Group 3

ACC311/CSC315 Proposal

Fleet Vehicles Management

<u>Problem Statement</u>

For our project, we have been tasked with finding a more cost effective and environmentally friendly way for TCNJ's fleet to operate. In order to become more cost effective and better for the environment, we suggest slowly transitioning from ICE vehicles to zero vehicles. By doing so over time, no large budget will need to be immediately created. Instead, money shall be allocated per year for the entire transitioning period. This transition period may last 20+ years. Our plan to achieve this involves using the FIFO method to retire the model older cars first and replace those with the zero vehicles. This will allow newer vehicles to continue in operation, and keep replacement costs as low as possible. As new vehicles are introduced, we will use the straight line method of depreciation. This will keep depreciation costs low and constant over the lifespan of the vehicles.

<u>Objective</u>

Our overall objective is to create a solution that will address how TCNJ can be more efficient in reducing emissions and simultaneously create a plan that will be cost effective for the school. Our specific objective for the module is to provide a database that holds data regarding TCNJ's vehicle fleet such as fleet fuel source and emissions and fleet service life and depreciation. The database will include a user interface that allows the user to input a year and retrieve information regarding TCNJ's vehicle fleet

such as cost and percentage of emission. This data could then be compared with previous and future years based on TCNJ's proposed transition to zero vehicles.

Description of the desired end product/ the part you will develop for this class.

We hope that our final database will help us solve the problem of creating a more cost effective and eco-friendly fleet for TCNJ. Our database should highlight different characteristics per vehicle for the proposal/future years. It should also specify what vehicles will be the most cost efficient and environment safe options. The following elements will be major variables and output data needed to help solve the problem: fleet fuel source and emissions, fleet quantity and age, and fleet operational costs. By examining the variables and outputs, we will be able to properly determine which vehicles need to be replaced, hopefully in accordance with FIFO.

Description of the importance/ need for the module/how it addresses the problem.

The module is necessary in addressing the problem because it provides information about how fuel source, emissions, age, quantity, and operational costs influences our solution. The module will also highlight the future plans for the vehicles and add a description to the proposed vehicles being put into place. Through our database, we will be able to illustrate how our plan for a slow integration of the new fleet will be the most beneficial to both TCNJ and the broader community. The database will be able to show how using a FIFO method of inventory management will be a necessary process in order to replace older vehicles first, as older cars emit more emissions than more modernized vehicles. Additionally, it will highlight how straight-line depreciation will be most beneficial through a possible depreciation schedule.

Plan for how you will research the problem domain and obtain the data needed

If we were to make a full transition to zero vehicles we would need to obtain current data of charging stations already available at the school. This would need to include how many charging stations are currently available and where they are installed. We would also have to research how installing more stations would impact the cost effectiveness of our plan (I.e. is there specific locations, cost constraints, other alternative power sources?) We would also need to research how different vehicles may emit different levels of emissions as this may impact our FIFO inventory restock and change which vehicles should be replaced first.

Other similar systems / approaches that exist, and how your module is different or will add to the existing system.

The module is different because it will be able to search for certain characteristics and for certain vehicles. The module will make it very easier to search the database to find the information that the user is looking for. The module will be much better than the database provided because the module will provide a user interface that will help the user find the information they are seeking easily and it will help them find the characteristics that they are looking for on certain vehicles.

Possible other applications of the system

Solution could also be used to determine the monetary cost and environmental costs of other machines/equipment in other industries. For example, monetary and environmental costs of certain kinds of manufacturing equipment.

Performance

Performance should be good since the data set for the database would not be large. We would try to make our database as efficient by using an ER model. Most

importantly we would want to optimize our queries to not only allow our database to perform more efficiently but also improve its performance as a whole.

Security

Github is a private repository not open to the public therefore it should be pretty secure when creating our database. We could also create an administrator system which would only allow those with access to edit the database thus separating the web servers from the database.

Backup and recovery

Github has backup capabilities that will allow us to be able to recover source code and update our source code. Additionally, we could develop a backup plan, perform effective backup management and perform periodic database restore testing.

Technologies and database concepts the group will need to learn, and a plan for learning these

Our team would need to research various database models to find the most efficient way to hold our data, how to create a user and administrator interface that supports our database, and how to allow the user to filter the database in order to retrieve the desired information. In order to achieve this our team will also need to learn how to create efficient databases.

A diagrammatic representation of the system
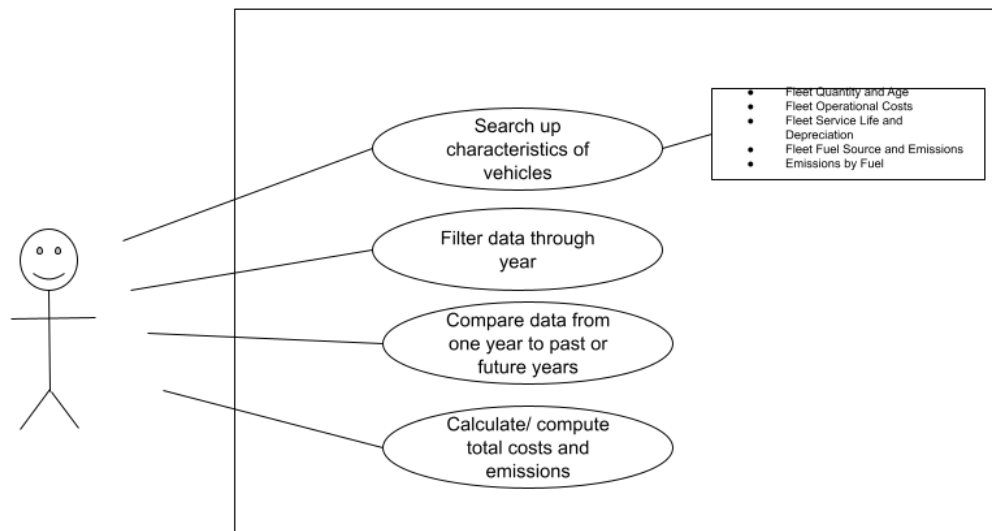
Fleet Vehicle Management

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Need

The customer needs an efficient, sustainable, and cost-effective strategy for the most economical composition of the TCNJ vehicle fleet. Along with developing an approach for the environmental conformation for the vehicle fleet.

Approach

The approach for addressing this is firstly transitioning ICE vehicles to zero vehicles. This will be done by using the FIFO method in retiring older vehicles and replacing those with zero vehicles first. Allowing for newer vehicles to continue operating smoothly.

Benefit

The specific benefits for the stakeholders would be the following: because of the proposed transition from ICE vehicles to zero vehicles this will cause money to be allocated annually for the entire transition period. No immediate budget is mandatory for this transition. The college's goal to reach carbon zero by 2040 will be feasible as well since this is a 20-year process.

Competition

The benefit of this approach is far superior to what others may propose because of the positive economic and environmental relationship. Different approaches can vary from rebuilding older models or decreasing the number of transportation vehicles being operated which would benefit the environment but also put constraints on labor. Instead, the FIFO approach positively impacts the environment using minimal cost, and low constraints on labor.

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