

BYU Fleet Electrification
Project ID: CEEEn_CPST_016

by

The Imagination Engineers
Cody Hakes
Camden Greenhalgh
Preston Ciccarello
Bridger Clymore

A Capstone Project Final Report

Submitted to

Therin Garrett
BYU Vehicle Fleet Manager

Department of Civil and Construction Engineering
Brigham Young University

April 17, 2023

Executive Summary

PROJECT TITLE: BYU Fleet Electrification
PROJECT ID: CEEEn_CPST_016
PROJECT SPONSOR: BYU Vehicle Fleet Manager
TEAM NAME: Imagination Engineers

Our project was to determine the feasibility of a conversion of Brigham Young University's (BYU) fleet of mostly internal combustion engine vehicles (ICEV's) to plug-in hybrid vehicles (PHEV's), hybrid electric vehicles (HEV's), or electric vehicles (EV's). As per requirements, we were to determine which vehicle option(s) produced the best benefits from an economic and an environmental standpoint.

Starting in September, 2022, the process involved significant data-gathering, asking advice from our faculty mentor, Dr. Sonntag, and sorting away any biased data and opinions. Once sufficient data had been gathered, it was used to create unbiased conclusions as to the best possible goal and plan for the fleet.

We did this by creating a set of Excel sheets to optimally organize the data and perform the necessary environmental and economic calculations. Using this method, we found that ICEV's are the worst option economically and environmentally. We also found that HEV's are the best option economically and the third best option environmentally. We found that PHEV's are the second best option both economically and environmentally. Lastly, we found that EV's are the best option environmentally but the third best option economically.

As a result of our analysis, we determined that currently conversion to HEV's and/or PHEV's, where possible, is the superior option. The additional cost to BYU due to the accelerated depreciation of electric vehicles and the current energy mix available to BYU consisting of a relatively high percentage of coal combine to prevent the additional jump to electric vehicles being the better option. This will however likely change within several years as EV technology improves and Utah moves to a cleaner energy mix.

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Introduction

The purpose of this project was to determine the current relative environmental and financial feasibility of converting the vehicle fleet of BYU from fossil fuel vehicles to electric ones.

As such, significant research has been done, as much as could reasonably be expected within the allotted time constraints. From last September until now, we have reached out to industry experts for advice, received important fleet information from our client, met regularly with our mentor and aforementioned client, organized and used the data, and so on. We had to make a few assumptions in the process, mostly due to limited time, primarily in the values used to estimate the manufacturing and disposal environmental impacts. However, our client did request that we learn and report as much as we could, so we did include some data on manufacturing and disposal.

We ultimately determined we would split the vehicles into four types: Gas vehicles (ICEV's), plug-in hybrid vehicles (PHEV's), hybrid electric vehicles (HEV's), and electric vehicles (EV's). This would help us vastly with organization and data manipulation.

As for budget and spending, no physical materials, costly software, or other similar resources were needed. Therefore, no financial aid or spending was necessary. However, in terms of time spent, at least two to three hours per week per person proved to be necessary overall, often more depending on weekly needs. This time was primarily directed to finding, then analyzing data we received. The rest of the time was given to reaching out to our mentor and our company contact, as well as other various experts who we needed to receive data and other aid from.

We believe ourselves to be quite qualified for this project and our conclusions. Each member of the team is a currently enrolled student majoring in Civil Engineering. The team has a diverse set of skills and emphasis of study including hydrologic, structural, and transportation engineering. This allowed us to approach the project from multiple perspectives and to consider all possible effects, both positive and negative, of electrification. The team also worked with Dr. Darrell Sonntag, the faculty mentor for this project who has experience in environmental engineering projects and emissions calculations, and a couple other field experts from UDOT and a university in Kansas City.

Schedule

In January and February, we researched how to perform the climate analysis and the cost analysis. We also started the climate and cost analysis at this time. Then, we finished the analysis and made the graphs in March and April. After we finished our graphs in April, we started work on our poster and this report.

Assumptions & Limitations

Environmental analysis:

We assumed the CO₂ emissions caused by operation in pounds per mile driven to be about the same for SUV's and normal cars.

GREET 2022 .Net Tool Assumptions: we used "SI ICEV - E10 (Type 1 Conventional Material)" to estimate our ICEV CO₂ emissions. We used "SI PHEV - E10 and Electricity (Type 1 Li-Ion/NMC111 Conventional Material)" to estimate our PHEV CO₂ emissions. We used "SI HEV - E10 (Type 1 Ni-MH Conventional Material)" to estimate our HEV CO₂ emissions. We used "EV300 - Electricity (Type 1 Li-Ion/NMC111 Conventional Material)" to estimate our EV CO₂ emissions. We chose these selections from the GREET 2022 .Net tool to represent our vehicle types because we believed that these best represented the types of vehicles that the BYU vehicle fleet would use. If the BYU vehicle fleet chooses to use one of the other vehicle options from the GREET tool such as an EV200 instead of an EV300, then the CO₂ emissions we used will be slightly higher than the actual CO₂ emissions.

We used the current BYU vehicle fleet odometer readings and year of the vehicles to calculate the average miles driven per year for BYU vehicles. This was calculated to be 5,144.8 miles per year per vehicle.

We also assumed that the BYU fleet will keep vehicles for approximately 5 years for making the second set of tables and graphs.

Cost analysis:

Tax Rebate: Due to the majority of major vehicle manufacturers having sold sufficient electric and hybrid vehicles to no longer qualify for government tax credits that were largely available in the past these tax credits have not been taken into consideration when determining cost. If a vehicle in consideration does happen to be eligible for the tax credit this can lower the cost of an electric vehicle by up to \$7500.

Chargers: Due to chargers being a more long term investment than an electric vehicle itself and the wide variability in cost to install based on existing electrical infrastructure they were left out of any cost analysis comparing vehicle type and instead were analyzed separately.

Insurance: While vehicle fuel type can affect insurance cost it is not one of the major factors that will influence this price and as such was ignored for all price comparisons as it varies between different insurance providers if it raises or lowers premiums.

Corporate discount: Through communication with our project sponsor a discount of 15% was used for all vehicle sale prices to account for the dealer incentives often offered to BYU when purchasing vehicles. This discount was assumed to be uniform across all vehicles.

Design, Analysis & Results

Environmental analysis:

The environmental analysis is intended to encompass the lifetime CO₂ emissions. To do this, our analysis consisted of three main parts. The first part was calculating average CO₂ emissions in pounds per mile driven for gas vehicles (ICEV's) using the fleet data given to us by Therin. The second part was to calculate the CO₂ emissions in pounds per mile driven for plug-in hybrid vehicles (PHEV's), hybrid electric vehicles (HEV's), and electric vehicles (EV's) using Utah's power grid data. The third part was to find the lifetime CO₂ emissions in lb per mile driven that were caused by the assembly, disposal, and recycling of the vehicle, making the battery, making the fluids, and making the components of the vehicle for each vehicle type using the Greenhouse gasses, Regulated Emissions, and Energy use in Technologies (GREET) model. We performed step three for both SUV's and normal cars.

The first part was performed by analyzing the data sheets given to us from Therin, as mentioned in the previous paragraph. This data sheet contained the whole BYU fleet (all 1056 vehicles). With each vehicle, came information about the year it was made, the make and model or description, as well as the current odometer reading and the miles per gallon of each vehicle. This was plenty of information to get started on the environmental analysis. After talking to Dr. Sonntag, he showed us a few conversion factors we could use that converted gallons of gasoline to grams of CO₂ emissions. This changed depending on if the vehicle used regular gasoline or diesel. First, we divided the current odometer reading of the vehicle by the miles per gallon of that vehicle to get the total number of gallons of gasoline used in its lifetime. We then were ready to use the conversion factor to get our total emissions for the fleet. It was more beneficial to look at the emissions in terms of pounds per mile so we could compare the different types of vehicles in the fleet. For the missing data points, we took the average odometer reading and plugged that into those blank cells. For missing miles per gallon per vehicle, we took the average for regular gasoline, and the average for diesel. We put asterisks next to the corrected averages. This was so we could still have the numbers not be too affected by missing points. If we deleted those vehicles, it could have thrown off the research. Using these numbers, we were able to compare all of the average CO₂ emissions per mile to determine which of the vehicle types were producing the least amount of pollution. The hybrids produced the least amount, while the diesels produced the most.

To perform the second part, we used <https://www.epa.gov/egrid/data-explorer> to determine that Utah's total CO₂ output emission rate is 1,560.50 lb/MWh. Then, we used the output emission rate and the equations from https://afdc.energy.gov/vehicles/electric_emissions_sources.html to approximate the CO₂ emissions for the operation of PHEV's, HEV's, EV's.

The third part was performed by downloading the GREET 2022 .Net software. Using this software and the assumptions listed in the previous section, we analyzed the CO₂ emissions in kg/mi, then we converted the values to lb/mi.

After performing parts 1 through 3, we made a table and a bar graph for car CO₂ emissions per mile and for SUV CO₂ emissions per mile.

Table 1.1

A breakdown of CO₂ emissions in lb/mi by vehicle type for cars

Emissions CO2(lb/mi)	Gas	Hybrid	Plug-in Hybrid	Electric
Assembly, disposal, & recycling	0.011243562	0.011243562	0.011243562	0.011243562
Battery	4.29E-04	0.004188778	0.015652802	0.066799986
Vehicle Emissions	1.6946	0.5957767722	0.5437998787	0.4334722222
Fluids	0.008157094	0.007275246	0.007275246	1.05E-03
Components	0.052690418	0.053792728	0.056658734	0.051588108
Total	1.76712049	0.6722770862	0.6346302227	0.5641546442

Table 1.2

A breakdown of CO₂ emissions in lb/mi by vehicle type for SUV's

Emissions CO2(lb/mi)	Gas	Hybrid	Plug-in Hybrid	Electric
Assembly, disposal, & recycling	0.0110231	0.0110231	0.0110231	0.015873264
Battery	6.03E-04	0.005732012	0.01763696	0.120372252
Vehicle Emissions	1.6946	0.5957767722	0.5437998787	0.4334722222
Fluids	0.0110231	0.00992079	0.00992079	2.05E-03
Components	0.065256752	0.065256752	0.06834322	0.091050806
Total	1.782505563	0.6877094262	0.6507239487	0.6628230296

Figure 1.1

A comparison of CO₂ emissions in lb/mi by vehicle type for cars

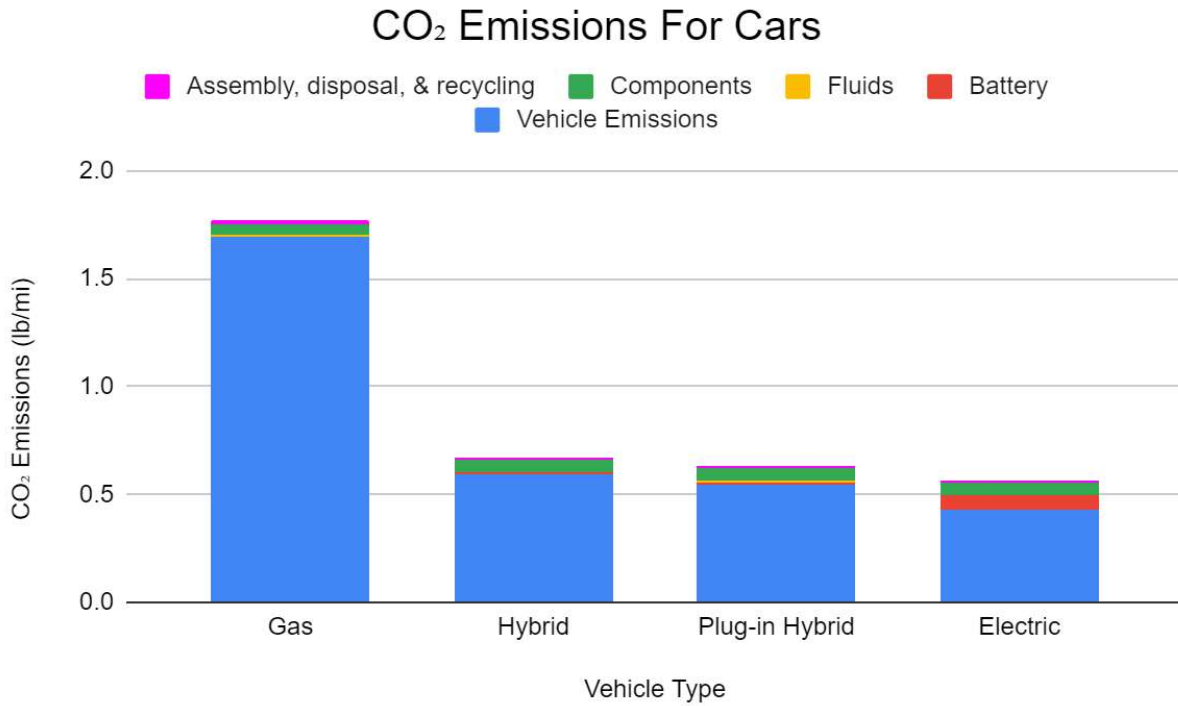
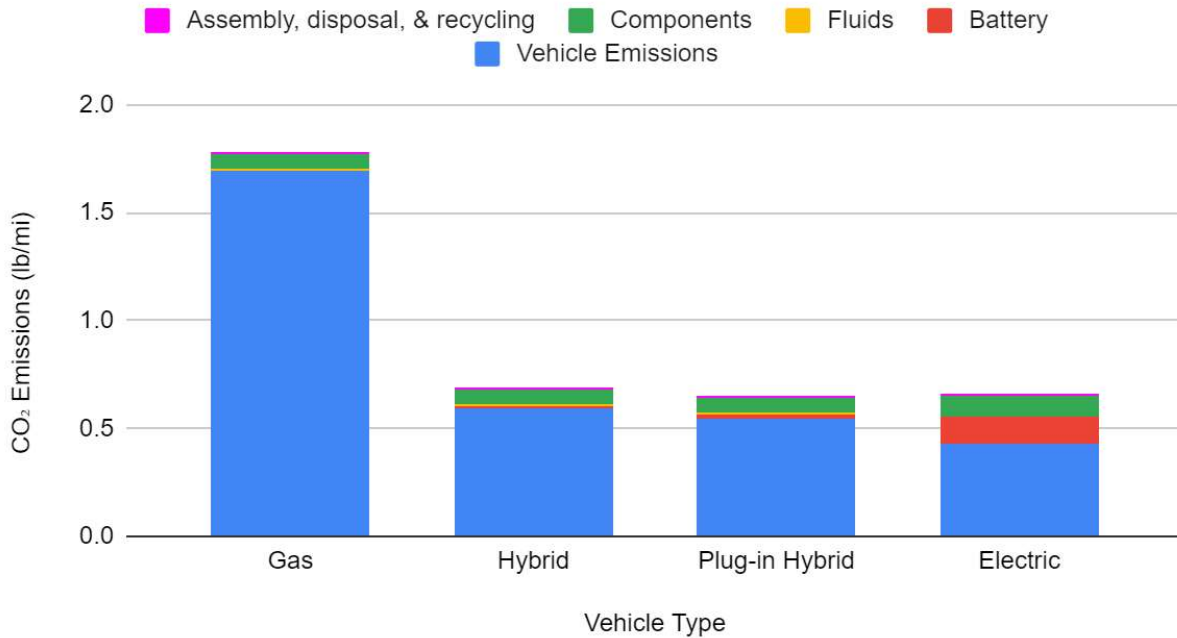


Figure 1.2
A comparison of CO₂ emissions in lb/mi by vehicle type for SUV's

CO₂ Emissions for SUV's



From these graphs and tables, we can see that HEV's, PHEV's, and EV's have far less emissions than ICEV's. For cars, EV's have the least emissions, PHEV's have the second lowest emissions, and HEV's are third. However, for SUV's, PHEV's have the least emissions with EV's as the second lowest emissions and HEV's as the third lowest again. This shows that the larger EV's require batteries that have more emissions when they are made, so PHEV's are more environmentally friendly for larger vehicles.

After making and analyzing these graphs, we used the assumption above that the vehicles drive 5,144.8 miles per year and that the vehicles will be kept for five years to create tables and graphs with the total CO₂ emissions while BYU owns the vehicles.

Table 2.1

A breakdown of CO₂ emissions for 5 years in lb by vehicle type for Cars

5 Year Emissions CO2(lb)	Gas	Hybrid	Plug-in Hybrid	Electric
Assembly, disposal, & recycling	289.2299992	289.2299992	289.2299992	289.2299992
Battery	1.10E+01	107.7523527	402.6535284	1718.366466
Vehicle Emissions	43591.98239	15325.79403	13988.7376	11150.66297
Fluids	209.8335289	187.148823	187.148823	2.70E+01
Components	1355.411173	1383.767055	1457.492349	1327.055291
Total	45457.50341	17293.69226	16325.2623	14512.34469

Table 2.2

A breakdown of CO₂ emissions for 5 years in lb by vehicle type for SUV's

5 Year Emissions CO2(lb)	Gas	Hybrid	Plug-in Hybrid	Electric
Assembly, disposal, & recycling	283.5588228	283.5588228	283.5588228	408.3247048
Battery	1.55E+01	147.4505879	453.6941165	3096.462345
Vehicle Emissions	43591.98239	15325.79403	13988.7376	11150.66297
Fluids	283.5588228	255.2029405	255.2029405	5.28E+01
Components	1678.668231	1678.668231	1758.064701	2342.195876
Total	45853.26986	17690.67461	16739.25818	17050.49559

Figure 2.1

A comparison of CO₂ emissions for 5 years in lb by vehicle type for cars

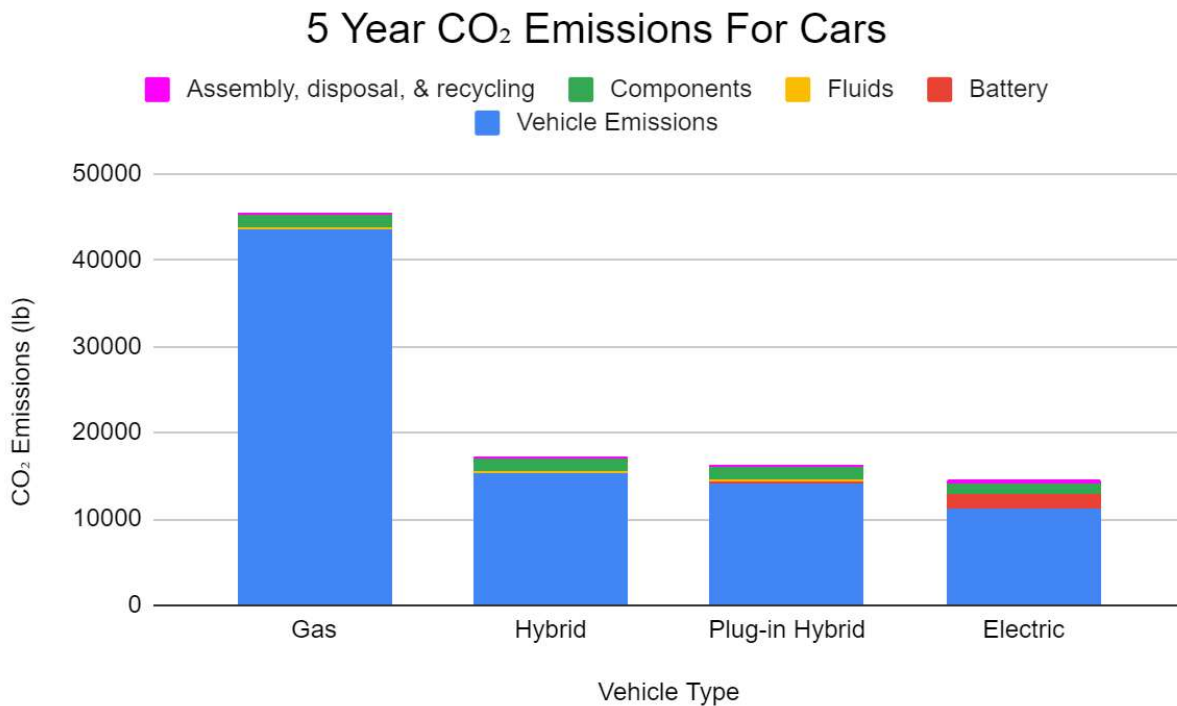
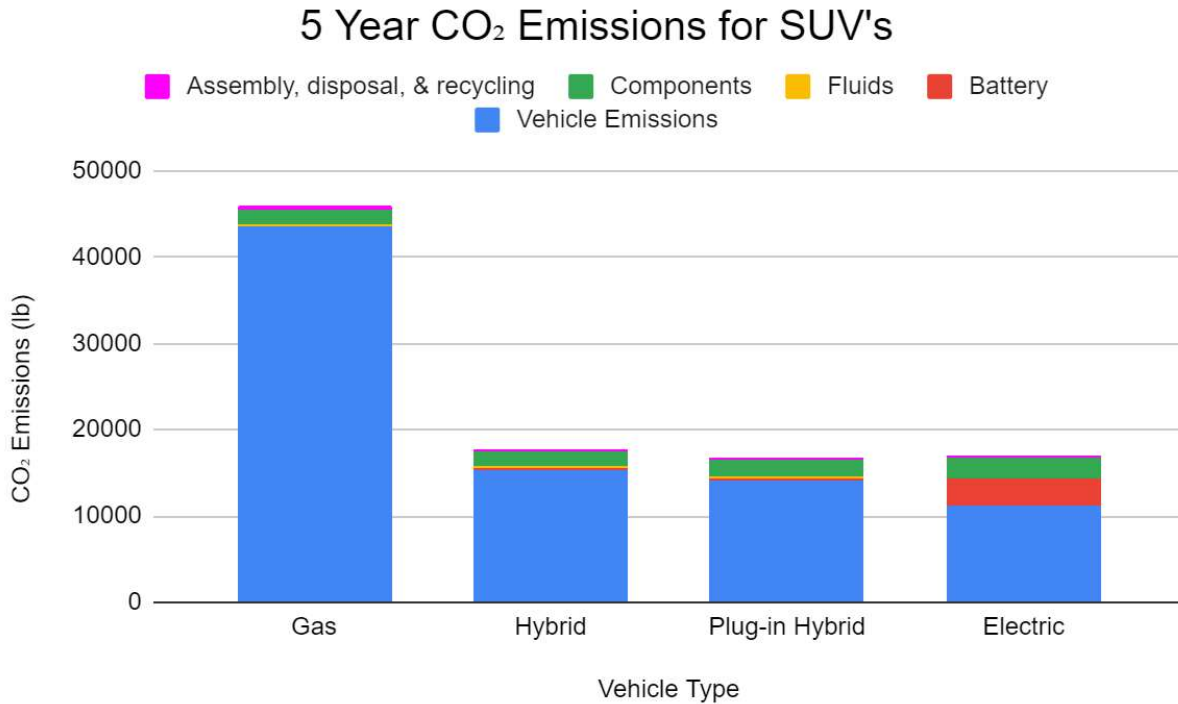


Figure 2.2

A comparison of CO₂ emissions for 5 years in lb by vehicle type for SUV's

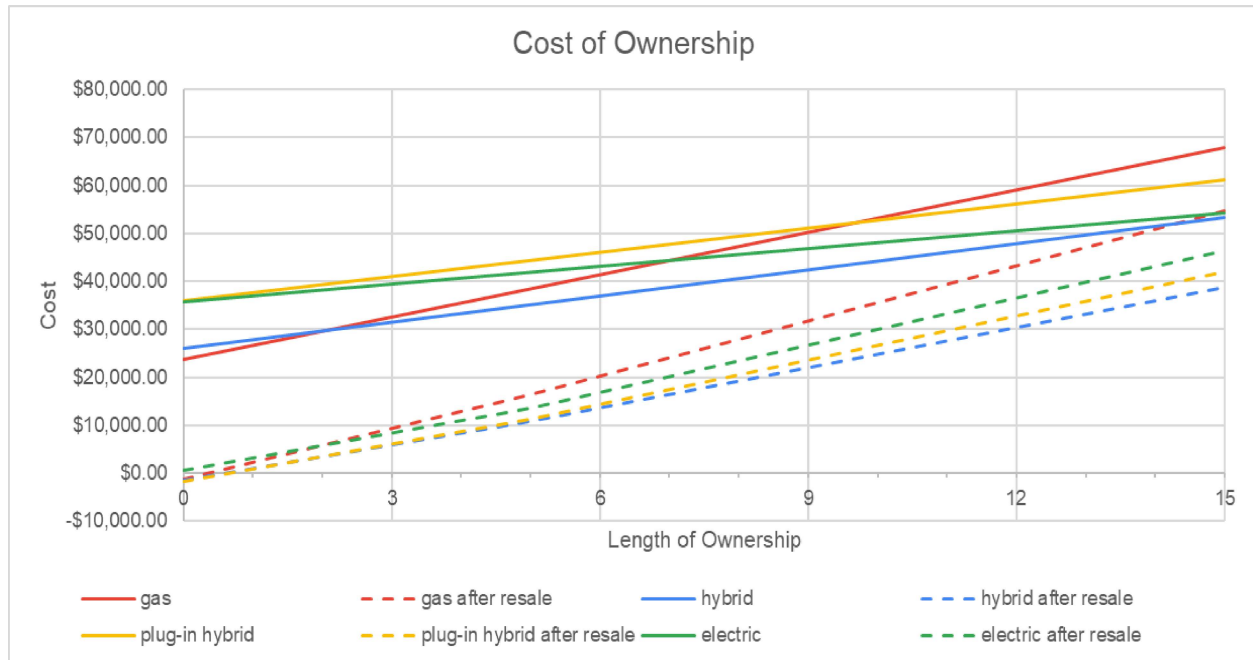


Cost analysis:

The cost analysis considered several factors when preparing recommendations and charts including, initial vehicle cost, fuel costs, maintenance costs and resale value. When considering all of these factors hybrids are the most economical options with plug in hybrids being a close second. Electric vehicles tend to depreciate in value faster than other vehicle types and, as such, are more expensive when considering resale and tend to have higher initial purchase prices causing them to still be more expensive when not considering resale prices, especially short term ownership. Gasoline vehicles however are the most expensive option when considering any length of ownership past two years.

Figure 3.1

A cost comparison by vehicle type by time taking into consideration fuel, maintenance and initial purchase costs. An additional comparison is included to consider the cost after selling the vehicle.



Electric vehicle chargers: While vehicle chargers can be viewed as infrastructure and considered somewhat separately from the price of the vehicle they are a key factor in the economical aspect of converting any fleet to electric vehicles. With smaller fleets this added cost is likely to have a much larger impact on the overall feasibility of such a conversion this cost can be offset with larger fleets by various other savings offered by electric vehicles.

Through an analysis of BYU’s existing fleet an average daily mileage of approximately 18.5 miles was found. This value with a 50% additional buffer was used when determining the need of each vehicle for access to an electric vehicle charger. Further assumptions of 12 hours of vehicle charging time per day per charger were used in calculation the cost of vehicle chargers.

Using these numbers level 2 chargers were shown to be by far the most economical at approximately 10% the cost of other options on a fleet-wide level. A cost of approximately \$85 dollars per vehicle was found when installing chargers on a fleet-wide level.

Table 3.1

A cost comparison of several vehicle chargers. Numbers used are general but have been adapted to provide a value that should be fairly accurate for any considerations of BYU’s fleet. Quantity needed and Total Cost of installation are calculated using a fleet size of 700 or approximately the entirety of BYU’s current fleet.

Electric Vehicle Charger Cost Analysis				
Charger type	Additional range per hour charging(miles)	Approximate Cost	Quantity Needed	Total Cost of installation
Level 1	5	\$1,800.00	324	\$583,487.72
Level 2	60	\$2,200.00	27	\$59,429.30
Level 3	250	\$85,000.00	6	\$551,071.73

Related Issues

The impact of our project will surely have environmental impacts as well as economic factors for our client. As Utah continues on its path of rapid growth it is important to consider the future effects that this will have on the environment. One of the large aspects of potential future environmental factors is air pollution. While Utah and more specifically Provo still has relatively clean air it is important to plan for the future and consider options to prevent any decrease in air quality. While BYU certainly isn't solely responsible for the air quality of Utah county it is important that they are proactive in looking for more environmentally friendly alternatives for all operations and in this case their vehicle fleet. A large part of our project was looking into the environmental impacts that the current fleet has and to what degree switching to electric vehicles would improve this. As shown in figure 2.1 gasoline vehicles which for decades have been the norm have much higher emissions and hybrid and electric alternatives can be effective solutions in reducing the impact that vehicles have on air quality. On a fleetwide level the effect of switching to these alternatives will undoubtedly have an effect on local air quality and as we have stated elsewhere is a path that we recommend for BYU.

Our project will also have an economic impact for BYU which will then be passed onto the students and needs to be considered. While vehicles can be a very expensive item and the difference in vehicle type can have an impact on this price it is important to consider not only the initial purchase price of the vehicle but also the annual costs associated with each vehicle as well as the price of fuel. Our analysis has shown that hybrids are the most economical option when considering all factors and that traditional ICE vehicles are the most expensive option overall. As such our analysis along with our recommendations will have a positive economic impact on BYU.

Overall our project will have a positive impact on every level. Often, it is necessary to make sacrifices in some aspects to achieve benefits in others. However, our analysis has found that in this case certain options provide benefits in every aspect. In other words, the cheaper vehicle options for BYU such as HEV's and PHEV's are also more environmentally friendly options. Because they are more environmentally friendly, they can improve the public health of those in the community by reducing emissions and pollution in the area. This also has benefits for the surrounding society as a whole because there will be less emissions from BYU vehicles. While certain options of which vehicles to include in the BYU fleet will have larger benefits in an environmental or economic aspect overall the balance may not be a positive impact and as such we have found and recommended options that we feel provide sufficient benefits in each category while maintaining a balance of all categories considered.

Lessons Learned

During the eight month period of our project, we learned a lot of valuable lessons that we can take with us in the future as we begin our careers. These lessons can also inform new students of things to focus on when working on a group project as big as this.

One of our first lessons learned was that of trust. In the beginning, when we were assigned our teams, we had to do certain trust and get to know you exercises. We slowly began to learn from one another and discover each others strengths and weaknesses as people, engineers, and team mates. Rather than let any of this hinder us, we embraced our differences and focused on our strengths.

Each one of us brings something to the table, so we also were able to divide our work evenly amongst each other. We wanted to make sure everyone contributes, and no one felt left out. A good thing we learned is how to divide and conquer. Towards the beginning, we had no focus. It seemed daunting the monumental task ahead of us. After discovering the focus that Therin wanted, we were able to divide our work into categories. We had the different types of cars, but also we had different categories for the pros and cons of each. Having a focus and even division of work is really important when maintaining the integrity of every member of the group.

Conclusions

We ultimately concluded that hybrid or plug-in hybrid vehicles would, in most cases, be the best option under current financial and environmental circumstances. They would, naturally, not be feasible in every case, due to non-existent models or extreme expense for certain models, but they are overall better in terms of resale value and lessened environmental impact.

To determine all this, we turned to our client's representative for current fleet data and his requirements for the project, then found values (as current as we could reasonably find) for CO₂ emissions for each aforementioned type of vehicle. We calculated each emission type as best as we were able, finding the ultimate values mentioned in the previous tables. Additionally, we managed to calculate financial impact, as seen above.

Hybrids are currently the best option, however this comes with some caveats. Each state has a power grid, and Utah currently uses a lot of coal for their power. This lessened the benefits of electric vehicles. As time goes on, if Utah's power grid goes more green, we conclude that electric vehicles will become an even better option in the future.

Recommendations

Based upon the data that we have obtained, we would recommend that Therin consider using plug-in hybrid vehicles and hybrid vehicles as a majority of the fleet. Overall, they have the best combination of economic feasibility and least environmental impact. A few electric vehicles could be nice to consider including in the fleet because they have the lowest environmental impact for cars. However, plug-in hybrids have the lowest environmental impact for SUV's. In other words, plug-in hybrids and hybrids are the best options, electric vehicles are the next best option, and gas vehicles are the option we least recommend. However, there may be situations where gas vehicles make more sense such as if there is not a good hybrid or electric substitute for the vehicle. These are our general recommendations. Also, it is worth noting that as Utah's grid starts to be powered with more green energy and as technology to make the batteries improves, EV's may become the best option overall. If there is any further analysis that Therin would like to have done, we would recommend using our sources in the appendix to do any research in the future. If there are any questions about our analysis, Therin can feel free to reach out to Cody Hakes, our team lead, and he will try to help explain anything that needs explanation.

Appendix A

Sources:

GREET Tool for environmental analysis: <https://greet.es.anl.gov/>

Equations for emissions calculations:

https://afdc.energy.gov/vehicles/electric_emissions_sources.html

Utah's Power Grid Emissions Data: <https://www.epa.gov/eGRID/data-explorer>

Values used to calculate Gas vehicle operation emissions:

<https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle?adlt=strict&toWww=1&redig=BB3727CA660340008D939D012EA6886F>

Depreciation values over time:

<https://www.lendingtree.com/auto/how-much-do-new-cars-depreciate/>

Depreciation values for specific vehicles:

<https://careedge.com/toyota/rav4/depreciation>

Costs for chargers:

<https://www.forbes.com/wheels/advice/ev-charging-levels/>

BRIDGER CLYMORE

855 E 700 N, Provo, UT 84606 · 435-272-8118
Bridger.Clymore@gmail.com

Motivated and intelligent University Student seeking an internship to help further my career and develop skills that will aid me on my path to becoming a Professional Engineer. I value accuracy and creativity and know that these skills can help further your company on its path to success.

EXPERIENCE

MAY 2022-CURRENT

INTERN, BOWEN COLLINS & ASSOCIATES

- Generated figures and reports to clearly communicate large amounts of information in a concise manner
- Expedited the presentation and development of project specific data
- Developed models in various computational engineering programs to assess future demand on resources and infrastructure

JULY 2017-JULY 2019

WAREHOUSE EMPLOYEE, ROCKY MOUNTAIN ATV/MC

- Autonomously accomplished multiple assigned tasks
- Ensured proper function of warehouse machines allowing a more efficient workplace for coworkers
- Assessed product to ensure proper placement and distribution

MAY 2015-JULY 2017

MISSIONARY, CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS

- Mastered a foreign language and overcame cultural barriers in order to effectively communicate and serve
- Led a diverse team in a foreign environment to accomplish goals and organizational objectives

EDUCATION

SEPTEMBER 2019 – DECEMBER 2023

CURRENT STUDENT, BRIGHAM YOUNG UNIVERSITY

- Aspiring Civil Engineer student with a current GPA of 3.29
- Hydraulics & Fluid Flow Theory • Structural Analysis • Engr Draft w/CAD Apps.

SKILLS

- Adobe Suite (Illustrator and Photoshop)
- ArcGIS Pro and ArcMap
- Revit
- HEC-RAS
- AutoCAD
- Civil3D
- Certifications in Microsoft Office (Word, Excel, and PowerPoint)
- Can reach the top shelf

Camden Greenhalgh

425-389-9290 | camden.g@frontier.com | www.linkedin.com/in/camden-greenhalgh

EDUCATION

Brigham Young University April 2023
Bachelor of Science, Civil Engineering, 3.21 GPA Provo, UT

- Active member of the American Society of Civil Engineers (ASCE), BYU branch
- **Relevant Completed Coursework:** Soil Properties and Mechanics, Basic Structural Analysis, AutoCAD, Hydrology, Technical Communication, Advanced Mathematics, Revit

Cascadia College June 2015
Associate Degree, Integrated Studies, 3.41 GPA Bothell, WA

- President's Honors, Fall Quarter 2013 and Faculty Honors, Fall Quarter 2014

RELEVANT EXPERIENCE

KING COUNTY June 2022–August 2022
Construction Inspector King County, WA

- Inspected 3 major construction projects to ensure worker safety and adherence to plan and budget
- Concisely reported on 7 project measurements to guarantee project accuracy
- Produced ~25 daily reports detailing worker presence and activities accomplished to ensure accurate pay and scheduling

CITY OF REDMOND July 2021–February 2022
Supplementary Engineering Technician Redmond, WA

- Analyzed streets to categorize individual road uses with 100% precision
- Added clear and easy-to-use road classifications to a shared ArcGIS map file
- Photographed and analyzed up to 20 sidewalks per day to determine structural integrity and repair needs

FTC ROBOTICS TEAM 2011–2015
FTC Team 417 Woodinville, WA

- Used CAD and programming skills to build customized robots to operate in 4 separate competitions
- Utilized power tools and other large pieces of equipment safely to produce needed parts
- Participated in numerous outreach events to recruit team members and teach people about STEM

ADDITIONAL EXPERIENCE

AMAZON April 2020–August 2020
Order Fulfillment Redmond, WA

- Fulfilled approximately 10 customer grocery orders per shift, adhering to company time restraints

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS Nov 2016–Nov 2018
Full-time Representative Bakersfield, CA

- Served as a full-time representative and teacher/trainer, meeting with 20+ people daily
- Coordinated daily work and weekly assignments with 6-10 nearby volunteers to enhance efforts

KONA MEDICAL Summers of 2014, 2015, 2016
Office Assistant Bellevue, WA

- Organized and logged manufacturing material to maintain inventory for producing medical devices
- Scanned and uploaded inventory documents to an online file-sharing site for easier access

Cody Hakes

685 N 1200 E • Provo, Utah 84606
(480) 765-7226 • cwhtoro@gmail.com
www.linkedin.com/in/cody-h-601b419b/

EDUCATION

Brigham Young University
Bachelor of Science, STEM Field, Emphasis in Civil Engineering

Dec 2023
Provo, Utah

- GPA 3.18

SKILLS

- **Proficient:** AutoCAD, MS Office, StruCalc (Vitruvius), FORTEWEB, BC Calc
- **Moderate:** VBA, Civil3D
- **Familiar:** Revit, Bluebeam Revu

RELEVANT EXPERIENCE

Apex Civil Engineering, Inc.
Structural Engineering Technician

Aug 2021 – Present
Provo, Utah

- Design buildings for clients in AutoCAD according to their wants and needs
- Draw structural sheets on AutoCAD for buildings (mostly homes)
- Perform structural calculations using Excel, StruCalc, and/or FORTEWEB to ensure structural stability
- Identify the best solutions for issues in building design to help the clients feel satisfied with their building

ASCE Steel Bridge Design Competition

Sep 2022 – Present
Provo, Utah

Club Member

- With a team, design a model bridge that meets the requirements set by the ASCE
- Assemble the model bridge with the team as quickly as possible to win the competition
- Compete with other schools across the nation to win the competition

OTHER EXPERIENCE

Golfland Sunsplash
Admissions Department Worker

May 2016 – Aug 2017
Provo, Utah

- Communicated with customers to provide them the wanted information or products
- Upsold passes for other attractions to offer customers more fun options
- Frequently won competitions with other employees for the most upsales sold every week of the summer.

48 Doorz

Apr 2020 – Jun 2020
Provo, Utah

Door Shop Worker

- Cut Casing for Doors to the proper height to increase the aesthetic appeal of the doors
- Worked in a team to deliver doors to the jobsites for the installation team as efficiently as possible
- Recognized how buildings are framed because of presence at job sites

The Church of Jesus Christ of Latter-Day Saints

Jun 2018 – Mar 2020
Jakarta, Indonesia

Full-Time Representative

- Communicated effectively to share beliefs respectfully and invite others to learn more
- Led and trained a group of representatives to communicate beliefs with others more effectively
- Trained about ninety representatives across Indonesia how to use technology to increase efficiency
- Provided, promoted, and taught English classes for locals who wanted to learn English

PRESTON CICCARELLO

352 – 403 – 7557 | prestoncicc@yahoo.com

Skills Summary

- Proficient in Microsoft Word and Excel
- Proficient in programs such as Revit, Civil 3D, ArcGIS, gINT, and can work a total station
- Fluent in Portuguese

Education and Acknowledgments

- Junior at BYU majoring in Civil Engineering
- Eagle Scout received in 2016

Experience

Wood Environment and Infrastructure

Geotechnical Intern – May 2022 – Present

I work in mostly gINT and ArcGIS, creating maps, inputting boring logs, examining samples, drafting reports, and field work surveying with different tools. Good time management.

BYU Lifeguard – Provo, UT

Lifeguard – October 2021 – April 2022

I am certified in CPR, and work with the other lifeguards to maintain order on the pool deck. We are in charge of helping patrons, and managing large groups of people at a time.

South End Market – Provo, UT

, Cashier / Freight Crew / Customer Service – September 2021 – April 2022

I work with money and customers to provide smooth transactions and I stock the store.

Greg Mojica LLC – Brooksville, FL

Interior Home Remodeling – Carpenter – July 2021 – August 2021

This employment included flooring, trim work, doors, cabinets, and columns. This job required attention to details and heavy lifting. Customers were always satisfied with the outcome.

Two-year mission in Pará, Brazil

I was over groups of about 30 missionaries, and would train them on missionary concepts and duties, teach them how to improve, and supervise them to make sure they work diligently.