

What's All The Hype On Hyperloops?

A transportation study for the Calgary-Edmonton Corridor

INTRODUCTION

The movement of people and goods in Alberta generates 7.6 MtCO₂e and is rapidly increasing due to the production and use of fossil fuels [1].

Pneumatically-driven Hyperloops have recently been proposed as a cost and energy effective intercity alternative [2][3]. Hyperloops function at extremely low air pressure and can reach speeds of up to 1200 km/hr.

This project explores the feasibility of a Hyperloop system implemented between Calgary and Edmonton, a corridor responsible for 40% of Alberta's transportation-related GHG emissions. We assess the potential reduction of energy consumption and emissions that would take place if this technology were to be deployed in Alberta.



METHODS

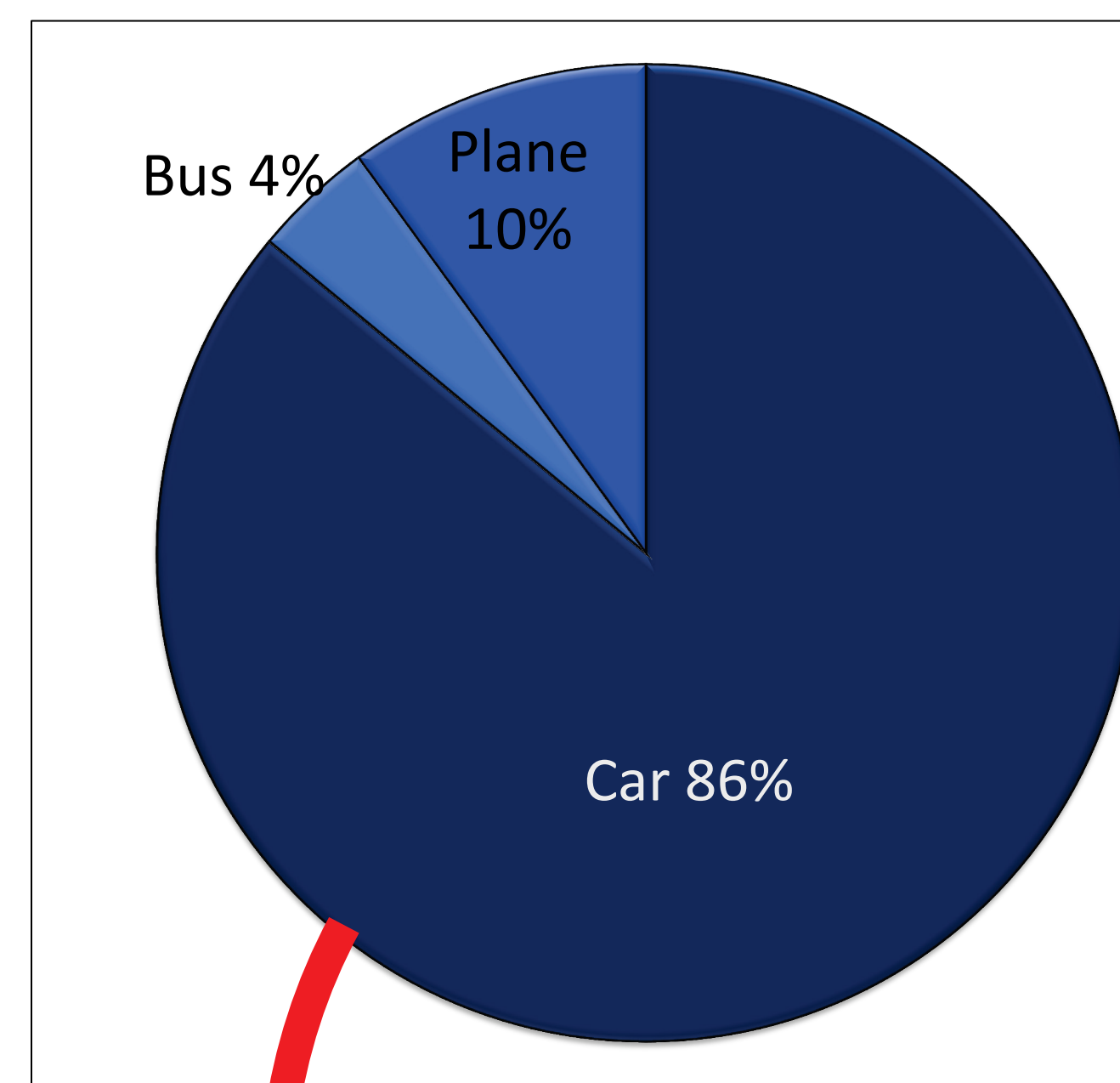
To examine the benefits of the Hyperloop technology in Alberta, a model of the historical and forecasted CO₂ emissions was constructed using MS Excel with the following assumptions:

- o CanESS model forecasted values are accurate
- o Freight movement between Calgary Edmonton is 30% of provincial movement
- o The Hyperloop system is implemented by 2030
- o Passenger ridership for Hyperloop is 60% of Calgary – Edmonton travel

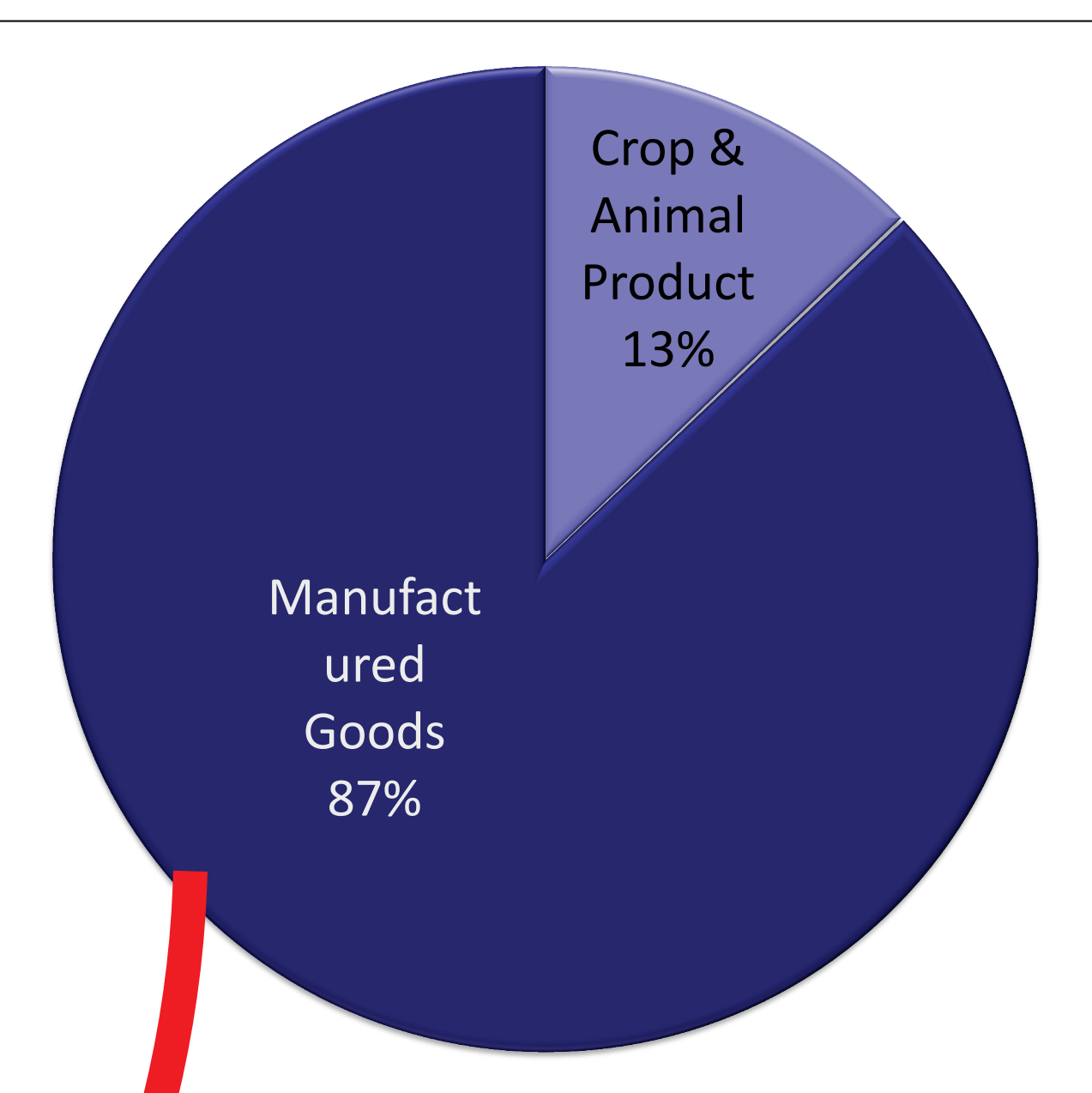
RESULTS

Transportation Estimates for the Calgary-Edmonton Corridor:

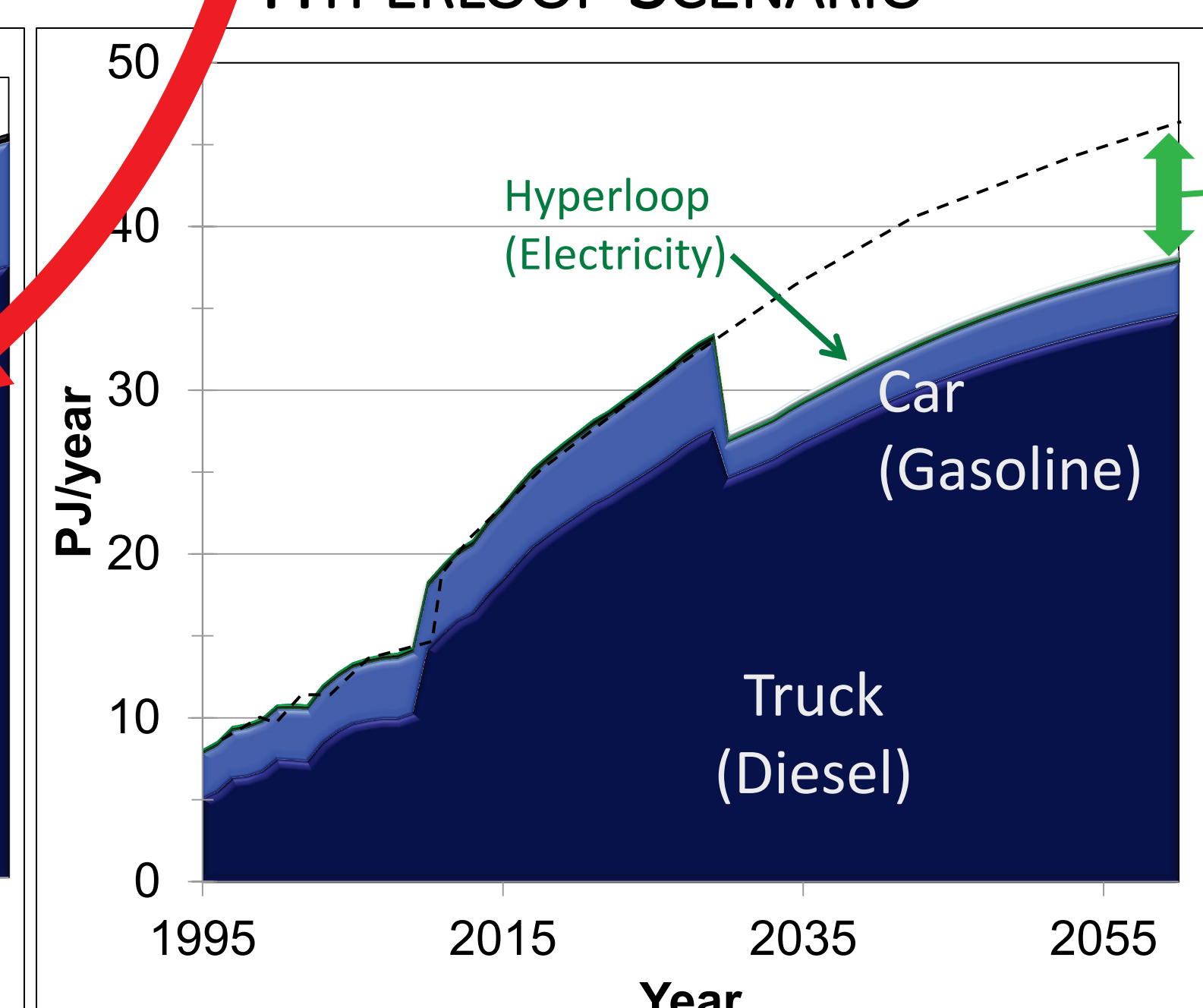
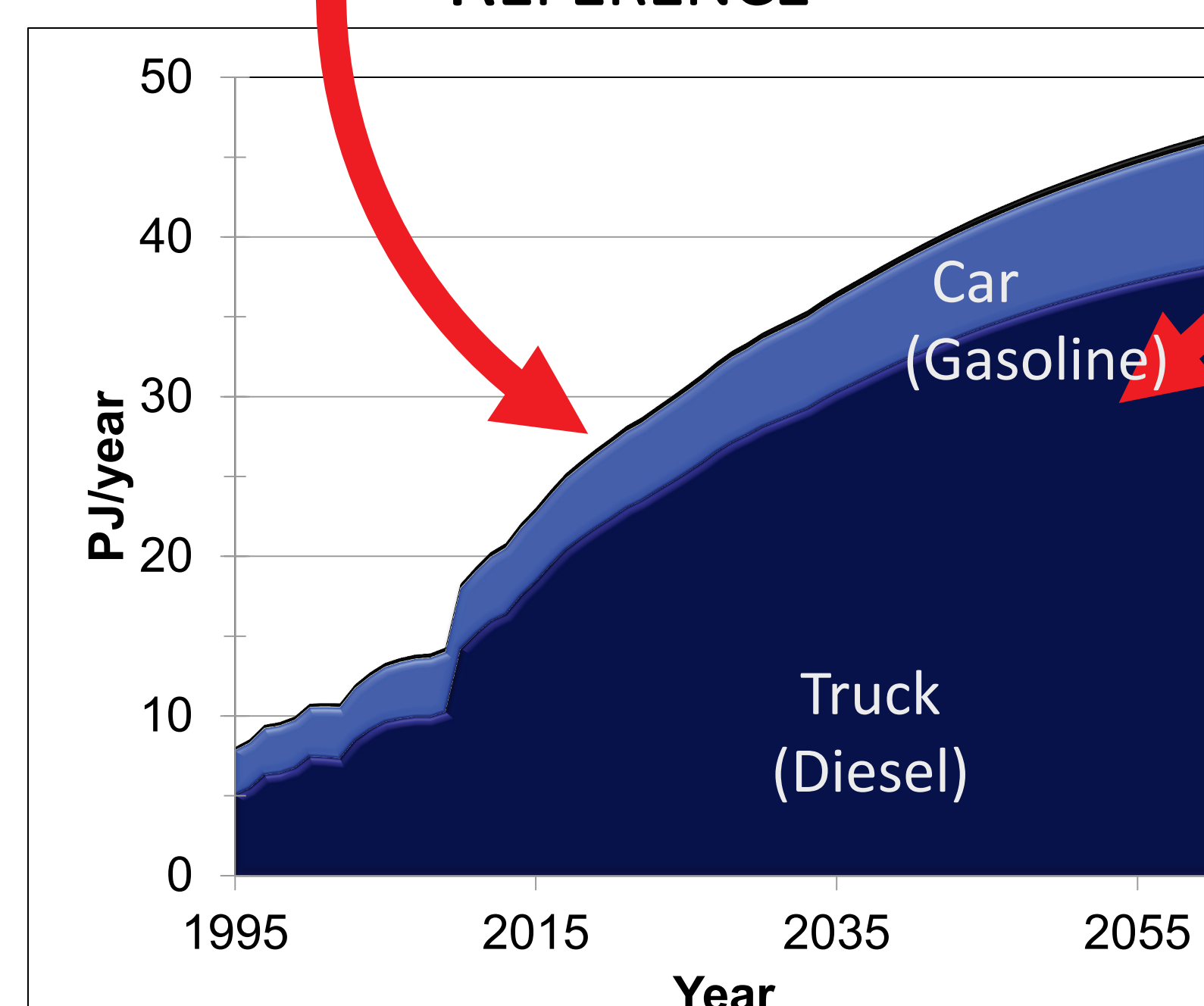
Passenger (Total: 2 billion Person-km/yr)



Freight by Truck (Total: 7 billion tonne-km/yr)

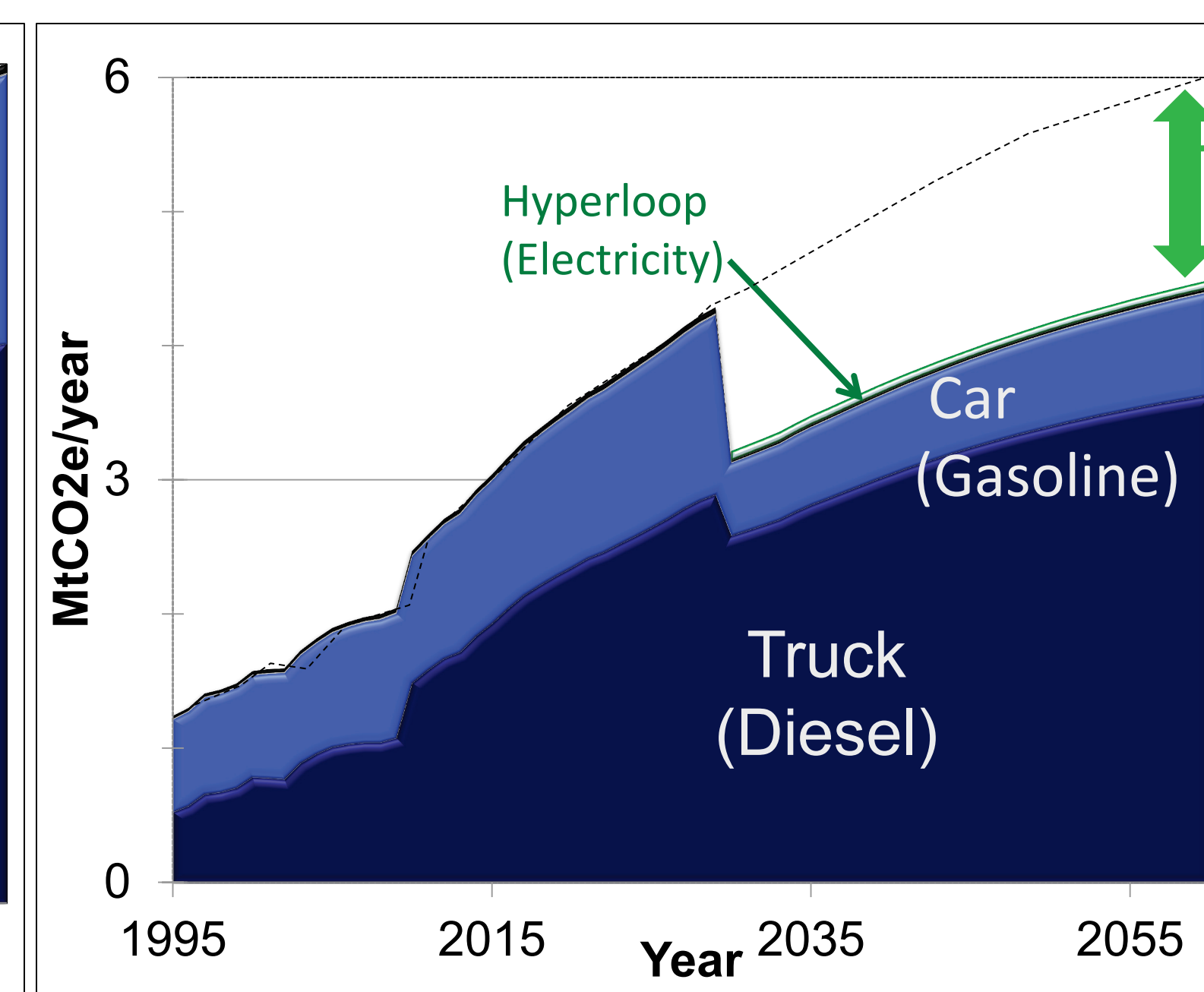
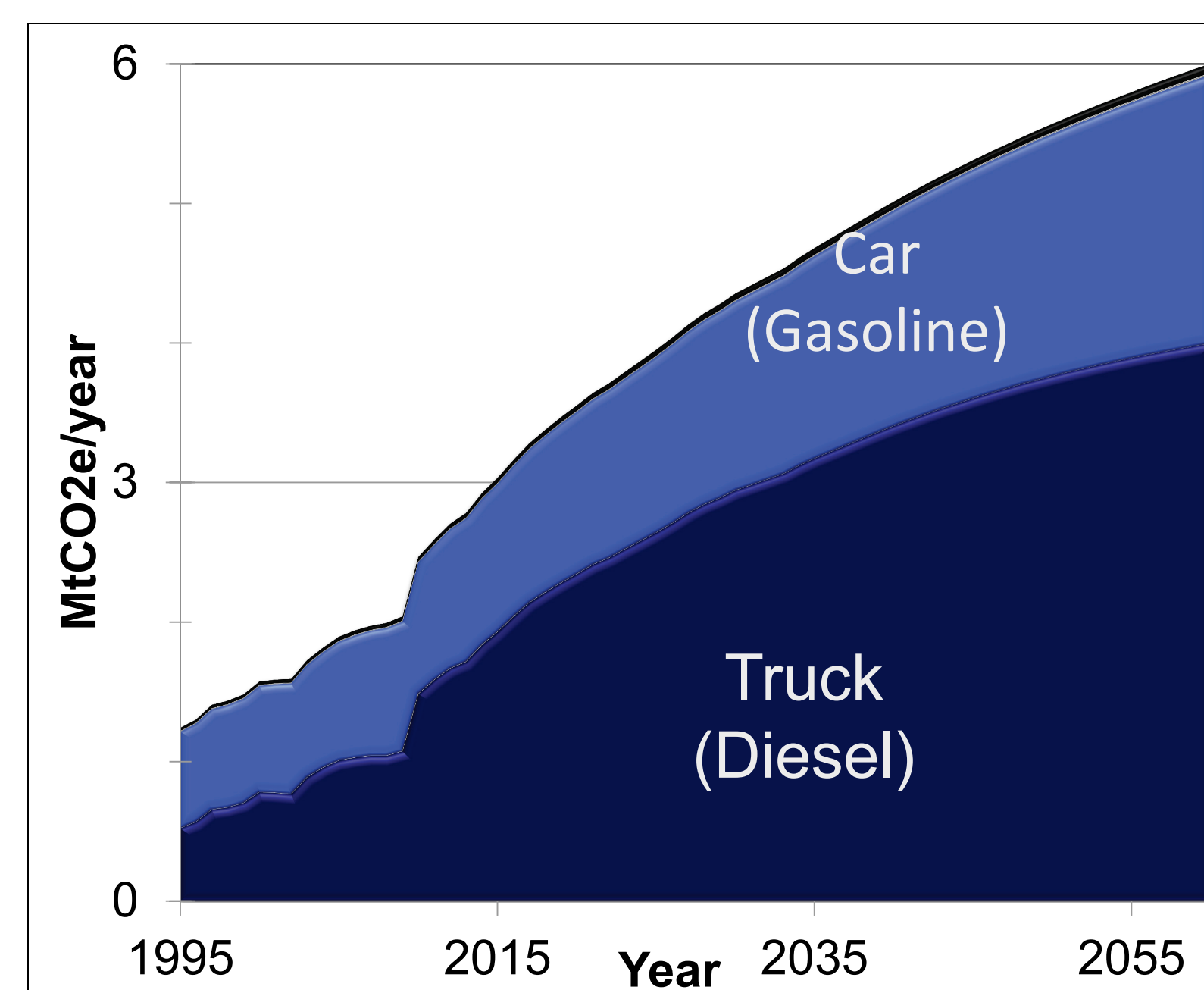


Energy Consumption (PJ/yr)



NOTE: 19% (6.6 PJ/yr) reduction in energy use in 2030.

Life Cycle Greenhouse Gas (GHG) Emissions (Mt CO₂e/yr)



NOTE: 26% (1.2 MtCO₂e/yr) reduction in GHG Emissions

Challenges & Opportunity

The Hyperloop provides the opportunity for creative thought on transportation adjustments to tackle provincial reduction in GHG emissions. However, it is challenged by the reality that ridership may not materialize, and Alberta may not be ready for such a large leap in transportation development. It is important to form an integrative system beyond the intercity stretch before true feasibility can be reached.

DISCUSSION

The Hyperloop may be a feasible option for reducing GHG emissions by reducing both passenger and freight traffic within the Calgary-Edmonton Corridor. Studied have analyzed the Hyperloop as sustainably economic mode relative to High Speed Rail [5], with a capital investment of \$3.21 billion required including O&M [2] and ROI in 8 years. Although the schematics of implementation show a potential to reduce GHG emissions; Hyperloop technology is still limited to its research phase. There have been no comprehensive studies preformed for deployment in Alberta. Further development of the Hyperloop technology, and funding for scaled simulations will advance the concept into a more real Understanding of the technology will improve with research by Hyperloops Inc. in California. Do not despair, Elon Musk is on the job!

CONCLUSIONS

The Hyperloop has theoretically been estimated to reduce energy consumption and lower Albertan GHG emissions. A summary of our conclusions on the potential of a Hyperloop system in Alberta:

- Reduction of 6.6 PJ of energy consumption and 1.2 MtCO₂e emissions in 2030
- By 2060, energy usage and carbon emissions reduced by 8.0 PJ and 1.5 MtCO₂e respectively

These conclusions are interesting by means of the economic feasibility of development. Relative to the High Speed Rail proposal by the Van Horne which was deemed infeasible subsequent to full economic analysis within Calgary-Edmonton Corridor [5].

We suggest the Alberta government further analyze the Hyperloop alternative as it has conceptually proven to be cheaper and more efficient than other transportation alternatives.

ACKNOWLEDGEMENTS

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 - o The audience, for the opportunity to present our project!

REFERENCES

[1] whatIf? Technologies Inc., 2014. Canadian Energy Systems Simulator (CanESS) - version 6, reference scenario. www.caness.ca

[2] SpaceX Hyperloop Alpha. Available at: www.spacex.com/hyperloopalpha.

[3] Evacuated Tube Transport Technologies: Space Travel on Earth. Available at: www.et3.com.

[4] Hyperloop picture retrieved from: <http://mashable.com/category/hyperloop/>.

[5] The Van Horne Institute: Updated Cost & Ridership/ Revenue for Calgary Edmonton High Speed Rail

[6] Kilograms of CO₂ per passenger kilometre for different modes within the UK. Available at: http://www.aef.org.uk/downloads/Grams_CO2_transportmodesUK.pdf