Artefact Development Sprint Plan

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May 2021

1 Project Description

1.1 Project Aim

The aim of my research project is to discuss about Microgrids thoroughly, then discuss about different scenarios that might occur in a microgrid. Once creating the scenarios is completed, I'll run simulations for each scenario and check how the microgrid reacts on those situations. After obtaining my results from these simulations, I'll have a better understanding of what metrics are necessary for the microgrid to achieve optimal functioning.

1.2 Project Scope

1.2.1 Project Goals

The scenarios I'm discussing in my paper are either concerns related to the weather or related to the supply-demand of a microgrid. I will then create a virtual environment on a Microgrid Simulation software and run each scenario to obtain results. By the end of these experiments, I'll have a better understanding of the necessary metrics required in running a microgrid successfully.

1.2.2 Project Deliverables

- Discuss the importance of microgrids and its popular trends.
- Answer each research question.
- Run each simulation and observe the results thoroughly.
- Discover the metrics of success for the microgrid.

1.2.3 Project Tasks

- Complete a thorough literature review of microgrid's importance, features that still require research and its popular trends.
- Find a suitable simulation software to run the different if scenarios.

- Read research papers based on the simulation software being used.
- Create different scenarios that might occur in the microgrid.
- Learn how to use the simulation software and enhance my skills.
- Search for data that will be used in the simulations.

2 Aims and Goals of the project

- Research about the gaps that are still present in a microgrid.
- Discuss about the microgrids importance and popular trends within it.
- What are the metrics of success for a microgrid and how does the microgrid achieve optimal functionality.

3 Research methodology

3.1 Essential Tools

- **Node Red-** I will design my microgrid environment in node red. It is a programming tool for wiring together hardware devices, API's and online services. It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its run time in a single-click.
- **C Sharp Code-** An essential feature of my microgrid design is its storage system i.e. the Battery. The battery must be smart enough to make its own decisions on when to store energy and on when to consume it. I will code a function for this and then run it in node red.
- **OpenWeatherMap API-** This tool is required for my data collection. It provides many features and is among the best in the business.
- **Resource Optimization-** This technique will help in evaluating the available resources with the needs of the microgrid. The management of the resources is beneficial for the microgrid.

3.2 Experiments set up

- The Microgrid Simulation tool will be set up.
- The virtual environment of the simulation will have solar panels for consuming solar energy, buildings which will consume the energy and run the whole process.
- The storage battery absorbs extra energy and provides the surplus energy when there's power shortage.

- The goal of the simulation is to achieve a fully functioning microgrid which consumes less energy and achieve carbon neutrality.

3.3 Overview of Data Collection

Each of my simulations will require data for them to run. I will use OpenWeatherMap API to collect data. The microgrid I'm designing is located in Waurn Ponds and I will collect Waurn Ponds forecast information of 1 week. OpenWeatherMap API provides real time weather data as well as hourly weather temperature for 4 days.