

The Tesla Target: Is Green the New Black?

How Would Tesla's Projected Electric Car Sales Impact Energy Systems in North America?

INTRODUCTION

Elon Musk, CEO of Tesla Motors Inc. has projected annual electric vehicle (EV) sales of 500,000 per year by 2020 [1]. If this projection is accurate, what will be the implications for our society and economy in Canada, particularly in terms of electricity requirements, oil demand, and greenhouse gas (GHG) emissions?

METHODS

To examine the impacts of Tesla's predictions, the reference model provided by CanESS [2] was modified assuming:

- Canada will receive 8.2% (41,000) of the 500,000 Tesla vehicles per year, based on current market sizes [7].
- All other major manufacturer electric vehicle sales will follow their current sales trends [4].
- Total vehicle stock on the road and total vehicle kilometers driven remain unchanged. This is because we assume consumers will not want to change their driving habits, just swap their current car for an electric car.

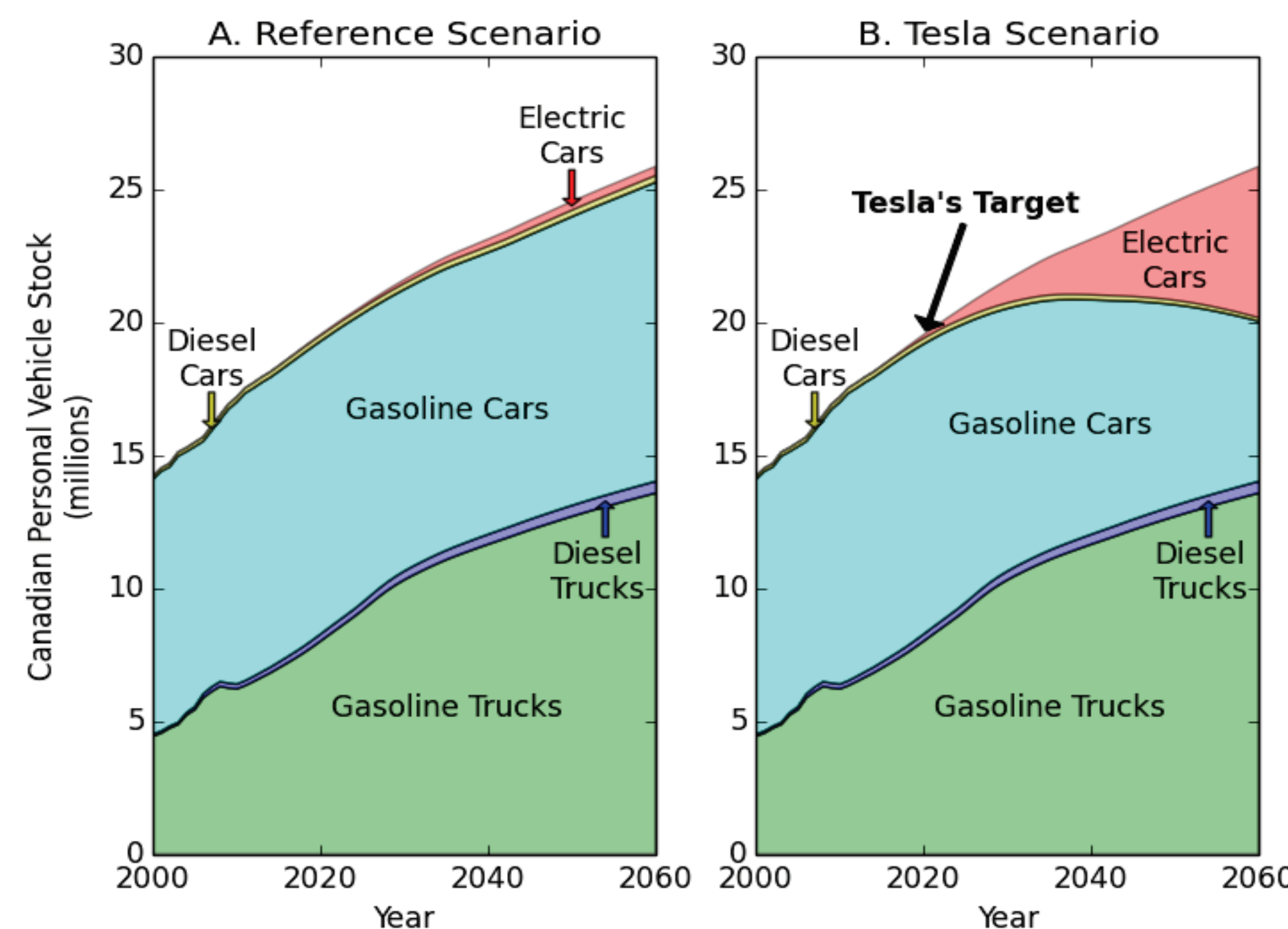


Fig. 1. Personal Vehicle Stock in Canada

To determine the likelihood, Tesla's introduction rate was compared to other introduction rates (Figure 2).

- 'Maximum introduction rate' is if all new cars sold today were electric.
- 'EV sales scenario' is a projection from 2010-2014 EV sales data.
- 'Minivan scenario' represents the fastest historical introduction rate of any car model [5].

Since Tesla's rate is below the 'minivan scenario' introduction rate, Elon Musk's target seems possible.

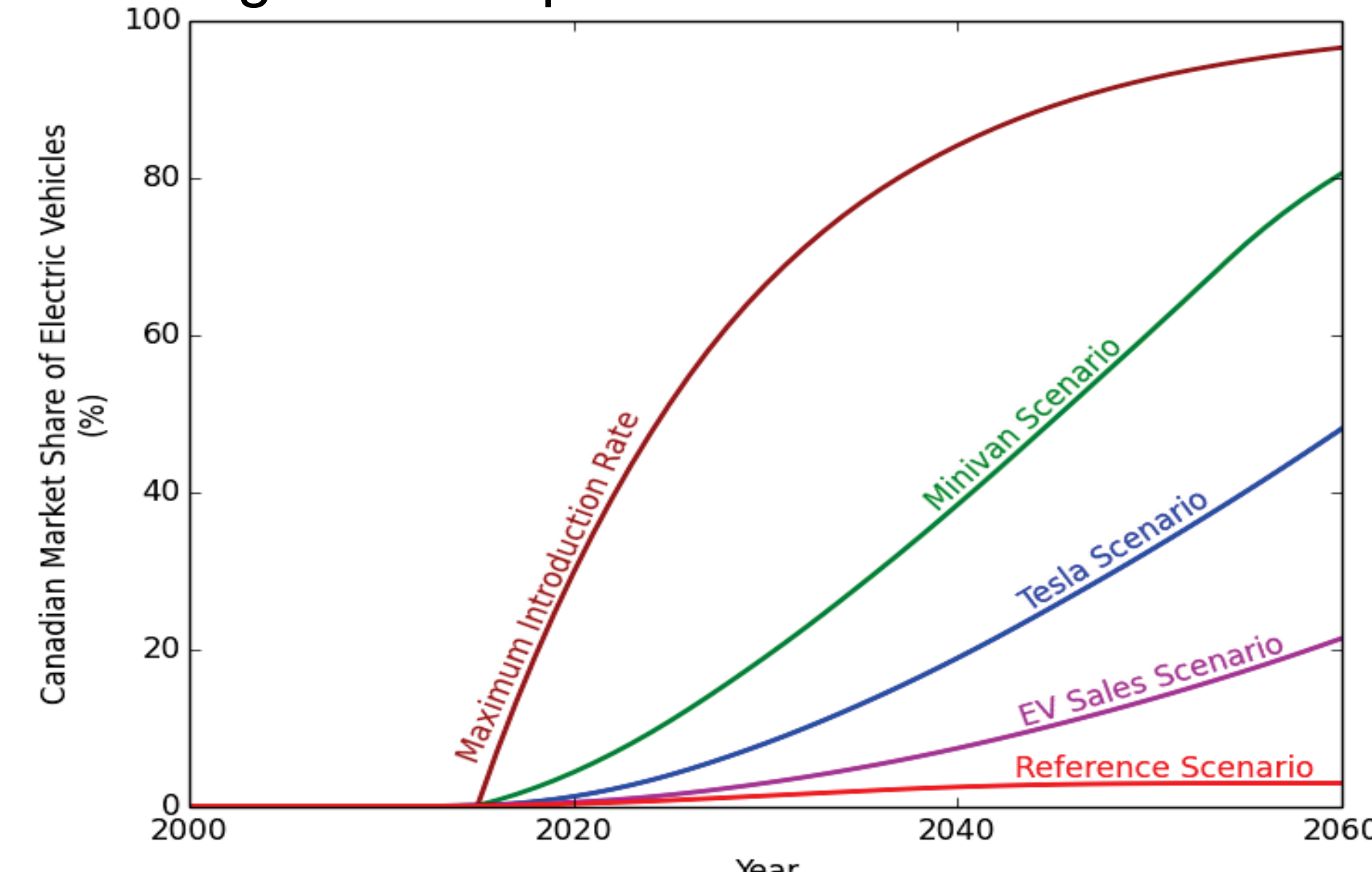


Fig. 2. Comparison of Possible Introduction Rates

RESULTS

The results from 2030 are focused on because policy makers are generally most interested in projections over the next 15 to 20 years and need to start planning big projects. The results were extrapolated to 2060.

A. Effect on Oil Demand

Because most of Canadian oil sales are linked strongly to demand across all of North America we can look to what effects EV sales will have on North American oil demand. (Figure 3)

- Drop of 241,000 bbl/day by 2030 (3.8%).
- Drop of 1,781,000 bbl/day by 2060.
- This oil will need new markets (Figure 4).

B. Effect on Electricity Demand

Each province's electricity grid will see a rise in demand proportional to its population. (Figure 3)

- Increase of 177 GWh by 2030 in Alberta (0.003%).
- Increase of 1.1 TWh by 2060 in Alberta (0.018%).
- This may not prove to be a problem for infrastructure capacity if charging is typically done in off-peak hours (Figure 5). Alberta has 21 GW of off-peak charging capacity per day.

C. Effect on GHG Emissions

Greenhouse gas emissions depend greatly on how electricity is generated.

- A green grid will show the biggest reductions.
- A coal grid will show no reductions.
- Reduction of 1.14 MtCO₂eq by 2030 (0.3% of 2010 emissions).
- Reduction of 8.74 MtCO₂eq by 2030 (2.5% of 2010 emissions).

DISCUSSION

If Elon Musk's sales projection of 500,000 Tesla vehicles per year by 2020 holds true, Canada will see a significant increase on the market share of EVs. Expected effects on demand for Canadian oil, Alberta electricity, and Canadian GHG are -3.8%, +0.003%, and -0.3%, respectively.

This predictive model does have some shortcomings in that it assumes EV technology will be only applied to replacing personal transport cars in the near future. Many fleet vehicle operations in North America such as city transit fleets are considering a change to electric power. Also, because small trucks hold about half of the personal vehicle market today, there is a large electric truck/SUV market waiting to be developed.

Electric vehicle technology needs to continue increasing range and reducing charging time. Tesla has additional plans to build green supercharging stations across the United States and some in Canada. With enough charging stations, electric cars could be possible for road trips.

Also, it remains to be seen whether EV sales will take the same market share in Canada as in the United States considering our cold climate is less conducive to EV utilization and GHG emissions are less of a concern for policy

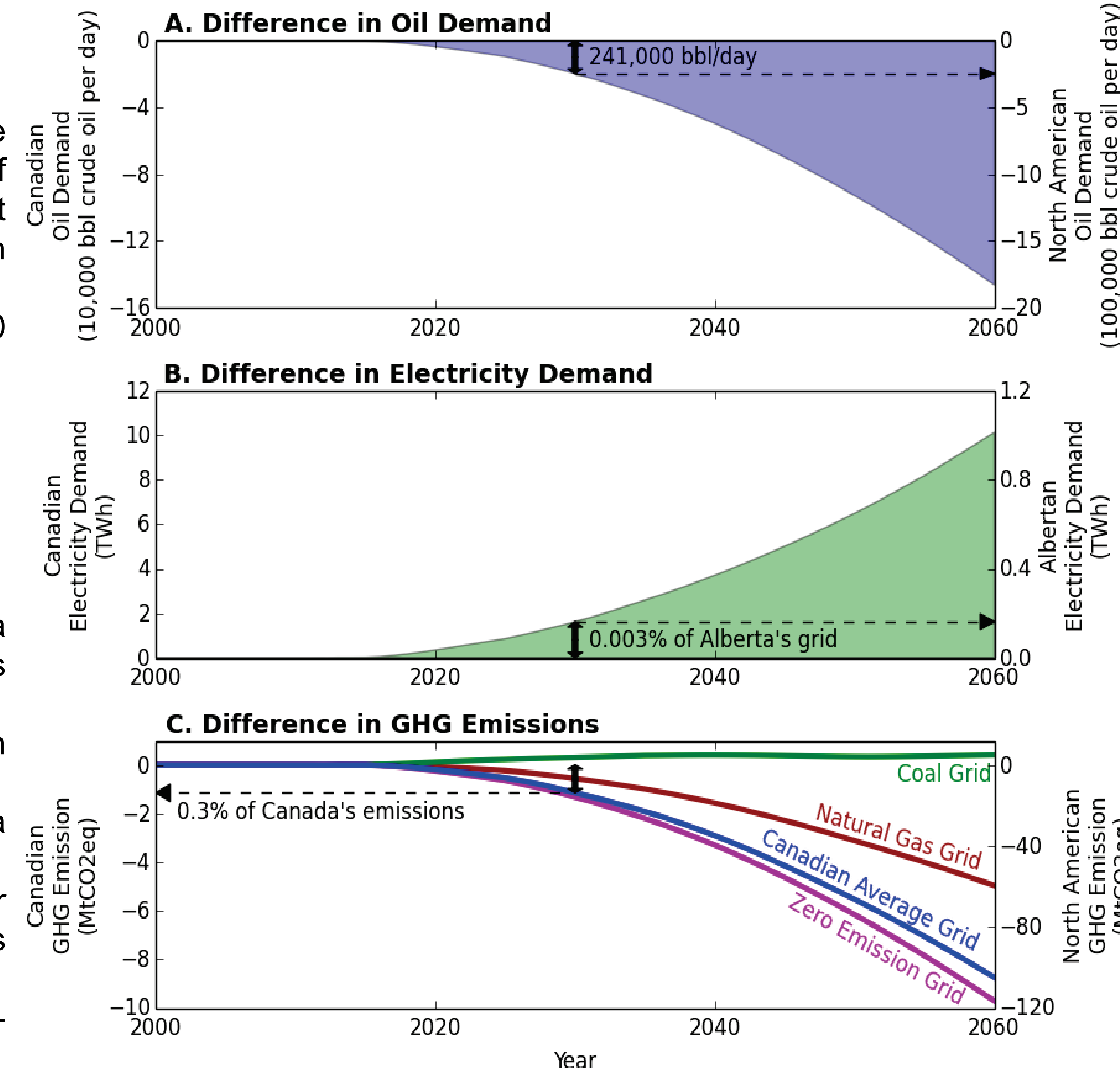


Fig. 3. Difference Between Reference and Tesla Scenario.

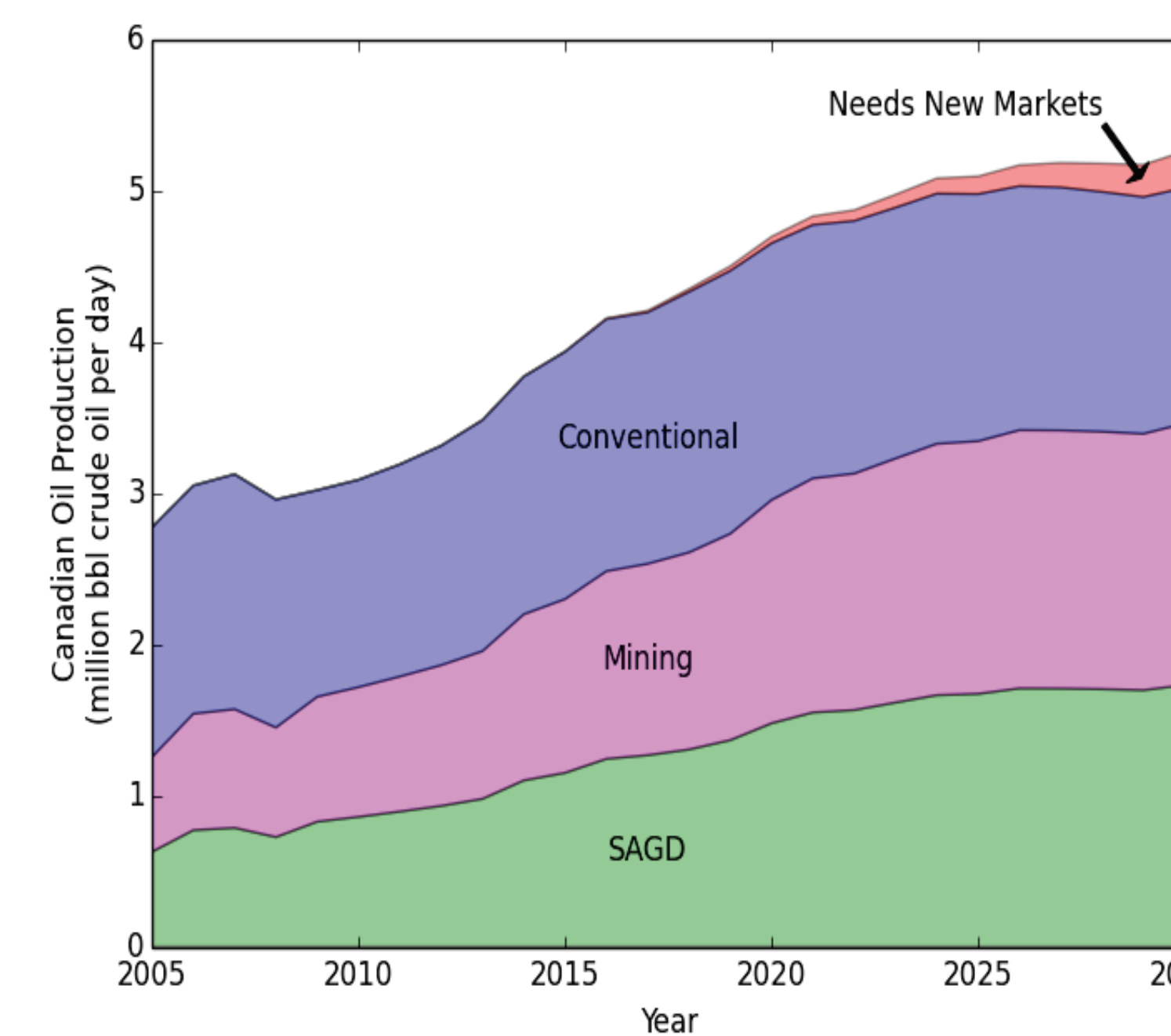


Fig. 4. CAPP Canadian Oil Production Projections.

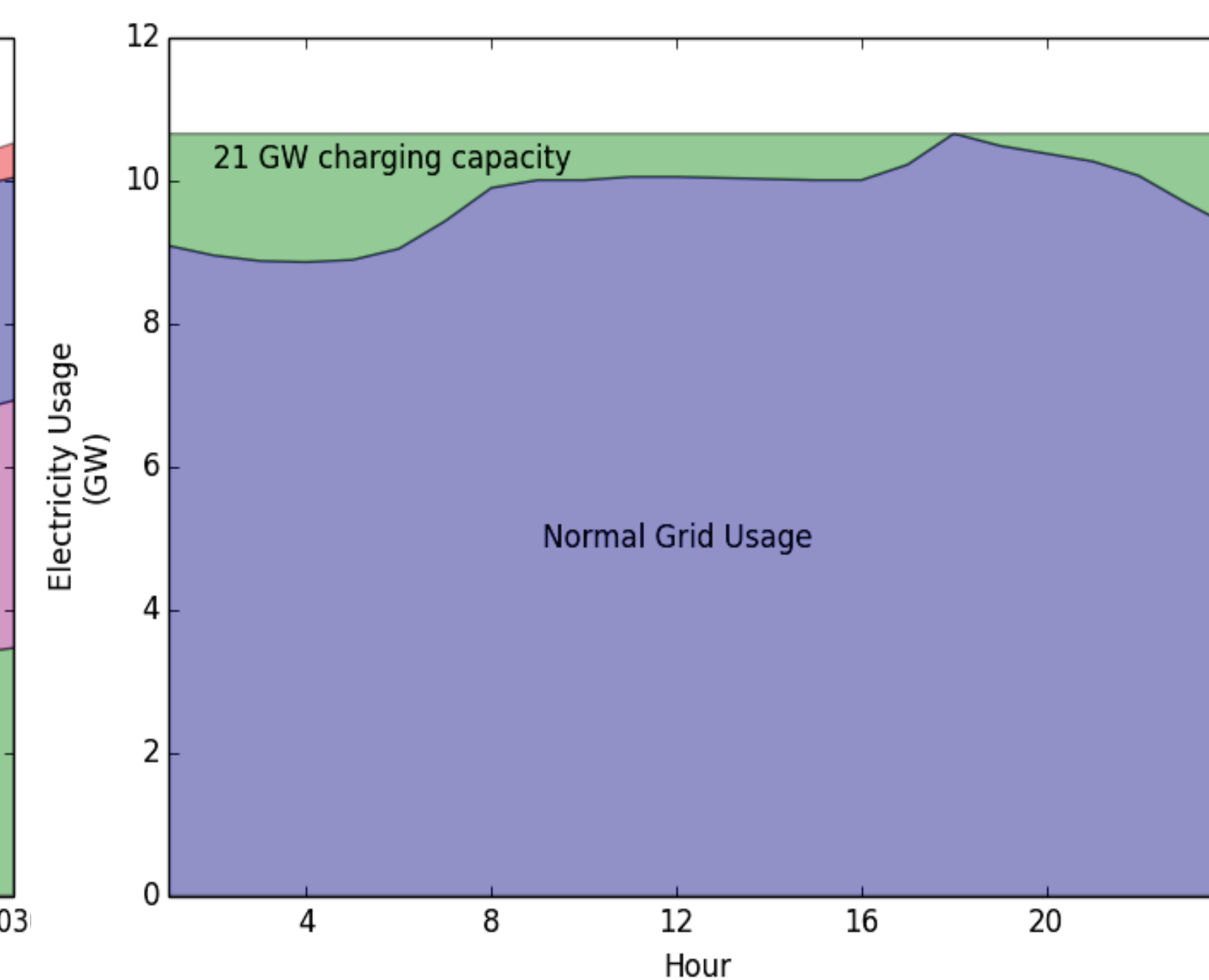


Fig. 5. Alberta Electricity grid charging capacity.

CONCLUSIONS

Tesla's projection for EV sales by 2020 does seem aggressive at first, but is feasible when compared to the introduction rate of minivans. If Tesla's projection holds true, we will not see a huge impact on the Canadian economy in terms of local electricity demand or GHG emissions. However, because Canadian oil production supplies the whole North American market, a decrease in demand for Canadian oil could mean 4% of projected production will need new markets by 2030.

ACKNOWLEDGEMENTS

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