Microgrid Data Platform Enhancements

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Project Vision

• Objective

- Gather, Store and Present Microgrid Data
- Interested Parties
 - Microgrid Administrators
 - \circ Researchers
 - General Public
- Purpose
 - Remotely monitor microgrid
 - Research how the solar crate/microgrid is performing
 - Garner excitement for energy production and usage

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	>Dranetz	6
-13w 23kw -23kw -23kw 16:54:30 18:13:49 19:33:07 20:54:50	Tesla Powerwall battery_average_voltage (V) battery_energy_exported (kWh) battery_energy_imported (kWh) battery_frequency (Hz) battery_instant_power (kW) battery_instant_power (kW)	Б
solar_instant_power -7kW	<pre>charge (%) load_average_voltage (V) load_average_voltage (V) load_energy_exported (kWh) load_energy_imported (kWh) load_freeweex (Wh)</pre>	
	load_instant_power (kW) load_instant_power (kW) load_instant_total_current (A) site_average_voltage (V) site_energy_exported (kWh)	
barres, senses poses (200	site_energy_imported (kiWi) site_instant_power (kW) site_instant_total_current (A) solar_average_voltage (V) solar_energy_exported (kWh) solar_energy_imported (kWh)	

Requirements

- Display historical data from microgrids.
- Restrict microgrid viewing access to authorized users.
- Securely transmit data from the microgrid to the database and webserver.
- Collect and store data from microgrid sensors.
- Allow new microgrids to be added to the system.
- Have functionality parity with the existing mobile app.

UX Requirements

- Display the graphs from the micro grid in an easy and digestible format appropriate to its audience.
- Display simplified data for public users.
- Provide a more advanced breakdown for researchers.
- Navigate between different graphs and different components of the microgrid.

Conceptual/Visual Sketch



Prototype

- Initial Figma Design
- Graph traces depend on data available for component



Conceptual Design Diagram



Design Complexity

- Full stack interaction between various components
 - Microgrid/Python data aggregators
 - Cassandra Database/Spring Boot Backend server
 - \circ Web frontend
- Security
 - Authentication and secure data transmission
- Indeterminate list of various sensors/devices
 - Tesla Powerwall, Solar Panels, Dranetz Power Quality Meter

Project Plan – Schedule

	October	November	December	January	February	March	April
Web app design							
Study existing Cassandra and Spring							
Web app prototype							
Change/implement Cassandra and Spring to suit project needs							
Edit APIs in existing backend to suit project needs							
Web-app implementation							
Integrate graphs into frontend							
Data-collection script design							
Data-collection script prototype							
Data-collection script implementation							
Identify and evaluate existing security posture							
New Security Controls implemented							

Project Plan - Risks

	Probability	Severity	Total Risk	Mitigations
Solar Grid goes offline (breaks)	0-10%	Moderate	Low	Use existing data for testing the project.
Solar Grid goes offline (moved/scheduled maintenance)	40-60%	Moderate	Moderate	Be aware of planned downtime by the grid and plan around it.
Security Breach (corrupting/manipulating data)	0-10%	High	Low	Backup our data to restore any lost/corrupted information.
Code lost to laptop crash	80-100%	Low	Moderate	Push code regularly. Work on separate branches to store progress without breaking other people's code.
ETG VMs go down	20-40%	High	Moderate	Restart VMs, contact ETG for support if needed.

Test Plan

Testing will be executed via simulating interactions within and between different levels of the stack.

Unit Testing	Interface/Integration Testing	System Testing
Aggregators	Frontend to Backend API	Aggregation System Testing
Backend API	Backend API to Database	Full-stack System Testing
Frontend/React	Aggregators to Database	

Conclusions

• Fall 2022

- Completed Web Application Design
- $\circ~$ Created Plan and Timeline for Spring 2023 Semester
- Spring 2023
 - Implement Web Application Design
 - Cybersecurity Assessment

