power is working, or whether it needs access to power distribution.
- Our design works the best because it allows the optimal restoration of power after an outage, with proper prioritization, distribution of energy, and restoration of power in a way that allows an area to begin to function properly again.

The Table

This design shows:

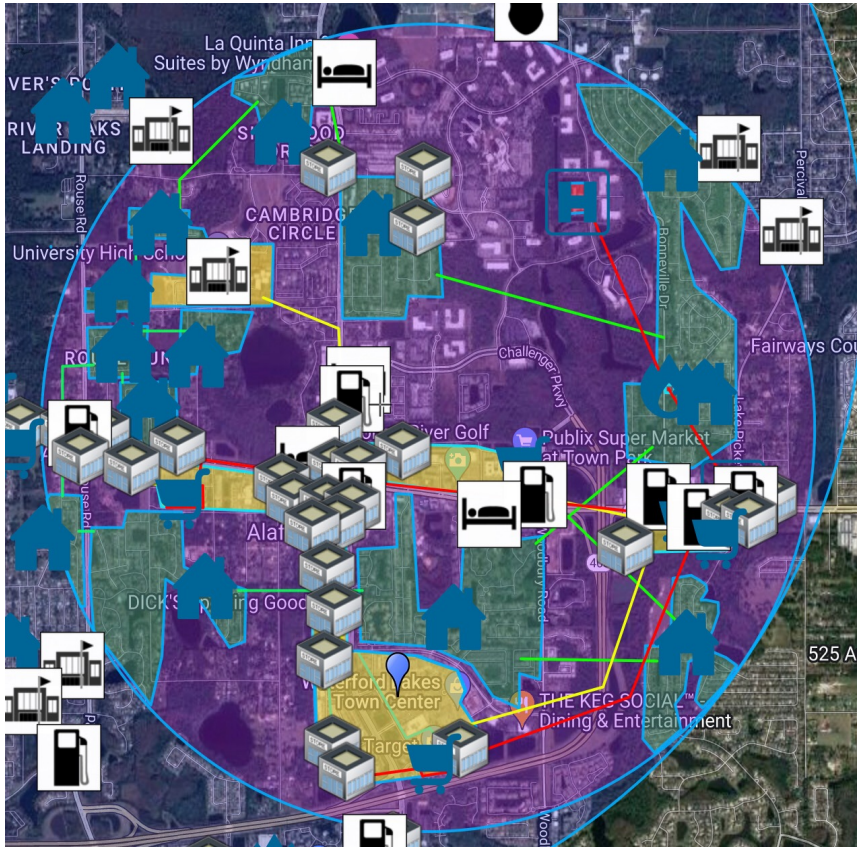
- What level of power prioritization the user has
- The details of which areas are gaining power access
- How much power each user is getting
- When the user is getting access to the power restoration

Final Design			
Grid Level	User Type	How much power is supplied? (kW)	When is the power supplied or cycled?
3	Hospital (1)	4654.95	Constantly
3	Fire Station (1)	83.56	Constantly
3	Gas Stations (5)	240.3	Constantly
2	Subdivisions (4)	7271.16	Sunrise to sundown
2	Hotels (1)	563.7	Sunrise to sundown
2	Grocery Stores (2)	1128.6	Operating hours
1	Schools (1)	——	——
1	Other stores	1057.68	Big stores – operating hours
	Total	15 MW	

The Map

The map for the design includes:

- Locations of power users
- Connections of similar types of power usage
- The main micro grid



References

- U.S. Energy Use Intensity by Property Type – Energy Star

  Average energy use per year for different user categories
- Energystar.gov – Energy Star

  Use the search bar to find reports on energy use throughout the U.S.
- Energy Sustainability of Food Stores and Supermarkets – Energies Journal

  Journal paper on energy use in grocery stores
- Business Energy Advisor – Tennessee Valley Authority

  Energy use information for many types of businesses

- For more than half of the daily cycles I used https://tva.bizenergyadvisor.com/categories/business-types

- For use on the yearly cycles https://learn.pjm.com/three-priorities/keeping-the-lights-on/how-energy-use-varies

Thank you
Any questions?