Stage IIa: Project Proposal Specifications

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I) Proposal: Energy Demand

II)

1. Problem Statement:
    a. Determine the efficiency of the energy consumption and cost benefit of alternative resources of buildings on the TCNJ campus.
2. Objective of the module:
    a. Provide an accessible and comprehensible way of viewing the data regarding energy consumption.
    b. Provide the client/stakeholder an analysis of the financial impact of the current energy usage.
    c. Explore green energy usage and the predicted energy usage benefits of switching to various green energy sources.
3. Description of the desired end product:
    a. Provide access to the TCNJ sustainability staff and Paul Romano.
    b. Create a login page that allows users to input login credentials to manage access to data.
    c. Create a home page that displays a description of the website and provides easy navigation.

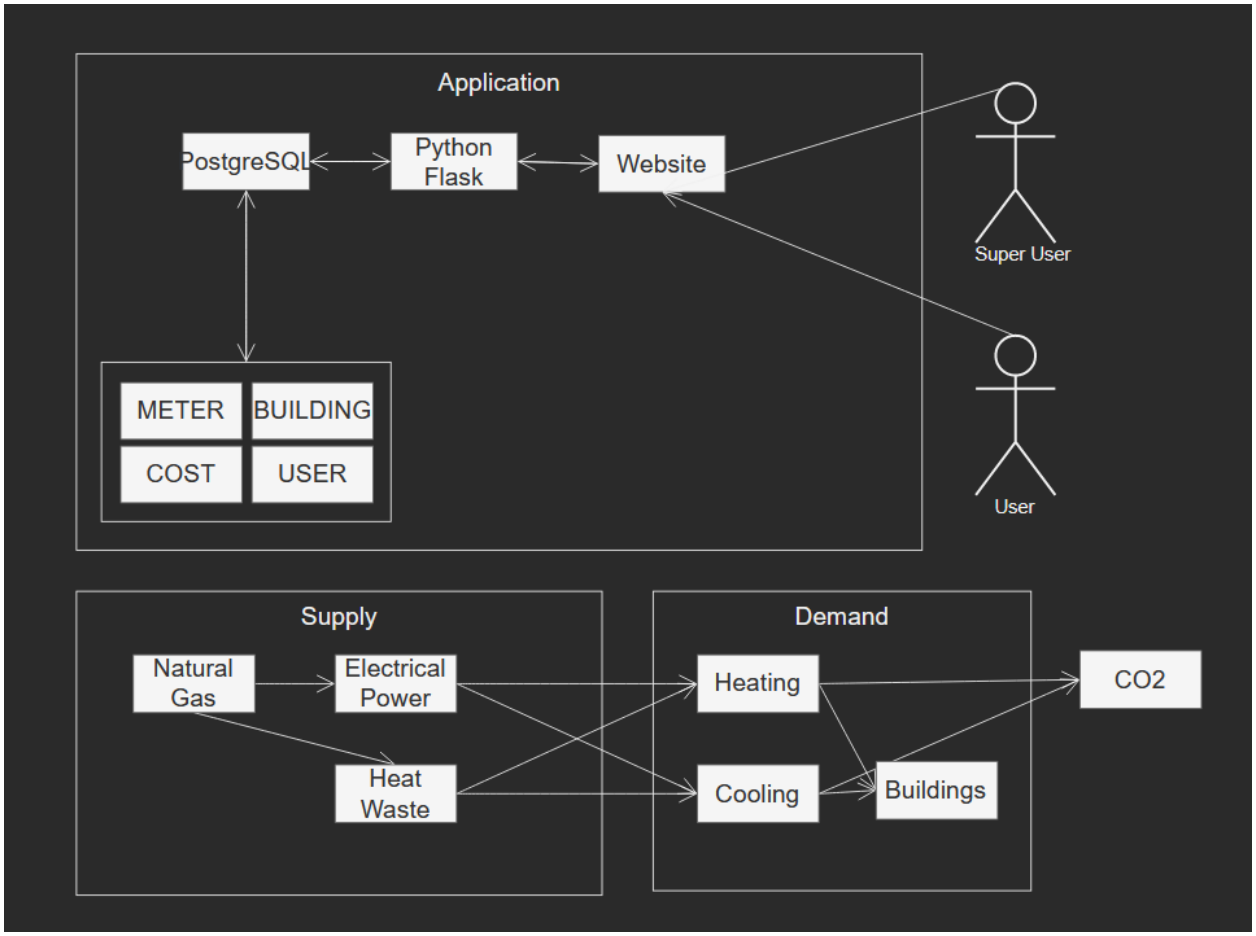
   d. Innovate interface for displaying graphical data and other relevant summary statistics or cost analysis.
   e. Implement users with privileged (can modify the data) and non-privileged (can not modify the data) access.
   f. Take into consideration the building features such as but not limited to building size, building use, and building operational hours.

4. Description of the importance and the need for the module, and how it addresses the problem:
   a. Personalized database architecture offers specific insight and knowledge for TCNJ energy consumption and carbon emissions.
   b. Graphical representation provides stakeholders with a more comprehensive understanding of energy consumption and carbon emission.
5. Plan for how you will research the problem domain and obtain the data needed:
   a. By using accounting principles involving cost analysis, we can analyze TCNJ's individual buildings' energy efficiency, in order to get the economic data and resulting monetary effect of the current energy consumption across campus.
   b. By using equivalent units, we will provide the client with a benchmark for CO2 emissions categorized by building. By using equivalent units, the user will be able to see current CO2 emissions in a way that can be measured against other forms of consumption involving green alternatives. This will aid the client greatly, as various fuels are measured in different units, so comparison of current carbon emissions against other forms of consumption will make it easy for the client to understand their energy consumption options in terms of CO2 emissions.

6. Other similar systems / approaches that exist, and how your module is different or will add to the existing system:
    a. Other systems may perform similar functions as ours, such as taking energy usage data and providing users with output on how efficient the building/area they own is using a certain energy type as well as the cost analysis based on that energy usage. However where our module differs is where we will both provide the energy efficiency and cost efficiency of used energy for a certain building/entity in an understandable format, as well as provide users with green solutions, which provide the predicted economic and energy efficiency effects of this green energy switch to aid the TCNJ sustainability staff in their decision making.
7. Possible other applications of the system (how it could be modified and reused):
    a. While the database will be built on the goal of providing Paul Romano and his team an easy way to analyze TCNJ buildings' energy consumption, the data could be extended to other sectors of TCNJ. For example, TCNJ workers who analyze the college's budget can use the database to determine how much money is being used for energy in specific buildings.
    b. Tools of the application are general (simple summary statistics: averages and outliers) enough to be utilized on various forms of data.
8. Performance - specify how and to what extent you will address this:
    a. The data is not at a large enough scale to significantly reduce performance. Thus, no extra measures need to address this.
9. Security - specify how and to what extent you will provide security features:
    a. TCNJ server cluster and GitHub provides the authentication services for security.

b. Access to the database will be provided by user authentication via login page.
c. Access to the data is exclusive only to members of the TCNJ sustainability team and other authorized users.

10. Backup and recovery
    a. The database will be hosted on the GitHub distributed servers therefore there is inherent redundancy. The TCNJ server cluster utilizes backup images thereby providing recovery for our application/database. Thus, no extra measures are needed for backup and recovery.
11. Technologies and database concepts the group will need to learn, and a plan for learning these.
    a. Develop an understanding of relational databases and how to efficiently and securely query the databases.
    b. Learn how to utilize data sanitation for protecting against SQL injection and other forms of malicious actors.
    c. Learn how to create effective ER diagrams and identify keys to develop a comprehensive schema.
12. A diagrammatic representation of the system boundary that specifies what data you will model and which queries you will implement.



13. 1-Page Quad Chart:

CAB Project – Energy Demanded

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Need

- How to optimize energy emissions
- How to provide more clean energy

Approach

- Generate graphical view of the data
- Utilize relational data model
- Use cost analysis to compare efficiency between different energy demands

Benefit

Easier data access to analyze:
•energy consumption of campus buildings on a Gross Square Footage basis
•the carbon equivalent emissions of campus buildings on a Gross Square Footage basis, on both a site and source basis

Competition

- More personalized data analysis
- Provide predicted emission for alternative sources of energy