THE DRIVE FOR SUSTAINABLE VEHICLES IN ALBERTA'S FUTURE

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INTRODUCTION

The use of over 2.2 million personal vehicles in Alberta generates more than 8 Mt CO_2e of GHG emissions per year between vehicle production and fuel consumption. [2] Companies such as Google, Tesla and Uber are engaged in rapid innovation to transform personal transportation through the introduction of self-driving, electric and shared vehicles.

This study will use scenario modeling tools to assess the potential impacts of these technologies (together, a "Super vehicle", SV) on GHG emissions.

METHODS

To examine the impact of SVs in Alberta, we modified the reference model provided by CanESS [2]. In doing so, historical data from CanESS was extrapolated to project our scenario models to 2060. Assume:

- Adoption of SVs will reach maximum of 90% by 2055 (Figure 2) [3] [4]
- Alberta is 3 years behind compared to California with the same SV deployment rate [3]
- 60% of vehicles would be removed from the road (2 SVs can replace 5 conventional vehicles) [3] [5]

		MJ/100km		g CO_2e/MJ	
		2016	2060	2016	2060
Gasoline	City	464.7	294.9	67.5	67.5
	Hwy	306.6	182.9		
Diesel	City	412.2	264.1	71.3	71.3
	Hwy	272.3	166.7		
Electric (SV)	City	111.3	86.7	184	109
	Hwy	73.4	56.6		

Table 1: Important parameters from the CanESS model

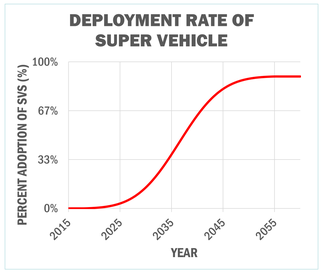


Figure 2: Adoption Rate of SVs

RESULTS

REFERENCE

Figure 3: Vehicles on Road

Without innovation and change, the number of vehicles will steadily increase until 2060.

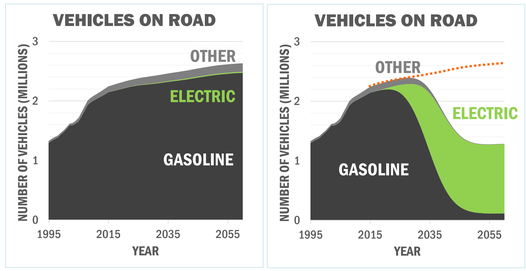


Figure 4: KM Travelled per Vehicle per Year

The CanESS model projects a stagnation of the distance people travel each year.

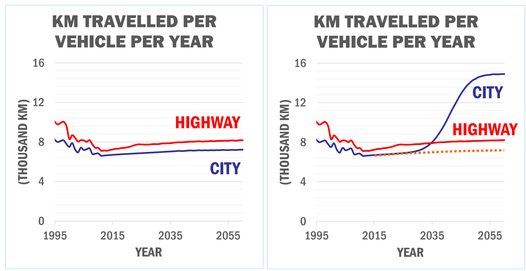


Figure 5: Total Energy Consumption

Increasing efficiency in the short term with a steady increase in vehicle count over time results in this trend.

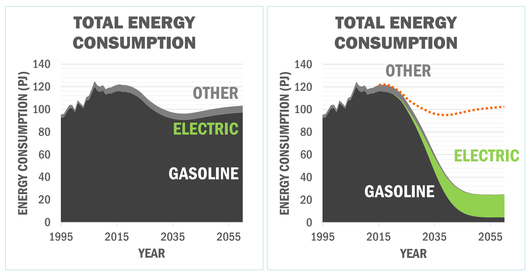
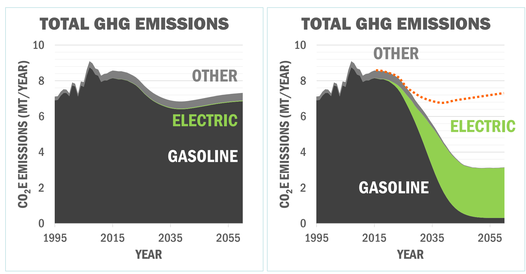


Figure 6: Total GHG Emissions

All of these factors add up to create the prediction depicted here.



ALTERNATIVE

Note the significant reduction in total number of vehicles on the road due to the use of car sharing.

This will however increase the distance each vehicle travels in a year, at least in cities.

The move to self-driving, shared electric vehicles will have a significant impact on energy consumption.

This will significantly reduce GHG emissions, and will move emissions out of city centres, reducing pollution levels near densely populated areas.

DISCUSSION

The main limitation of our study is that extrapolating from research done in the US and Europe to Alberta inherently poses some potential for error. [4]

To prevent potentially increasing GHG emissions and road traffic due to an influx of vehicles as self-driving cars become popular, car sharing policies and additional fees should be introduced to help prevent congestion.

Based on our results, driving emissions account for the majority of GHG emissions from personal transportation. The SV can reduce yearly driving emissions by 4.47 Mt by the year 2060. However, keeping into consideration the high production emissions of the SV [5], we can effectively reduce total yearly emissions by 4.17 Mt by 2060.

CONCLUSIONS

Super Vehicles are a viable and appealing option for sustainable transportation in Alberta. In our scenario, personal transport GHG emissions decrease by over 50% by 2060. Numerous economic, infrastructure, health and societal improvements are also made possible [4], making the SV a highly desirable mode of transportation [3]. In fact, companies like Google, Uber, and Tesla have been actively producing these vehicles in the U.S., saying that it is not a matter of if we will see these vehicles in the future, but a matter of when [1].

REFERENCES

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