

Proposal on Smart grids in Ocala

School: Forest High School

Team: The Illumicats

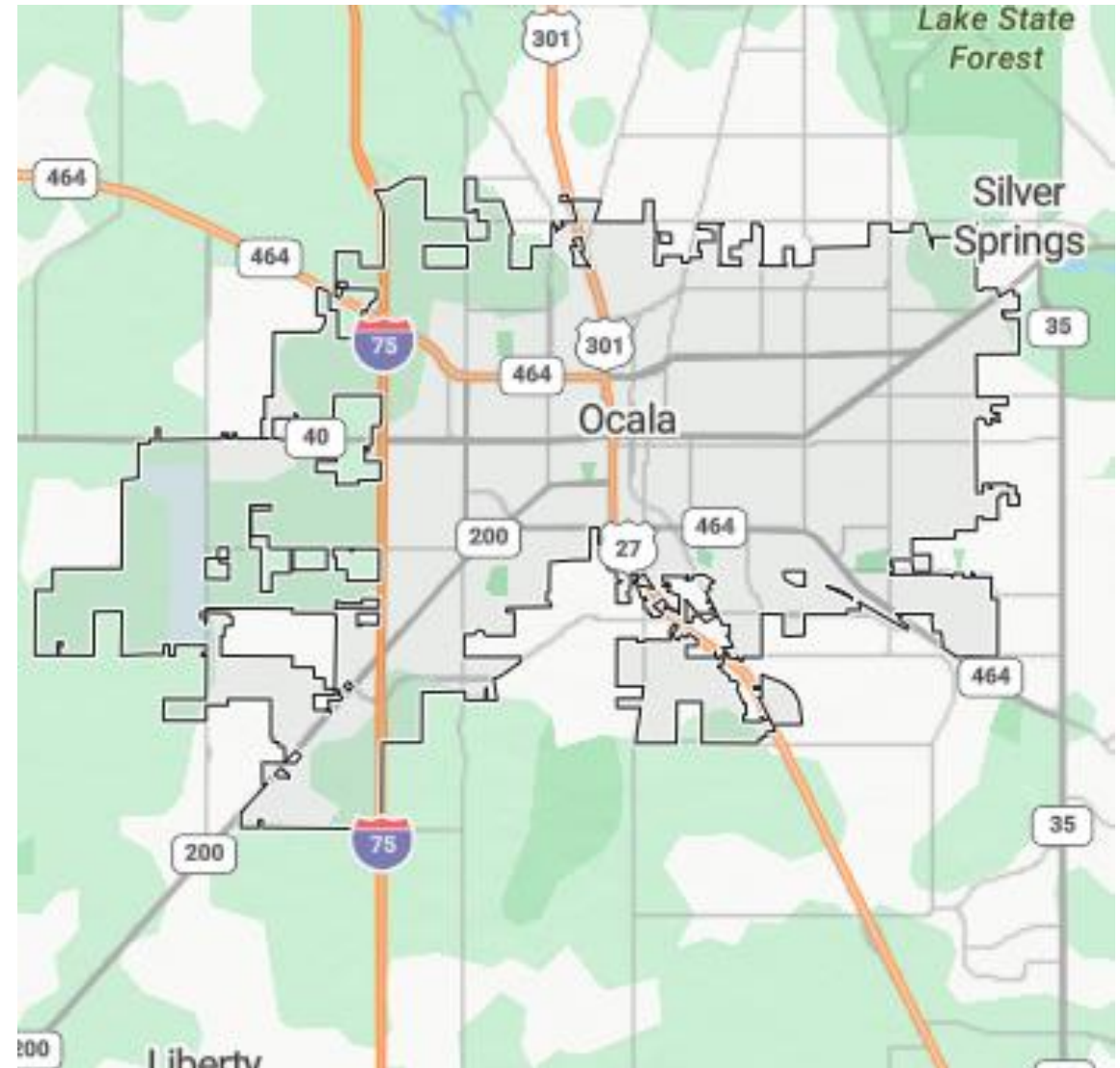
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Mentor: Allyson Galvin

Teacher: Michael Stepp

Ocala, Florida

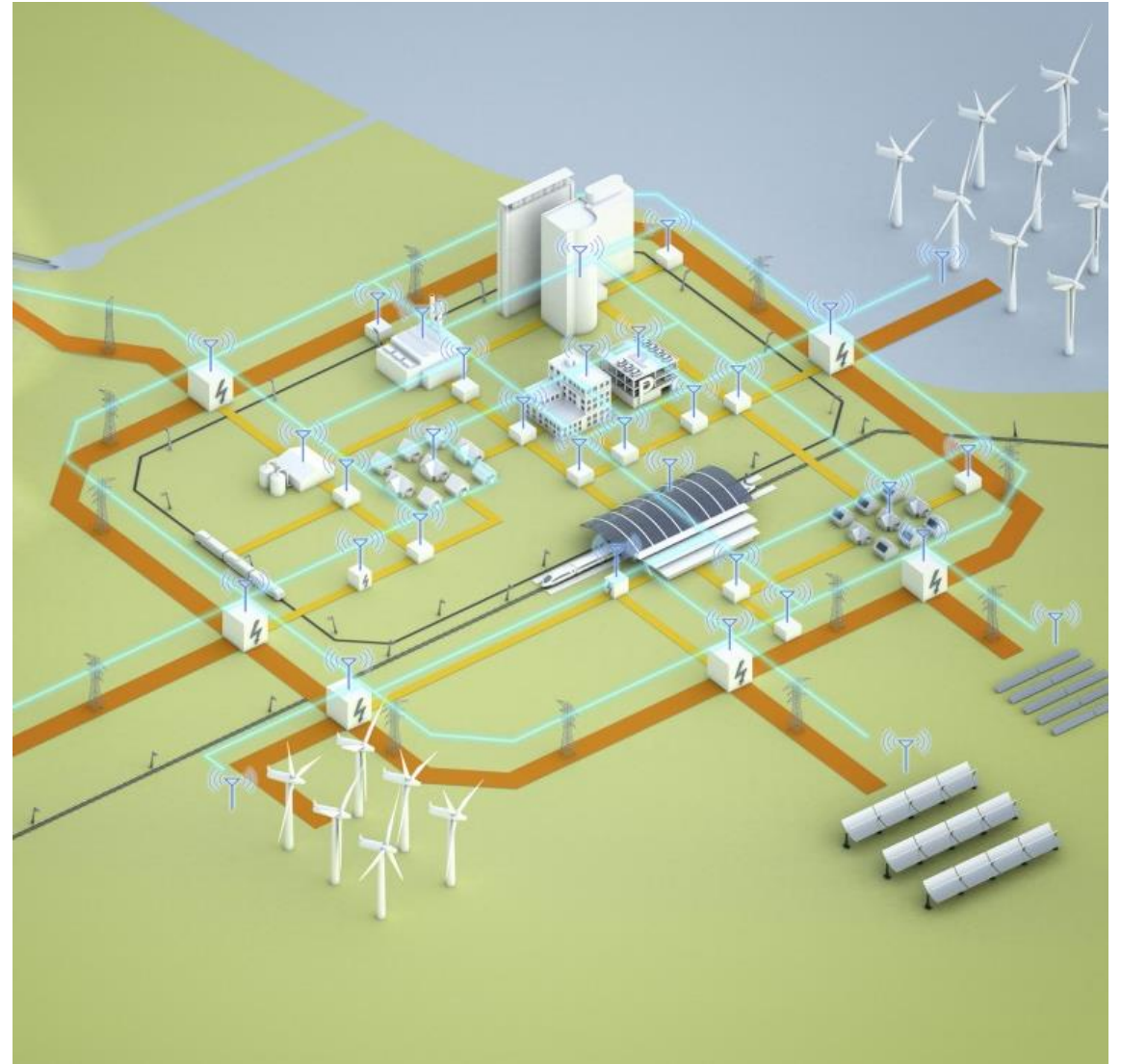
- Ocala is a spread-out city without dense urban areas
- Recent Hurricanes
 - Milton- Category 3
 - Helene- Category 4
- Challenges
 - Downed lines
 - Insufficient power
- How do microgrids help our community?



Traditional Grids

A grid is a large, interconnected system that provides power to all users through centralized energy distribution. Some weaknesses may include:

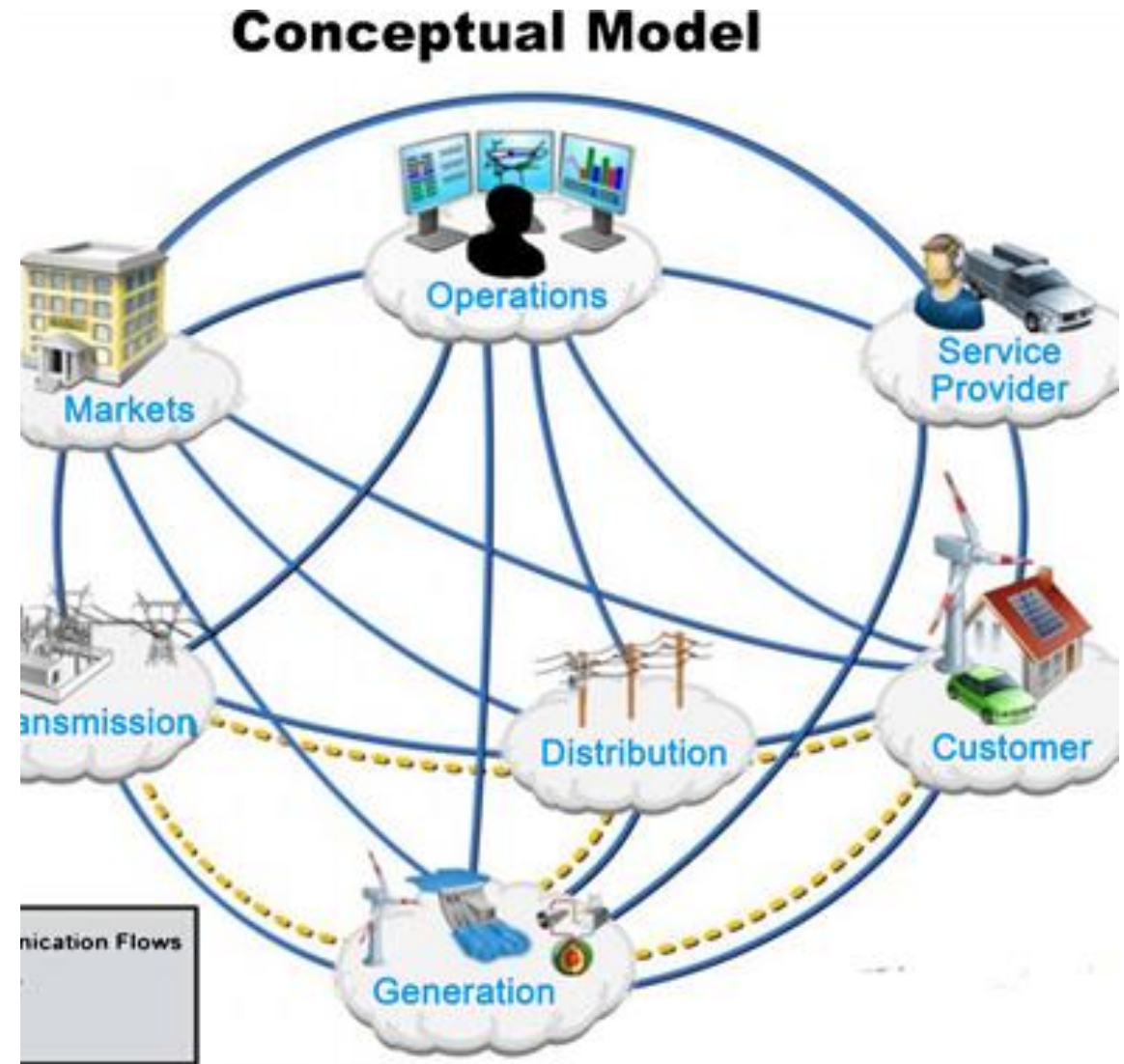
- Manual User Reporting
- Uni-Directional and Centralized Power
- Uses Non-Renewable Resources



Microgrids and Smart Grids

Some benefits for using Microgrids and Smart Grids are:

- Quickened Responses to Power Outages
- Real Time Knowledge of System Health
- Integration of New Technologies



Ocala's Community

User Rank	User Type	User Count	
1.	Energy/Power Stations	5	High Priority Users (Users 1-4) Essential Utilities and Healthcare. [1]
2.	Water Treatment	5	
3.	Medical Clinics	5	
4.	First Responders	6	
5.	Gas Stations	5	Medium Priority Users (Users 5-7) Food/Goods and Shelter.
6.	Grocery Stores	6	
7.	Schools	6	
8.	Prisons/incarceration centers	3	Low Priority Users (Users 8-10) Highly dense population areas and refrigerated goods.
9.	Nursing Home/Assisted Living	5	
10.	Refridgerated Warehouses	4	

Ocala's Power Needs

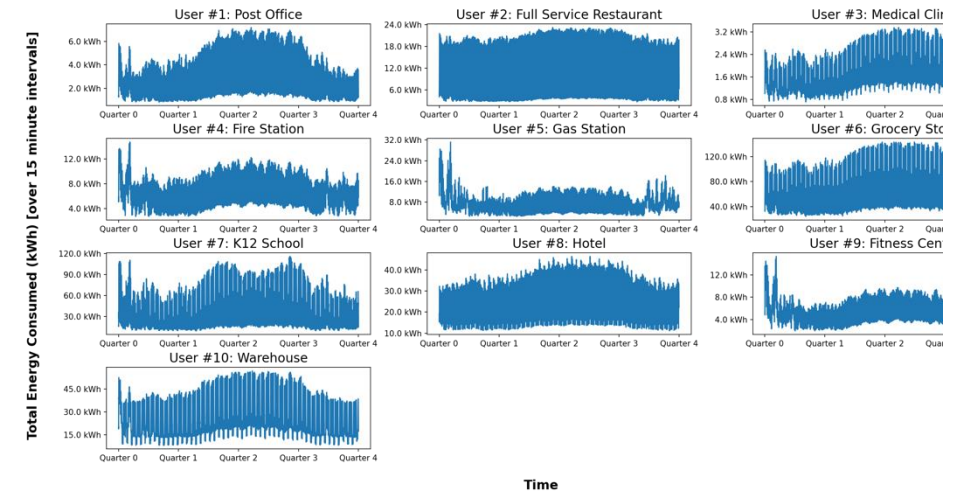
Yearly Trends may differ due to:

- Seasonal Temperatures [2]
- What Months are Businesses the Busiest?

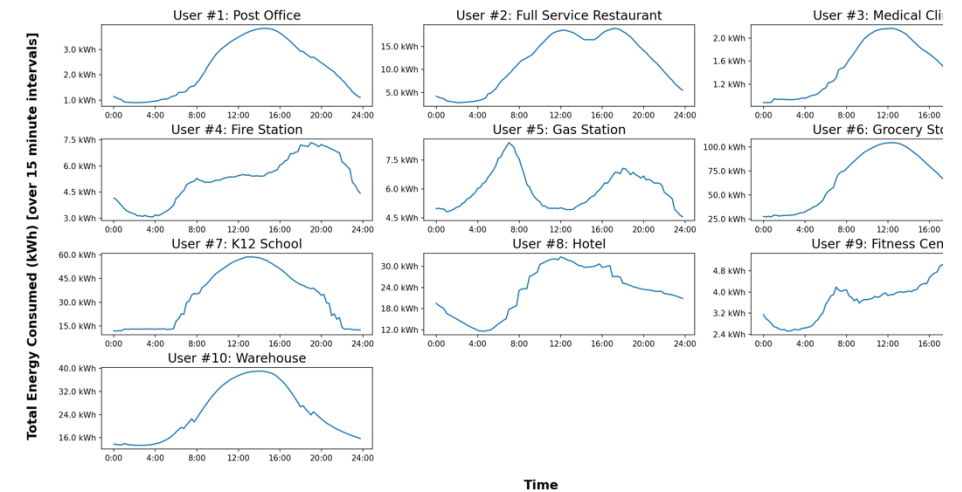
Daily Trends may differ due to:

- Times of Business Opened
- Difference in Temperatures over time

Yearly Energy Consumption for 10 Selected User Types

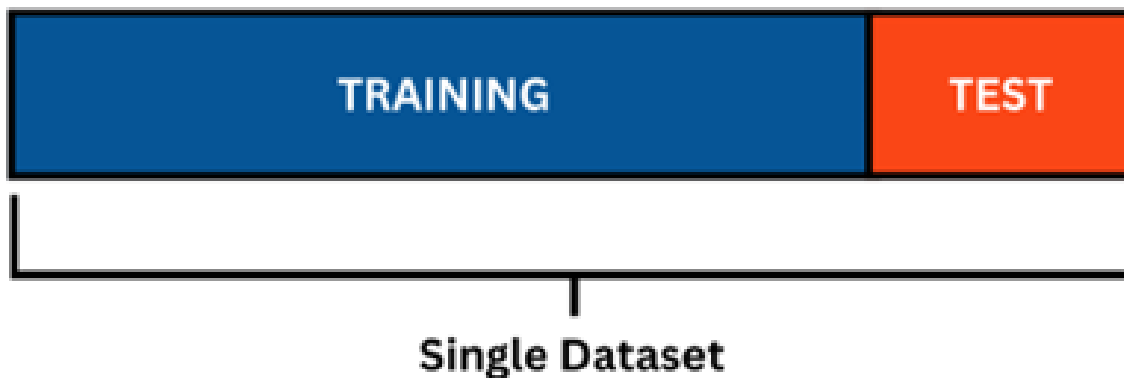


Daily Energy Consumption for 10 Selected User Types



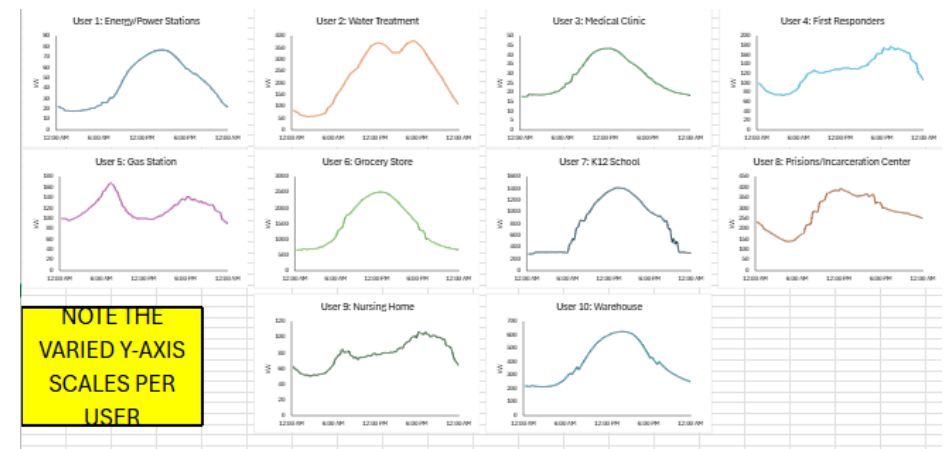
How Ai Could Optimize Power Distribution

Using Ai could help consolidate and distribute power more efficiently by giving certain users priority over others.

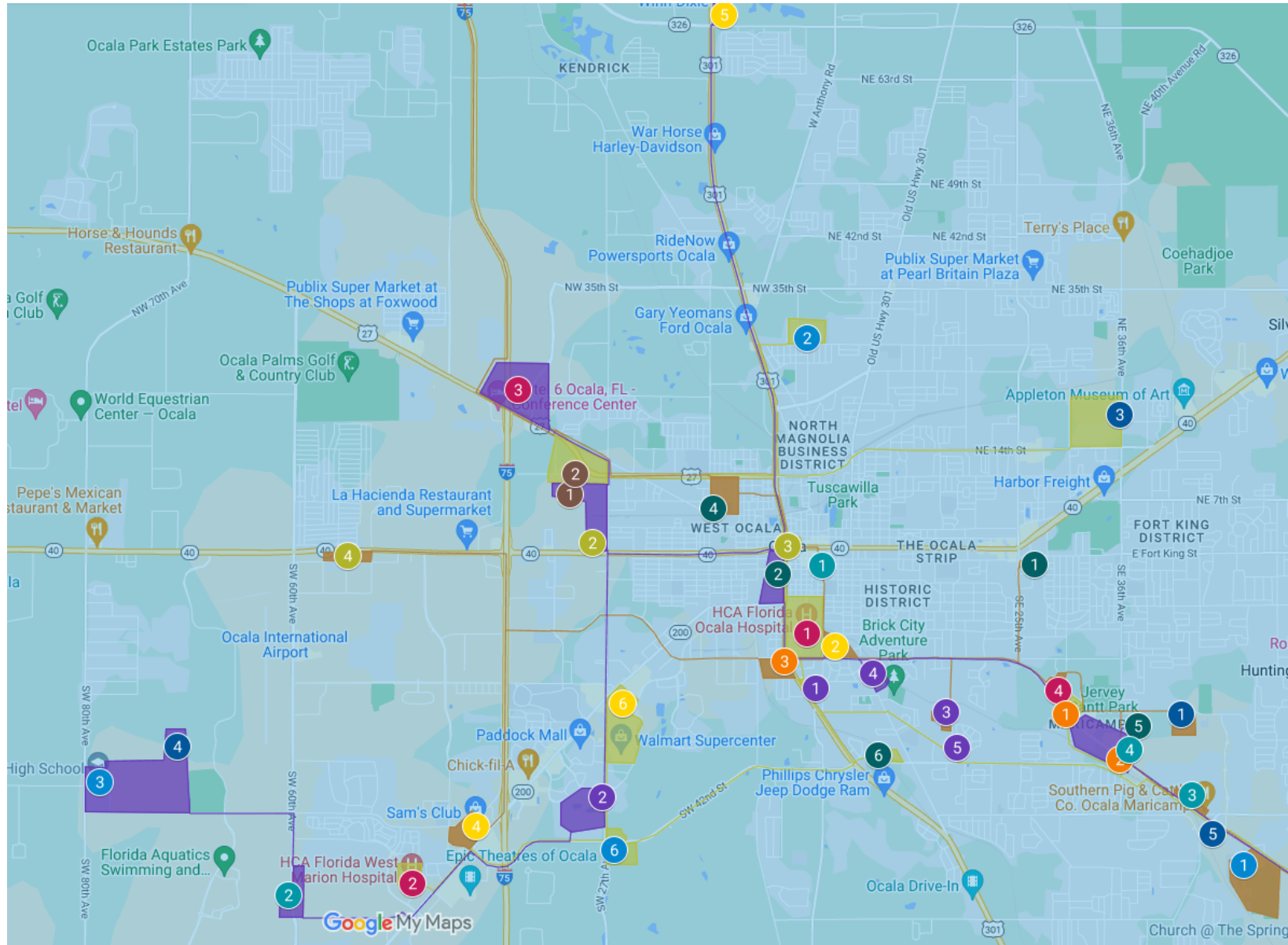


YOUR TASK IS TO DISTRIBUTE 100% OF THE AVAILABLE POWER (CELL C15) THROUGHOUT EACH QUARTER PHASE OF THE DAY									
12:00 AM - 5:59 AM - Adjustment					6:00 AM - 11:59 AM - Adjustment				
User	Disaster Power Distribution (% Max)	Distributed Power (kW)	Normal Max Power Demand (kW) from 12A-6A	Power Allocation Difference (kW) from 12A-6A	User	Disaster Power Distribution (% Max)	Distributed Power (kW)	Normal Max Power Demand (kW) from 12A-6A	Power Allocation Difference (kW) from 12A-6A
User 1	10.0	353.0	23.2	329.8	User 1	2.5	89.2	55.4	33.8
User 2	7.0	247.1	115.7	131.4	User 2	10.5	370.6	366.4	4.2
User 3	5.0	176.5	22.4	154.1	User 3	1.5	52.9	43.2	9.8
User 4	3.0	105.9	99.7	6.2	User 4	3.7	130.6	129.3	1.3
User 5	5.0	176.5	143.8	32.7	User 5	4.9	173.0	167.8	5.1
User 6	35.0	1235.4	1076.1	159.4	User 6	71.0	2496.1	2491.9	4.2
User 7	10.0	353.0	336.9	16.1	User 7	5.9	208.3	1349.4	-1141.2
User 8	15.0	529.5	234.0	295.5	User 8	0.0	0.0	384.8	-384.8
User 9	2.0	70.6	64.5	6.1	User 9	0.0	0.0	83.8	-83.8
User 10	0.0	282.4	273.2	9.2	User 10	0.0	0.0	592.4	-592.4
	100.00	2529.74				100.00	2529.74		

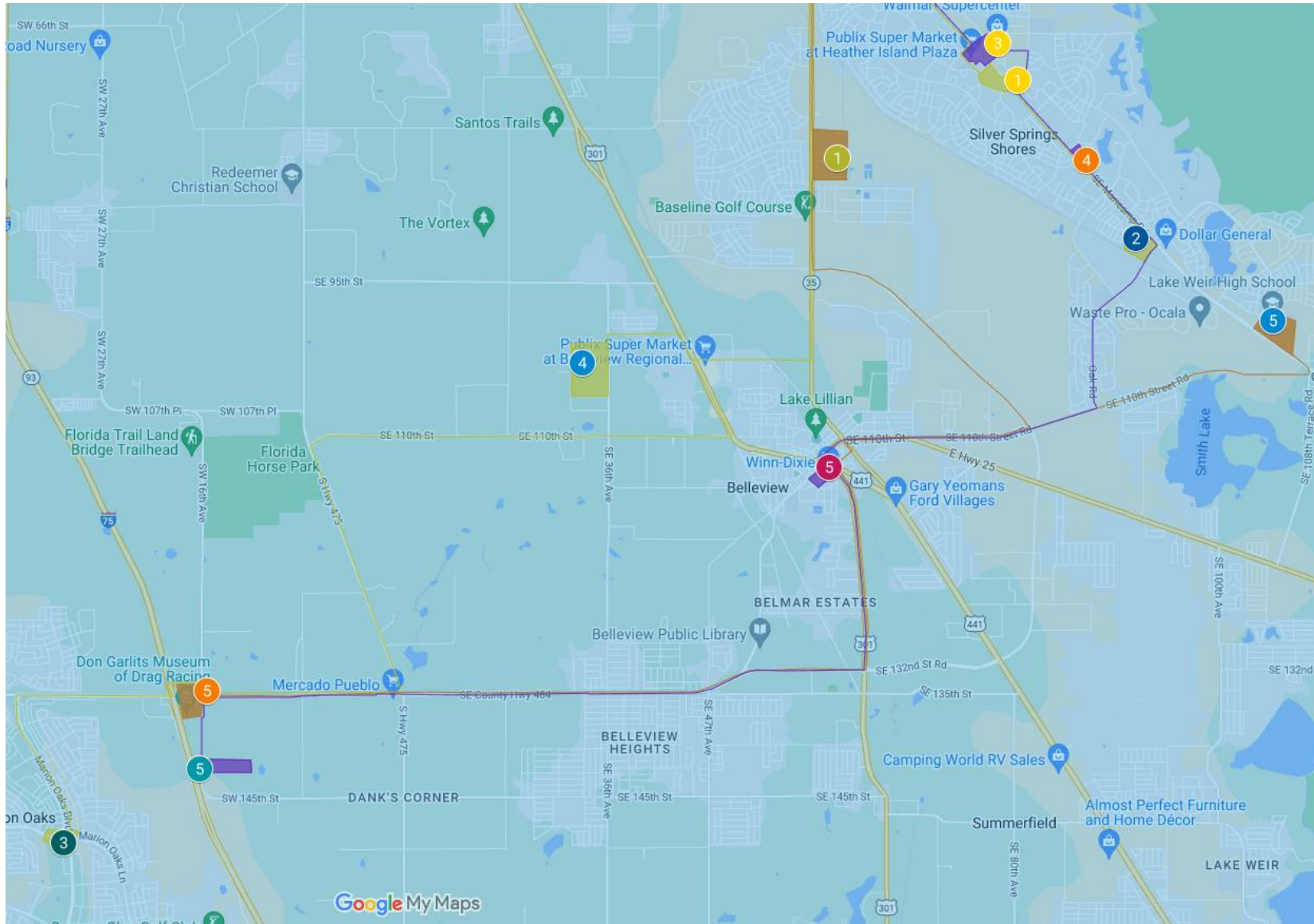
12:00 PM - 5:59 PM - Adjustment					6:00 PM - 11:59 PM - Adjustment				
User	Disaster Power Distribution (% Max)	Distributed Power (kW)	Normal Max Power Demand (kW) from 12A-6A	Power Allocation Difference (kW) from 12A-6A	User	Disaster Power Distribution (% Max)	Distributed Power (kW)	Normal Max Power Demand (kW) from 12A-6A	Power Allocation Difference (kW) from 12A-6A
User 1	2.2	77.7	76.5	1.1	User 1	1.9	67.1	55.5	11.6
User 2	10.8	381.2	378.4	2.8	User 2	10.5	370.6	364.7	5.9
User 3	1.5	52.9	43.3	9.6	User 3	1.0	35.3	27.6	7.7
User 4	4.8	169.4	163.8	5.6	User 4	5.2	183.5	176.2	7.3
User 5	4.0	141.2	127.0	14.2	User 5	4.0	141.1	141.1	0.1
User 6	71.2	2513.2	2507.8	5.4	User 6	37.5	1322.7	1322.4	1.3
User 7	5.5	194.1	1409.6	-1215.6	User 7	28.0	988.3	966.2	2.2
User 8	0.0	0.0	391.9	-391.9	User 8	8.8	310.6	302.2	8.4
User 9	0.0	0.0	101.6	-101.6	User 9	3.1	109.4	106.1	3.0
User 10	0.0	0.0	624.9	-624.9	User 10	0.0	0.0	433.0	-433.0
	100.00	5042.7				100.00	5042.7		



100



Our Microgrid



All Together

Incorporating Smart and Microgrids will Improve our Community By:

- Utilities and important resources prioritized
- User variety
- Dispersed grids [3]
- Well distributed power load
- Instant System Health Analysis



References and Sources

- [1] “About Small Wastewater Systems.” United States Environmental Protection Agency. Accessed Nov. 6, 2024. [Online.] Available: <https://www.epa.gov/small-and-rural-wastewater-systems/about-small-wastewater-systems>
- [2] “Home Heating Systems.” energy.gov. Accessed: Nov. 6, 2024. [Online.] Available: <https://www.energy.gov/energysaver/home-heating-systems>
- [3] D. Wheatley. “Can Microgrids Help Reduce The Vulnerabilities Of The U.S. Power Grid?” Forbes. Accessed Nov. 5, 2024. [Online.] Available: <https://www.forbes.com/councils/forbesbusinesscouncil/2021/11/11/can-microgrids-help-reduce-the-vulnerabilities-of-the-us-power-grid/>

Thank you!
Questions?