

## Honors Research Project Proposal



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Title of Proposed Project: Powering Electric Vehicles: Are We Ready?	
Major: Civil Engineering	Graduation (semester/year): Spring 2023

Please include a brief (maximum 200 words) summary of your proposed project

This project will be to investigate how much power is needed to charge and run electric vehicles if there was a sudden increase in the amount of these electric vehicles in the area. Then find out if the electric companies have capabilities to support a steep increase. This will include investigation of the power grid's capacities and current usage.

**Approval:**

Honors Course No.: 4300 497 003	No. of Project Credits: 3
Honors Project Sponsor Signature/Date  2/20/2023	
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Your approved cover sheet and proposal must be [submitted to the Williams Honors College through IdeaExchange](#)

## **1. Goals and Objectives**

Today the focus on driving electric vehicles is larger than it has ever been and it keeps growing. With threats of global warming countries around the world are acting to try to cut harmful emissions. One way the United States are doing this is by making a very strong push for citizens to be driving electric vehicles. Depending on the power supply some many fully electric vehicles can have a emission neutral life span or at the very least much lower emissions than a gasoline or diesel vehicle. This is because of the electric vehicle's lack of tailpipe emissions. The only real emissions come from the power supply companies burning fuels to generate electricity.

With driving electric vehicles comes charging them as well. Electricity and power is not an unlimited resource. Energy and power companies are tasked with providing the energy to all its consumers. Power grids are made to handle all the residential and commercial electrical demands with room for expansion and growth. The question comes down just how much growth was expected when these power grids were built.

Many electric vehicles have the capability to be charged at home with a standard 120v outlet. However, this is very time consuming with some vehicles only gaining about five miles in one hour of charge. This is effective for the people who do not drive often and when they do they do not drive very far. This type of charging would be nearly negligible for the power companies and likely would not make a large impact if a much larger group of people charged their vehicle at home.

With level one chargers being impractical for many to most users faster charging has been and is being developed. Level three direct current fast chargers can often charge most electric vehicles to full battery in about 30 minutes. The problem is that these level three chargers are not practical for the home and consume exponentially more energy than the level one outlet chargers. Drawing on this much power is no problem for a couple of charging stations but with the all-out push for as many people as possible to be driving electric, are the power grids capable of supporting this much usage?

The main objective of this report is to find out approximately just how equipped a city like Akron, Ohio is for a surge of electric vehicle owners to be living in, working in, or driving through the city.

## **2. Methodology**

A report like this will require work in probabilities and statistics as well as information about the existing power companies infrastructure. Efforts will be made to try to determine from power companies such as FirstEnergy exactly much energy they are able to produce and how much they are producing now. This will be done through emails and phone calls to these companies to see how much information they will be willing to give to me. Ideally I will be able to find out about how much energy is being consumed per capita or about how many kilowatt hours are being consumed in the peak of usage in a day. This information along with about how much the grid could support would be used to determine how close we are to maxing out the production of the electricity companies infrastructure.

Using this information the amount of electric vehicle charging capabilities can be determined. This will be done through much more research into charging and exactly how much energy is consumed with charging. This information along with gaining a better understanding of how electric vehicles work will help estimate how equipped the city is to moving more toward charging stations and away from gasoline filling stations.

A deeper look into how electric power plants work will also be required to make sure to seem knowledgeable about the topic to any sources that may be contacted. This knowledge will also be helpful in determining how much of a factor of safety is needed to make sure that there is not more consumption than production and avoiding surges and blackouts.

The end goal of the project is to find what percentage increase of vehicles driving and interacting with the city could be fully electric and the current infrastructure be able to handle it without risk of overconsumption or blackouts. This information will be useful for arguing a need for upgrading the grids and infrastructure if the results show that the city is not prepared for a swell of electric vehicles. Conversely, if the city is well prepared for this it will give contractors and people considering switching to electric vehicles confidence in building charging stations and buying new electric vehicles.

### **Tentative Schedule**

2/20/2023

Begin research into electric vehicles and power plants.

2/27/2023

Start making calls and finding information about consumption and capabilities.

3/6/2023

Start using the data and information collected to calculate how much charging the city can reasonably support. Start writing the draft.

3/13/2023

Continue writing the draft.

3/27/2023

Submit draft to sponsor and readers and obtain feedback

4/3/2023

Submit revision to sponsor and readers

4/21/2023

Final deadline.

### **3. Outcomes**

The final outcome of this project will be see how equipped the city and power companies are for rapid growth in electric vehicle popularity. Large investments from automobile companies and government financial support are pushing for as many people as possible to convert from gas to electric vehicles. This report aims to educate the public and those interested. If the city is ready it will tell them that they should have no problems buying electric cars and they should be pushing companies to build more charging stations. If the city is not ready it will tell the people to maybe hold off for a while and push their power companies to improve their infrastructure so that the city can keep up with the times.

### **4. Academic Impact**

This project is building onto my undergraduate knowledge because at the moment these questions are unanswered. What would be the point in investing so much time and energy into electric vehicles if they are impractical for the area. Electric vehicles are very relevant for civil engineering especially transportation specialists. They are arguably the most controversial and currently relevant category in transportation engineering. This is because we know most all we need to know about gasoline powered vehicles and there is finally innovation after all this time of using gasoline. Even though the amount of electric vehicles is comparatively very low it is very important to learn everything there is to know now because it is likely the future of the automobile industry. This is what engineering is about, staying on top of the newest innovations and finding if they are going to be beneficial. I expect to learn much more about a topic that is mostly unknown to me but highly relevant to my future.