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ParaChoice Heavy-Duty Vehicle Simulation

Abstract

The objective of this project is to improve ParaChoice's Heavy-Duty Vehicle (HDV) model and determine how these improvements affect the market. One of these improvements is natural gas vehicles incentives. Here we incorporate several python modules expanding the HDV simulation and analyze the projections using federal incentives for natural gas vehicles. After implementation, current federal fuel incentives minimally increase the sales amount of natural gas vehicles in the market. Reasonable fuel based incentives do not provide enough impact to change the market for natural gas vehicles.

Introduction

The ParaChoice Heavy-Duty Vehicle (HDV) Simulation determines trends for the trucking industry up to year 2050. These trends include total amount of vehicles of different powertrains, fuel types, incentives, efficiency improvements and infrastructure accessibility. The simulation aids the user in determining what decisions have large impacts on the market. This guides the user on where to focus their efforts. This research examines how the addition of the incentives affect the Heavy-Duty Vehicle market.

Method

It is essential to understand the design of the HDV simulation to determine the best way to include fuel incentives.

- Implement the Federal Excise Tax Credit incentive as a credit to the fuel price of the Natural Gas vehicles in a Python code module.
- Vary the dollar value of the tax credit as well as how many years it is offered to generate several visual aids.
- Compare the fraction of HDV sales by fuel type to understand the incentive's effect on the market.

Results and Discussion

Figures 1 and 2 compare fractional HDV sales with and without the $0.50/gallon natural gas fuel incentive implemented until 2016. Inclusion of this incentive has minimal effects on the HDV market. Figure 3 extends the $0.50/gallon incentive throughout 2050. Similarly, there is only a subtle increase in the sales of liquid natural gas and compressed natural gas vehicles. It is expected when the incentive credit is increased an unreasonable amount we would see a large change in the fractional sales of vehicles. Figure 4 displays the incentive credit being set to $3.00 throughout 2050. Together these simulations demonstrate that in order to influence the market the government would have to excessively credit the vehicle owner to drive a natural gas vehicle. From an economic perspective this is infeasible. Therefore if the government aims to increase the amount of natural gas vehicles it should focus its efforts in other areas.

Fraction of Heavy Duty Vehicle Sales

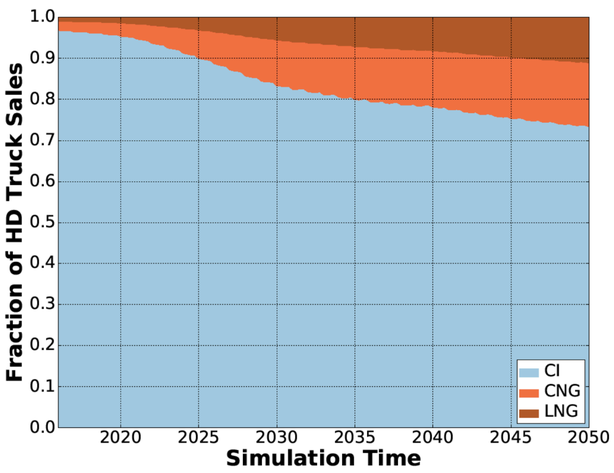

Figure 1: Without NGV Incentive through 2016

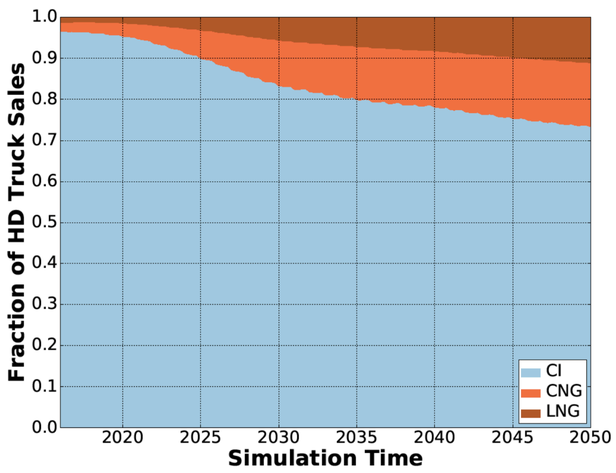

Figure 2: With $0.50 NGV Incentive through 2016

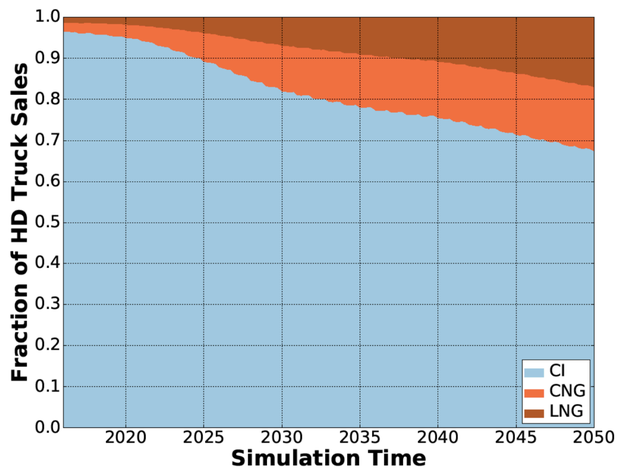

Figure 3: With $0.50 NGV Incentive through 2050

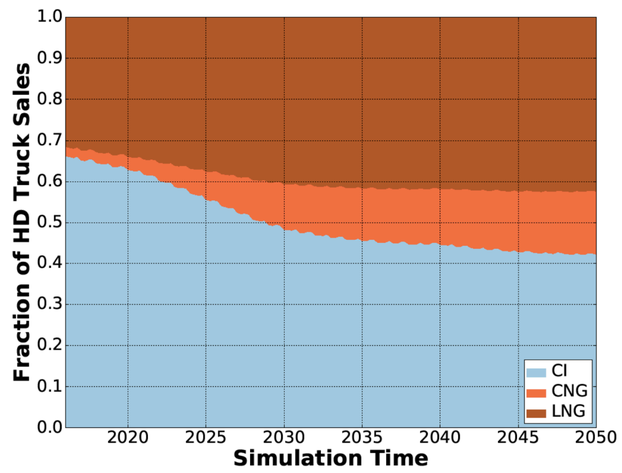

Figure 4: With $3.00 NGV Incentive through 2050

Jereme Barnett-Woods
University of Southern California
Masters Electrical Engineering, est. December 2017
Mentor: Rebecca Levinson, Todd West, 08114, Systems Research & Analysis II

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