Clean & Prosperous Washington
Low Carbon Prosperity Institute

PASSENGER VEHICLES

PROJECT BACKGROUND

Electrification of passenger vehicles, known as light-duty vehicles (LDV), is a key plank of meeting statewide GHG emissions limits. Deep decarbonization modeling scenarios suggest electric LDVs need to be at least 22% of new LDV sales by 2025, 85% by 2030, and 100% by 2035 to reach a total fleet of 1.0 million LDV electric vehicles (EV) by 2030, and 2.3 million by 2035.[4] This market growth for LDVs operates within an evolving landscape that includes increased offerings of electric LDVs, falling battery costs, and shifting incentive programs. Cost-parity in the manufacturing costs of electric LDVs relative to their gasoline competition is currently projected for sometime between 2025 and 2028, although it remains unclear how this will translate to purchase price. Additionally, factors outside of price influence purchase decisions. While many vehicles may rely predominantly on home charging from an existing connection, greatly enhanced public-charging infrastructure will be increasingly necessary to reach all vehicle owners.

PROJECT DESCRIPTION

To estimate lifetime costs and avoided emissions benefits, we developed a modeling tool that extends on a California Air Resources Board (CARB) calculator tool platform. This model provides wide-ranging potential applications to inform vehicle purchase decisions and incentive program design, calculating costs of ownership and air pollution benefits through easily defined use-cases and vehicle characteristics. For this case study, we considered two potential EV models: a new 2022 light-duty truck and a 2024 passenger car. Vehicle-use is assumed to be 12,500 miles annually for 15-years. New vehicle costs are modeled with a 25% down payment and 3-year, 2% financing for the remainder of the costs and no battery replacement over the 15-year vehicle lifetime. We assume that each vehicle requires $2,700 in infrastructure costs to install an at-home Level 2 station. For the SUV/Light Truck, we select an incremental cost for a 2022 model of $13,000 based on a 250-mile range SUV cost premium projected by the ICCT's Figure 4.[5] We select an incremental cost for a 2024 model LDV of $3,500 for the vehicle purchase as generally representative of cost-parity being reached between 2025 and 2028.

CASE STUDY RESULTS

Timeframe
2022 SUV **15 years**
2024 LDV **15 years**

Public Health Benefits
2022 SUV
$11 / tCO_2e emitted
2024 LDV
$13 / tCO_2e emitted

Cumulative Avoided Emissions
2022 SUV **35 tCO_2e**
2024 LDV **30 tCO_2e**

Cumulative Public Health and Climate Benefits, NPV
2022 SUV **$1,500**
2024 LDV **$1,400**

Total Costs, NPV
2022 SUV **$5,900**
2024 LDV **-$2,800**

Abatement Cost, NPV
2022 SUV **$235 / tCO_2e**
2024 LDV **-$130 / tCO_2e**

Potential CFS Credits, NPV
2022 SUV **$5,300**
2024 LDV **$4,600**

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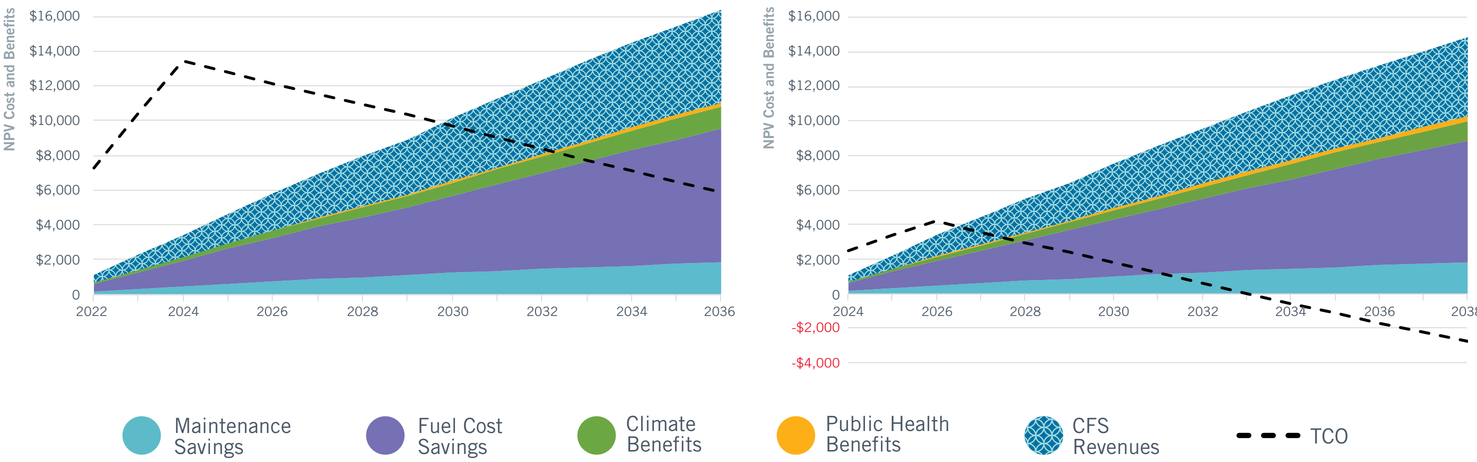
[4] *State Energy Strategy Appendix B: Data Accompanying Deep Modeling Technical Report* t.ly/MAMz

[5] *Nic Lutsey and Michael Nicholas, 2019. Update on electric vehicle costs in the United States through 2030. The International Council on Clean Transportation.* t.ly/eQOU

NET COSTS, SAVINGS, AND VALUE OF BENEFITS OVER THE PROJECT LIFETIME

2022 Light Truck/SUV

2024 Passenger Car/LDV



DISCUSSION

Our selected cost premiums are not necessarily reflective of what purchase costs will be for a given customer at a given point in time and do not assume any financial incentives for purchase. It is likely that a new EV will reach these assumed price premiums and continue to decline before 2030. Because of barriers to accessing capital, even a substantial negative abatement cost can hide the impact of financial assistance on accelerating EV uptake and increasing access to a greater share of the population. In the tables below, we present the TCO perspective over 3- and 5-years for the two vehicle scenarios.

TCO premium for 2022 Light Truck/SUV Electric Vehicle

Timeframe	No CFS Credits	With CFS Credits
3-year net TCO	$13,400	$12,200
5-year net TCO	$12,100	$10,000

TCO premium for 2024 Passenger Car/LDV

Timeframe	No CFS Credits	With CFS Credits
3-year net TCO	$4,200	$3,000
5-year net TCO	$3,000	$1,100

POTENTIAL SCALE AND IMPACT

Scaling electric LDVs to 2.3 million by 2035 has enormous implications for emissions and costs. The majority of these vehicles are anticipated to be purchased after manufacturing price parity is achieved, meaning that abatement costs would be substantially negative (money is saved by reducing emissions) if those manufacturing costs are passed on to consumers. To provide a very general and conservative estimate of potential impact and costs, we assume the average of the two vehicle types assumed in this case study scaled to 2.3 million vehicles, which would lead to 75 million tCO_2e at $50/$tCO_2e$. The NPV costs of $3.6 billion are similar the $3.3 billion in NPV climate and public health benefits. Initial cost premiums and access to charging present real barriers that must be addressed to reach this level of LDV electrification. This general sale assessment assumes that electric LDVs displace other new vehicles with better fuel economy than a typical car currently on the road. Programs that target early retirement of less fuel efficient cars, a cash-for-clunkers style approach, would be expected to generate greater and more rapid climate and public health benefits.