The Smart Grid

TEAM: HAL-10000

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THE BACKGROUND INFORMATION

The Smart Grid: A gird that has the ability to change power flow by reacting to energy usage in the local area.

Our Smart Grid: Focuses on locations within a 1.5 mile radius of Colonial High School. Priority choices will be based on usage and amount of power required to maintain minimum levels of service. Maximum power supply of the grid is 15 MWs

Priority List of Users:
1. Fire station
2. Hospitals
3. Senior Living Center
4. Schools
5. Social Meeting Areas
6. Airport
7. Banks
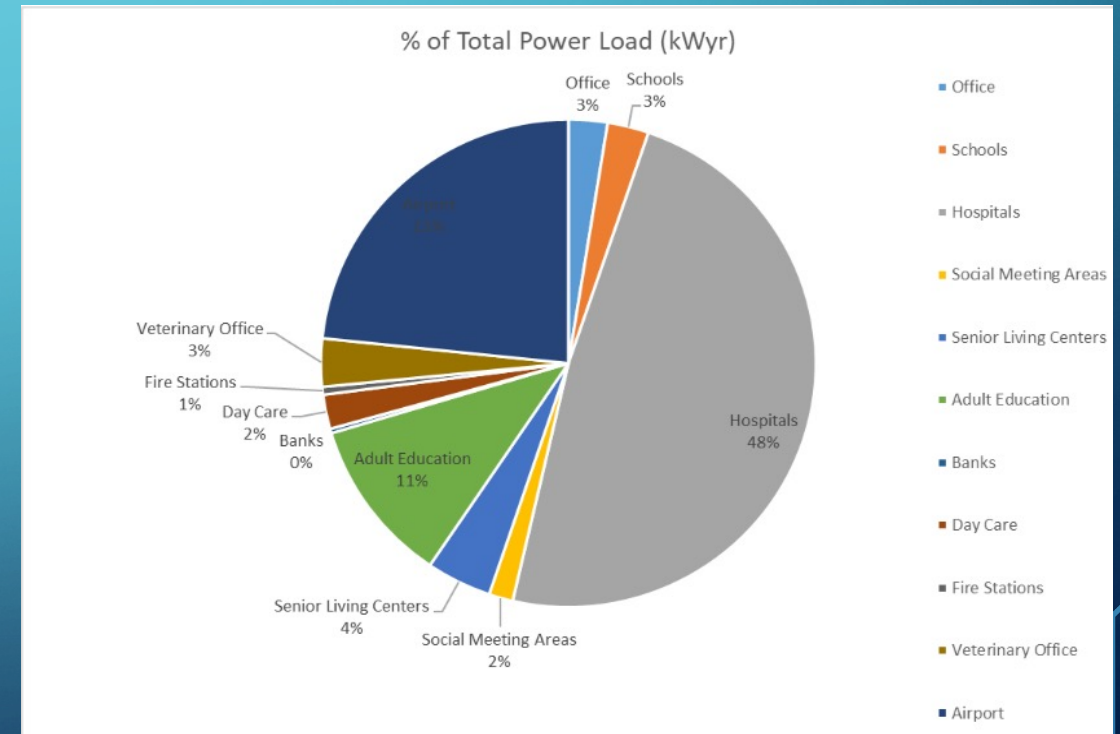8. Veterinary Office
9. Day Care
10. Adult Education

DESIGN PROCESS

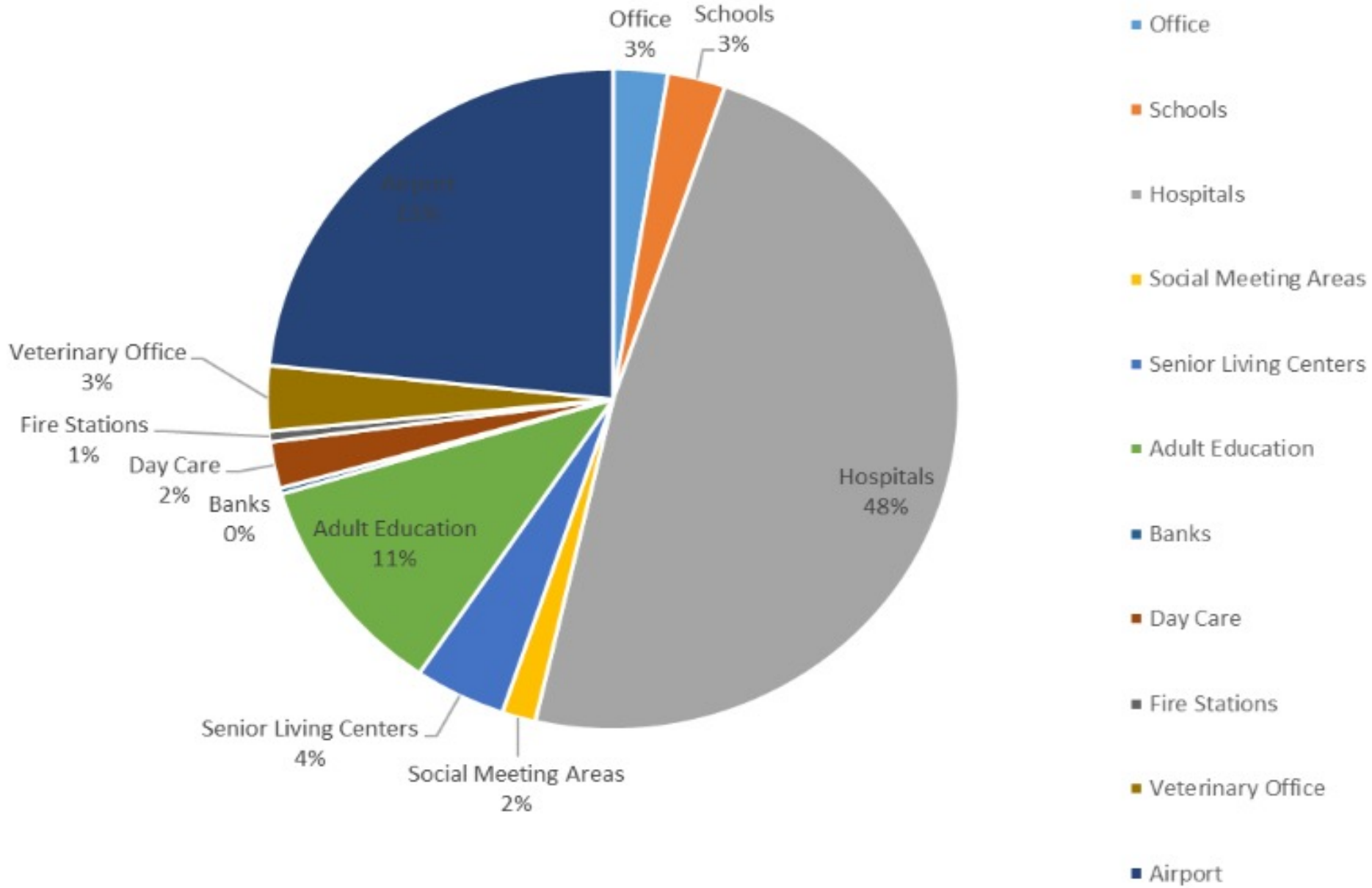**Decision Making: Decisions were made by group meetings and discussions.**

Priorities: Priorities were set based on which users had the most impact on the community in a time of crisis. Example: If a wild fire caused the power grid to go down, we looked at which users functions were most vital to getting the community up and running again.

Research: By looking at information from U.S. Energy Use Intensity by Property Type report and comparing that to our identified users, we focused on how much energy each building consumed at various points during days and times of years and how usage impacted the smart grid.

User Type	Daily Cycle Notes	Yearly Cycle Notes
Residential	Peaks during the day	Peaks during the summer
Veterinary Office	Peaks during the day	Peaks during the summer
Schools	Peaks during the day	Peaks during august to may
Hospitals	Peaks Consistent	Peaks during holidays
Social meet	Peaks during the night	Peaks during Holidays
Senior Living Center	Peaks during the day	Peaks during the summer
Adult education	Peaks during the night	Peaks during the summer
Banks	Peaks during the day	Peaks during the summer
Day care	Peaks during the day	Peaks during the summer
Fire station	Peaks Consistent	Peaks during the winter and fall

% of Total Power Load (kWyr)

- Office
- Schools
- Hospitals
- Social Meeting Areas
- Senior Living Centers
- Adult Education
- Banks
- Day Care
- Fire Stations
- Veterinary Office
- Airport

Office 3%
Schools 3%
Veterinary Office 3%
Fire Stations 1%
Day Care 2%
Banks 0%
Adult Education 11%
Hospitals 48%
Senior Living Centers 4%
Social Meeting Areas 2%

% of Total Power Load (kWyr)

THE DESIGN

The Design: Criteria was established based on the priority ranking of the user and the location of the users to population centers.

Sensors will be introduced to monitor power usage and to indicate where additional power cutbacks can be made, such as soda machines and parking lot lights.

We also recommend the increases use of generators and alternative energy storage devices in low priority areas

The highest priority areas are identified by various color grids on the map.
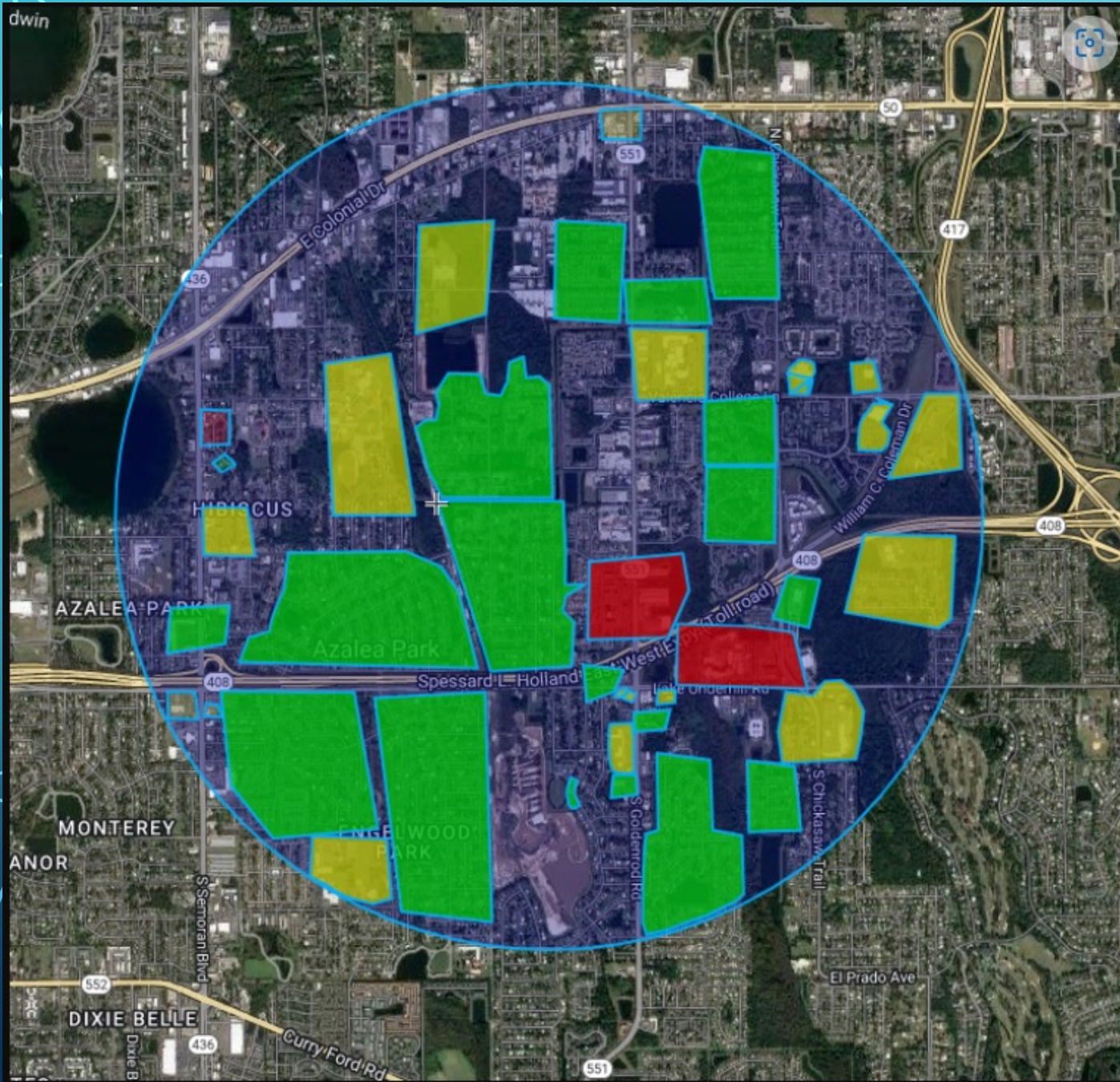
- **Red Block** are top priority users such as Hospitals and Fire Stations

- **Yellow Blocks** are mid-level users such as Schools, Social Meeting Areas, and Airports

- **Green Bocks** are low level priority users such as Banks, Veterinary Offices, and Day Care

WHY YOU SHOULD SELECT THIS DESIGN

The Reason: This design takes into account a wide variety of elements.

This will bring essential services back on line first so that human life can be saved and maintained.

Use of Sensors: Recommendation is to implement sensors which will identify additional non-essential power usage and shut those area down (vending machines, lights in areas not being used).

Power Backs Ups: Additional sources of back up power such as generators and UPS's should be added to help lower level priority users to still have access to limited power without taxing the grid.

REFERENCES

- <u>U.S. Energy Use Intensity by Property Type</u>

- <u>Energy Star Average energy use per year for different user categories</u>

- <u>The Electricity Journal</u>

- <u>Smart Energy Consumer Collaborative</u>

- <u>Pro Tool Reviews</u>

QUESTIONS?