Project Proposal and Specifications
ACC311/CSC 315
Group 4 Members: Bret Elphick, Andrew Fellenz, Katherine Gellman, Dalton Hutchinson, Brooks Watson, Jimmy Fay

Problem Statement:
With the effects of global warming becoming increasingly apparent, it is of the utmost importance for TCNJ to monitor its energy use. Companies and colleges around the world are striving to lessen their carbon footprint and become carbon neutral in the near future. Additionally, it is important to meet these environmental goals in an economically feasible way. To aid in this endeavor, our group wants to create an interactive software application for the TCNJ Energy Management Team that makes use of the energy demand data by building.

Objective of the Module:
At Paul Romano's presentation, he stated that TCNJ wants to be carbon neutral by 2040. Keeping this goal in mind, the overall objective of the project is to make this important energy demand data easily accessible to the Energy Management Team at TCNJ and others who might find it useful. We also want to use the energy demand data to help evaluate and estimate the cost of the building energy demand. Therefore, this application will be a useful tool for monitoring the data and making the right decisions for both the environmental and economic sides of this problem.

Description of the desired end product, and the part you will develop for this class:
Ideally, the application will be able to present data about building energy demand and cost in both graphical and tabular forms depending on the user's request. It should also make use of energy demand data from other colleges as a useful comparison tool. Realistically, it might not be feasible to obtain this data from other colleges so we could provide other useful information, such as how to lower the TCNJ carbon footprint and eventually reach carbon neutrality. In order to do this, we could provide features for comparing energy consumption among different buildings at TCNJ itself. Then, along with addressing the environmental side of the problem, we also want to output the cost of energy demand for the buildings at TCNJ. This might help TCNJ identify important patterns, such as a relationship between building age and energy cost.

Description of the importance and need for the module, and how it addresses the problem:
According to NOAA scientists, New Jersey temperatures have gone up by 3 degrees Fahrenheit over the past century. Also, over the past decade, we have seen record-setting storm seasons in NJ. The data has made it clear that the effects of climate change are in motion. Therefore, it is important to create a tool that can be used by energy experts to reduce the carbon footprint of TCNJ. With our tool, TCNJ can monitor its energy consumption and use that data to come up with a strategic environmental plan. Going along with that, the tool will also address cost, thus allowing TCNJ to tackle this problem in the most economically efficient way.

Plan for how you will research the problem domain and obtain the data needed:
The TCNJ energy demand data appears to already be on Canvas. To obtain the additional data that we talked about, such as other northeastern colleges' energy demand, we will need to either make use of public data or reach out to the colleges themselves. Some colleges that we might reach out to include Sacred Heart (6417 students), Fairfield (4354 students), and Marist (5682 students). To learn more about how to reach carbon neutrality we will likely use governmental resources. Also, if cost is not provided in the dataset, we will need to use publicly available data about the cost of different fuel sources (natural gas, coal, clean energy, etc.) in New Jersey.

Other similar systems/approaches that exist, and how your module is different or will add to the existing system:
Reliant has an energy usage tool for residencies that makes comparisons to averages. There are also many applications where the user enters in their energy usage and it outputs the cost of the by day/month/year. While we might be incorporating some of these ideas into our own implementation, ours is unique because it's specifically for colleges and should be able to provide feedback on how to reach carbon neutrality.

Possible other applications of the system (how it could be modified and reused):
If our application is useful to the TCNJ Energy Management Team we could reach out to other colleges to see if they could benefit from the tool. Additionally, if companies track their energy usage they might be able to make use of it as well. We are hoping that it could be useful in monitoring energy usage, monitoring energy cost, making comparisons, and reducing carbon footprint.

Performance:
As we learn more about proper ER design the CSC 315 portion of the team will come up with efficient access paths. Also, since we are not dealing with huge amounts of data, performance should not be a serious problem. We also plan to keep the user interface rather clean and simple so that no unnecessary UI features slow down the application.

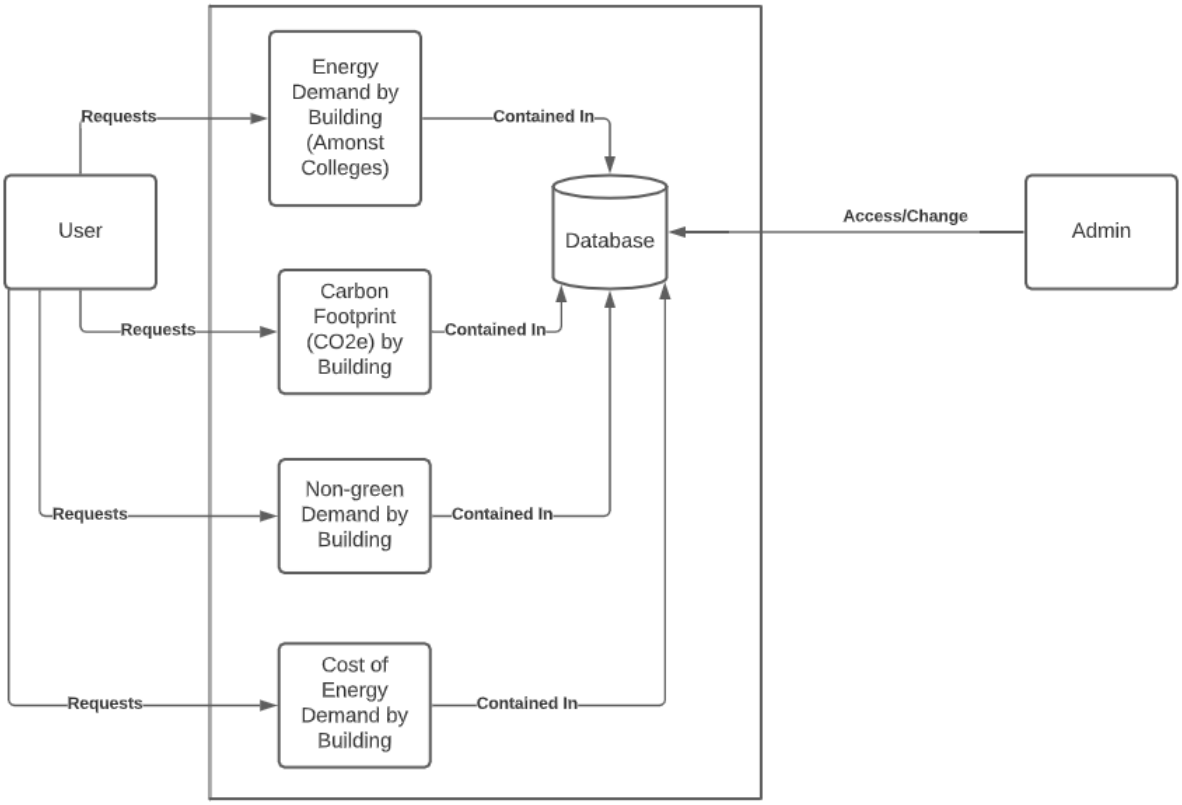
Security:
Since the project will be on GitHub we do not have to deal with security for now. However, if we want to make the application publicly available we will use database security knowledge from CSC 315. As we create our application we will keep in mind techniques, such as defense in depth, and make sure only approved admin accounts can change things in the database. We will use an already existing login system with encryption of login credentials to ensure the security of admin accounts.

Backup and Recovery:
Github has features in which we can revert our project to previous versions if something were to go wrong. Since we have multiple computer science members who are experienced with GitHub, the project should be safe if we need to recover it. However, if we want to make the

application publicly available we will use database backup and recovery knowledge from CSC 315.

Technologies and database concepts the group will need to learn, and a plan for learning these:
We will need to learn more about proper relational database design. As of now, we have a basic understanding of entities, attributes, and the relationships amongst entities. But we will need to learn more about how to make efficient access paths and how to limit the number of NULL entries. As we learn more about databases we will be able to choose a technology that seems right for our project, whether it be Postgres, MySQL, etc.

Diagrammatic Representation of System Boundaries:



Quad Chart:

TCNJ THE COLLEGE OF NEW JERSEY

Energy Demand

Section 1 Group 4

Need

With the effects of climate change becoming more prominent, TCNJ and most other universities are striving to lessen their carbon footprint and become carbon neutral in the near future. We believe there is a need to track energy consumption in specific parts of our campus and make this data easily available to the people who can use it to the school's benefit.

Approach

Our group wants to create an interactive software application for the TCNJ energy Management Team that makes use of the energy demand data. The application will be able to present data about building energy demand in both graphical and tabular forms depending on the user's request.

Benefit

If our tool is useful, we could aid our university and possibly other universities in their goal to reach a carbon neutral status by showing useful information to the respective energy management teams, which they could react accordingly to.

Competition

Reliant has an energy usage tool for residencies that makes comparisons to averages. There are also many applications where the user enters in their energy usage, and it outputs the cost of the by day/month/year. While we might be incorporating some of these ideas into our own implementation, ours is unique because it's specifically for colleges and should be able to provide feedback on how to reach carbon neutrality.

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