

#### Section 4: Items Excluded From This Study:

It is important to emphasize that the total subsidy per EV calculated by this study, \$54,778, is actually a conservative estimate given the assumptions made and the items we excluded from this study.

First and foremost are the tax credits, grants, and loans for domestic battery manufacturing, which is by far the most expensive component of an EV. The Inflation Reduction Act (2022, Sec. 13502) provides billions in grants and loans for battery manufacturing and research, plus the aforementioned tax credit that provides \$45 million per gigawatt-hour for battery modules made in the U.S.A. To put that dollar amount in perspective, one battery plant the size of Tesla's Gigafactory, which produces more than 37 gigawatt-hours of batteries annually (The Tesla Team, 2023), could receive nearly \$1.7 billion in federal tax credits every year. That comes out to about \$3,600 for an average EV battery. State and local subsidies are also significant. Tesla received \$1.3 billion from the state of Nevada for its Gigafactory outside of Reno (Whaley, 2014), and Ford may receive up to \$1 billion in state and local incentives to build an EV battery factory in south-central Michigan (Eggert, 2023).

This analysis also does not include battery replacement or disposal costs. The typical EV battery is only warranted for 8 years (Fischer, 2022), yet Burnham et al. (2021, p. 34) assume no replacement or repair costs over 15 years. An EV battery can cost up to \$20,000 to replace (Recurrent, 2023), so whether that cost is incurred during the 15-year window of this lifecycle cost analysis is a significant unknown variable. Because most EVs are relatively young, it is not yet known how long the average EV battery will last and whether it makes more sense to replace it or to scrap the whole vehicle. For the same reason, the disposal and recy-

cling costs of EV batteries, and who will pay those costs, are not yet well-known.

Recent data suggest that the EV scrappage rate is substantially higher than that of gasoline vehicles. S&P determined that despite EVs having an average age of 3.6 years and gasoline vehicles having an average age of 12.5 years, during “the 10-year period from 2013-2022, 6.6% of BEVs in operation were pulled out of commission. During the same period, just 5.2% of combustion vehicles left the fleet” (Leinert, 2023, para. 7). Therefore, the EV scrappage rate is already higher than that of gasoline vehicles and is likely going to increase in future years as the average age of the EV fleet increases. Of course, a higher EV scrappage rate and, in turn, fewer miles traveled compared to gasoline vehicles should also be accounted for in any cost-benefit analysis.

Other issues excluded from this analysis include:

- Billions of dollars in taxpayer-funded subsidies for electric buses, trucks, and truck stops, plus the addition of charging infrastructure at public facilities such as ports and airports.
- Billions in state and city taxpayer-funded subsidies other than state buyer credits.
- Credits from California’s low-carbon fuel standard, which is a cross-subsidy from gasoline buyers to subsidize EVs in California.
- The unaccounted cost of EVs in terms of additional emissions from power plants, and the embedded environmental costs of the EV supply chain.
- The cost of allowing EVs to use managed lanes, such as high-occupancy vehicle lanes, and the cost of parking spaces given to EVs and EV charging stations.
- The cost to consumers of additional time spent charging EVs relative to fueling gasoline/diesel vehi-

cles.

- Disproportionately high road damage from heavier EVs compared to gasoline/diesel vehicles.
- Disproportionately high EV recall costs compared to gasoline/diesel vehicles, which are socialized to buyers of gasoline and diesel vehicles from the company initiating the recall.
- Building construction costs as some municipalities are beginning to require “EV-ready” construction in new homes and buildings.