



Electric Vehicle Ownership Costs: Chapter 2—Maintenance

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This is a chapter from an upcoming analysis from Consumer Reports on the ownership costs of electric vehicles. The full report is due for release in the coming weeks.

Introduction

Electric vehicles (EVs) are generally expected to cost less to maintain because their electric motors and other drivetrain components have fewer moving parts than internal combustion engines, and they don't require fluid changes.¹ However, because EVs are relatively new, little hard data are available to put numbers to these claims, and most estimates in the literature are based on predicted repair and maintenance costs.² However, each year CR surveys hundreds of thousands of our members about the reliability and maintenance costs of their vehicles. In recent years this survey sample has included more and more electric vehicles, including thousands of both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). This data was analyzed to estimate average real-world repair and maintenance costs for BEVs, PHEVs, and internal combustion engine (ICE) vehicles.

Key Findings

- Analysis of real-world maintenance and repair cost data from thousands of CR members shows that BEV and PHEV owners are paying half as much as ICE owners are paying to repair and maintain their vehicles.

Approach

Data for this analysis came from Consumer Reports' 2019 and 2020 spring reliability surveys.³ This comprehensive survey is sent to hundreds of thousands of CR members and is used as the basis for CR's reliability ratings. Among many other questions, individual drivers are asked to estimate how much they spent on repairing and maintaining their vehicle over the past 12 months, as well as how many miles they drove in the past 12 months, and how many total miles their vehicle has on it.

The data were filtered to remove:

- Incomplete responses.
- Vehicles that reported traveling less than 2,000 miles in the past 12 months.
- Vehicles that reported traveling more than 60,000 miles in the past 12 months.
- Vehicles that reported maintenance costs of over \$20,000 over the past 12 months.
- Vehicles with more than 200,000 total miles.

These filters on the data were used to eliminate outliers and keep the sample within the range of reasonably likely consumer experience while retaining as much of the original data set as possible. While 60,000 miles is a lot of driving for one year, it's within the range of possibilities for, for example, a salesman with a large territory, or someone who drives full-time for a

¹ <https://www.consumerreports.org/hybrids-evs/your-ev-questions-answered-electric-vehicle-faq/#reliable>

² https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf

³ <https://www.consumerreports.org/car-reliability-owner-satisfaction/consumer-reports-car-reliability-faq/>

ride-hailing company, such as Uber or Lyft. Similarly \$20,000 is a lot to spend on vehicle repairs but may represent the cost of major repairs on a luxury vehicle.

The final data set was then sorted by total vehicle mileage. Average maintenance costs were estimated in three mileage bins: 0 to 50,000 miles, 50,000 to 100,000 miles, and 100,000 to 200,000 miles. For each bin, a vehicle-miles-traveled (VMT) weighted average repair and maintenance cost per mile was calculated. To account for any bias in the data based on the brands of vehicles purchased by CR members, for ICE vehicles the estimates were reweighted based on calculated average maintenance costs for each automaker and the average market share over the past five years for each brand, using data from auto industry analyst Wards Intelligence.⁴ The sample size for PHEVs and BEVs was not large enough to do a similar automaker weighted average calculation, but for ICE vehicles the difference between the automaker weighting and the total average sample for each mileage bin was negligible.

Detailed Findings

The results of the analysis are shown in Table 2.1, binned by mileage range and averaged over a 200,000-mile vehicle lifetime. Notable results are that estimated lifetime average repair and maintenance costs for BEVs and PHEVs are approximately half the cost for ICE vehicles. This is generally consistent with other sources that have estimated the relative repair and maintenance costs of EVs at 40 percent⁵ and 47 percent.⁶

The data show that repair and maintenance costs are slightly higher for PHEVs than for BEVs until the 100,000-mile mark, and slightly lower beyond 100,000 miles. It should be noted, however, that there is a higher degree of uncertainty in these numbers because of a lower sample size: A little over 200 PHEV vehicles with more than 100,000 miles, and only 55 BEVs. Furthermore, the 55 BEVs with more than 100,000 miles were predominantly early versions of the Nissan Leaf and Tesla Model S, suggesting that our projections may overestimate the long-term maintenance costs expected from current-generation BEVs as automakers learn from their early models. These estimates will continue to be refined over the next few years as more data on more electric vehicles at higher mileages become available in Consumer Reports' survey sample..

⁴ Wards Intelligence, U.S. Vehicle Sales by Company, 2015-2019 data series.

<https://wardsintelligence.informa.com/WI060875/US-Vehicle-Sales-by-Company-20152019>.

⁵ <https://neo.ubs.com/shared/d1ZTxnvF2k>.

⁶

https://www.2degreesinstitute.org/reports/comparing_fuel_and_maintenance_costs_of_electric_and_gas_powered_vehicles_in_canada.pdf.

Table 2.1. Estimated Per-Mile Repair and Maintenance Costs by Powertrain

Powertrain Type	0-50K Miles	50K-100K Miles	100K-200K Miles	Lifetime Average
BEV	\$0.012	\$0.028	\$0.043 ⁷	\$0.031
PHEV	\$0.021	\$0.031	\$0.033 ⁵	\$0.030
ICE	\$0.028	\$0.060	\$0.079	\$0.061

The results are put into the context of consumer budgets in Table 2.2, which shows the lifetime repair and maintenance costs for vehicles of the different powertrain types.⁸ They show that BEVs and PHEVs will both cost consumers about \$4,600 less to repair and maintain over their lifetimes, compared with ICE models.

Table 2.2. Lifetime Maintenance Costs by Powertrain

Powertrain Type	Lifetime Maintenance and Repair Cost	Lifetime Savings vs. ICE
ICE	\$9,200	
BEV	\$4,600	\$4,600
PHEV	\$4,600	\$4,600

⁷ Lower confidence in this value because of the small sample size.

⁸ Present value savings at 3 percent discount rate in \$2019 over a 200,000-mile lifetime.